Biological Assessment for Threatened, Endangered, and Proposed Species

Revised Forest Plan for the Flathead National Forest

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List of Terms and Abbreviations

Terms	Additional information/full name
amendment forests	Collective term for the Helena-Lewis & Clark, Kootenai, and Lolo National Forests
the Forest	Flathead National Forest
the Service	U.S. Fish and Wildlife Service
assessment	Assessment of the Flathead National Forest
forest plan	Flathead National Forest Revised Land Management Plan
1986 forest plan	Flathead National Forest Land and Resource Management Plan (1986)
2012 planning rule	National Forest System land management planning rule (effective 2012)

Abbreviation	Description
BA	biological assessment
BO	biological opinion
CFR	Code of Federal Regulations
d.b.h.	diameter at breast height
DC	desired condition (forest plan component)
DCA	demographic connectivity area
EIS	environmental impact statement
ESA	Endangered Species Act
FW	forestwide (forest plan component)
GA	geographic area
GBCS	Grizzly Bear Conservation Strategy
GDL	Guideline (forest plan component)
GIS	geographic information system
INFISH	Inland Native Fish Strategy
MA	management area
mi	mile
mmbf	million board feet
mmcf	million cubic feet
MFWP	Montana Fish Wildlife and Parks
NCDE	Northern Continental Divide Ecosystem
NEPA	National Environmental Policy Act
NFS	National Forest System
NRLMD	Northern Rockies Lynx Management Direction
PACFISH	Pacific Fish Strategy
PCA	primary conservation area
PIBO	PACFISH/INFISH Biological Opinion
STD	standard (forest plan component)
TMDL	total maximum daily load
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

Federally Designated Species and Designated Critical Habitat

In accordance with section 7(c) of the Act, the U.S. Fish and Wildlife Service has determined that the following federally designated species may be present on the Flathead National Forest (table 1) (08/04/2017):

Table 1. Federally designated species on the Flathead National Forest.

Common Name	Scientific Name	Status[1]	Range – Montana
Bull Trout	*Salvelinus confluentus*	Threatened; Critical Habitat	Clark Fork, Flathead, Kootenai, St Mary, and Belly river basins; cold water rivers and lakes
Grizzly Bear	*Ursus arctos horribilis*	Threatened	Resident, transient; Alpine/subalpine coniferous forest
Canada Lynx	*Lynx canadensis*	Threatened; Critical Habitat	Resident; western Montana – montane spruce/fir forests
Spalding's Campion (or "catchfly")	*Silene spaldingii*	Threatened	Upper Flathead River Fisher River drainages; Tobacco Valley – open grasslands with rough fescue or bluebunch wheatgrass
Water Howellia	*Howellia aquatilis*	Threatened	Wetlands; Swan Valley, Lake, and Missoula Counties
Wolverine	*Gulo luscus*	Proposed	High elevation alpine and boreal forests that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season
Meltwater Lednian Stonefly	*Lednia tumana*	Proposed	High-elevation meltwater glacial areas; Glacier National Park
Whitebark Pine	*Pinus albicaulis*	Candidate	Forested areas in central and western Montana in high-elevation, upper montane habitat near treeline

1. **Endangered** - Any species that is in danger of extinction throughout all or a significant portion of its range.
Threatened - Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
Candidate - Those taxa for which the Service has sufficient information on biological status and threats to propose to designate them as threatened or endangered. We encourage their consideration in environmental planning and partnerships, however, none of the substantive or procedural provisions of the Act apply to candidate species.
Critical Habitat - The specific area (i) within the geographic area occupied by a listed species, at the time it is listed, on which are found those physical or biological features (I) essential to conserve the species and (ii) that may require special management considerations or protection: and (iii) specific areas outside the geographic area occupied by the species at the time it is listed upon determination that such areas are essential to conserve the species.
Proposed - Once a species is proposed, a year-long review period commences at the end of which the Service will make a final listing determination. ESA regulation 50 C.F.R. 402.10(a) states: "Each Federal Agency shall confer with the Secretary on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed." Conferencing is not required for anything less than a jeopardy call, but conferencing or concurrence may be requested by the action agency.

Summary of Findings

Section 7 consultation does not include candidate species. The determinations for proposed species, threatened species, and designated critical habitat are summarized below.

Terrestrial Wildlife Species

The proposed framework programmatic action *may affect, is likely to adversely affect* Canada lynx and designated Canada lynx critical habitat. The proposed framework programmatic action *may affect, is likely to adversely affect* grizzly bear. The proposed framework programmatic action *may affect, is not likely to jeopardize* the wolverine.

Aquatic Species

The proposed framework programmatic action *may affect, is likely to adversely affect* bull trout and designated bull trout critical habitat. The proposed framework programmatic action will have *no effect* on meltwater stonefly.

Plant Species

The proposed framework programmatic action *may affect, is not likely to adversely affect* water howellia. The proposed framework programmatic action will have *no effect* on Spalding's catchfly.

Introduction

This programmatic biological assessment addresses the effects of implementing the revised Land and Resource Management Plan (hereinafter referred to as the "revised forest plan") on all threatened, endangered, and proposed species known or suspected to occur on the Flathead National Forest. For ease of discussion throughout this document, the Flathead National Forest will be referred to as "the Forest" when referencing the single administrative unit, the staff that administers the unit, or the National Forest System (NFS) lands within the unit.

Threatened, endangered, and proposed species are managed by the U.S. Fish and Wildlife Service under the authority of the Endangered Species Act (PL 93-205, as amended) and by the U.S. Forest Service under the authority of the National Forest Management Act (PL 94-588). Section 7(a)(1) of the Endangered Species Act (ESA) of 1973 directs all Federal agencies to "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act." Section 7(a)(2) of the ESA requires federal agencies to ensure that any actions authorized, funded, or carried out by the agency are not likely to jeopardize the continued existence of any threatened, endangered, or proposed species or adversely modify it's critical habitat.

A biological assessment (BA) must be prepared for federal actions (defined under NEPA as a project significantly affecting the quality of the human environment) to evaluate the potential effects of the proposal on listed or proposed species (50 CFR 402.12(b)). The contents of the BA are at the discretion of the federal agency and will depend on the nature of the federal action (50 CFR 402.12(f)). The Forest Service also has direction in Forest Service Manual 2670 that guides habitat management for threatened, endangered, and proposed species. This document satisfies those requirements. Additional consultation occurs as site-specific projects are implemented under the programmatic framework provided by the national forest plans.

Purpose and Need

The purpose of the proposed federal action (preferred alternative B-modified) is to revise the Flathead National Forest Land and Resource Management Plan (1986, as amended; hereinafter referred to as the "1986 forest plan"). The revised forest plan provides direction for the management of the Forest by guiding programs, practices, uses, and projects.

In May 2012, the Department of Agriculture began using new planning regulations, commonly called the 2012 planning rule, to guide collaborative and science-based revision of forest plans. The purpose of the revised forest plan is to provide an integrated set of plan direction (or plan components) in accordance with the 2012 planning rule.

The revised forest plan provides guidance for project and activity-level decision making on the Forest for the next 15 years, approximately. This guidance includes:

1. Forestwide components to provide for integrated social, economic, and ecological sustainability, and ecosystem integrity and diversity, while providing for ecosystem services and multiple uses. Components must be within Forest Service authority and consistent with the inherent capability of the plan area (36 Code of Federal Regulations (CFR) 219.7 and CFR 219.8–219.10).

2. Recommendations to Congress (if any) for lands suitable for inclusion in the National Wilderness Preservation System and/or rivers eligible for inclusion in the National Wild and Scenic Rivers System (36 CFR 219.7(2)(v) and (vi)).

3. The plan area's distinctive roles and contributions within the broader landscape.

4. Identification or recommendation (if any) of other designated areas (36 CFR 219.7 (c)(2)(vii).

5. Identification of suitability of areas for the appropriate integration of resource management and uses, including lands suited and not suited for timber production (36 CFR 219.7(c)(2)(vii) and 219.11).

6. Identification of the maximum quantity of timber that may be removed from the plan area (36 CFR 219.7 and 219.11 (d)(6)).

7. Identification of geographic area- or management area-specific plan components (36 CFR 219.7 (c)(3)(d).

8. Identification of watersheds that are a priority for maintenance or restoration (36 CFR 219.7 (c)(3)(e)(3)(f).

9. Plan monitoring program (36 CFR 219.7 (c)(2)(x) and 219.12.

The revised forest plan would guide natural resource management activities on the Forest and address changed conditions and direction that have occurred since the 1986 forest plan was prepared and amended while meeting the objectives of federal law, regulation, and policy. It is important to note that the revised forest plan does not authorize site-specific prohibitions or activities; rather, it establishes broad direction, similar to zoning in a community. Project or activity decisions will be made following appropriate procedures. For example, site-specific analysis in compliance with the National Environmental Policy Act would need to be conducted in order for prohibitions or activities to take place on the ground that are in compliance with the broader direction of the forest plan. The revised forest plan is expected to provide guidance for project- and activity-level decision making on the Forest for approximately the next 15 years.

In addition, there is a need to incorporate habitat-related direction from the Northern Continental Divide Ecosystem (NCDE) Grizzly Bear Conservation Strategy into multiple forest plans so that the USFS will be able to demonstrate to the U.S. Fish and Wildlife Service (hereinafter referred to as "the Service" or USFWS) that adequate regulatory mechanisms exist in the forest plans to support a delisted grizzly bear population. In 2013, the Service announced the availability of a draft Grizzly Bear Conservation Strategy (hereinafter referred to as the GBCS) for the NCDE grizzly bear population for public review and input. The NCDE conservation strategy contains habitat-related management direction that pertains to the portions of national forests that are within the NCDE, including the Flathead, Kootenai, Helena-Lewis and Clark, and Lolo National Forests. Habitat conditions and management on the Flathead, Kootenai, Helena-Lewis and Clark, and Lolo National Forests have contributed importantly to the increased population size and improved status of the grizzly bear across the NCDE. Supporting the continued

recovery of the grizzly bear population will depend on continued, effective management of the NCDE grizzly bear's habitat. The national forests will implement direction related to habitat management on National Forest System (hereinafter referred to as NFS) lands in the NCDE to contribute to sustaining the recovery of the NCDE grizzly bear population. When finalized, the GBCS would become the post-delisting management plan for the NCDE grizzly bears and their habitat.

Forest Plan Direction

The provisions in the 2012 planning rule (USDA, 2012a) were used to develop the revised forest plan. Those expected to be most relevant to this BA include the sections on sustainability and the diversity of plant and animal communities, in that they will influence the planning process and plan content with respect to federally listed species, species proposed for listing, and candidate species; the ecosystems upon which they depend; and furtherance of ESA goals.

Within the requirements set forth in the 2012 planning rule, land management plans provide a programmatic framework and the sideboards to guide decisions for all natural resource management activities on their respective NFS units. Plans include plan components (desired conditions, objectives, standards, guidelines, and suitability of areas) that influence the design and choice of future proposals for projects and activities in a plan area, and also include monitoring items. They provide additional definition of resource management activities needed to implement and achieve desired conditions and objectives and, through suitability determinations, standards, and guidelines, they establish constraints upon the decision space for on-the-ground management decisions.

The forest plan provides the framework and text guiding day-to-day resource management. It is strategic and programmatic and does not provide project-level decisions or result in irreversible or irretrievable commitments of resources.

The purpose of the revised forest plan is to guide management toward the attainment of long-term desired conditions. Given the multiple resource nature of land management, the many types of projects, and the various activities that can occur over the life of the revised forest plan, it is not likely that a project or activity would maintain or contribute to the attainment of all desired conditions. Additionally, not all desired conditions are relevant to every activity (e.g., recreation desired conditions may not be relevant to a fuels treatment project). Most projects and activities are developed specifically to maintain or move conditions toward one or more of the desired conditions of the revised forest plan. It should not be expected that each project or activity would contribute to all desired conditions in a plan; usually it would contribute to one or a subset.

Plan components

Plan components guide future projects and activities and the plan monitoring program. Plan components are not commitments or final decisions approving projects or activities. Some plan components have also been designed to address drivers and stressors of ecosystems.

Desired conditions, objectives, standards, guidelines, suitability, and monitoring questions and monitoring indicators have been given alpha-numeric identifiers for ease in referencing within the forest plan. The identifiers include:

- the level of direction (e.g., forestwide = FW, management area = MA, or geographic area = GA; note that with management area or geographic area direction, the management area number and the geographic area acronym are also included);

- the type of direction (where DC = desired condition, OBJ = objective, STD = standard, GDL = guideline, SUIT = suitability, MON = monitoring question, IND = monitoring indicator);
- the resource (for forestwide direction), e.g., WTR = watersheds and TE&V = terrestrial ecosystems and vegetation; and
- a unique number (i.e., numerical order starting with "01").

Thus, forestwide direction for desired conditions associated with watersheds would be identified starting with FW-DC-WTR-01; management area direction for desired conditions in management area 2b would be identified starting with MA-2b-DC-01, and desired conditions for the Hungry Horse geographic area would be identified starting with GA-HH-DC-01. The identifiers are included as part of the headings in chapters 2 through 4, with the unique number preceding each plan component.

If the component is based upon the Grizzly Bear Conservation Strategy (GBCS), then it will reference the Northern Continental Divide Ecosystem (NCDE) and the management zone to which it applies: recovery zone/primary conservation area, zone 1, and/or demographic connectivity area (e.g., within the NCDE primary conservation area).

Following are the definitions and, where necessary, a description of the context of the required plan components (36 CFR 219.7(e)).

Management, geographic, and designated areas

Every plan must have management areas or geographic areas or both. The plan may identify designated or recommended designated areas as management areas or geographic areas (36 CFR 219.7(d)). These areas are assigned sets of plan components such as desired conditions, suitable uses, and in some areas either standards or guidelines or both. Geographic area desired conditions describe what we want to achieve in specific geographic areas that are not necessarily covered by forestwide desired conditions. Although all resources have been considered, the only desired conditions specified for a geographic area are those that are not adequately addressed by forestwide desired conditions.

Designated areas or features are identified and managed to maintain their unique special character or purpose. Some categories of designated areas may be designated only by statute and some categories may be established administratively in the land management planning process or by other administrative processes of the Federal executive branch. Examples of statutorily designated areas are national heritage areas, national recreational areas, national scenic trails, inventoried roadless areas, wild and scenic rivers, wilderness areas, and wilderness study areas. Examples of administratively designated areas are experimental forests, research natural areas, scenic byways, botanical areas, and significant caves (36 CFR 219.19).

Desired conditions

A desired condition is a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be described in terms that are specific enough to allow progress toward their achievement to be determined but must not include completion dates (36 CFR 219.7(e)(1)(i)).

Desired conditions are not commitments or final decisions approving projects and activities. The desired condition for some resources may currently exist, but for other resources they may only be achievable over a long time period.

This plan presents three types of desired conditions, as follows:

- Forestwide desired conditions apply across the landscape but may be applicable to specific areas as designated on a map.
- Management area desired conditions are indications of what future conditions would typically be desired. They help clarify the general suitability of various parts of the Forest for different activities and management practices. These desired conditions help us clarify what outcomes might be expected in land areas with different general suitability descriptions.
- Geographic area desired conditions are specific to an area or place, such as a river basin or valley, and reflect community values and local conditions within the area. They do not substitute for or repeat forestwide desired conditions. These desired conditions allow us to focus on specific circumstances in specific geographic locations. The Forest is divided into six geographic areas (see Figure B-1).

Objectives

An objective is a concise, measurable, and time-specific statement of a desired rate of progress toward a desired condition or conditions. Objectives should be based on reasonably foreseeable budgets (36 CFR 219.7(e)(1)(ii)). Objectives describe the focus of management in the plan area within the plan period. **Objectives will occur over the life of the forest plan, considered to be over the first 15 years of plan implementation, unless otherwise specified.** Objectives can be forestwide or specific to management areas or geographic areas. Refer also to appendix C: Potential Management Approaches and Possible Actions for possible strategies to achieve certain objectives.

It is important to recognize that objectives were developed considering historic and expected budget allocations as well as professional experience with implementing various resource programs and activities. It is possible that objectives could either exceed or not meet a target based upon a number of factors, including budget and staffing increases/decreases, increased/decreased planning efficiencies, and unanticipated resource constraints.

Standards

A standard is a mandatory constraint on project and activity decision-making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iii)). Standards can be developed for forestwide application or be specific to a management area or geographic area.

Guidelines

A guideline is a constraint on project and activity decision-making that allows for departure from its terms, so long as the purpose of the guideline is met. Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iv)). A guideline can be forestwide or specific to a management area or a geographic area.

Suitability of lands

Specific lands within the Forest are identified as suitable for various multiple uses or activities based on the desired conditions applicable to those lands. The plan identifies lands within the Forest as not suitable for uses that are not compatible with desired conditions for those lands. The suitability of lands are not identified for every use or activity following guidance provided at 36 CFR 219.7 (e)(1)(v)).

The identification of suitability of lands for a particular use in the forest plan indicates that the use may be appropriate but does not make a specific commitment to authorize that use. If certain lands are identified

as not suitable for a use, then that use or activity may not be authorized. Prohibiting an existing or authorizing a new use requires subsequent, site-specific NEPA analysis. Generally, the lands on the Forest are suitable for uses and management activities appropriate for national forests, such as outdoor recreation or timber, unless identified as not suitable. For suitability determinations, refer to chapters 2 and 3.

Monitoring program

The monitoring program is designed to test assumptions used in developing plan components and to evaluate relevant changes and management effectiveness of the plan components. Typically, monitoring questions seek additional information to increase knowledge and understanding of changing conditions, uncertainties, and risks identified in the best available scientific information as part of an adaptive management framework. The best available scientific information can identify indicators that address associated monitoring questions. The best available scientific information is also important in the further development of the monitoring program as it may help identify protocols and specific methods for the collection and evaluation of monitoring information (from Forest Service Handbook 1909.12 07.11). See chapter 5 of the revised forest plan for the monitoring program and additional information about adaptive management.

Other required plan content

In addition to requiring that a plan have components, the 2012 planning rule requires that a plan have "other required content" (36 CFR 219.7(f)(1)) addressing priority watersheds, the distinctive roles and contributions of the plan area, a plan monitoring program, and proposed and possible actions.

Proposed Action

The Flathead National Forest proposes to revise its Land and Resource Management Plan. The revised forest plan proposes to designate seven different management area categories across the Forest (see table 2 and table 3). In general, the areas can be described as: areas with wilderness characteristics (management area 1); wild and scenic rivers (management area 2); special areas, e.g., areas with botanical interest (management area 3); research natural areas and experimental forests (management area 4); backcountry areas (management area 5); general forest areas (management area 6); and focused recreation areas (management area 7). Allocation to any specific management area is not intended to mandate or direct the agency to propose or implement any site-specific action and but allows for an array of different uses.

The revised forest plan was also developed to supplement or replace parts of the existing forest plan that were determined to be outdated, ineffective, or absent. Many components of the existing plan are effective at directing management and providing protection for natural resources and were subsequently retained through the revision process, in part or in whole. See the "plan element summary" section of this document for more details.

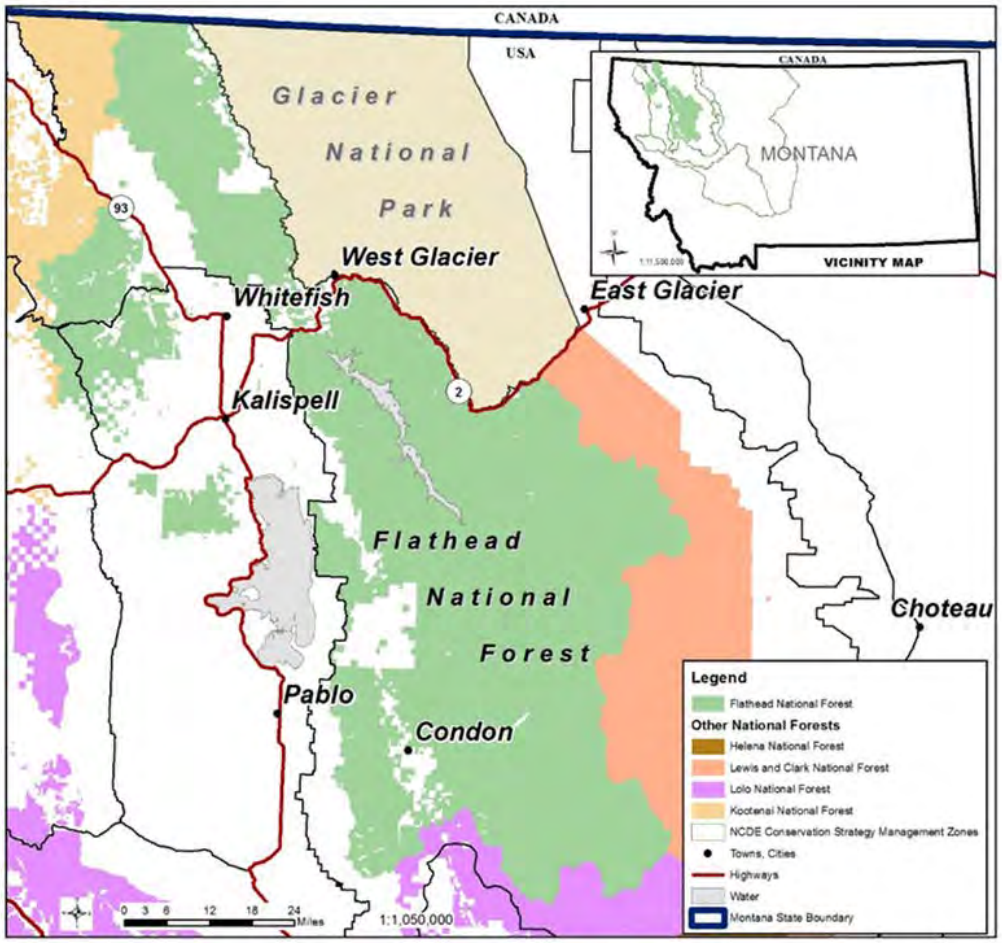


Figure 1. Flathead National Forest and vicinity

Action Area

The Flathead National Forest (figure 1) is at the heart of the northern Rocky Mountain ecosystem and is encircled by the Kootenai, Helena-Lewis and Clark, and Lolo National Forests; Glacier National Park; and Canada. Large designated wilderness areas, such as the Bob Marshall Wilderness Complex and the Mission Mountains Wilderness, in concert with other special areas such as wild and scenic river systems, the Jewel Basin Hiking Area, other undeveloped backcountry areas, lands managed for production of timber, and lands interspersed with private development provide habitat for diverse plant and animal species. Under the proposed action, the analysis area for an individual species may be larger area than the Flathead National Forest, as described in the individual species sections.

Programmatic Decision

The revised forest plan is programmatic in scope. It provides the framework for future site-specific actions that are subject to section 7 consultation but does not authorize, fund, or carry out future site-specific actions. Future project-level activities must be consistent with the direction in the revised forest plan and must undergo their own National Environmental Policy Act (NEPA) planning and decision-making procedures, including the appropriate Endangered Species Act (ESA) section 7 consultation. The management direction contained in the revised forest plan will go into effect once the final record of

decision is signed by the Forest Supervisor. Project-level environmental analysis will still need to be completed for proposals that would implement the direction in the forest plan.

Consultation History

Because the scope of the revised forest plan is much broader than that for the forest plan amendments, two separate biological assessments are being prepared concurrently, one for the Flathead National Forest's revised forest plan and one for the amendments of the other NCDE national forests. The record of consultation for the revised forest plan is found in appendix A. The following is a synopsis of key ESA Section 7 consultations completed on the current forest plan, as amended.

The Flathead National Forest Plan was approved in 1986, after receiving a May 15, 1985, biological opinion (BO) that implementation of the Forest Plan would not be likely to jeopardize the continued existence of threatened and endangered species, including the NCDE grizzly bear population. In 1989, the Service amended the BO to include an incidental take statement, in conformance with changes to 50 CFR part 402. On February 17, 1995, the Service issued a final BO on Amendment 19 of the forest plan with an incidental take statement regarding access management and grizzly bears. Subsequently, an access management strategy was developed specifically for intermingled lands in the Swan Valley managed by the Flathead National Forest, Montana Department of Natural Resources and Conservation, and Plum Creek Timber Company (Plum Creek et al., 1997). The Service issued a BO and incidental take statement for this strategy, known as the Swan Valley Grizzly Bear Conservation Agreement, on December 4, 1995 (USFWS, 1995c).

The Forest reinitiated consultation on the A19 implementation schedule in 2004 (S. Anderson, 2005; USDA, 2004b). On October 25, 2005, the Service issued a biological opinion (BO) on the effects of the revised implementation schedule for Flathead National Forest Plan amendment 19 on grizzly bears (hereafter "A19") (USDA, 1994, 1995a, 1995b; USFWS, 1995b, 1995d). The 2005 consultation examined projections of the period through the end of 2009 and the access improvements to be accomplished during that period, as well as additional access changes per recent project decisions through 2011, and analyzed the effects on grizzly bears (USFWS, 2005a). The Service anticipated that additional formal consultation would be required at that time to address the outstanding access changes required by A19.

In March of 2006, the Service issued a BO on Amendment 24 of the Forest Plan with an incidental take statement regarding winter (over-snow) motorized access management (USDA, 2004a; USDC-Missoula, 2010; USFWS, 2006b). On May 28, 2008, the District Court issued an order (CV 06-73-M-DWM) setting aside the biological opinion on A24. In December 2008, the Service issued a final biological opinion on the proposed Winter Motorized Recreation Forest Plan Amendment for the Flathead National Forest (hereafter "A24").

On June 2, 2006, the Service issued a BO and incidental take statement regarding the effects of the continued implementation of the Flathead National forest plan on federally listed species, including grizzly bears. The 2006 BO focused on the effects of forest plan direction related to access management, sanitation/food storage and livestock grazing on grizzly bears occurring on the Forest outside the recovery zone, as well as the effects of forest plan direction related to sanitation/food storage and livestock grazing on grizzly bears occurring on the Forest within the recovery zone.

The Forest reinitiated consultation on the A19 implementation schedule in 2009 (S. Anderson, 2009). On May 15, 2012, the Service issued an updated amended incidental take statement for grizzly bears based on updated information on the environmental baseline provided by the Flathead National Forest. The Service concluded that continued implementation of the forest plan is not likely to jeopardize the continued

existence of the grizzly bear. The Service based this conclusion on the information presented in the 2005 BA (A. Jacobs, 2005), the 2006 BO (USFWS, 2006a), the new information on the status of the species, and the new information received from the Forest in 2011 updating the environmental baseline (USDA, 2011b).

On January 31, 2014, the Service issued a BO on the effects of the revised implementation schedule for Flathead National Forest Plan Amendment 19 on grizzly bears (USFWS, 2014c). In this most recent biological opinion, the Service acknowledged that by 2018, all access changes required by A19 would not likely be met. The Service anticipated that additional Section 7 consultation would occur by 2018 to address a proposed action for revision of the Forest Plan, and their biological opinion provided for incidental take until the Forest consulted on a revised forest plan or until 2018, whichever came first. A revised forest plan would replace the current plan (as amended) and guide all access management on the Forest for as long as the new plan is in effect. All consultations received non-jeopardy opinions from the Service.

With respect to Canada lynx, the Service issued three programmatic BOs following listing: one on the existing national forest land and resource management plans (October 25, 2000), one on Montana ski areas (February 9, 2001), and one on the Northern Rockies lynx amendment of 18 national forest land and resource management plans (March 19, 2007). The Northern Rockies Lynx Management Decision (NRLMD) incorporated management direction that conserves and promotes recovery of Canada lynx, by reducing or eliminating adverse effects from land management activities. The BO and incidental take statement addressing effects to the contiguous U.S. distinct population segment of Canada lynx was issued by the Service on March 19, 2007. All consultations received non-jeopardy opinions from the Service. USFS Region 1 is in the process of consulting on the NRLMD for effects to critical habitat.

With respect to *Howellia aquatilis,* the Service issued a biological opinion on Amendment 20 to the forest plan on February 22, 1996. Amendment 20 ("A20") added objectives and standards to guide management of this plant's habitat, including adoption of the conservation strategy for water howellia (USDA, 1996). The Service concurred with the Forest's determination that the forest plan, as amended by A20, was not likely to adversely affect and was not likely to jeopardize the continued existence of water howellia on the Flathead National Forest and would promote the conservation of the species.

With respect to bull trout, the 1986 forest plan was amended by INFISH in 1995 and a biological opinion received by the Service in 1998 for all forests within the range of bull trout. On November 20, 2003, the Forest completed a BA and biological evaluation (BA/BE) for aquatic species associated with the A19 Revised Implementation Schedule. The forest determined the Revised Implementation Schedule would have "no effect" on Endangered Species Act-listed aquatic species or their habitats. The BA and "no effect" determination were challenged in Federal Court by environmental organizations claiming a violation of provisions of the Endangered Species Act. The Forest requested a remand of its November 20, 2003, BA/BE to reconsider the rationale that led to the 2003 "no effect" determination.

In May 2008, the Forest submitted a BA that re-evaluated the 2003 "no effect" determination for bull trout and further considered results of road and culvert surveys that revealed culvert failures on the existing road network. The Forest stated that although it is difficult to ascertain whether compliance with the original A19 schedule would have prevented such failures, in part because the site-specific roads were not identified in the original schedule, in theory fewer roads and road crossings result in reduced risks and threats to bull trout. In addition, the Forest acknowledged that leaving roads that remain on the landscape without appropriate maintenance can adversely affect bull trout. The 2008 BA had a "May Affect, Likely to Adversely Affect" determination for bull trout. Due to staffing shortages and other priorities, the Service could not complete the formal consultation process within the allotted time frame (due November 9, 2008). The Service informally requested a 90-day extension in an October 30, 2008, letter from the

Service's Montana Field Office Supervisor to the Flathead National Forest Supervisor. The Forest concurred in a letter dated November 13, 2008.

The forest re-evaluated the 2008 BA and re-submitted a BA for the revised implementation schedule of A19 in June 2010 with a "May Affect, Likely to Adversely Affect" determination for bull trout. A BO was received from the Service on November 22, 2010. In the BO, the Service determined that this level of anticipated take is not likely to result in jeopardy to bull trout or destruction or adverse modification of critical habitat.

On October 18, 2010, the Service posted the "Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for Bull Trout in the Coterminous United States: Final Rule" in the *Federal Register* ("Final Rule"). 75 Fed. Reg. 63898 (October 18, 2010). The final rule designated bull trout critical habitat in certain portions of rivers across Montana, Idaho, Nevada, Oregon, and Washington. The forest consulted on and received concurrence for effects of ongoing projects in bull trout critical habitat in 2015.

Description of the Preferred Alternative—B Modified

Alternative B modified has been identified as the preferred alternative for the FEIS. Alternative B modified is the result of public engagement efforts since 2013 and responds to the identified purpose of and need for the revised forest plan. This alternative emphasizes moving towards desired future conditions and contributing to ecological, social, and economic sustainability.

Vegetation management, timber production, and fire and fuels management

Desired conditions for vegetation are based on maintaining and promoting forest conditions that are resilient in the face of potential future disturbances and climate change and that contribute to social and economic sustainability. Under alternative B modified, a variety of vegetation management techniques would be employed, including timber harvesting, planting, thinning, fuel treatments, natural unplanned ignitions, and prescribed burns. The role of fire, both planned and unplanned ignitions, as a tool to achieve desired vegetation and wildlife habitat conditions is articulated in the plan, and direction related to its use and management is provided. Direction is also provided for fuels management to protect identified values, such as in wildland urban interface areas. Biodiversity is addressed by providing desired conditions and management direction associated with a diverse array of plant communities and species, such as aquatic and riparian areas, deciduous forests, burned forests, grasslands and shrublands, whitebark pine.. Fens and other unique botanical or geological areas are given special emphasis by designation as special areas (management area 3b).

Timber harvest is conducted to provide for societal goods and to move the vegetation towards desired conditions. Approximately 465,200 acres (about 20 percent of the Forest) are suitable for timber production. Under alternative B modified, with the budget constrained the projected timber sale quantity for the first decade would be 27.3 million board feet per year and the projected wood sale quantity would be 6.3 million cubic feet per year. The intensity of management of lands suitable for timber production varies by management area (see description of timber management in the forest plan for each management area). Management areas 4b and 6c emphasize a higher intensity of management while management area 6b is more moderate. The intensity of timber management in management area 7 varies, depending on the site. Alternatives B Modified has approximately 52 percent of lands suitable for timber production allowing for a moderate level of intensity of management while 48 percent allows for more intense management.

In addition to lands suitable for timber production, timber harvest is allowable on some lands not suitable for timber production, for such purposes as salvage, fuels management, insect and disease mitigation, protection or enhancement of wildlife habitat, to perform research or administrative studies, or recreation and scenic-resource management. Acres where timber harvest is allowed on land *not* suitable for timber production are about 429,300 (about 18 percent of the Forest). Under alternatives B modified, approximately one-half of these acres are comprised of inventoried roadless areas. Timber harvest on all NFS lands would have to be consistent with other plan management direction.

Wildlife and fish habitat

Alternative B modified has forestwide desired conditions, objectives, suitability, standards, and/or guidelines to support long-term persistence of species listed as threatened, endangered, or species of conservation concern and to support key ecosystem characteristics for other species, such as those that are of interest for hunting, trapping, observing, and subsistence. Diversity is addressed by coarse-filter plan desired conditions and management direction as well as species-specific desired conditions and management direction. This alternative includes 1,072,040 acres (45 percent of the Forest) in designated wilderness (management area 1a), 190,403 acres (8 percent of the Forest) in recommended wilderness (management area 1b), and 317,770 acres (13 percent of the Forest) in backcountry (management areas 5a through 5d), contributing to high levels of habitat security and connectivity over large land areas for species that are sensitive to higher levels of human disturbance (e.g., grizzly bear). These management areas also emphasize natural processes, with relatively high levels of habitat created by natural disturbances such as wildfire, insects, or disease. In all management areas across the forest, the close interrelationship of vegetation conditions and wildlife habitat is emphasized. Forest plan components related to vegetation conditions provide key ecosystem characteristics that support wildlife habitat needs and diversity (e.g., species associated with old-growth forests, riparian habitats, deciduous trees, grass/forb/shrub habitats, dead and defective tree habitat, and habitat connectivity). Management direction is proposed to address key aquatic and riparian ecosystem characteristics and their integrity and to improve resilience in light of the changing climate and the anticipated future environment. Along with fish habitat and water quality, wildlife habitat is emphasized in riparian management zones, which are not suitable for timber production, but where timber harvest is allowable to meet desired conditions if it is compatible with other management direction. Outside of riparian management zones, coniferous forests in management areas 4b, 6b, 6c, and some management area 7 lands are suitable for timber production and provide opportunities for active management of vegetation to move towards desired vegetation composition, structure, function, and distribution as described throughout the Vegetation section of the revised plan.

Access and recreation

Existing or slightly reduced levels of motorized road access could be expected to support social and economic sustainability while addressing desired ecological conditions for soils, water, fish, and wildlife. Some additional motorized trail access could occur in grizzly bear management zone 1, outside of the Salish demographic connectivity area. Alternative B modified would provide the opportunity for public motorized vehicle use (suitable on designated roads and trails) on about 1,653 miles of the NFS lands. Motorized over-snow vehicle use would be suitable on about 31 percent of the Forest, and mechanized transport (e.g., mountain bikes) would be suitable on about 52 percent of the Forest. Based upon public collaboration and comment as well as on site-specific ecological conditions, the areas suitable for motorized over-snow vehicle use would be shifted from some parts of the Forest to others, resulting in a small net increase of less than 0.1 percent of the Forest acreage. Areas open to motorized over-snow vehicle use during the den emergence time period would be limited to about 3 percent of modeled grizzly bear denning habitat. To reduce the risk of grizzly bear-human conflicts on NFS lands in light of increasing human use of national forests, there would be limits on the number and capacity of new

developed recreation sites (those that are designed and managed for overnight use) in the primary conservation area for grizzly bears. Outside of the primary conservation area, the number of developed recreation sites could be increased or the capacity of existing recreation sites could be expanded to meet desired conditions for increased recreation opportunity.

Recommended wilderness

With the proposed action, alternative B modified, there are 8 areas totaling about 190,418 acres recommended for wilderness designation (MA1b)(Figure B-2). Mechanized transport and motorized use would not be suitable within recommended wilderness areas. The boundaries of recommended wilderness were drawn so that existing trails with mechanized and motorized use were not included.

- In the North Fork geographic area, there is one area recommended for wilderness: Tuchuck-Whale (79,821 acres).
- In the Swan Valley geographic area, there is one area recommended for wilderness to be added to the Mission Mountains Wilderness, Elk Creek (1,442 acres). There is one area recommended for wilderness to be added to the Bob Marshall Wilderness; Swan Front (42,534 acres).
- In the Middle Fork geographic area, there are two areas recommended for wilderness: Java-Bear Creek (1,824 acres) and Slippery Bill-Puzzle (12,393acres).
- In the Hungry Horse geographic area, there is one area recommended for wilderness: Jewel Basin (18,462 acres).
- In the South Fork geographic area, there are two areas recommended for wilderness to be added to the Bob Marshall Wilderness: Limestone-Dean Ridge (15,026 acres) and Alcove-Bunker (18,901 acres).

Plan Element Summary

For more details on plan elements, see the following sections of the revised forest plan:

- Forestwide, management area, and geographic area desired conditions, objectives, standards, and guidelines (see revised forest plan chapters 2 and 3);
- The suitability of lands for specific multiple uses, including those lands suitable for timber production (see revised forest plan chapter 3, suitability determinations by management areas);
- An estimate of the long-term sustained yield and projected timber sale quantity (see revised forest plan chapter 2, production of natural resources);
- The identification of priority restoration watersheds (see revised forest plan appendix E);
- Possible management actions and strategies that may occur in the plan area over the life of the plan (see revised forest plan appendix C);
- Areas proposed to be recommended to Congress for inclusion in the National Wilderness Preservation System (see revised forest plan chapter 3, management area 1b);
- The rivers identified as eligible for inclusion as part of the wild and scenic river system (see revised forest plan chapter 3, management area 2b); and
- The plan monitoring program (see revised forest plan, chapter 5), including any focal species.

Plan Management Areas

The 1986 Flathead forest plan provided a suite of overarching Forestwide management direction goals, objectives, research needs, desired future conditions, and standards to guide implementation of future land management decisions. To facilitate this, management areas (MAs) were designated across the Forest Please refer to the 1986 forest plan for specific details (USDA, 1986).

Because the 1986 forest plan had a different suite of management areas than the proposed plan, the Forest created a cross-reference to link the 1986 plan management areas to those used in the proposed revised forest plan (table 2).

Allocation to a specific management area does not mandate or direct the Forest Service to propose or implement any action. The management areas provide additional direction that is specific to individual parcels of land within the Flathead National Forest that represent a management emphasis for that parcel of land. The management area direction includes desired conditions, standards and guidelines and suitability of certain uses within that MA.

The proposed revised forest plan would designate seven management area categories across the Forest. Management area prescriptions have been grouped into categories that have similar management characteristics. For example, MA1 is broken down into subcategories that represent designated wilderness (MA1a) and recommended wilderness (MA1b). Management areas range from little human-caused alteration to the Forest (MA1, wilderness) and focus on passive management to more human-caused change (MA7, focused recreation areas) and focus on active management. For a more complete description of categories and management areas prescriptions, see the revised forest plan.

Table 2. Proposed Flathead National Forest management areas matched with their equivalent current management areas

Proposed MAs	Category	Description	Current MAs (1986 forest plan)
1a	Wilderness Designated	The Forest manages three Congressionally designated wilderness areas—the Bob Marshall, Great Bear, and Mission Mountains—as part of the National Wilderness Preservation System. If, over the life of this plan, Congress designates any additional wilderness areas on the Forest, those areas would be allocated to this MA.	21, 22
1b	Recommended Wilderness	These areas are recommended as additions to the National Wilderness Preservation System. The wilderness characteristics and potential for each area recommended to be included in the National Wilderness Preservation System are to remain intact until Congressional action is taken.	Not an MA[1]
2a	Designated Wild and Scenic Rivers	These river segments and adjacent lands have been designated as part of the Wild and Scenic Rivers System under the authority granted by the Wild and Scenic Rivers Act of 1968, as amended. If, over the life of this plan, Congress designates any additional wild and scenic rivers on the Forest, those areas would be allocated to this MA.	18
2b	Eligible Wild and Scenic Rivers	The river segments and adjacent lands have been identified as eligible for inclusion in the Wild and Scenic Rivers System under the authority granted by the Wild and Scenic Rivers Act of 1968, as amended.	Not an MA[2]
3a	Administrative Areas	These areas are mapped Forest administrative sites.	10

Proposed MAs	Category	Description	Current MAs (1986 forest plan)
3b	Special Areas	These are administratively designated areas that are managed to protect and conserve the values for which they were identified. The Forest currently has one special area, the Condon Creek Botanical Area.	3A
4a	Research Natural Areas	These areas are established to provide for research, observation, study, and conservation of biological diversity. Research natural areas are designated jointly with the appropriate Forest Service research station.	3A
4b	Experimental and Demonstration Forests	Coram Experimental Forest was established in 1933, and its management is the responsibility of the Rocky Mountain Research Station. The Miller Creek Demonstration Forest was set aside in 1989, and its management is the responsibility of the Forest. The 1986 forest plan did not designate the demonstration forest as a management area.	14
5a, 5b, 5c, 5d	Backcountry	These areas provide a variety of backcountry recreational experience, ranging from nonmotorized year-round to motorized summer and over-snow areas/routes. They also include areas from the 1986 forest plan that have a high level of other amenity values or site conditions that would limit vegetation treatments and are unsuitable for timber production (e.g., high scenic value in elk winter range, non-forest vegetation types, riparian areas).	1, 2, 2A, 2B, 2C, 3, 11, 11A
6a	General Forest—Low	Timber management is expected to be at a low level of intensity due to other resource conditions, and this area is not suitable for timber production. Most of this area has roads, trails, structures, and other signs of forest management activities, and it provides a variety of recreation opportunities, both motorized and nonmotorized.	13A, 13D, 12
6b and 6c	General Forest—Moderate to High	Timber management is expected to be at a moderate to high level of intensity. This area is suitable for timber production, with timber harvest contributing to regulated timber harvest estimates. This area has roads, trails, structures, and other signs of forest management activities, and it provides a variety of recreation opportunities, both motorized and nonmotorized.	5, 7, 8, 9, 11C, 13, 15, 15A, 15C, 15D, 15E, 16, 16A, 16B, 16C, 17
7	Focused Recreation Areas	These are areas where certain types of recreational uses are featured and receive special attention.	4, 15B, 20

1. The 1986 plan identified areas for recommended wilderness, but they were not designated as a management area. A variety of management areas from the old forest plan occur within recommended wilderness in the revised forest plan.

Table 3 shows the approximate acres in each management area for the 1986 forest plan compared to the revised forest plan preferred alternative. Refer to Figure B-2 for a map of the management areas for the preferred alternative (B modified).

Table 3. Summary of existing management area allocations and proposed action management area allocations (single designation based upon established hierarchy), updated June 5, 2017.

Management Area	Existing plan [b] acres (percent)	Alternative B modified acres (percent)
1a Designated wilderness	1,072,040 (45%)	1,072,040 (45%)
1b Recommended wilderness	98,388 (4%)	190,403 (8%)

Management Area	Existing plan [b] acres (percent)	Alternative B modified acres (percent)
2a Designated wild and scenic rivers	17,605 (1%)	17,592 (1%)
2b Eligible wild and scenic rivers	0[c]	20,473 (1%)
3a Administrative areas	1,918 (< 1%)	435 (< 1%)
3b Special areas	226	1,579 (< 1%)
4a Research natural areas	9,870 (< 1%)	7,820 (< 1%)
4b Experimental and demonstration forests	6,602 (< 1%)[d]	11,544 (< 1%)
5a Backcountry nonmotorized year-round	--	149,258 (6%)
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	--	50,002 (2%)
5c Backcountry: motorized over-snow vehicle use	--	107,656 (4%)
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	--	9,854 (< 1%)
5a-d Backcountry **Total**	381,685[e] (16%)	316,770 (13%)
6a General forest low	93,714 (4%)	123,693 (5%)
6b General forest medium	--	297,674 (12%)
6c General forest high	--	271,895 (11%)
General forest medium to high	703,454 (29%)	--
6a-c General forest **Total**	797,168 (33%)	693,262 (28%)
7 Focused recreation areas	7,305 (< 1%)[f]	60,888 (3%)
Total **Forest acres**	2,392,807 acres (100%)	2,392,807(100%)

a. Acres and percentage from GIS dataset. The official acres for NFS lands and wilderness areas can be found in the land area report.

b. Alternative A, the no-action alternative, is included even though it does not use the management areas shown in the draft forest plan.

c. Acres of eligible wild and scenic rivers in the existing plan are the same as in the action alternatives (see Table 5). However, they were not assigned a MA in the existing 1986 forest plan, and were not mapped for the DEIS.

d. Miller Creek Demonstration Forest (4,942 acres) was not assigned its own management area in the existing 1986 plan.

e. The existing plan does not differentiate backcountry areas like the action alternatives; thus all backcountry acres are combined.

f. There is no MA in the existing 1986 forest plan equivalent to Focused Recreation Areas. These acres are the Round Meadow and Essex cross country ski areas and the mapped developed recreation sites.

Management area allocations are consistent with inventoried roadless areas designated under the Roadless Area Conservation Rule (USDA, 2001a). The Roadless Area Conservation Rule prohibits road construction or reconstruction and cutting, selling, or removing timber in inventoried roadless areas unless a listed exemption applies. For example, one exemption allows the cutting, sale, or removal of generally small-diameter timber when it is needed to improve threatened, endangered, proposed, or sensitive species habitat or to maintain or restore the characteristics of ecosystem composition and structure that would be expected to occur under natural disturbance regimes. The forest plan cannot modify Roadless Area Conservation Rule direction.

Inventoried roadless areas of the Forest total about 478,757 acres, which is about 20 percent of the Forest (see Figure B-3). The purpose of changing the management direction for the inventoried roadless areas from the 1986 forest plan is to remove inventoried roadless areas from the lands suitable for timber production, to determine the recreation opportunity spectrum classification, and to delineate the desired management area.

The sections below summarize plan elements specific to the grizzly bear, Canada lynx, bull trout, water howellia, and Spalding's catchfly.

Summary of plan elements for grizzly bear

The 1986 Flathead National Forest plan contains management direction related to grizzly bear habitat to provide specifically for recovery of the threatened grizzly bear. In 1995, amendment 19 (A19) of the 1986 forest plan was completed and resulted in the establishment of new management direction related to motorized use of roads and trails and security for grizzly bears. Forest plan A19 established limits on open motorized access density, total motorized access density, and security core for 54 of the 73 grizzly bear subunits across the Flathead National Forest portion of the Northern Continental Divide Ecosystem for grizzly bears (NCDE).

Habitat conditions and management actions on the Forest have contributed importantly to the improved the status of the grizzly bear across the NCDE (Costello, Mace, & Roberts, 2016; Mikle, Graves, Kovach, Kendall, & Macleod, 2016). The population size of the NCDE grizzly bear population is estimated to be greater than 765 bears, more than double the existing estimate based on sightings of females with young (Kendall et al. 2009); the recovery criteria for occupancy of BMU subunits have been met; and mortality is at an acceptable level because ongoing research and monitoring of the NCDE grizzly bear population indicates that it has been stable to increasing (Costello et al. 2016) and is expanding in distribution. Supporting continued recovery of the grizzly population will depend on the Forest Service's continued effective management of the NCDE grizzly bear habitat.

In 2013, the USFWS announced the availability of a draft grizzly bear conservation strategy (GBCS) for the NCDE population for public review and input. When finalized, the GBCS will become the post-delisting management plan for the NCDE grizzly bears and their habitat. Adopting this document is necessary for the USFWS to demonstrate the adequacy of regulatory mechanisms in order to delist this grizzly population. Incorporating this strategy in the Flathead National Forest plan would likewise demonstrate the adequacy of regulatory mechanisms on the Flathead National Forest to support delisting. Thus, the Flathead National Forest proposes to update its forest plan where necessary to incorporate the habitat-related desired conditions, standards, guidelines, objectives (called plan components) and monitoring items for management of National Forest System (NFS) lands to support recovery of the NCDE grizzly bear population. Once the Forest has completed consultation and issued a Record of Decision, the plan components included in the revised forest plan would replace the 1986 Flathead National Forest plan in its entirety, including but not limited to A19, the Swan Valley Grizzly Bear Conservation Agreement, and other Flathead National Forest plan direction related specifically to grizzly bears. Many components of past strategies are included in the revised forest plan, discussed in detail in the grizzly bear section of this document.

The Flathead National Forest planning team is also coordinating the NEPA effort to incorporate and amend habitat-related desired conditions, standards, guidelines, and monitoring items from the GBCS into the Helena-Lewis and Clark, Kootenai, and Lolo forest plans to provide consistent direction related to grizzly bear habitat management on National Forest System lands throughout the recovery zone/primary conservation area of the NCDE as well as management direction for what is identified as management zones 1, 2, and 3 in the grizzly bear conservation strategy.

Under the NCDE conservation strategy, grizzly bear management direction applies to the primary conservation area (the same area as the recovery zone), as well as to zone 1 (about 4.8 million acres,), zone 2 (over 4.6 million acres), and zone 3 (over 12 million acres) (see Figure B-5).

The Flathead National Forest has lands in the primary conservation area and zone 1 (including the Salish demographic connectivity area). A summary of the habitat-related management direction for these zones on the Forest is as follows:

- Within the primary conservation area, open motorized route density, total motorized route density, and secure core would be maintained at baseline levels (see the glossary in the revised forest plan) in each grizzly bear subunit. High-use nonmotorized trails would no longer be counted in calculations of secure core, but the baseline would be updated to reflect this change. Temporary increases in open and total motorized route densities and temporary decreases in secure core would be allowed for projects (as defined in the glossary), as long as they comply with standards.
- Special orders for storage of food/wildlife attractants would apply across NFS lands in the primary conservation area and zone 1 (including the Salish demographic connectivity area).
- Within the primary conservation area, developed recreation sites designed and managed for overnight use would be limited to one new site or one increase in capacity in a bear management unit in a 10-year period, as described in the standard.
- In the primary conservation area, vegetation management, livestock allotments, and minerals and energy development would be managed with consideration for grizzly bear habitat and to reduce the risk of grizzly bear-human conflicts.
- In zone 1, habitat protections would focus on maintaining miles of roads open to public motorized use during the non-denning season at baseline levels. In the Salish demographic connectivity area, motorized trails would also be limited.

Key management direction for grizzly bear habitat from the NCDE conservation strategy is integrated into forest plan components throughout sections of the revised forest plan. For example, management direction related to roads and motorized trails is included in the "infrastructure" section of the revised plan whereas management direction related to developed recreation sites is included in the recreation section. Appendix D of this document lists key plan components for the grizzly bear that meet the intent of having a consistent set of management direction on National Forest System lands in the NCDE. The Flathead's plan contains some additional plan components whose effects are discussed in this document.

Summary of plan elements for Canada lynx and its critical habitat

The 1986 forest plan contains direction designed to conserve and promote the recovery of Canada lynx that was incorporated into the plan in 2007 when the plan was amended to include the Northern Rockies Lynx Management Direction (NRLMD) (USDA, 2007a). Since 2007, new information on Canada lynx has been published, including designation of critical habitat for Canada lynx (USFWS, 2009a, 2014d), an updated version of the Lynx Conservation and Assessment Strategy (ILBT, 2013), and scientific research results relevant to Canada lynx in northwest Montana (see literature cited section).

Based upon new information, the Forest has also updated its map of modeled lynx habitat (see appendix C of this BA and the Canada lynx section of this BA for more details).

The Forest would carry forward the lynx management direction from the current forest plan, as amended (appendix A of the revised forest plan, and replicated in this document in appendix D), except for two Forest-specific changes:

- A modification to NRLMD vegetation standard VEG S6 to add an exception to allownoncommercial felling of trees larger than sapling size within 200 feet of whitebark pine trees (in stands that contain trees identified for cone/scion/pollen collection) to make whitebark pine more likely to survive wildfires, more resistant to mountain pine beetle attack, and more likely to

persist in future environments(see FW-STD-TE&V-02). Standard VEG S5 already has an exception that allows precommercial thinning to restore whitebark pine, but VEG S6 does not provide a comparable exception.

- Changing some areas identified as suitable for over-snow motorized recreational vehicle use, which was addressed by NRLMD human use guideline HU G11 (see FW-GDL-REC-03).

Summary of plan elements for bull trout and its critical habitat

INFISH Standards and Guidelines

The Inland Native Fish Strategy (USDA, 1995c), which is the current aquatic conservation strategy for the Forest, was designed to provide protection for native fish. Although it allowed for restoration, INFISH primarily provided direction for protection and passive restoration measures. With that amendment, the 1986 forest plan direction reduced the risk to watersheds, soils, riparian, and aquatic resources from new and ongoing activities primarily because of the standards and guidelines that influenced management within the Riparian Habitat Conservation Areas (USDA, 1995d, pp. 1-2). For some resources, standards and guidelines in the 1986 forest plan contained general direction for repairing past damage, although INFISH direction was lacking for other resources, such as timber harvest. During implementation of the 1986 forest plan, the intensity and risks associated with new and ongoing land management activities has been greatly reduced, compared to the previous several decades, and it is anticipated that vegetation treatments associated with timber production, vegetation restoration, and other future projects will be lower than historic levels, as compared to the past 20 to 25 years.

INFISH has been implemented considerably longer than its intended 18 months. The strategy has been documented to be effective in protecting aquatic resources through ongoing PACFISH/INFISH biological opinion (PIBO) effectiveness monitoring (C. Meredith et al., 2012); however, the one component identified as lacking in INFISH is an active restoration component. This was iterated clearly in the Service's 1998 BO for the 1986 forest plan. The absence of a clearly stated aquatic restoration goal in the existing plan was one of many items identified as needing to be changed in the plan revision process, and revised forest plan direction is also intended to address the conservation recommendations in the 1995 BO.

The revised forest plan adds an active restoration component through desired conditions, objectives, guidelines, and standards that would supplement the retained passive components of INFISH. The revised forest plan will also help move projects and activities towards the desired conditions and improve aquatic habitats, and the following elements provide additional protective measures for bull trout and their habitats. This direction will be applied across the entire landscape, although there are no objectives, standards, or guidelines specific to bull trout for individual management areas or geographic areas.

For revised forest plan components related to bull trout, refer to appendix D.

Summary of plan elements for water howellia

The conservation strategy for *Howellia aquatilis* would be retained. The conservation strategy for *Howellia aquatilis*, signed in 1994, requires a 300'-minimum management buffer width around all occupied and unoccupied but suitable ponds that support or could support *Howellia*. In the revised forest plan, *Howellia aquatilis* pond sites are included in riparian management zones (RMZs), see Figure B-4. RMZs are identified in the revised forest plan as areas where riparian-dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines.

The riparian management zone adjacent to ponds, lakes, reservoirs, and wetlands is defined as follows (FW-STD-RMZ-01):

> Category 4a Ponds, lakes, reservoirs, and wetlands greater than one half acre, and all sizes of howellia ponds and fens/peatlands: Riparian management zones consist of the body of water or wetland and the area to the outer edges of the riparian vegetation; or to the extent of the seasonally saturated soil; or to the distance of the height of one site-potential tree; or 300 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond, or lake; whichever is greatest. For management direction related to water howellia, refer to the following plan components: FW-DC-PLANT-01 and 02, FW-GDL-PLANT-01, 02, and 03, FW-DC-NNIP-01, MA3b-Special Area-DC-04, and GA-SV-DC-01 and 02.

See Figure B-6 for the occupied and unoccupied but suitable *Howellia aquatilis* sites included in category 4 riparian management zones. There are four unoccupied but suitable *Howellia aquatilis* sites in the Middle Fork of the Flathead River watershed in the vicinity of Lake Five that are not shown.

Summary of plan elements for Spalding's catchfly

There are no known populations of Spalding's catchfly on the Forest. The dry grassland habitats where this species might occur would have low likelihood of substantial impact from human activities. Risk of invasive plant species poses the greatest threat to integrity of the dry grassland communities. Plan components that emphasize protection of high-priority areas (including native grasslands) and treatments that focus on these areas provide protection to these rare plant communities that serve as potential habitat for Spalding's catchfly (see appendix D).

Terrestrial Wildlife Species

Canada Lynx

Affected Environment – Canada Lynx

Canada lynx population ecology, biology, habitat descriptions, and relationships identified by research are described in detail in the literature cited. The following description of the affected environment provides a summary in the context of the northern Rocky Mountains, focusing on the Flathead National Forest and information that is necessary to understand the consequences of the proposed federal action. Canada lynx critical habitat is discussed in a separate section below.

Canada lynx population, distribution, and status

The range of Canada lynx extends from Alaska across much of Canada (except for the coastal forests), with southern extensions into parts of the western United States, the Great Lakes region, and the northeast. Lynx distribution is closely aligned with the distribution of snowshoe hares and boreal forests (McKelvey, Aubry, & Ortega, 1999).

Snowshoe hares are the primary winter prey of lynx in Montana (J. R. Squires & Ruggiero, 2007) and throughout the range of lynx (Aubry, Koehler, & Squires, 1999). Lynx are highly specialized predators of snowshoe hares, with unique adaptations that include a lightweight body frame and proportionately large paws that enable them to travel on top of deep snow. In their study of lynx winter diets in northwest Montana, Squires and others (2013) described 86 lynx kills that included 7 prey species. Snowshoe hares contributed about 96 percent of prey biomass whereas red squirrels, the second most common prey, provided only about 2 percent of prey biomass (J. R. Squires, Ruggiero, Kolbe, & DeCesare, 2006).

Lynx do not occur everywhere within the range of snowshoe hares in the contiguous United States as discussed in both Bittner and Rongstad (1982) and McCord and Cardoza (1982) (USFWS, 2014d). This may be due to inadequate abundance, density, the spatial distribution of hares in some places, the absence of snow conditions that would allow lynx to express a competitive advantage over other hare predators, or a combination of these factors (USFWS, 2014d). In the southern part of its range, the low densities of lynx populations are likely a result of naturally patchy habitat and lower densities of their snowshoe hare prey (Adams, 1959; Paul Carlo Griffin, 2004; Koehler, Hornocker, & Hash, 1979; Mills et al., 2005).

The lynx recovery outline (USFWS, 2005b) stratified lynx habitat into three categories: core, secondary, and peripheral. Core areas are places where long-term persistence of lynx and recent evidence of reproduction have been documented, and the quality and quantity of habitat is available to support both lynx and snowshoe hare life needs. The lynx recovery outline emphasized focusing conservation efforts on core areas to ensure the continued persistence of lynx in the contiguous United States. Six core areas were identified in the recovery outline, one of which is in northwestern Montana/northeastern Idaho. The Flathead National Forest is located entirely within the northwestern Montana/northeastern Idaho core area.

Museum records, trapping data, and other information verify the historical occurrence of lynx in western Montana (McKelvey et al., 1999). Squires and others have conducted extensive studies of Canada lynx in northwest Montana and have stated, “Our study area encompassed the occupied range of lynx within the Northern Rockies as estimated from a compilation of lynx distribution data collected from 1998 to 2007. The study area border followed natural topographic and vegetative boundaries to generally encompass all forested regions with recent evidence of lynx presence, including all telemetry locations we documented for resident lynx from 1998 to 2007 (N = 81,523 locations); this study area represented our best estimate

of the current distribution of lynx in western Montana" (J. R. Squires et al., 2013). The study area delineated by Squires and others encompasses most of the Flathead National Forest, with the exception of the area west of Kalispell known as "the island unit."

Canada lynx are known to be distributed throughout portions of the Flathead National Forest included in the study area delineated by Squires and others in 2013. During 2010–2015, 15 individual adult or sub-adult lynx were captured and fitted with radio-telemetry collars on the Flathead National Forest, confirming that the North Fork, Middle Fork, and South Fork of the Flathead River watersheds were occupied by lynx (Holmquist, 2015; Olson, 2015).

Noninvasive sampling techniques have also been used to detect lynx. In the winter of 2012, members of the Southwestern Crown Collaborative (SWCC) Wildlife Working Group began systematic, landscape-scale carnivore monitoring efforts within the Southwestern Crown of the Continent (SW Crown) landscape, which spans the area from north of Condon on the Swan Lake Ranger District of the Flathead National Forest, through the Seeley Lake Ranger District on the Lolo National Forest, to just east of Lincoln on the Helena-Lewis and Clark National Forest. Surveys combined multi-species snow track surveys with noninvasive DNA collection from bait stations as well as motion-sensor cameras. In order to standardize the approach across the SW Crown, eighty 5 x 5-mile grid cells were targeted for sampling; each grid cell represents an area slightly smaller than an average female lynx home range. Genetic samples were sent to the Forest Service's Rocky Mountain Research Station in Missoula to determine species and individual. Sampling in the SW Crown has now identified a total of 26 unique lynx across 41 grid cells across all years, including both males and females. All but five of these individuals were new to the Rocky Mountain Research Station genetic database (SWCC, 2015).

The Flathead National Forest also conducted carnivore monitoring from 2013–2016 using same-sized 5 x 5-mile grid cells in portions of the Forest that are outside the SW Crown area, in cooperation with Swan Valley Connections. In this portion of the Forest, about 64 grid cells were surveyed, resulting in 40 detections by either tracks, camera, or genetic verification. In addition to areas where Squires had previously trapped lynx, this effort detected lynx in the Salish Mountain Range (tracks and DNA). A female lynx with two kittens were also photographed on the east side of Hungry Horse Reservoir. Lynx have been detected in all geographic areas of the Forest (Curry et al., 2016; SWCC, 2015).

Based upon telemetry locations of lynx to date, Squires' best estimate of the current distribution of lynx in western Montana is an area about 8.9 million acres in size that ranges from the Purcell Mountains east to Glacier National Park and then south through the Bob Marshall Wilderness Complex to Highway 200. The Flathead National Forest lies in the heart of this area, highlighting its importance to lynx conservation.

The Service convened an expert workshop in October 2015 to improve understanding of the status of the contiguous U.S. distinct population segment (DPS) of Canada lynx (*Lynx canadensis*) (Bell et al., 2016). The workshop was organized by a lynx Species Status Assessment (SSA) Team consisting of Service and U.S. Geological Service staff who developed and piloted implementation of the SSA framework, as well as other biologists who are working on lynx throughout the range of the DPS. The results of the workshop contributed to the SSA report, which compiled and summarized the best available scientific and commercial data, including empirical data, published literature, and expert input. This information will then be used by the Service to develop a Final Species Status Review, and inform recovery planning direction, classification decisions, and other determinations required by the Endangered Species Act (Bell et al., 2016).

An important consideration for the long-term persistence of lynx in the northern Rockies is maintaining connectivity with lynx populations in Canada (ILBT, 2013). Squires et al. (2013) combined resource

selection, step selection, and least-cost path models to predict movement corridors for lynx in the northern Rocky Mountains. The models identified a few corridors that extend south from the international border with Canada. Currently, there is no evidence that there are significant impediments to lynx movements or that genetic isolation is occurring in western Montana (J. R. Squires et al., 2013). Lynx are managed provincially in Canada, with each province responsible for its own management program, harvest (trapping) policies, and conservation strategies. Lynx are considered secure in all provinces except New Brunswick and Nova Scotia) (Bell et al., 2016).

In the Geographic Unit identified in the SSA Workshop Final Report that encompasses northwestern Montana/northeastern Idaho, experts concluded there would be an initially high and subsequently decreasing probability of Canada lynx persistence due to projected climate change, with increasing uncertainty over time but a higher probability of persistence in all time frames than other units occupied by lynx. For the Geographic Unit unit encompassing northwestern Montana/northeastern Idaho, all experts predicted near-term (year 2025) persistence probability >= 95 percent and mid-century persistence = 70 percent to 100 percent (median = 90 percent)) (Bell et al., 2016).

Canada lynx reproduction, survival, and mortality

According to Quinn and Parker in 1987, breeding by Canada lynx occurs during March and April in the northern part of the range of lynx (ILBT, 2013). As reported in 2011 by Olson et al., in Montana, female lynx stayed in natal dens on average for 21 ± 17 days, and subsequently used an average of 3 ± 2 maternal dens in a given year (ILBT, 2013). Nine female lynx exhibited roughly equal levels of activity from dawn to dusk when they had newborn to 2-month-old kittens. Kittens are left alone at den sites while the female lynx hunts, as noted by Slough in 1999, Moen et al. in 2008, and Olson et al. in 2011(ILBT, 2013). In northwest Montana, litter sizes vary from one to five kittens per litter, with two or three kittens being the most frequently observed (Kosterman, 2014).

The most commonly reported causes of Canada lynx mortality are starvation, especially of kittens, as reported by Quinn and Parker in 1987, Koehler in 1990a, and Vashon et al. in 2012 (ILBT, 2013), and human-caused mortality, including trapping and shooting, is addressed in Ward and Krebs in 1985, Bailey et al. in 1986, and Moen in 2008 (ILBT, 2013). Predation on lynx by mountain lion, coyote, wolverine, gray wolf, fisher, and other lynx has been confirmed by Berrie in 1974, Koehler et al. in 1979, Poole in 1994, Slough and Mowat in 1996, O'Donoghue et al. in 1997, Apps in 2000, Squires and Laurion in 2000, O'Donoghue et al. in 2001, and Vashon et al. in 2012 (ILBT, 2013). Squires and Laurion (2000) reported that two of six mortalities of radio-collared lynx in Montana were due to mountain lion predation.

At southern latitudes, where lynx population density and productivity are lower than in the northern part of its range, harvest may be an additive source of mortality and lynx may be highly vulnerable to overexploitation (Koehler, 1990). Aubry et al. (1999) hypothesized that human-caused mortality such as illegal or incidental harvest could significantly reduce lynx population numbers in southern regions. The state wildlife agencies have taken actions to reduce incidental or illegal trapping and shooting, which has reduced the potential for adverse cumulative impacts.

Trapping and snaring of lynx is currently prohibited across the contiguous United States. Incidental trapping or snaring of lynx is possible in areas where regulated trapping for other species, such as wolverine, coyote, fox, fisher, marten, bobcat, and wolf, overlaps with lynx habitats (J. R. Squires & Laurion, 2000). A trapped lynx can be released, but there is potential for accidental injury or mortality (Kolbe, Squires, & Parker, 2003).

State wildlife management agencies regulate the trapping of furbearers. Trapper outreach is used as a tool to avoid or minimize incidental take of lynx. Montana Fish, Wildlife and Parks (MFWP) has implemented

special regulations to reduce the likelihood of incidental capture of lynx. A recent court settlement with MFWP established a lynx protection zone (which includes the Flathead National Forest) that restricts the size and the placement of traps and snares that can inadvertently catch lynx and requires bobcat trappers to check their traps at least once every 48 hours. The use of fresh meat or feathers as bait is now prohibited in the lynx protection zone. MFWP also provides education and outreach programs aimed at preventing illegal shooting of lynx. The magnitude of illegal shooting of lynx is unknown. Incidents have been reported throughout the range of the species. State wildlife agencies work to reduce lynx mortality by disseminating information to the public and providing guides to identifying characteristics to hunters.

Since implementation of changes to the trapping regulation in 2008, the amount of accidental trapping of lynx has decreased. A total of three lynx were captured during the eight license years 2008-2015, and all were released uninjured. Overall, lynx "take" during 2000-2007 averaged 1.6/year, and during 2008-2015, when more protective regulations were in place, they averaged 0.4/year, a fourfold decrease (MFWP, 2016).

Canada Lynx Habitat

Action Area and Relationship of the Project Area to Canada Lynx Habitat

The action area lies within the Northern Rocky Mountain region of the contiguous distinct population segment (DPS) of Canada lynx. Lynx habitat within the Northern Rockies geographic area was delineated into lynx analysis units (LAUs) for analysis and management purposes. An LAU is intended to provide the fundamental unit for evaluating and monitoring the effects of management activities on lynx. Lynx analysis units do not depict actual lynx home ranges but are approximately the size of a female's home range (25-50 mi^2 or 16,000-32,000 acres), contain at least 10 mi^2 (6,400 acres) of primary vegetation capable of supporting lynx, and encompass year-round foraging and denning habitat components (ILBT, 2013). Lynx analysis units (LAUs) were delineated for the Flathead National Forest in accordance with the guidance provided in the Lynx Conservation Assessment and Strategy and the Northern Rockies Lynx Management Direction and have not been changed since they were originally delineated (Figure B-7). The area covered by the lynx analysis units on the Forest is the primary area used for analysis of effects on lynx. For analysis of cumulative effects under the Endangered Species Act, the area selected is large enough to include the effects of activities on adjoining non-federal lands but not so large so as to obscure effects on a biologically meaningful unit. Lynx Habitat Mapping

Under guidance provided by the Interagency Lynx and Wolverine Steering Committee, Canada lynx habitat was initially mapped on the Flathead National Forest in 2000 (USDA, 2000) using geographical information system (GIS) modeling, based on direction and recommendations from the Lynx Science Team (Ruggiero et al., 1999), and the Lynx Biology Team (Ruediger et al., 2000). In 2007, 18 national forest plans (including the Flathead National Forest's forest plan) were amended to incorporate the Northern Rockies Lynx Management Direction (NRLMD). Appendix B in the NRLMD FEIS (USDA, 2007b) includes a letter from the Lynx Biology Team to the Lynx Steering Committee that summarizes criteria for lynx habitat mapping and a 2000 review of mapping methods used by Forests within the Northern Rockies Geographic Area. The Lynx Biology Team determined that habitat mapped in 2000 within the Northern Rockies Geographic Area (including the Forest) was consistent with established criteria and process. The area of lynx habitat modeled and mapped by the Forest in 2000 was 1,730,000 acres (USDA, 2007b, p. appendix C), and is spatially displayed in figure 1-1 in the NRLMD FEIS. The NRLMD FEIS (p. 99) states that during site-specific project analysis, maps of lynx habitat would be reviewed and updated based on local information and that future plan amendments or revisions may also consider lynx and information about local lynx presence as appropriate. The Service, in their 2007 NRLMD BO (USFWS, 2007b), also recognized and expected that lynx habitat maps would be refined and improved as new information and refined GIS mapping techniques became available (p. 4). The

Canada Lynx Conservation and Strategy (ILBT, 2013) encourages updating maps where new information and vegetation databases will improve identification of lynx habitat (p. 87). Thus, guidance for updating lynx habitat maps on lands managed by the Forest Service is well documented and encouraged when new information is available to inform improved and more accurate mapping of lynx habitat.

In 2013-14, the Flathead National Forest initiated the planning process to revise its forest plan and conducted a review of lynx habitat originally mapped on the Forest in 2000. The review indicated a need to update and refine mapped lynx habitat based on: (1) new information from research concerning lynx populations, distribution, habitat use, and prey species on the Forest; (2) improved vegetation classification data; and (3) improved geographical information system (GIS) mapping. The updated modeling and mapping process is described in detail in a February 2014 process paper (Hanvey, 2016), which is included as appendix C of this biological assessment). Modeling and mapping is consistent with the definition of lynx habitat and is verified at project level. The Flathead National Forest's updated estimate of lynx habitat is about 1,795,000 acres (Figure B-9), and this is the area used for analysis of effects of the proposed action on Canada lynx.

At the forestwide scale, biophysical attributes that can be derived from remote sensing data are used to model and map potential lynx habitat. This information is also used to classify non-forest areas (e.g., rock, water) and exclude them from lynx habitat. The resulting map provides an estimate of the overall area that is capable of providing habitat for lynx. Modeling parameters included areas within the elevation range used by lynx on the Flathead National Forest (to predict areas that likely provide deep, fluffy snow conditions for extended periods of time). The Forest's updated mapping process also used potential vegetation types (J. Jones, 2004) having boreal forest habitat types (Pfister, Kovalchik, Amo, & Presby, 1977) that are capable of growing subalpine fir and spruce trees as well as habitat types that are able to grow grand fir if they are in close juxtaposition. The process used by the Forest (appendix C) is consistent with mapping direction provided by the Interagency Lynx Biology Team (Hanvey, 2016; ILBT, 2013). The Interagency Lynx Biology Team direction stated that subalpine fir habitat types that are dominated by cover types of spruce and subalpine fir, as well as Douglas-fir and seral lodgepole pine, should be mapped as primary vegetation whereas other cool, moist habitat types (e.g., grand fir) that may contribute to lynx habitat (especially where intermingled with and immediately adjacent to primary vegetation) should be mapped as secondary vegetation. Mapping direction provided by the Lynx Biology Team and the Forest's updated lynx habitat map are both based on biophysical conditions capable of supporting coniferous vegetation at the ground level that is sufficiently dense to support snowshoe hares during winter. Such conditions may occur during various time periods of stand development.

At any given point in time in a forest stand's development, it may provide habitat in a suitable condition or it may provide lynx habitat in a temporarily unsuitable condition, depending upon existing structural condition. Structural condition is in turn dependent upon time since disturbance (e.g., fire, timber harvest) and the rate of forest succession. Satellite imagery and forest databases can accurately classify recently harvested and burned areas, which helps to identify areas that are temporarily in an unsuitable condition (see NRLMD glossary). However, satellite imagery is poor at detecting dense horizontal cover that provides snowshoe hare habitat in a multistory forest structure, which is an important feature of lynx foraging habitat, nor coarse woody debris for denning habitat. Therefore, no forestwide estimates are made for these components of lynx habitat. During site-specific planning, the forestwide map of lynx habitat is field verified, habitat types are refined, and lynx habitat is further characterized to estimate the amount and distribution of foraging and denning habitat components.

Lynx Habitat Characteristics

Habitats across the Flathead National Forest have been grouped into broad potential vegetation types (Broad PVTs) based on broad climatic and site conditions, for purposes of analysis at the forestwide scale.

Some Forest plan components are also linked to these broad potential vegetation types. Broad PVTs serve as a basis for description of certain ecological conditions across the Forest and are useful in understanding the various ecosystems and their potential productivity, natural biodiversity, and the kinds of processes that sustain these conditions. In contrast, forest dominance types refer to the existing vegetation types that are dominant across the Forest's landscape at any one point in time.

Across their range, lynx typically occur in boreal and subalpine coniferous forests dominated by subalpine fir and spruce in landscapes with gentle topography (J. R. Squires et al., 2013). On the Flathead National Forest, subalpine fir and Engelmann spruce are found within portions of the Cool Moist and Cold Broad PVTs, also described as biophysical settings in the revised forest plan (see appendix D of the revised forest plan for more details). Portions of the Warm Moist Broad PVT in close juxtaposition to the Cool Moist Broad PVT are capable of growing grand fir.

Forests with a subalpine fir/spruce dominance type currently occur on an estimated 43 percent (90 percent C.I. = 39-47 percent) of all Flathead NFS lands (R1 Summary Data Base, Forest Inventory and Analysis (USDA)). Both tree species are very shade tolerant and commonly are most abundant in mid- and understory tree canopy layers, often found in mixed forest with western larch, lodgepole pine, and/or Douglas-fir in the overstory.

Squires and others (2010) compared lynx resource selection in summer versus winter, including lynx success in capturing snowshoe hares. During winter, lynx foraged primarily in mid- to high-elevation forests (4,134–7,726 feet) composed of mature, large diameter (greater than about 11 inches d.b.h.) trees and in and selected forests with relatively denser horizontal cover, more abundant hares, and deeper snow than was available within a home range. The preferred forests had a multistory structure with dense horizontal cover provided by the young trees in the understory and conifer boughs touching the snow surface, which could support snowshoe hare populations at varying snow depths throughout the winter. Engelmann spruce and subalpine fir were the dominant tree species in forests used by lynx, but these forests contained a mix of other conifer species including lodgepole pine, western larch, and Douglas-fir. Squires stated that the primary limiting factor for Canada lynx in northwest Montana appears to be suitable winter foraging habitat.

During the summer months, lynx in Montana broaden their preferred habitat use to include more of the early successional forest with dense horizontal cover provided by abundant shrubs, spruce and fir saplings, and small diameter trees (J. R. Squires et al., 2010). These conditions can occur in forests burned by wildfire, regenerated by insects or disease, or regenerated by timber harvest. Squires and others found that lynx used slightly higher elevations during the summer but, as in winter, were located below the alpine zone and above the low-elevation, dry forests dominated by ponderosa pine. Low-elevation, ponderosa pine forests were not modeled as potential lynx habitat on the Flathead National Forest.

In Montana, Squires and others (2010) reported that horizontal cover was denser at lynx kill sites than along travel paths. They further reported that lynx kill sites were associated with a higher proportion of spruce-fir overstory than lodgepole pine overstory and that neither snow depth nor snow penetrability influenced lynx kill sites. Snowshoe hare abundance is also positively associated with dense horizontal cover (Hodges, 2000). In western Montana, Griffin and Mills (2007) found the highest snowshoe hare densities in regenerating conifer stands that had a high density of saplings (defined as more than 2,267 stems/acre) and in mature multistory conifer stands that had abundant saplings. Hare abundance was negatively affected in stands treated with traditional precommercial thinning prescriptions that reduced stem densities to about 263-526 stems/acre (Paul C. Griffin & Mills, 2007). Snowshoe hare abundance in control stands was comparable to thinned stands if 20 percent of the precommercially thinned stand was retained in uncut 0.6-acre patches (Paul C. Griffin & Mills, 2007). Young regenerating stands (20-40 years old) can support high densities of snowshoe hares before growing into a structure that no longer

provides the needed dense horizontal cover. A regular influx of this "early stand initiation stage" of forest succession (created by processes such as fire or vegetation management) can help to enhance snowshoe hare production.

Cheng and others (2015) studied snowshoe hare densities in areas of Glacier National Park adjacent to the Forest that were burned by wildfire in 1988 and 1994. Regenerating forests with a lodgepole pine tree dominance type made up 50 percent of the 1988 burn area. Hare pellet densities in lodgepole pine stands regenerating after the 1988 fire (i.e., 17 years post-fire at the time of their study) were far greater than in other canopy types within the 1988 burns and also exceeded pellet densities in lodgepole forests burned in 1994, or other mature forests, by a factor of at least 10. Their "best" model for habitat predicted that mean pellet density for lodgepole forests in the1988 burns equates to hare densities nearly three times the threshold believed necessary to support lynx populations.

Among the continuous habitat parameters measured in the Cheng et al. study, only understory cover (at a height of 0 to 20 inches above the ground surface) and percent canopy cover were identified as predictors of hare density. Canopy cover had the next largest effect, with mean pellet densities increasing from 10percent canopy closure to 70percent canopy closure when other variables were held at typical values. The next most important predictor of hare pellet density was understory cover. Mean pellet density increased slowly with understory cover up to 80 percent, above which pellet densities declined (Cheng et al., 2015). Cheng and others (2015) stated that snowshoe hares' association with regenerating lodgepole pine forests is transient because these forests will eventually grow tall enough and dense enough to no longer provide the habitat conditions selected by snowshoe hares.

At the landscape scale, a mosaic of forest structure, from young regenerating to mature multistory stands, is recommended to provide for the habitat needs of lynx (ILBT, 2013). Kosterman collected field data on denning and offspring survival in northwestern Montana from 1998–2012, studying the relationship between female lynx reproductive success and habitat composition/arrangement at the scale of a lynx home range on two national forests adjacent to the Flathead (Kootenai and Lolo). Connectivity of mature forest, percent composition of young regenerating forest, low perimeter-area ratio of young regenerating forest patches, and adjacency of mature to young regenerating forest types were the most important predictors for overall lynx reproductive success in her study areas (Kosterman, 2014).

Although Kosterman's 2014 thesis provides valuable new information with potential to inform changes in Forest Service management of lynx and lynx habitat, the relationships between vegetation composition and lynx reproductive success described in the thesis are not well enough understood to determine whether specific changes in management direction are warranted and, if so, what they should be. By design, Kosterman classified vegetation in a way that was deliberately imprecise in order to allow her to correlate lynx demography to habitat in a simple and rough sense. For this purpose, the classification was a success. However, the parameters and metrics that Kosterman used do not directly correlate to Forest Service vegetation inventory data or the management direction established by the NRLMD. Kosterman and Rocky Mountain Research Station scientists are working to refine her lynx habitat classification and publish the results of her study in a peer-reviewed scientific journal. Some of the analysis or findings in the original thesis may change through that process. Forest Service staff will continue to work in partnership with the USFWS, the Rocky Mountain Research Station, and Kosterman to determine the appropriate application of her information to the management of Canada lynx habitat (Marten, 2016).

During the winter and early spring, availability of den sites is also important to lynx. Boutros and others in 2007 as well as Moen et al. in 2008 found that coarse woody debris provides kittens with protection from extreme temperatures, precipitation, or predators (ILBT, 2013). Lynx dens in northwest Montana are typically found in multistory stands of spruce-fir forests with dense horizontal cover and abundant coarse woody debris. Squires and others found that 80 percent of dens were in mature forest stands and 13

percent in mid-seral, regenerating stands (J. R. Squires, DeCesare, Kolbe, & Ruggiero, 2008). Young stands that were either naturally sparse or mechanically thinned were seldom used for denning. Denning habitat is generally abundant across the coniferous forest landscape of northwest Montana and is not likely to be limiting for lynx (J. R. Squires et al., 2008, 2010; J. R. Squires & Kennedy, 2006).

Stand dynamics of snowshoe hare and lynx habitat on the Flathead National Forest

Immediately after a disturbance, the removal of live trees and shrubs means these areas are not yet able to support snowshoe hares and lynx. As vegetation regrows, the burned or harvested areas develop into summer hare habitat. During this "early stand initiation" stage, if there is sufficient horizontal cover and adjacent forest edge, lynx may forage for hares in the regenerating forests during the summer months. Then, after approximately 20 years (the typical average time for the Forest), trees and some shrubs will have grown tall enough to have branches at the snow surface and dense enough to provide winter food and cover for hares. During the next couple of decades, this later "stand initiation" phase will likely provide winter snowshoe hare habitat, depending upon the species composition and density of regenerating trees. As the trees continue to grow, stands dominated by shade intolerant species such as lodgepole pine may move into the "stem exclusion" stage, in which the crowns close, shading out understory vegetation, and the tree branches grow out of reach of the hares. The denser the regenerating forest stand, the faster trees such as lodgepole pine lose their lower live branches and grow out of reach of hares. Given enough time (several to many decades) and absent another stand-replacing disturbance, within-stand competition and disturbances such as windthrow and forest pathogens usually will create canopy gaps that enable the stand to develop into the "understory reinitiation" stage, which is one type of older multistoried forest structure described by Oliver and Larson (1996). However, in the boreal forests of the northern Rocky Mountains where stand-replacing wildfire is a dominant landscape process, not all forest stands will reach the understory reinitiation stage. Instead, they may burn or may stagnate in the stem exclusion stage.

Snowshoe hare and lynx habitat and natural ecosystem processes

Both subalpine fir and Engelmann spruce are intolerant of drought and fire due to their shallow roots, thin bark, and tree crowns that extend to the ground, making them susceptible to being killed by even low-severity fires. Though they may regenerate into the opening created by a fire, they have comparably slow growth rates and are soon overtopped by other early successional species such as lodgepole pine or western larch. However, their shade tolerance allows them to persist indefinitely, and eventually, over many decades to centuries, they will dominate the site unless there is a fire event or other stand-replacing disturbance that re-initiates succession with early successional species. Subalpine fir is the indicated climax species across most of the Flathead National Forest.

The prevalence of subalpine fir and spruce-dominated forests is tied to the frequency of fire. More frequent fires will reduce the presence and dominance of these species; long fire-free intervals and/or the lack of a seed source of other species will favor their dominance. Forests dominated by subalpine fir and Engelmann spruce tend to support higher severity fires due to the lower fire frequency, higher tree densities, multiple canopy layers, and greater litter depths and fuel loads typical in these stands. These stand-replacing fires make lynx habitat temporarily unsuitable. The multistory forest conditions that typically develop in subalpine fir and Engelmann spruce-dominated forests are also highly susceptible to damage from western spruce budworm. In contrast with stand-replacing wildfires, beetles may only kill some of the overstory trees, allowing the understory to respond.

Past disturbances and the natural range of variation for Canada lynx habitat

Historically, fire, insects, and disease were the primary processes that affected forest vegetation in lynx habitat, reverting them to an early stage of succession or creating openings within the forest canopy

(USDA). The NRLMD (USDA, 2007a) defines lynx habitat in an unsuitable condition as lynx habitat in the stand initiation structural stage where trees are generally less than 10 to 30 years old (e.g., current burned forest less than 20 years old) and have not grown tall enough to protrude above the snow in winter. As a result, trees in this structural stage are too short or too open to provide dense, seedling-sapling forage for snowshoe hares during winter, but the trees will become taller and denser as the forests go through vegetative succession.

The USFS SIMPPLLE model (SIMulating Patterns and Processes at Landscape scaLEs) was used to model the natural range of variation (NRV) for lynx habitat in a temporarily unsuitable condition. Ecosystem Research Group provided the Forest with an assessment using the USFS SIMPPLLE model (see appendix 3 of the revised forest plan). The SIMPPLLE model is a spatially explicit model that uses logic pathways to predict how forests respond over time to succession, wildfires, and insect/disease risks based on cover types, size classes, crown closure, aspect, and slope (Chew, Moeller, & Stalling, 2012). Figure 2 shows the NRV going back about a thousand years, for maximum, minimum, and average levels of lynx habitat in an unsuitable condition within the Forest's LAUs, and compares that to the current level (projected back in time for comparison, with decade 101 on the x-axis representing the decade beginning with 2010).

To provide context for NRLMD standard VEGS1, NRV was modeled to display the number of LAUs with more than 30 percent of lynx habitat in a temporarily unsuitable condition for the Flathead National Forest. The model estimated that at a maximum level, 13.8 percent of Forest LAUs would have had more than 30 percent of the lynx habitat in an LAU in an unsuitable condition. At a minimum level, 4.0 percent of LAUs would have had more than 30% of lynx habitat in an unsuitable condition, with a mean level of 8.6 percent.

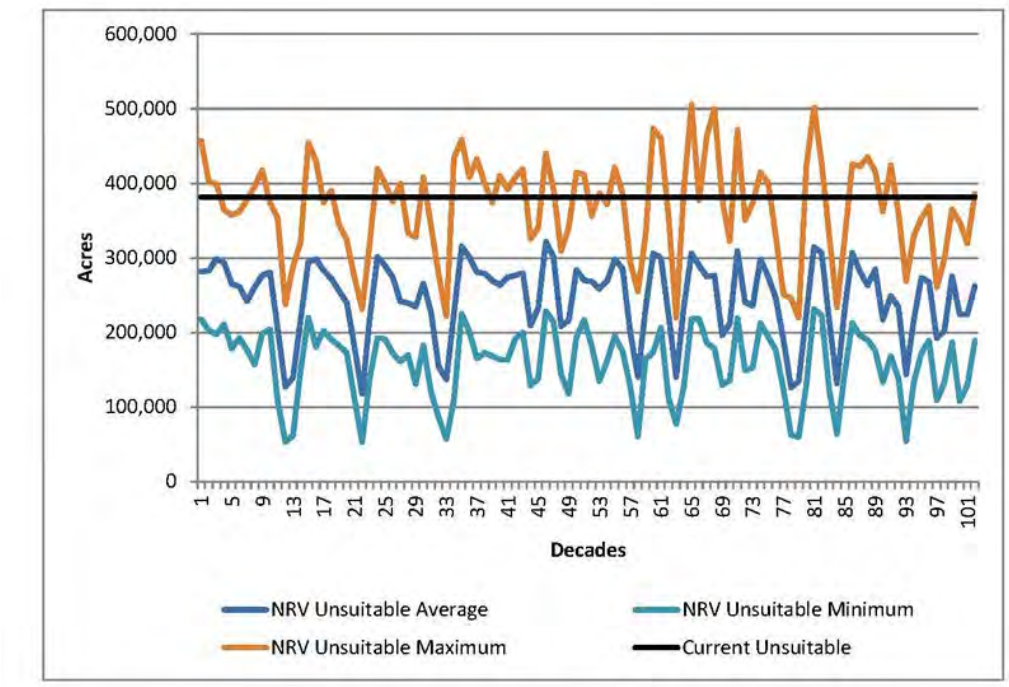


Figure 2. Lynx habitat in a temporarily unsuitable condition modeled for the past 102 decades: natural range of variation (NRV) and current levels

Historically, the acreage burned by wildfires has fluctuated substantially from decade to decade on the Flathead National Forest. Many factors (including weather, climate, ignition sources, available fuels, and fire suppression efforts) interact to influence the amount of acreage burned by wildfire in a given year. As shown in Figure 2, we are above maximum NRV for some decades and below maximum NRV for others, and the current condition is above the long-term average.

The SIMPPLLE model was also used to estimate the maximum and minimum amounts of the stand initiation structural stage on the Forest that would have occurred historically due to naturally occurring fires. Modeling indicates the stand initiation phase would have been a maximum of about 13 percent of all lynx habitat at a forestwide scale. There is a wide range of variation of about 180,000 acres between maximum and minimum NRV. This is because the stand initiation phase occurs for a relatively short period of time following major disturbances (e.g., stand-replacing fire), which typically begins once small trees and shrubs have regenerated, but may only last another decade or two until the stand moves into stem exclusion condition (depending upon factors such as elevation and stem density).

Figure 3 displays all Forest acres burned from 1889-2015. The number of acres burned on the Flathead National Forest in 2016 totaled less than 500 acres. During the largest fire years about a century ago, the actual area burned on the Flathead National Forest was about 140,000 acres in 1890, 432,500 acres in 1910, 150,000 acres in 1919, and 90,000 acres in 1929. From 1939 to 1987, very few acres were burned. Starting in 1988, there has been an increase in acres burned; the three largest recent fire years burned about 235,000 acres in 2003, 120,000 acres in 2008, and about 100,000 acres in 2014.

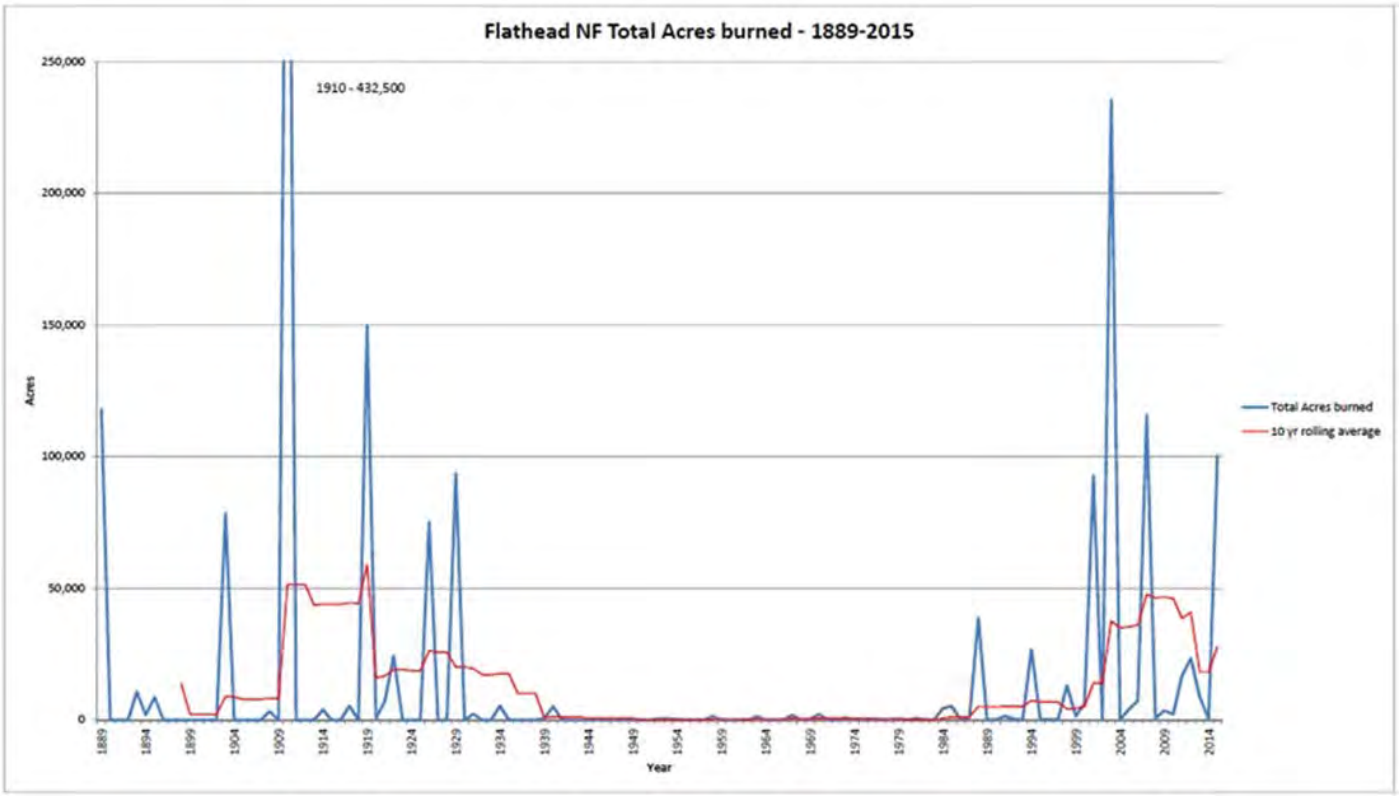


Figure 3. Forest total acres burned 1889-2015

Associated with the recent increase in the prevalence and extent of wildfires, about 381,336 acres (approximately 21 percent) of lynx habitat in LAUs on national forest system lands of the Forest were burned by wildfire within the last two decades. In the subalpine zone that supports lynx habitat, wildfires

are typically stand-replacing events. For purposes of forestwide modeling, areas burned in the past 20 years are not yet providing snowshoe hare habitat in all seasons.

On the Forest, western larch, lodgepole pine, Douglas-fir, and white pine generally are the dominant tree species on boreal forest habitat types during the early and late stand initiation stage. Some areas that experience intense stand-replacing wildfire and/or repeated burns may regrow as monotypic forests of lodgepole pine. If these lodgepole pine stands are extremely dense (e.g., 20,000-50,000 stems per acre), the trees will move quickly into stem exclusion, losing their lower live branches and eliminating seedlings and shrubs in the understory due to competition and lack of light. If lodgepole pine stands are less dense, they move into a stem exclusion condition more slowly. Much of the forest that burned in the 1988 fires in the North Fork Flathead River geographic area have developed sufficient height and density of trees and shrubs to produce winter snowshoe hare and lynx habitat; however, some stands that regenerated with extremely dense lodgepole pine have already moved into the stem exclusion stage and no longer have live branches at the snow surface or shrubs in the understory to provide hare foraging habitat.

Some of the extremely dense lodgepole pine forests that regenerated after wildfires in 1910, 1919, and 1929 have stagnated in the stem exclusion stage. These forests are composed of very dense lodgepole pine with an average diameter of 4-5 inches d.b.h. and generally will not progress into a condition where they provide multistoried hare and lynx habitat. These forests are known to remain "stagnated" in the stem exclusion structural stage until they are replaced by a stand-replacing wildfire or by human intervention. In lodgepole pine stands with a more moderate tree density, shade-tolerant trees such as subalpine fir or Engelmann spruce are able to grow and eventually dominate the stand. These stands are able to develop into a multistory structure that provides snowshoe hare and lynx habitat. Examples of both scenarios exist on the Flathead National Forest.

Since about 1950, the early stand initiation stage has also been created in lynx habitat by vegetation management activities, including timber harvest. About 30,926 acres (approximately 2 percent) of lynx habitat in LAUs was treated by regeneration harvest on national forest system lands of the Flathead National Forest from 1994-2013 and are less than 20 years old. Observations suggest that, similar to wildfire, regeneration harvest units do not develop into stand initiation snowshoe hare habitat until 20 or more years post-harvest. Telemetry locations of lynx on the Forest indicate that lynx begin to use the harvested stands for foraging once sufficient tree and shrub growth has occurred and continue to frequent harvested stands if they develop a multistoried structure. In past harvest units in the Cool-Moist Broad PVTs (biophysical setting) of the Forest, tree density and composition often supports lynx use. Tree density and composition are affected by natural factors as well as by post-harvest treatments (depending upon factors such as aspect, elevation, type of harvest, and whether the stand was precommercially thinned and/or planted with small trees after harvest).

Squires and others are conducting research evaluating how lynx and hares respond to fire across a continuum of fire age and post-fire silvicultural treatment. Retrospective analysis of stand history (harvest prescription, fuels disposal, tree planting, precommercial thinning) is also underway to gain a better understanding of how silvicultural practices influence lynx habitat use, as determined using previously collected telemetry locations of lynx (J. Squires, pers. comm. to R. Kuennen, June 2016).

Existing conditions in lynx analysis units on the Flathead National Forest

There are 109 lynx analysis units that are wholly or partially within the Flathead National Forest (see table 4). These lynx analysis units encompass a total of about 2.4 million acres on the Forest. Under the NRLMD standard LAU S1, changes to lynx analysis units may only be made if site-specific habitat information demonstrates it is needed and after review by the Regional Office. Changes have not been

made to lynx analysis unit boundaries on the Flathead National Forest subsequent to their delineation in 2000.

Within the lynx analysis units, an estimated 1.8 million acres provide potential lynx habitat (Figure B-9) where NRLMD management direction applies. The remainder of Forest lands occur at low elevations lacking in deep, fluffy snow or are inclusions that are not capable of producing boreal forest habitat (e.g., dry forest types, non-forest). Under NRLMD standard VEGS1, if the early stand initiation stage (not yet winter snowshoe hare habitat) exceeds 30 percent of an LAU, no additional habitat may be regenerated by vegetation management projects unless:

- it meets criteria applicable to the wildland-urban interface (as discussed in the WUI section)
- a broad scale assessment has been completed that substantiate different historic levels of stand initiation structural stages.

As of 2015, there were about 25 of 109 (23%) of lynx analysis units on the Flathead National Forest (see table 4) that have more than 30 percent of lynx habitat modeled as being in an early stand initiation condition as a result of stand-replacing wildfires. As shown in table 4, wildfire was clearly the driver in creating substantial acreages on the Forest in a condition where they do not yet provide winter hare and lynx habitat. Although a large percentage of some LAUs is in the WUI, as shown in table 4, the percentage of lynx habitat affected by regeneration harvest has generally been minor in comparison.

Under NRLMD standard VEG S2, no more than 15 percent of lynx habitat on NFS lands can be regenerated by timber management projects within a lynx analysis unit in a ten-year period, unless it meets criteria applicable to the wildland-urban interface. Table 4 displays the condition of lynx analysis units based on forestwide modeling. On the Flathead National Forest, only 10 of the 109 lynx analysis units have had more than 5 percent of the lynx habitat acres regenerated by vegetation management activities over the time period from 1994-2016. Since the forest plan was amended to include the NRLMD in 2007, none of the LAUs has had more than 15% regenerated by timber harvest (two LAUs exceed 15 percent due to regeneration harvest that occurred prior to 2007).

Table 4. Existing conditions of lynx analysis units (LAU) on the Flathead National Forest with regard to acres of lynx habitat on NFS land.

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1996-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1994-2016[b]	Approximate percentage of lynx habitat on NFS lands in wildland-urban interface
Canyon	96%	23,578	45%	3%	16%
Hay	90%	22,318	None	None	11%
Lakalaho	100%	21,148	< 0.5%	None	18%
Lower Big	99%	18,543	93%	< 0.5%	9%
Lower Coal	53%	13,968	58%	None	17%
Lower Whale	94%	18,341	27%	3%	22%
Moose	82%	11,102	None	1%	48%
North Trail	85%	26,722	1%	< 0.5%	25%
Red Meadow	87%	21,956	None	None	27%
South Trail Tepee	93%	20,236	76%	3%	40%

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1996-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1994-2016[b]	Approximate percentage of lynx habitat on NFS lands in wildland-urban interface
Teakettle	59%	6,868	1%	None	70%
Upper Big	98%	18,039	24%	None	None
Upper Coal	93%	23,894	7%	<0.5%	None
Upper Trail	100%	15,404	None	None	None
Upper Whale	100%	21,775	< 0.5%	None	None
Bear Creek	96%	21,039	28%	< 0.5%	52%
Challenge Granite	100%	17,419	18%	< 0.5%	None
Clayton Anna	100%	16,183	66%	4%	None
Coram Abbot	84%	6,653	none	None	37%
Dirtyface Spruce	100%	13,023	5%	None	6%
Doris Creek	100%	24,118	24%	3%	9%
Emery Creek	100%	12,844	None	1%	2%
Essex Java	99%	14,052	15%	< 0.5%	29%
Felix Logan	100%	17,471	13%	None	None
Graves Forest	100%	21,221	8%	None	< 0.5%
Hungry Horse Creek	100%	11,537	None	None	None
Lake Five	58%	2,745	None	None	99%
Long Cy	100%	21,494	23%	None	none
Moccasin Nyack	92%	13,427	2%	< 0.5%	64%
Murray Canyon	100%	12,625	None	0.5%	None
Paola Ridge	92%	9,534	<0.5%	2%	48%
Slippery Bill	100%	12,587	14%	< 0.5%	None
South Firefighter	100%	10,726	None	5%	None
Stanton Grant	95%	16,800	None	1%	51%
Vinegar Moose	100%	21,481	10%	None	4%
West Columbia	87%	7,851	None	None	86%
Wheeler Creek	100%	15,087	None	None	14%
Wildcat Mountain	100%	15,831	20%	2%	None
Albino Necklace	99%	14,269	13%	None	None
Babcock Creek	100%	11,665	8%	None	None
Bent Whitcomb	100%	21,268	63%	1%	4%
Big Prairie Cayuse	100%	11,042	49%	None	None
Big Salmon Lake	97%	22,216	46%	None	None
Black Bear Helen	100%	14,766	79%	None	None
Bunker Creek	100%	23,273	45%	< 0.5%	None
Cox Creek	100%	19,936	4%	None	None

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1996-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1994-2016[b]	Approximate percentage of lynx habitat on NFS lands in wildland-urban interface
Dolly Varden Creek	100%	24,864	14%	None	None
Dryad Miner	99%	16,882	< 0.5%	None	None
Foolhen Danaher	100%	25,440	10%	None	None
Holbrook Bartlett	100%	29,119	47%	None	None
Hungry Picture	100%	18,561	30%	None	None
Kah Soldier	100%	15,288	9%	2%	8%
Little Salmon Creek	100%	27,766	11%	None	None
Lodgepole Creek	100%	21,319	4%	None	None
Lost Jack Mid	100%	13,182	91%	None	None
Lower Gordon Creek	100%	15,795	42%	None	None
Lower White River	100%	17,902	38%	None	None
Lower Youngs Creek	100%	18,885	50%	None	None
Mud Lake	100%	10,488	62%	None	None
Pale Clack	100%	13,956	3%	None	None
Peters Crossover	100%	17,925	None	None	None
Quintonkon Creek	100%	15,888	7%	< 0.5%	2%
Rapid Basin	100%	29,821	25%	None	None
Shadow Dean	100%	27,399	24%	None	None
Silvertip Creek	100%	12,540	35%	None	None
Spotted Bear Mountain	100%	20,943	53%	< 0.5%	1%
Stadium Gorge	100%	25,091	13%	None	None
Stony Jungle	100%	17,700	61%	1%	3%
Strawberry Creek	100%	16,688	27%	None	None
Sullivan Creek	100%	27,743	16%	1%	None
Three Sisters Bungalow	100%	27,654	18%	None	None
Trail Bowl	100%	24,727	78%	None	None
Twin Creek	100%	18,890	5%	< 0.5%	< 0.5%
Upper Gordon Creek	99%	12,638	5%	None	None
Upper White River	100%	12,521	24%	None	None
Upper Youngs Creek	100%	26,021	59%	None	None

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1996-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1994-2016[b]	Approximate percentage of lynx habitat on NFS lands in wildland-urban interface
Blacktail	79%	13,680	< 0.5%	7%	80%
Haskill Mount	76%	7,885	None	5%	37%
Bond	82%	10,903	None	None	37%
Buck	68%	9,854	16%	None	61%
Elk	77%	18,879	7%	7%	29%
Glacier	92%	21,066	40%	7%	20%
Holland	81%	8,294	None	3%	53%
Krause	85%	13,308	< 0.5%	None	50%
Lion	98%	10,950	< 0.5%	5%	None
Lost	78%	12,365	12%	None	< 0.5%
Lower Beaver	86%	16,661	< 0.5%	12%	39%
Meadow	87%	7,248	41%	5%	4%
North Crane	78%	10,258	None	2%	65%
Piper	91%	18,696	< 0.5%	10%	15%
Porcupine	63%	8,087	None	None	1%
Schmidt	83%	9,677	None	None	52%
Soup	18%	2,351	None	None	None
South Cold	93%	17,989	< 0.5%	2%	13%
South Crane	97%	13,938	None	3%	36%
South Woodward	94%	13,370	1%	4%	8%
Squeezer	51%	10,759	2%	1%	None
Upper Beaver	96%	10,684	< 0.5%	< 0.5%	< 0.5%
Woodward	21%	3,743	None	1%	1%
Ashley Herrig	30%	6,660	None	5%	87%
Evers Reid	73%	9,586	< 0.5%	10%	82%
Lost Tally	89%	9,590	None	6%	99%
Lower Good	84%	19,746	< 0.5%	6%	56%
Lower Griffin	93%	17,622	57%	17%	25%
Martin Stillwater	90%	15,804	None	5%	16%
Sheppard	94%	21,352	80%	17%	22%
Upper Good	98%	28,384	15%	13%	23%
Upper Griffin	81%	15,844	5%	6%	1%
Upper Logan	80%	17,893	< 0.5%	12%	15%

a. acres burned by wildfire may include areas with previous regeneration harvest, so wildfire and regeneration percentages are not additive. These percentages are based upon forest scale data, modeled as a time period of 20 years, and are verified at the project level.

b. based on USFS FACTS database, which does not include decisions not yet implemented. For inclusion of decisions not yet implemented, Table 5.

* shaded LAUs are estimated to have 30 percent or more of lynx habitat in a temporarily unsuitable condition. This is verified at the project level.

Fuels treatments and precommercial thinning in lynx habitat

Standards VEG S1, VEG S2, VEG S5, and VEG S6 include an exemption for fuels treatments to protect communities at risk in lynx habitat within the wildland-urban interface. Such fuels treatments may not occur on more than 6 percent of lynx habitat on each national forest considered "occupied" as defined in the NRLMD, which is a limit of about 103,800 acres on the Flathead National Forest (USDA, 2007b). (For additional discussion of the wildland-urban interface, see the Canada lynx critical habitat section below.)

Standard VEG S5 also contains six listed exceptions that allow for precommercial thinning in lynx habitat to meet other specific resource objectives. VEGS6 contains several listed exceptions for vegetation management projects that reduce snowshoe hare habitat in multistory mature or late successional forests. The estimated acres that would possibly be treated through precommercial thinning exceptions are shown in appendix K of the FEIS for the Northern Rockies Lynx Management Direction. For the Flathead National Forest, the estimated acres to be thinned under the exceptions to the vegetation standards was 1,460 acres over a 10-year period (less than 0.1 percent of the lynx habitat on the Forest). The estimates were distributed as 500 acres for defensible space, 220 acres for research studies and genetic tree testing, and 740 acres for daylight thinning of western white pine. It was noted throughout appendix K that the acreages for precommercial thinning exceptions were only estimates and might change due to changing needs. Since these estimates were the basis of incidental take, this biological assessment and consultation updates the estimates for purposes of determining incidental take.

In its biological opinion on the Northern Rockies Lynx Management Direction, the Service concluded that there was potential for incidental take to occur in lynx habitat, mostly due to the exemptions and exceptions to the vegetation standards, which could diminish the value of lynx habitat and thereby impair feeding and reproduction by adult female lynx and survival of kittens. Because of the difficulty of detecting incidental take of lynx, the Service used the total estimated acreage of the exemptions and exceptions as a surrogate measure. The amount of incidental take thus was anticipated to be represented by fuels treatments on up to 6 percent of lynx habitat across the entire Northern Rockies analysis area over 10 years (729,000 acres) and precommercial thinning for other resource benefits on up to 64,320 acres (less than 0.5 percent) of snowshoe hare habitat (lynx foraging habitat) over a 10-year period. The Service provided reasonable and prudent measures and terms and conditions in order to minimize incidental take.

Annual monitoring and reporting is a requirement of the NRLMD biological opinion in order to ensure that the level of incidental take is not exceeded. The actual acres with decisions for treatments using wildland-urban interface exemptions on the Forest was a little over 10,000 acres as of January 2017 (table 5). During the same period, the Flathead National Forest had decisions for 940 acres (including 939 acres treated under the VEGS5 exceptions and 1 acre treated under VEGS6 exceptions (table 5). The vast majority of thinning completed under the exceptions was for western white pine, in which 80 percent of the winter snowshoe hare habitat was retained as required by the standard. The allowable level of incidental take has not been exceeded for the Northern Rockies analysis area (MFWP, 2016) nor for the Flathead National Forest (table 5, Figure B-11).

Table 5. Acres of lynx habitat on the Flathead National Forest treated with exceptions and exemptions to the forest plan vegetation standards (decisions from 2007 thru January 2017, updated via consultation) (source: (USDA, 2016e).

Habitat	Estimated acres in the 2007 FEIS	Sum of acres with decisions for treatment
Lynx habitat outside the wildland-urban interface with decisions for precommercial thinning using the VEGS5 exceptions (only 1 acre was treated using the VEGS6 exceptions)	1,460 (over 10 years)	940* (2007-2016)
Lynx habitat inside the wildland-urban interface with decisions for treatments using the fuels reduction exemption	103,800 (cumulative)	10,079 (2007-2016)

*The Forest consulted on 940 acres but dropped 675 acres, so only 265 are actually planned for treatment.

Existing conditions in relation to winter recreation

Ski Resorts on the Flathead National Forest

Effects to lynx from Montana's ski resorts were assessed in 2000 and 2001 after the Canada lynx was listed (USDA-USDI, 2000; USFWS, 2001b). In 2007, when consultation on the NRLMD occurred, the effects of ski areas and other types of winter recreation on lynx were further analyzed. The Flathead National Forest has two ski resorts; Whitefish Mountain Resort (formerly known as Big Mountain) and Blacktail Mountain Resort. Both of these resorts were addressed in the BOs (USFWS, 2001b, 2007b). In its 2001 BO, the Service stated that habitat loss results from clearing of trees for ski runs, roads, and other developments associated with ski areas. Winter activity associated with ski resorts, including skiing, ski-lift operation, and grooming of ski runs, may also cause disturbance or displacement of individual lynx. In its 2007 BO, the Service determined that although individual lynx may be adversely affected by recreation developments, the management direction in the NRLMD would reduce potential impacts at a landscape scale, avoiding an appreciable reduction in the reproduction, numbers, and distribution of lynx.

About 3,100 acres of the Lakalaho lynx analysis unit is in the Whitefish Mountain Ski and Summer Resort permit area. Since 2007, the Forest has consulted on the effects of projects within the resort, including consultation for Canada lynx critical habitat (USDA-USFWS, 2016; USFWS, 2007a, 2011b, 2013b, 2015a).

The Blacktail Mountain Resort is located in the Blacktail lynx analysis unit (LAU). The resort includes cleared or gladed ski runs with heavily treed areas between. Primarily winter operations occur on about 600 acres of NFS lands at this downhill ski area on the summit of Blacktail Mountain. The resort is in mapped lynx habitat. This ski area was evaluated as part of the biological assessment and biological opinion for all ski areas in Montana on Forest Service and Bureau of Land Management lands (USFWS, 2001b).

Over-snow vehicle use

In November 2006, the Flathead National Forest issued a decision for a motorized winter recreation plan, also known as amendment 24 (A24) to the forest plan. Developed with consideration of the terms of a settlement agreement, the decision clarified where, when, and under what conditions over-snow vehicles are allowable on the Flathead National Forest. The specific areas and routes that are suitable for motorized over-snow vehicle use are identified on maps that were incorporated into the forest plan. Under this decision, about 32 percent of lynx habitat on the Forest is open to motorized over-snow use or is in cross-country ski areas where trails are groomed. Across the Forest, there are about 1,098 miles of routes in lynx habitat open to motorized over-snow use at various times throughout the year, snow conditions permitting.

In their March 3, 2006, biological opinion on A24 (USFWS, 2006b), the Service concurred with the Flathead National Forest's determination that the proposed federal action was not likely to adversely affect the Canada lynx. The Service based their determination on (1) the proposal's compatibility with the Lynx Conservation and Assessment Strategy, (2) snow compaction that would occur in areas and routes remaining open for snowmobiling, (3) a decrease of more than 300,000 acres in the overlap between modeled lynx habitat and areas open to snowmobiling, (4) a decrease of about 220 miles in routes open for snowmobiling through lynx habitat, (5) no new snowmobile areas or routes would be opened under A24, and (6) there could be an indirect benefit of a reduced risk of inadvertent trapping.

Subsequently, Squires and others (2010) reported on the effects of snowmobiling on Canada lynx in their Seeley Lake study area, south of the Forest. They were unable to quantify the number of snowmobiles using forest roads in lynx home ranges, but one primary groomed trail was used by approximately 130 snowmobiles/day. They reported that they found no evidence that lynx selected areas away from forest roads or groomed snowmobile trails during winter.

In the past, some researchers have speculated that packed trails could indirectly affect Canada lynx by serving as travel routes that might enable competing predators (e.g., coyotes) to access snowshoe hare prey in lynx habitat (Murray & Boutin, 1991; Murray, Boutin, & O'Donoghue, 1994; Ruggiero et al., 1999). However, in its remanded determination (Federal Register vol. 68, no. 128, pp. 40076-40101, July 3, 2003), the Service found no evidence for competition between lynx and other predators such as coyotes or, if competition exists, there is no evidence that it exerts a population-level impact on lynx, and therefore the Service did not consider this to be a threat to lynx. Additionally, Kolbe, Squires, Pletscher, and Ruggiero (2007) completed a study of the effect of snowmobile trails on coyote movements in lynx habitat in northwestern Montana. They reported that coyotes in their study area were primarily scavengers in winter (snowshoe hare kills composed only 3 percent of coyote feed sites). Furthermore, coyotes did not forage closer to compacted snowmobile trails than random expectation, and the overall influence of snowmobile trails on coyote movements and foraging success appeared to be minimal (Kolbe et al., 2007). John Squires confirmed that Kolbe's findings are the best available science for the Flathead National Forest (J. Squires, 2015; Warren, 2016b). However, because snow compaction results varied across the 18 national forests encompassed by the NRLMD, Guideline HU G11 specified that designated over-the-snow routes or designated play areas should not be expanded outside baseline areas of consistent snow compaction unless designation serves to consolidate use and improve lynx habitat.

Habitat Connectivity or Linkage

Lynx linkage areas were identified in the NRLMD. Lynx linkage areas are intended to maintain connectivity and allow for movement of animals between blocks of habitat that are otherwise separated by intervening non-habitat areas such as basins, valleys, and agricultural lands or places where habitat naturally narrows due to topographic features. These linkage areas were initially identified on the basis of expert opinion and were coarsely mapped at a broad scale. The group anticipated that linkage areas would be further refined as more information became available. Subsequently, Squires and others (2013) used telemetry data for 64 lynx monitored during 1998–2007 to create a broad-scale resource selection model that predicted probable lynx habitat and "putative movement corridors" across the species' distribution in the Northern Rocky Mountains. This analysis included quantification of the relative likelihood of lynx crossing major highways, one of the major hypothesized anthropogenic threats to lynx connectivity.

Squires et al. (2013) reported that the putative movement corridors they identified for lynx also showed reasonable correspondence with previously published models for wolverine (M. K. Schwartz et al., 2009), for wolves (Oakleaf et al., 2006), and for grizzly bears (R. D. Mace, Waller, Manley, Ake, & Wittinger, 1999). Most of the least-cost paths generated by their model went along the lower slope of the Swan

Range to the east of highway 83 and crossed the U.S. Highway 2 transportation corridor within a six-mile stretch of highway to the north of Hungry Horse Reservoir near the town of Hungry Horse, Montana. The travel route then moved northwest to the Whitefish Mountain divide and split into two routes in the Red Meadow LAU in the North Fork Flathead River watershed as it approached the Canadian border. The Forest used the updated information published by Squires and others in 2013 in developing its plan components for habitat connectivity.

Citing a 2002 article by Hansen et al., Squires and others (2013) stated, "Given that increased traffic and urbanization are projected for the Northern Rockies, mitigation such as land purchases and conservation easements may be necessary to preserve connectivity among lynx populations" (p. 194). Private land development, especially along highway corridors in mountain valleys, may also fragment habitat and impede the movement of lynx.

Effects of the framework programmatic action

Introduction

In this section, "effects of the action" refers to the effects of an action on the Canada lynx and its habitat, together with the effects of other activities that are interrelated or interdependent with that action. The environmental baseline includes the past and present impacts of actions and human activities in the action area, considering the anticipated impacts of proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the cumulative impact of State or private actions that are contemporaneous with the consultation in process.

This section considers the effects from implementation of the revised forest plan as guided by the plan components (objectives, desired conditions, suitability, standards, and guidelines applied forestwide or to management areas). This analysis addresses how the specific components targeted for Canada lynx (biological assessment appendix D), as well as key plan components not targeted for the Canada lynx, have the potential to affect its persistence and recovery.

As is typical of Forest Service land and resource management plans, the revised forest plan does not prescribe site-specific actions, and so this document does not provide an analysis of site-specific projects. Because this is a broad-scale analysis of actions that could potentially result in effects on the Canada lynx, its habitat, the Flathead National Forest is responsible for section 7 consultation on future projects (conducted under the revised forest plan).The forest plan was amended in 2007 to add objectives, standards, and guidelines that addressed the major threats to lynx and remedied the inadequacy of existing regulatory mechanisms. The NRLMD addressed vegetation management, livestock management, human use projects (e.g., special uses, recreation management, roads, highways, and mineral/energy development), linkage areas, and some general direction that applies to all management practices and activities. The BO for the NRLMD stated, "We conclude, based on our entire analysis, that the proposed action would support lynx populations in core areas, and would not appreciably reduce the reproduction, numbers or distribution of lynx in the NRLA. The recovery outline for lynx (USWS 2005) presents our current understanding of historical and current lynx distribution, ecology, population dynamics, and the relative importance of different areas to the persistence of lynx in the contiguous United States. We have determined that the proposed action is compatible with our understanding of recovery needs for lynx in the contiguous United States DPS." (USFWS, 2007b). The effects to lynx that were described in the 2007 FEIS (volumes 1 and 2), biological assessment, biological opinion, and record of decision for the Northern Rockies Lynx Management Direction (NRLMD) are incorporated by reference.

Alternative B modified is based on the detailed proposed action that was published with the notice of intent in March 2015 and alternatives displayed in the May 2016 draft revised forest plan, with

clarifications and modifications in response to comments. Alternative B modified emphasizes moving towards desired future conditions that contribute to ecological, social, and economic sustainability. The forestwide NRLMD management direction is carried forward as appendix A of the proposed action, with two forest-specific modifications:

- an additional Forest-specific exception under VEG S6 for the felling of trees within 200 feet of selected mature whitebark pine trees that are genetically resistant to disease;
- amended wording of NRLMD guideline HU G11 to shift areas suitable for motorized over-snow use provided there is no net increase in suitable areas on a forestwide basis.

The previous section presented risk factors and activities that can affect Canada lynx in the action area, some of which may also result from future actions undertaken as allowed by the proposed action (alternative B modified). First, the effects section assesses allowable activities that can pose a risk to Canada lynx (the key stressors or anthropogenic influences identified in the 2013 Lynx Conservation Assessment and Strategy, discussed above in the affected environment section). Effects are also put in context based upon the extent to which they are allowed under the existing forest plan versus the proposed action. Lastly, the cumulative effects are examined.

The anticipated effects of the proposed programmatic action (B modified) are based upon:

- updates to the environmental baseline and best available science,
- plan components in the revised forest plan,
- updated estimates of the acres that would be treated with existing exceptions or exemptions to NRLMD standards to reflect the expected 15-year life of the revised forest plan and an updated assessment of treatments needs,
- an estimate of the acres that would be treated with the new, proposed exception to VEGS6,
- areas and routes suitable for motorized over-snow use.

Effects of forestwide plan components:

Key indicators for analysis

To assess key habitat features and conditions, key indicators for analysis of effects of the revised forest plan for the Flathead National Forest related to risk factors and habitat effectiveness are displayed in table 6.

Table 6. Key indicators for assessing effects to Canada lynx

Resource Element	Indicator
Effects of wildland fire on Canada lynx habitat diversity	Forestwide plan components that are adaptive to the effects of wildland fire. Management areas and the role of wildland fire.
Canada lynx habitat diversity and climate change	Forestwide plan components for terrestrial ecosystems that promote boreal forest vegetation diversity in snowshoe hare and lynx habitat. Management areas and the role of vegetation management. Forestwide components that minimize potential adverse effects of vegetation management.
Canada lynx habitat connectivity, fragmentation of habitat, linkage areas, and travel corridors	Forestwide plan components that support habitat connectivity and reduce fragmentation

Resource Element	Indicator
Recreation	Forestwide plan components that minimize potential adverse effects of snowmobiling and mortality risk due to incidental trapping/shooting
Mineral and energy activities	Forestwide plan components that minimize potential adverse effects of mineral and energy activities.
Forest/backcountry roads	Forestwide plan components that minimize potential adverse effects of forest/backcountry roads and indirect effects of trapping/shooting
Livestock grazing	Forestwide plan components that minimize potential adverse effects of livestock grazing

The Lynx Conservation Assessment and Strategy (ILBT, 2013) identified anthropogenic influences that may affect lynx and lynx habitat, sorted into either the "upper tier" or the "lower tier." The upper tier includes the anthropogenic influences that are of greatest concern to the conservation of the lynx: climate change, vegetation management, wildland fire management, and fragmentation of habitat. The "lower tier" of anthropogenic influences includes recreation (primarily snowmobiling), minerals and energy management, forest/backcountry roads and trails, grazing by domestic livestock, and mortality due to incidental trapping or illegal shooting. It is thought that the lower-tier activities could affect individual lynx but are not likely to have a substantial effect on lynx populations and are of less concern for conservation of the species (Warren, 2016b). These influences are also discussed below. The effects analysis considers the previous analysis and decision under the Northern Rockies Lynx Management Direction FEIS (USDA, 2007b) and assesses the effects of changed conditions or proposed modifications to the forest plan components under the proposed action, alternative B modified.

Wildland fire management

Objectives, standards, and guidelines carried forward from the 2007 NRLMD in proposed alternative B modified are aligned with the following conservation measures for wildland fire management in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (p. 91) at a forestwide scale, considering exemptions allowed by the incidental take statement. Wildland fire management direction allows for activities to occur to meet social, economic, and multiple-use objectives of the Forest while promoting recovery of the Canada lynx population, as discussed below.

- Maintain fire as an ecological process in lynx habitat, where small populations are not at risk of extirpation due to habitat loss. Evaluate whether fire suppression, forest type conversions, and other management practices have altered fire regimes and the functioning of ecosystems. (FW-DC-TE&V-23 and 24)
- Consider the use of mechanical pre-treatment and management ignitions if needed to restore fire as an ecological process or to maintain specific lynx and/or prey species habitat components. (FW-DC-TE&V-23 and 24)
- Design burn prescriptions to promote response by shrub and tree species that are favored by snowshoe hare. (objective VEG O3)

Objective VEG O3 encourages fire use activities that restore ecological processes and maintain or improve lynx habitat. Fire use is a combination of wildland fire and use of prescribed fire to meet resource objectives. Under guideline VEG G4, prescribed fire activities should not create permanent travel routes that facilitate snow compaction and permanent firebreaks should not be constructed on ridges or saddles.

As explained in the affected environment, Canada Lynx Habitat section above, historically, fire has played a significant role in creating forested landscape patterns on the Flathead National Forest and continues to be a dominant ecological process, as expected. Most of the boreal forest zone where lynx habitat occurs has not been strongly influenced by past fire suppression efforts since these areas naturally burn infrequently. Since the late 1980s, the Forest has experienced an increase in the number of large, stand-replacing wildfires. Fire has already been restored as an ecological process and we know of no science indicating that fire regimes in lynx habitat on the Forest have been altered by fire suppression. The Forest is currently experiencing a spike in the amount of lynx habitat that is currently in a temporarily unsuitable condition, similar to the spike that occurred in the time period around 1910. By the expected end of the life of the revised forest plan (about 15 years after adoption), a substantial portion of burned habitat is expected to have developed sufficient height and density to provide dense horizontal cover of branches at the snow surface for snowshoe hare and lynx habitat.

Alternative B-modified includes fire management direction that would support Canada lynx by emphasizing actions that move the Forest towards desired conditions for lynx habitat. Standard FW-STD-FIRE-01 states that when wildland fires occur, appropriate response strategies should be developed based on the risk considerations of life, safety and potential resource impacts and with the participation of other responsible agencies, authorities, and jurisdictions as appropriate. Guideline FW-GDL-FIRE-02 states that the Forest should use wildfires forestwide to meet multiple resource management objectives where and when conditions permit, keeping risk within acceptable limits. Meeting resource objectives generally means progress toward or maintaining desired conditions. Standard VEGS1 ensures that habitat conditions in each LAU will be considered as wildfire, insect, and disease conditions change over time.

Vegetation management

Desired conditions for lynx habitat and vegetation standards VEGS1, VEGS2, VEGS5, and VEGS6 support conservation of Canada lynx and their habitat. Exceptions and exemptions to the standards allow for activities to occur to meet social, economic, and multiple-use objectives of the Forest while promoting recovery of the Canada lynx population on the Forest, as discussed below.

The Forest's habitat components for Canada lynx and are aligned with the following conservation measures for vegetation management in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (p. 91) at the forestwide scale, considering exceptions allowed by the incidental take statement.

- Design vegetation management to develop and retain dense horizontal cover. Focus treatments in areas that have the potential to improve snowshoe hare habitat by developing dense horizontal cover in areas where it is presently lacking. In areas of young, dense conifers resulting from fire, timber harvest, or other disturbance, do not reduce stem density through thinning until the stand no longer provides low, live limbs within the reach of hares during winter (e.g., self-pruning processes in the stem exclusion structural stage have eliminated snowshoe hare cover and forage availability during winter conditions with average snowpack). If studies are completed that demonstrate that thinning can be used to extend the duration of time that snowshoe hare habitat is available (e.g., by maintaining low limbs), then earlier thinning could be considered. (VEGS5, note: exemptions and exception #3 addresses potential for thinning).
- Retain mature multistory conifer stands that have the capability to provide dense horizontal cover. If portions of these stands currently lack dense horizontal cover, focus vegetation management practices (such as group selection harvest) in those areas to increase understory density and improve snowshoe hare habitat. (VEGS6, note: some conifer stands called "multistory" by a silviculturist do not have the capability to provide dense horizontal cover)To maintain the amount and distribution of lynx foraging habitat over time, manage so that no more than 30 percent of the

lynx habitat in an LAU is in an early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (i.e., does not provide winter snowshoe hare habitat). Emphasize sustaining snowshoe hare habitat in an LAU. If more than 30 percent of the lynx habitat in an LAU is in early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (e.g., clearcuts, seed tree harvest, precommercial thinning, or understory removal), no further increase as a result of vegetation management projects should occur on federal lands. (VEGS1, exemptions address precommercial thinning and understory removal in the WUI).Recognizing that natural disturbances and forest management of private lands also will occur, management-induced change of lynx habitat on federal lands that creates the early stand initiation structural stage or silvicultural treatments to remove horizontal cover should not exceed 15 percent of lynx habitat on federal lands within a LAU over a 10-year period. (VEGS2, exemptions address management-induced changes in the WUI).

- Design harvest units to mimic the pattern and scale of natural disturbances and retain natural connectivity across the landscape. (VEG O1).
- Provide for continuing availability of lynx foraging habitat in proximity to denning habitat. (VEG G1)
- When designing fuels reduction projects, where possible retain patches of untreated areas of dense horizontal cover within treated areas. (VEG G10).

The following discussion summarizes and paraphrases the effects of the Forest's plan components for Canada lynx, which carry forward objectives, standards, and guidelines from the NRLMD, with two site-specific modifications. As part of the previous consultation on the NRLMD, the Forest Service estimated acres to be treated, using numbered exceptions to the vegetation standards, anticipated to occur over one decade. In their BO, the Service used these estimated acres in determining incidental take. The Forest is now providing an estimate of acres to be treated using exceptions and exemptions to vegetation standards anticipated to occur over the 15-year time period of the revised forest plan.

Objectives VEG O1, VEG O2, and VEG O4 encourage management of vegetation to mimic or approximate natural succession and disturbance processes while maintaining lynx habitat components. Plan components provide for a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hare, with winter snowshoe hare habitat provided by the stand initiation stage and by mature multistory conifer vegetation. Under alternative B-modified, these objectives would be met at the forestwide scale, which would benefit lynx by creating or sustaining desired habitat conditions. At the project level, vegetation management is focused on areas that have the potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover, except to protect communities at risk in the wildland urban interface.

Guideline G1 encourages development of projects that are designed to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Guideline VEG G5 is to provide habitat for alternative prey species, particularly red squirrel, in each lynx analysis unit. Guideline VEG G10 states that all the vegetation standards should be considered when designing fuel treatment projects within the wildland-urban interface to promote lynx conservation and should be explained in the project NEPA. Guideline VEG G11 describes how denning habitat should be retained and distributed in each lynx analysis unit. These guidelines benefit lynx by encouraging management that creates or maintains lynx habitat components, and they would continue to be considered in the site-specific design of projects under this alternative.

Vegetation treatments in the WUI (wildland urban interface)

The wildland-urban interface (see glossary) is defined by the Healthy Forests Restoration Act. The wildland-urban interface is an area within or adjacent to an at-risk community that is identified in a community wildfire protection plan or that is a certain distance around the community if a community protection plan is not available. For analysis purposes, the wildland-urban interface was modeled in 2007 as a 1-mile buffer surrounding communities with more than 28 people/mi^2.

In recognition of the escalating monetary and societal costs associated with fires in the wildland-urban interface, fuels treatment projects in the wildland-urban interface would be exempted from compliance with VEG S1, VEG S2, VEG S5, and VEG S6 under certain conditions designed to protect communities at risk. Over the entire Northern Rockies analysis area, about 6 percent of lynx habitat was found to be within 1 mile of communities. The 2007 incidental take statement constrains WUI exemption treatments to no more than 6 percent (cumulatively) of lynx habitat on an individual national forest. The Forest is proposing to carry forward the 6 percent exemption for vegetation treatments within the wildland-urban interface (which is 103,800 acres for the Flathead National Forest) for the life of the revised forest plan, which is anticipated to be 15 years.

During the period 2007-2016, the Flathead National Forest used the exemption to treat fuels on 10,079 acres of lynx habitat within the wildland-urban interface, or about 9 percent of the limit allowed under the NRLMD consultation incidental take statement. Fuels treatments in the wildland-urban interface are expected to have some adverse effects on lynx and their snowshoe hare prey, because the intent would be to maintain lower tree density in these areas, resulting in less area of dense horizontal cover. The limitations on the extent and distribution of these projects would, however, limit the impacts on the Canada lynx population. Additionally, on the Flathead National Forest, 48 of the 109 lynx analysis units (44 percent) do not contain any identified wildland-urban interface; these are mostly located within the Bob Marshall Wilderness Complex.

The wildland urban interface on the Forest is defined by community protection plans. An analysis of these WUI boundaries on the Forest shows that much of the WUI is at lower elevation and is relatively poor quality habitat for lynx (J. R. Squires et al., 2013), reducing the potential for adverse effects. The Salish Mountains geographic area has the highest percentage of lynx habitat in the wildland-urban interface (ranging from 1 to 99 percent of individual lynx analysis units), followed by the North Fork of the Flathead River (ranging from 9 to 70 percent) and the Swan Valley geographic area (ranging from 0 to 61 percent). In its previous biological opinion on the NRLMD, the USFWS assumed that fuel treatments within the wildland-urban interface would not be excessively concentrated in adjacent lynx analysis units because fuel treatment projects may not result in more than three adjacent lynx analysis units exceeding standard VEG S1. These limitations would continue to limit the concentration of impacts to Canada lynx in the future.

Vegetation Standards

In summary, standard VEG S1 allows no additional regeneration harvest by vegetation management projects if more than 30 percent of the lynx habitat in lynx analysis unit is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, with certain exceptions or exemptions allowed under the 2007 incidental take statement. As a result of recent large wildfires, currently 25 of the 109 lynx analysis units on the Forest exceed the 30 percent VEGS1 threshold (table 4). Limiting further regeneration harvest in lynx analysis units that do not meet all of the VEGS1 exemption requirements until vegetation regrows into snowshoe hare habitat would help to support lynx by maintaining a mosaic of habitat, as called for under VEG O2, so that a lynx is more likely to be able to access sufficient prey resources within its home range.

In summary, standard VEG S2 does not allow timber management projects to regenerate more than 15 percent of lynx habitat on National Forest System lands within a lynx analysis unit in a 10-year period, with certain exceptions or exemptions allowed under the 2007 incidental take statement. By limiting the rate of regeneration harvest in each LAU, this standard would help to maintain a mosaic of habitat over time, as called for under VEG O2, which would benefit lynx by providing distribution of prey resources across the landscape.

In summary, standard VEG S5 limits precommercial thinning projects during the stand initiation structural stage until the stand no longer provides winter snowshoe hare habitat, with certain exceptions or exemptions allowed under the 2007 incidental take statement. The intent is to maintain the habitat conditions that are expected to produce high densities of snowshoe hares, which would contribute to sustaining the lynx population. There are six exceptions to the standard VEG S5 that could be used to meet other resource objectives.

The six exceptions to standard VEG S5 are as follows: (1) within 200 feet of administrative sites, dwellings, or outbuildings; (2) for research studies or genetic tree tests; (3) based on new, peer-reviewed information demonstrating that a project is not likely to affect lynx or would have short-term adverse effects but long-term beneficial effects; (4) for conifer removal or daylight thinning where aspen is in decline; (5) for daylight thinning of planted rust-resistant western white pine where 80% of the winter snowshoe hare habitat is retained;; or (6) to restore whitebark pine. Exceptions 2 through 6 may only be utilized in lynx analysis units where standard VEG S1 is met. The overall effects of the VEG S5 exceptions on lynx across the Northern Rockies analysis area, as summarized in the 2007 record of decision, are as follows. Few acres would be precommercially thinned at administrative sites and for research and genetic tests, and these would generally be benign with little or no adverse effect on lynx. Thinning to enhance whitebark pine and aspen would benefit other wildlife species and would occur on a limited number of acres of lynx habitat, resulting in a minor adverse effect on lynx. Daylight thinning would be allowed around individual western white pine in a manner that retains most winter snowshoe hare habitat. Daylight thinning may reduce lynx habitat effectiveness, but since this tree species has declined by 95 percent across its range, it was decided that a limited amount of thinning should be allowed to maintain western white pine on the landscape. The Forest is proposing to increase its anticipated pre-commercial thinning treatments using exceptions to VEGS5 for the life of the revised forest plan, which is anticipated to be 15 years, as outlined below. The exceptions to VEG S5 were anticipated to result in the loss of lynx foraging habitat in some treated stands, which could have an adverse effect on lynx survival and reproduction by reducing prey resources. However, the Forest now has an abundance of acres which have burned since 2000, creating an abundance of forests that are, or soon will be providing stand initiation hare habitat, so adverse effects of proposed pre-commercial thinning are expected to be minor.

In summary, standard VEG S6 limits vegetation management projects that would reduce winter snowshoe hare habitat in multistory forests, with certain exceptions or exemptions allowed under the 2007 incidental take statement. Fuels treatments intended to protect communities at risk within the wildland-urban interface that do not meet the vegetation standards may occur on no more than 6 percent cumulatively on each national forest. Research in northwest Montana demonstrated that mature multistory forests provide important snowshoe hare habitat and are more important to lynx than younger stands during the critical winter period (J. R. Squires et al., 2010). Timber harvest would be allowed in areas that have the potential to improve winter snowshoe hare habitat but presently have poorly developed understories. Implementation of this standard is expected to benefit lynx by retaining and developing important winter habitat. There are three exceptions to standard VEG S6: (1) to accommodate fuels reduction activities within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special-use permit improvements, including infrastructure within permitted ski area boundaries, to

provide defensible space; (2) for research studies or genetic tree tests; and (3) for incidental removal during salvage harvest (e.g., removal due to location of skid trails). Exceptions 2 and 3 can only be used in lynx analysis units where standard VEG S1 is met. The exceptions to VEG S6 were anticipated to result in the loss of lynx foraging habitat in some treated multistory stands, which could have an adverse effect on lynx survival and reproduction by reducing prey resources. However, it was expected that an insignificant number of acres would be affected under the exceptions. The Forest is proposing anticipated treatments using exceptions to VEGS6 for the life of the revised forest plan, which is anticipated to be 15 years, as outlined below. In addition, alternative B-modified includes an additional site-specific exception to standard VEG S6 to benefit whitebark pine, as discussed in detail below.

Under alternative B modified, the estimate for all of the exceptions to vegetation standards VEGS5 and VEGS6 is given as a range of acres, from about 10,900 to 15,460 acres. The high end of the range includes acres that could be treated with existing NRLMD exceptions and exemptions but that cannot be specifically identified at the present time. For planning purposes, the upper end reflects potential treatment needs, updated in 2016, distributed as follows:

- about 500 acres for defensible space (VEG S5/S6 exception 1);
- about 1,510 acres for research studies and genetic tree tests (VEG S5/S6 exception 2);
- about 1,800 acres for conifer removal or daylight thinning of aspen (VEG S5 exception 4);
- about 4,750 acres for daylight thinning of planted, rust-resistant western white pine (VEG S5 exception 5);
- about 2,500 acres to restore whitebark pine in wildfire areas and forests with sapling-size trees (VEG S5 existing exception 6);
- about 4,400 acres to restore whitebark pine in forests with trees larger than sapling-size (VEG S6 new Forest-specific exception).

As previously analyzed in the biological assessment for the NRLMD, the Forest anticipates that the overall acres for purposes of incidental take would be constrained but that there would be flexibility as to which exception categories are used in order to respond to changing budgets, conditions and needs. Additional consultation would occur at the project level to assess site-specific effects on Canada lynx and their habitat. The maximum acres outlined above is about 0.9 percent of lynx habitat on the Flathead National Forest. The Forest anticipates that effects would be minor.

VEG S5 exception 3 has not been included in the acreage estimates because use of this exception first requires peer review and acceptance by the regional level of the Forest Service and state level of the Fish and Wildlife Service, with a written determination stating that modified precommercial thinning techniques would not be likely to adversely affect lynx or would have short-term negative but long-term benefits to the Canada lynx or its habitat. Acres listed under VEGS5 exception 2 include about 1,260 acres of anticipated precommercial thinning that may occur for research studies. Some of this research may involve study of the effects of precommercial thinning in wildfire areas and/or alternative precommercial thinning treatments designed to provide long-term lynx habitat benefits.

Standards and guidelines to retain old growth, snags and down wood would contribute to denning habitat for Canada lynx.

As a result of recent wildfires, there is a large pulse of lynx habitat in the early stand initiation stage on the Flathead National Forest. It is likely that these stands will develop into good-quality winter snowshoe hare habitat within about 20 years; however, after another 20 years or so, this large cohort of forests that are dominated by shade intolerant species and not subalpine fir or spruce, is likely to move into the stem

exclusion stage, producing little hare habitat for several decades. In addition, burned areas that have regenerated into very dense monotypic stands (with densities of 20,000-50,000 trees per acre), are likely to stagnate in the stem exclusion stage. Monitoring conducted on the Forest has shown than some of the very dense forested stands that regenerated after the 1910 wildfires have remained in a stagnated condition (with lodgepole pine trees that are only 3-5 inches d.b.h. and have no live tree branches at the snow surface) for over 100 years and have not progressed to a multistory mature condition.

Recently burned areas provide an opportunity to test modified techniques for precommercial thinning with the aim of increasing tree species diversity, promoting development and retention of dense horizontal cover over longer time periods, and shortening the time it takes for burned forests with very high densities of regenerating trees (often lodgepole pine and/or western larch) to develop into multistory mature forest with a dense understory of spruce and subalpine fir. The Forest Vegetation Simulator has been used to model stand structure and growth following traditional and modified precommercial thinning techniques to predict which methods offer the most promise for providing the desired forest composition and structure to support snowshoe hares and lynx over the long term. These modeling results, as well as monitoring (and possibly research) of past treatments in areas with lynx telemetry data, could inform project planning and design. The Forest is actively working with research scientists to design and conduct studies that clarify the relationships between stand treatments and the effects on lynx.

New exception to standard VEG S6 for noncommercial thinning around mature whitebark pine trees

Standard VEG S5 has an exception that allows precommercial thinning to restore whitebark pine, but VEG S6 does not provide a comparable exception to accommodate vegetation treatments to protect whitebark pine in multistory mature stands. Under Alternative B modified, standard VEG S6 would have an additional exception that would allow noncommercial felling of trees of any size that are growing within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. Removal of these trees would be aimed at reducing the risk of mortality of the whitebark pine trees due to wildfire, within-stand competition, and other stressors and making the trees more resilient and adaptable to changing future environments.

Whitebark pine historically was widespread on the Flathead National Forest and resilient to losses due to wildfire, drought, insects, or pathogens. However, an introduced disease, white pine blister rust, has caused extensive mortality and severe decline of the whitebark pine across its distribution on the Forest. In addition, some whitebark pine trees on the Forest are surrounded by dense forests dominated by larger subalpine fir, making whitebark pine very susceptible to being killed by wildfires. The Forest has already lost some of its remaining live whitebark pine trees of all sizes to high-severity wildfire. The Flathead National Forest is an important source of whitebark pine seeds that are used for restoration of the species throughout the region.

Under the Forest's new VEG S6 exception, along with the existing exception to VEG S5 for whitebark pine, it is estimated that a total of about 2,500 acres over the next 15 years would be treated with precommercial thinning and about 4,400 acres would be treated with noncommercial thinning to protect and restore whitebark pine. The acreage estimate is for the entire stand, although not all of the acres within a stand would be affected since only trees located within 200 feet of the selected whitebark pine trees would be felled. Preliminary analysis, subject to further site-specific analysis, suggests that 18 out of the 109 lynx analysis units distributed in all but the Salish Mountains geographic area may have treatments using this new exception, with no more than 6 percent of the lynx habitat in any one LAU that is identified for possible treatment (for estimated exception acres in lynx analysis units on the Forest see Figure B-8)

Removal of the trees that surround selected mature, rust-resistant whitebark pine trees in mature multistory stands has the potential to decrease the habitat quality of lynx and snowshoe hare habitat. At this time, it is not known whether the stands that would be targeted for treatment actually provide the dense horizontal cover needed by snowshoe hares, and therefore the effects on lynx are uncertain, but site-specific consultation would be conducted when treatments are proposed. Since the felled trees would not be removed from the site, the down logs would provide additional horizontal cover that may partially offset the adverse effects for a short period of time. Because whitebark pine grows at high elevations and no treatment areas were identified in the Salish geographic area, treatments would not be adjacent to areas currently in the wildland-urban interface. Overall, although there could be adverse effects on individual lynx due to the limited number of acres of lynx habitat that would be treated, it is not likely that there would be a detectable impact on the lynx population as a result of this new exception category. Exceptions #2-6 to VEG S5 shall only be utilized in LAUs where standard VEG S1 is met. Exceptions 2, 3, and 4 to VEG S6 shall only be utilized in LAUs where VEG S1 is met. These limitations would continue to limit the concentration of impacts to Canada lynx in the future.

Habitat connectivity, travel corridors, and linkage areas

Additional plan components in alterative B modified address habitat connectivity, travel corridors, and linkage areas on a Forest-specific basis (see examples of key plan components listed below). Management direction allows for activities to occur to meet social, economic, and multiple use objectives of the Forest while promoting recovery of the Canada lynx population, as discussed below.

As explained in the affected environment, Canada lynx habitat section, maintaining Canada lynx habitat connectivity and minimizing fragmentation is important to conservation and recovery. Objectives, standards, and guidelines carried forward from the 2007 NRLMD in the proposed alternative B modified are aligned with the following conservation measures to minimize habitat fragmentation in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (p. 93) at a forestwide scale.

- Emphasize land uses that promote or retain conservation of contiguous blocks of lynx habitat. (Desired condition FW-DC-LSU-01).
- Maintain a mosaic of vegetation and features such as riparian areas, forest stringers, unburned inclusions, or forested ridges to provide habitat connectivity within and between LAUs. (Standard FW-STD-RMZ-01, Guideline FW-GDL-RMZ-09, FW-GDL-TIMB-01, FW-DC-TE&V-19)
- Identify linkage areas where needed to maintain connectivity of lynx populations and habitat. Factors such as topographic and vegetation features and local knowledge of lynx movement patterns should be considered. Retain lynx habitat and linkage areas in public ownership and acquire land to secure linkage areas where needed and possible. On private lands in proximity to federal lands, agencies should strive to work with landowners to develop conservation easements, explore potential for land exchanges or acquisitions, or identify other opportunities to maintain or facilitate lynx movement. (Desired condition FW-DC-P&C-01).
- Minimize large-scale developments that would substantially increase habitat fragmentation, reduce snowshoe hare populations, or introduce new sources of mortality. (No large-scale developments are anticipated on NFS lands over the life of the plan).
- Give special attention to the design of highway improvements such as new road alignments, adding traffic lanes, installing Jersey or Texas barriers, or other modifications that increase highway capacity or speed. Upgrading unpaved roads should be avoided in lynx habitat if the result would be increased traffic speeds and volumes or a substantial increase in associated

human activity or development. Crossing structures or other techniques could be used to minimize or offset impacts (Guideline FW-GDL-IFS-13).

In summary, under alternative B modified there are multiple objectives, standards, and guidelines that apply in lynx habitat in lynx analysis units in occupied habitat (except for wildfire suppression or wildland fire use). Standard ALL S1 specifies that new or expanded permanent developments and vegetation management projects must maintain habitat connectivity in a lynx analysis unit and/or linkage area. Guideline ALL G1 says that methods that avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Objective LINK O1 encourages working with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions in mixed ownership areas to reduce the potential of adverse impacts on lynx and lynx habitat. In linkage areas, potential highway crossings will be identified (LINK S1), and Forest Service lands should be retained in public ownership (LINK G1). Guideline HU G6 says that methods to avoid or reduce the effects on lynx in lynx habitat should be used when upgrading unpaved roads to maintenance levels 4 or 5 if the result would be increased traffic speeds and volumes or a foreseeable contribution to increases in human activity or development in lynx habitat. Guideline HU G7 states that new permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.

Many actions that fragment habitat, such as highway expansions and residential developments, are not under the authority of the Forest Service and are discussed in the section on cumulative effects. However, the forest plan components listed above are beneficial in maintaining or improving habitat connectivity on National Forest System lands, and would help to reduce or minimize adverse effects. In addition, alternative B modified includes site-specific plan components to help provide connectivity for Canada lynx. In addition, other Forest-specific plan components promote connectivity between areas of Canada lynx habitat, including:

- Guideline FW-GDL-IFS-13 specifies: Within areas specifically identified as being important for wildlife connectivity across highways (see table 7) the Forest should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety.

Table 7. Key highway crossing areas for wildlife

Area	Route	Mile Marker
east of Essex[1]	U.S. 2	181-184
east of Essex[1]	U.S. 2	189-190
east of Columbia Falls[1]	U.S. 2	141-143
north of Columbia Falls[1]	Rt 486	7-9
between Whitefish and Eureka[1]	U.S. 93	148
between Whitefish and Eureka[1]	U.S. 93	157-160
Swan Valley[2,3,4]	U.S. 83	31-36
Swan Valley[2,3,4]	U.S. 83	45-58

[1]Based on Ament and others (2014)

[2, 3, 4] Based on Huijser et al. (2006), Sandstrom (1996), and Weaver (2014)

- Desired condition FW-DC-TE&V-19 specifies that forest patterns contribute to connectivity of habitat for wildlife (e.g., Canada lynx, marten), movement within and between home ranges, and dispersal between populations.

- Desired condition FW-DC-LSU-01 specifies that land ownership adjustments, through purchase, donation, exchange, or other authority, improve national forest management by consolidating ownership, reducing wildlife-human conflicts, providing for wildlife habitat connectivity, improving public access to public lands, and retaining or acquiring key lands for wildlife and fish and within Wild and Scenic River corridors.

- Desired condition FW-DC-P&C-01 specifies that the Forest work towards an all-lands approach to management, cooperating with other land managers, for example, to mitigate threats or stressors, provide for wildlife and fish habitat connectivity, and provide social, economic and ecological conditions that contribute to mutual objectives.

- GA-HH-DC-03 specifies that the Coram connectivity area (see Figure B-10) provides habitat connectivity for a north-south movement corridor for wide-ranging species (e.g., grizzly bear, Canada lynx, wolverine) moving between the southern and northern watersheds on the Forest (note: this incorporates the highest value putative travel corridor identified in Squires and others (2013).

- GA-MF-DC-04 specifies that the Nyack, Essex, and Pinnacle connectivity areas (see Figure B-10) provide habitat connectivity for wide-ranging species (e.g., grizzly bear, Canada lynx, wolverine) moving north-south between Glacier National Park and the Bob Marshall Wilderness Complex and east-west in the Middle Fork watershed (note: this incorporates a putative travel corridor identified in Squires and others (2013).

- GA-NF-DC-06 specifies that the Haskill Basin connectivity area (see Figure B-10) provides habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, wolverine) moving north-south between the Swan Range and the Whitefish Range (note: this incorporates a putative travel corridor identified in Squires and others (2013).

- GA-NF-DC-07 specifies that the North Fork and North Whitefish Range connectivity areas (see Figure B-10) provides habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, wolverine) moving between Glacier National Park and the Whitefish Range (note: this incorporates a putative travel corridor identified in Squires and others (2013).

- GA-SM-DC-04 specifies that in areas between the [grizzly bear] primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. NFS lands in the Swift Creek-Stillwater connectivity area (see Figure B-10) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges (note: this incorporates a putative travel corridor identified in Squires and others (2013).

- GA-SV-DC-08 specifies that the portion of the Seeley Clearwater connectivity area from Condon south to the boundary of the Swan Valley geographic area and the area near the town of Swan Lake (see Figure B-10) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, and wolverine) moving between the Swan and Mission Mountain Ranges (note: this incorporates a putative travel corridor identified in Squires and others (2013).

In addition, forestwide guidelines for riparian management zones would promote connectivity. Two of these guidelines state, “to protect water quality and maintain live trees that contribute to forest structural diversity for provide habitat for aquatic- and riparian-dependent species, clearcuts should not occur in an RMZ” and “If new openings are created in RMZs through even-aged regeneration harvest or fuel

reduction vegetation management activities, the created opening's distance to cover (see glossary) should not exceed 350 feet to provide wildlife habitat structural diversity, connectivity and cover". These guidelines would benefit lynx and are consistent with findings by Squires and others (2013) regarding lynx avoidance of areas more than 364 feet to cover.

Recreation

Developed ski areas

HU O3 encourages concentrating activities in existing developed areas; and HU O4 says to provide for lynx habitat needs and connectivity when developing or expanding existing developed recreation sites or ski areas. No standards were adopted because recreational activities were not considered to be a threat to the population of lynx. Two guidelines were included that address ski area development or expansion: HU G1 says that provisions should be made for inter-trail islands that maintain winter snowshoe hare habitat and HU G2 encourages providing foraging habitat consistent with the ski area's operational needs. Guideline HU G3 says that recreation development and operations should be planned to provide for lynx movement and maintain the effectiveness of lynx habitat.

Downhill ski resorts typically occur at high elevations in areas with coniferous forests and deep snow, which coincides with lynx habitat. On the Flathead National Forest, two ski resorts, Whitefish Mountain Resort (formerly known as Big Mountain Resort) and Blacktail Mountain Resort contain lynx habitat, each located within one lynx analysis unit. In a 2000 consultation for 12 ski resorts in Montana, including Big Mountain and Blacktail Mountain Resorts, existing conditions, proposed expansions, and ongoing operations were determined to be likely to adversely affect lynx. However, given the limited proportions of the lynx analysis units affected and other factors, USFWS concluded that ongoing and proposed actions were not likely to jeopardize the species nor to result in incidental take of individual lynx. The 2007 biological opinion on the Northern Rockies Lynx Management Direction (USFWS, 2007b) reconfirmed the conclusion that individual lynx may be adversely affected through habitat avoidance, alteration, or loss but that the total area affected is limited and the objectives, standards, and guidelines would reduce the potential impacts. Under this alternative, the two ski resorts will continue to operate within their existing permit area boundaries, so effects are anticipated to be the same as in previous consultations.

Motorized over-snow use and winter routes

Guideline HU G11 addresses designated over-the-snow routes or designated play areas and areas of consistent snow compaction, which are defined as areas that get enough human use that individual tracks are indistinguishable. Areas such as over-snow motorized vehicle use routes, groomed cross-country ski routes, parking lots, and adjacent openings with consistently high levels of use would meet this definition.

Unlike some other national forests within the Northern Rockies, under forest plan amendment 24 (USDA, 2006) the Flathead National Forest designated specific routes and areas, as well as seasons, for motorized over-snow vehicle use in accordance with §212.81 of the Travel Management Rule. About 68 percent of the lynx habitat on the Flathead National Forest is closed to motorized over-snow vehicle use (see Figure B-12, mapped lynx habitat with over-snow vehicle use).

Under alternative B modified, the wording of HU G11 would be replaced with a Forest-specific guideline to better mesh with the Forest's desired conditions for social and economic sustainability of motorized winter recreation while addressing ecological sustainability for Canada lynx, as shown in table 8.

Table 8. NRLMD guideline HU G11

Northern Rockies Lynx Management Direction, guideline HU G11	Flathead National Forest-specific modification of HU G11 under Alternative B modified
Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This is calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.	To provide ecological conditions to support Canada lynx on NFS lands at a forestwide scale, there should be no net increase in miles of designated motorized over-snow vehicle routes, groomed routes or areas where motorized over-snow vehicle use would be suitable. The “no net increase” is in comparison to suitability displayed in figure B-11. This guideline does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by guideline HU G12.

In summary, the effects of this change in the guideline would be that additional areas would be suitable for motorized over-snow use in seven lynx analysis units. In the North Fork Flathead River geographic area, there would be an increase in acres suitable for over-snow use of about 217 acres in the Lower Big LAU and about 7,660 acres in the Canyon LAU (see Figure B-12). There would be an increase of about 485 acres in the middle of an existing route in the Upper Big LAU and an increase of about 260 acres in the Upper Coal LAU. In the Red Meadow LAU there would be an increase of about 235 acres adjacent to an existing area. In the Middle Fork geographic area there would be an increase of about 1,548 acres adjacent to an existing open area in the Bear Creek LAU and about 602 acres in the Challenge-Granite LAU. Additional snow compaction would occur on some, but not all of this acreage, because there are portions where tree cover is too dense for snowmobiles to navigate.

At a forestwide scale, the above increases would be offset by changing some areas in five different lynx analysis units to make them unsuitable for motorized over-snow vehicle use. These changes would total about 48 acres in the Bunker Creek LAU, about 2,646 acres in the Kah Soldier LAU, about 94 acres in the Stony Jungle LAU, about 8,812 acres in Sullivan LAU, and about 344 acres in the Slippery Bill LAU.

In addition, there would be some very minor adjustments in suitable and non-suitable areas (generally less than 15 acres) scattered across about 30 LAUs in order to clean up boundaries previously mapped in a raster format or to assist in enforcement of closed areas. Thus, for the Forest as a whole there would be a very small net increase in the percentage of lynx habitat designated as suitable for over-snow vehicle use, totaling less than 0.1%.

In the lynx analysis units with an increase in acres suitable for motorized over-snow vehicle use, an increase in over-snow use would be expected to occur. This increase could affect some individual lynx, but as shown on Figure B-12, there are adjacent areas which are not suitable for motorized over-snow use where snow compaction would not occur. In vicinities that are already heavily used by motorized over-snow vehicles, such as Canyon Creek, there is a potential for the additional suitable areas to result in an increase in the area of consistent snow compaction, as defined by the NRLMD. The effects of this increase on Canada lynx are anticipated to be minor, based upon findings by Squires and others (Kuennen, 2017a; J. R. Squires et al., 2010; J. R. Squires et al., 2013) and Kolbe and others (2007). In addition, not all of the acreage in added suitable areas would be expected to have an increase in the area of consistent snow compaction. This is because terrain and vegetation also influence where over-snow vehicles can physically go. Vegetation conditions are dynamic over time and change in response to disturbance and succession. Wildfire may initially open up dense forest for over-snow use, but as high densities of dead trees fall or as succession occurs, areas previously open to over-snow use become unavailable because machines cannot physically maneuver between or over the trees.

This guideline provides a strategy for management of over-snow motorized recreation that is more adaptive in the future, as compared to the current guideline for addressing designated routes/play areas and areas of consistent snow compaction. Overall, there would be no net increase in routes, groomed routes, or areas that are suitable for over-snow vehicle use across the Forest as a whole under alternative B modified. By limiting where snow compaction and disturbance could occur in the future, a small benefit to lynx and snowshoe hares might result. Changes to over-snow motorized use would go through site-specific consultation at the project level.

Lynx are distributed across the Forest, with telemetry data documenting lynx use of areas such as Big Creek and Skyland Creek that receive use by snowmobiles. As discussed previously, Kolbe et al. (2007) found that compacted trails from over-snow motorized vehicles in their study area (western Montana) had only minimal impacts on coyote movements and foraging success and that snowshoe hares were an insignificant portion of the winter diet of coyotes, indicating that snow compaction did not promote a competitive interaction between coyotes and lynx. Mountain lions are a known source of mortality of lynx, accounting for roughly one third of documented mortalities in northwest Montana study areas, but all documented mountain lion predation on lynx occurred in the snow-free period (Warren, 2016a).

Although the Forest is closed to lynx trapping, a potential indirect effect of over-snow vehicle use is that it could facilitate access to lynx habitat and increase the vulnerability of lynx to incidental or accidental trapping or illegal shooting. Since 2008, changes in trapping regulations by MFWP have greatly reduced the number of lynx caught in traps, as explained in the affected environment section. Glacier National Park is closed to trapping and to public over-snow vehicle use, greatly reducing the risk of mortality. Wilderness areas of the Forest are closed to motorized use. Due to the large size and the remoteness of the Bob Marshall Wilderness complex, it too has a low risk of lynx mortality due to trapping. The combined area of Glacier National Park and the Flathead's portion of the Bob Marshall Wilderness Complex is over 2 million acres. In addition, some of the recommended wilderness areas included in alternative B modified are large or increase the size of the Bob Marshall Wilderness complex, further reducing the risk of accidental or incidental trapping. Shifting areas suitable for over-snow vehicle use within the Forest would not increase the risk of accidental or incidental trapping. Overall, the level and distribution of winter recreation under this alternative is not likely to negatively impact the overall lynx population, although there is some risk of injury or mortality to individual lynx.

Mineral and energy activities

At the present time, there is no leasable energy development activity occurring on the Flathead National Forest. There are existing gravel pits. Objective HU O5 says to manage human activities, including minerals and oil and gas exploration and development, to reduce impacts to lynx and lynx habitat. Guideline HU G4 encourages remote monitoring of mineral and energy development sites and facilities to reduce snow compaction; guideline HU G5 addresses development of a reclamation plan to restore lynx habitat when mineral and energy development sites and facilities are closed. HU G12 limits winter access for non-recreation special uses and mineral and energy exploration and development to designated routes or designated over-the-snow routes. The application of these measures is expected to minimize adverse effects on lynx.

At the present time, there is little exploration and no leasable development activity occurring on the Flathead National Forest. Existing oil and gas leases were suspended and would require further NEPA analysis and consultation before any activity could occur. The Forest has low potential for locatable minerals and low to high potential for leasable minerals (such as oil and gas). Many acres of NFS lands on the Forest are withdrawn from mineral entry (Figure B-37). The type of lands withdrawn from mineral entry and leasing in the Flathead National Forest plan area include:

- Administrative sites, such as campgrounds;
- Forest lands within the boundaries of a ski area permit;
- The Bob Marshall, Great Bear, and Mission Mountains Wilderness areas;
- Sections of the North, South and Middle Forks of the Flathead River;
- portions of the Forest withdrawn from mineral development by the North Fork Watershed Protection Act of 2013.

Withdrawal of these large areas reduces the risk of Canada lynx habitat loss, disturbance, displacement, and mortality. All withdrawals are subject to valid existing rights. The Forest Service does not have the discretion to deny the exercise of an outstanding mineral right. However, the developer does not have unrestricted rights, as the developer's rights are limited to use only as much of the surface as is reasonably necessary to explore, develop and transport materials. The developer must provide an operating plan to the Forest, and the Forest has some ability to manage surface resources. FSM 2832 provides direction for administration of an outstanding mineral right (source of minerals information is Volume 2 of the Flathead National Forest assessment, 2014, as updated by the 2015 leasing withdrawal). In addition, the "no surface occupancy" stipulation proposed for new leases in the grizzly bear primary conservation area would limit the potential for future activity.

Forest/backcountry roads

Forest roads have minimal effects on lynx (ISDA, 2013). Four forest plan guidelines concern forest roads: HU G6 says to use methods that avoid or reduce effects on lynx when upgrading unpaved roads to maintenance levels 4 or 5 if the result would be increased traffic speeds and volumes or a foreseeable contribution to increases in human activity or development; HU G7 discourages building new permanent roads on ridgetops, saddles, and forested stringers or in areas identified as important for lynx habitat connectivity; HU G8 says that brush-cutting along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety; and HU G9 says that public motorized use should be restricted on new roads built for projects. These objectives and guidelines would continue to limit the potential local impacts of roads on lynx and lynx habitat.

On the Forest, implementation of amendment 19 has resulted in decreased road mileage, decreased road maintenance, and many miles of public road use restrictions in the last decade. Standards to maintain baseline densities of motorized routes in the grizzly bear primary conservation area and Salish demographic connectivity area would limit potential risks to lynx associated with motorized public access (see Grizzly Bear section for more details).

Livestock grazing

The forest plan includes one objective and four guidelines concerning livestock grazing in lynx habitat. Objective GRAZ O1 is to manage livestock grazing to be compatible with improving or maintaining lynx habitat. Guideline GRAZ G1 is to manage livestock grazing in fire- and harvest-created openings so that regeneration of shrubs and trees is not prevented; under GRAZ G2, livestock grazing in aspen stands should be managed to contribute to the long-term health and sustainability of aspen; under GRAZ G3, livestock grazing in riparian areas and willow carrs should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages; and under GRAZ G4, livestock grazing in shrub-steppe habitats that are in the elevation ranges of forested lynx habitat in LAUs should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages. With these components in place, the effect of livestock grazing on lynx and lynx habitat was judged to be minimal across the Northern Rockies analysis area. Very little livestock grazing occurs on the Flathead National Forest, and standards for the grizzly bear would limit livestock grazing in the future (see grizzly bear section for more details). There would continue to be little or no effect on lynx attributable to livestock grazing.

Summary of Effects of Forestwide Plan Components

- Silvicultural treatments (e.g., timber harvest, fuels treatment, and/or precommerical thinning) that reduce dense horizontal structure within forest stand understories can reduce an area's carrying capacity for snowshoe hares (Homyack, Harrison, & Krohn, 2007). With the proposed action, the NRLMD would be applied for vegetation management in Canada lynx habitat. This means that all vegetation management projects would meet the NRLMD, or, if they would not, then the project would need a site-specific forest plan amendment. Plan components protect and promote development of dense horizontal cover unless allowed by specific exceptions or exemptions consistent with incidental take.
- Vegetation treatments focused on reduction of snags and/or down woody material (fuel reduction or salvage of dead and dying trees) can result in the removal of coarse woody material or negatively affect its recruitment into the stand. This may reduce the area's potential use as denning habitat for lynx, but denning is not considered a limiting factor across the landscape. Analysis of FIA data on snags and large down woody material for the Flathead National Forest revised forest plan shows that their availability has increased due to an increase in wildfires. Plan components for snags and down woody material promote their retention.
- The proposed action limits the area where new leasable mineral activities may occur (subject to valid existing rights) within 97 lynx LAUs because there would be a standard for "no surface occupancy" for new leases in the grizzly bear primary conservation area. The primary conservation area covers 90% of the Forest. Additional direction in the NRLMD regarding mineral activities would apply with site-specific project implementation.
- Standard ALL S1 specifies that new or expanded permanent developments and vegetation management projects must maintain habitat connectivity in a lynx analysis unit and/or linkage area. The proposed action plan components identify key connectivity areas across highways for multiple wildlife species. This includes the key 6-mile stretch of Highway 2 near Hungry Horse identified by Squires et al. (2013).
- Vehicle speeds on forest roads are relatively slow in comparison to highways or other public roads due to topography, substrate, and road conditions. Thus, the potential for lynx mortality or injury due to collisions with vehicles is thought to be low on forest roads. There would be no net increase in roads open to motorized public use in potential lynx habitat under the proposed action. Standards to maintain baseline densities of motorized routes in the grizzly bear primary conservation area and Salish demographic connectivity area would limit potential risks to lynx associated with motorized public access. Guideline HU G6 in the NRLMD mentions methods to avoid or reduce the effects on lynx in lynx habitat that should be used when upgrading unpaved roads to maintenance levels 4 or 5 if the result would be increased traffic speeds and volumes or a foreseeable contribution to increases in human activity or development. The proposed action does not make site-specific decisions about travel routes. Travel is managed according to the Motor Vehicle Use Map, which restricts non-winter travel to designated routes. Changes to motorized public use would go through site-specific consultation at the project level.
- Although lynx are believed to be tolerant of many types of human activities, there is a potential for negative effects to lynx due to disturbance, displacement, and/or mortality risk (from non-target trapping) in winter. The proposed action plan components specify no net increase in the percentage of Forest area or miles of routes suitable for motorized over-snow use.
- The proposed action limits the amount of grazing allowed within the lynx LAUs because grizzly bear standard FW-STD-GR-05 specifies that there will be no net increase in the number of active cattle grazing allotments above the baseline in the grizzly bear primary conservation area, and a

guideline for the Swan Valley geographic area (GA-SV-GDL-05) addresses closing open and active grazing allotments if the opportunity arises with a willing permittee. Additional direction in the NRLMD regarding grazing would apply with site-specific project implementation.

Effects of plan components for broad potential vegetation types

Although standards and guidelines carried forward from the 2007 NRLMD provide direction for many aspects of land management, the proposed action has additional plan components that integrate Canada lynx habitat with desired conditions for vegetation that are tied to broad potential vegetation types, within the context of the natural range of variation. The following section discusses the effects of these plan components on Canada lynx.

Desired conditions in proposed alternative B modified are aligned with the following conservation measures for vegetation management in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (p. 91) at the forestwide scale, considering exceptions allowed by the incidental take statement.

- Provide a mosaic that includes dense early-successional coniferous and mixed-coniferous-deciduous stands, along with a component of mature multistory coniferous stands to produce the desired snowshoe hare density within each LAU. (FW-DC-TE&V-19)
- Recruit a high density of stems, generally greater than 4,600/ha (1,862/ac), of conifers, hardwoods, and shrubs, including species that are preferred by hares. (FW-DC-TE&V-19)
- In aspen stands, maintain native plant species diversity, including conifers. (FW-DC-TE&V-09)

Under alternative B modified, desired conditions for vegetation pattern are tied to broad potential vegetation groups. The majority of modeled Canada lynx habitat is in the cool-moist and cold groups, which corresponds to boreal forest habitat types capable of growing spruce and fir trees. A desired condition is a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions are not commitments or final decisions approving projects and activities. The desired condition for some resources may currently exist, but for other resources they may only be achievable over a long time period.

Forestwide desired condition FW-DC-TE&V-19 promotes ecological conditions to support Canada lynx habitat and its connectivity because it is consistent with the desired vegetation conditions described in the section of the affected environment for Canada lynx habitat. Desired condition FW-DC-TE&V-19 states:

> Forest patterns contribute to connectivity of habitat for wildlife (e.g., Canada lynx, marten), movement within and between home ranges, and dispersal between populations. Desired conditions related to forest patterns across the landscape and within potential vegetation types are described below. . . .
>
> **Cool-Moist type:** Natural disturbance processes (such as insects, disease, fires, avalanches) as well as vegetation management create patches of different tree sizes, species, and stand structures within the larger patch matrix. Forest patterns generally reflect the natural variation that might occur where moderate- and high-severity fire are prevalent, although very large high-severity fires are relatively infrequent. A mosaic pattern composed of relatively large patches of different forest size classes tends to occur across the landscape. Early successional openings (< 5 inches d.b.h.) across this landscape range from less than 100 to several thousand acres in size. Even-aged, single canopy forest patches of shade-intolerant species (e.g., lodgepole pine, western larch, and Douglas-fir) are common, particularly in the early (seedling/sapling) and mid-successional

stages of forest development. Over time, large patches of even-aged forest trend towards more diversity in size and structure, as dense understory canopy layers of shade-tolerant trees (subalpine fir and spruce) develop. Larger-sized, usually fire-tolerant species (e.g., western larch and Douglas-fir) occur in a discontinuous pattern across the landscape, sometimes in large patches and sometimes as scattered individual trees in younger stands, having survived one or more fire events.

Forests in the cool-moist broad potential vegetation type provide habitat for a variety of wildlife species over long time frames as climate, forest, and landscape conditions change (see FEIS appendix 6 for a full list of species). Processes (e.g., fire, wind, insect infestation, and disease) that create diverse patches and patch sizes also create forest groundcover consisting of a wide variety of plant species that produce berries for grizzly bears as well as willow, alder, or yew that provide cover and forage for species such as snowshoe hares and moose).

Other than in areas of recent natural disturbance (such as stand-replacing wildfire or epidemic insect infestation), patches of shrubs and coniferous trees in the small to very large size classes (> 5 inches average d.b.h.) trend towards larger, more interconnected patches, allowing animals such as lynx, fisher, and marten to move within and between home ranges. The width and distribution of patches are highly variable due to environmental conditions that change over time (e.g., disturbance, forest succession), so their location changes over time.

In Canada lynx habitat and critical habitat (see Figure B-9), a mosaic of successional stages promotes the conservation of the Canada lynx at the lynx analysis unit scale as well as at larger scales. Except in portions of the wildland-urban interface, patches of dense, young, seedling/sapling forests with branches touching the snow surface are interspersed with contiguous and interconnected areas of mature multistory hare and lynx habitat. Young forests with extremely high densities (greater than 14,000 stems per acre) occur following fires but are interspersed in a mosaic with stands of much lower densities that are developing a multistoried stand structure. Large, stand-replacing wildfires may make large areas of lynx habitat temporarily unsuitable, but over time forest conditions within post-fire landscapes promote development of snowshoe hare and lynx habitat to support long-term persistence of lynx populations.

Cold type: Forest patterns across the area generally reflect the variation that might occur in a mixed-severity fire regime, where low-, moderate-, and high-severity fires would occur. A very diverse mosaic pattern of vegetation conditions occur, reflecting both the influence of natural disturbances and the complex arrangement of site and environmental conditions that prevent or delay the establishment and growth of trees. Variable size patches of small, medium, or large trees are intermingled with small and large grass/forb/shrub openings and other non-forest types, such as avalanche chutes or high-elevation rocklands. Forest characteristics within patches are variable, usually composed of multiple canopy layers, tree ages, and size classes. The size of early successional seedling/sapling forest patches, originating mainly from fire, ranges from small (e.g., 20 acres) to large (e.g., several thousand acres).

Forests in the cold type provide habitat for a variety of wildlife species over long time frames as climate, forest, and landscape conditions change. Processes (e.g., fire, wind, insect infestation, and disease) that create diverse patches and patch sizes also create openings in moister or more protected sites that support grass, forb, and shrub species that provide forage for a variety of wildlife. Harsh climate and fires create conditions suitable for regeneration and maturation of white-bark pine trees, particularly on dry and exposed ridges and slopes, resulting in seed-producing trees that provide forage for wildlife species such as Clark's nutcrackers. The more gently sloped, moist basin areas are more densely stocked (e.g., 40 to 60 percent canopy cover),

providing cover interspersed with more open areas for species such as grizzly bears, elk, and mule deer.

In Canada lynx habitat and critical habitat (Figure B-9), a mosaic of successional stages promotes the conservation of the Canada lynx at the lynx analysis unit scale as well as at larger scales. Some patches of high-density young forest (seedlings/saplings) are present, interspersed with patches of older forests with dense understories to provide food and cover for snowshoe hares and Canada lynx. Large, stand-replacing wildfires may make large areas of lynx habitat temporarily unsuitable, but over time forest conditions within post-fire landscapes promote the development of snowshoe hare and lynx habitat to support long-term persistence of lynx populations.

Other than in areas where harsh conditions limit tree growth or in areas of recent stand-replacing wildfire, patches of shrubs and coniferous trees in the small to large size classes (> 5 inches average d.b.h.) are interconnected, allowing animals such as lynx to move within and between home ranges. The width and distribution of patches are highly variable due to environmental conditions that change over time (due to disturbance, forest succession, etc.), so their locations change over time.

Desired condition FW-DC-T&V-09 provides direction to maintain native plant species diversity, including conifers, in aspen stands:

Transitional hardwood communities occur most commonly in the early successional stage of succession, such as after a fire or harvest, where hardwood trees comprise 40 percent or greater of the tree canopy cover. These communities are most abundant on warm moist types and in riparian areas. Through natural succession, conifer species become more dominant, but hardwood species (especially aspen and birch) are present within these stands for several decades, providing habitat for a wide variety of wildlife species, including decayed hardwood trees for cavity nesters. Canopy gaps and small openings are periodically created over time within the coniferous forest landscape by disturbances (such as fire or harvest) to provide sites where hardwoods continue to successfully regenerate and/or grow into larger-sized trees. Refer also to desired conditions related to early successional and recently burned coniferous forest types (FW-DC-TE&V-11, 12, and 24).

Effects of vegetation management plan components in the context of the reference conditions and future climate scenarios

As stated in the 2013 Lynx Conservation and Assessment Strategy, “There is some uncertainty about the rate and magnitude of impacts from climate change, and federal agencies may be limited in actions that can be taken to ameliorate those impacts. Nevertheless, those impacts will interact with and perhaps magnify the effects of vegetation management, wildland fire, and fragmentation of habitat” (p. 68). In the Lynx Conservation and Assessment Strategy, no conservation measures are identified for climate change due to the limited ability of the federal land management agencies to alter the current trajectory, but the conservation measures for vegetation includes the following measure: “Conduct a landscape evaluation to identify needs or opportunities for adaptation to climate change. Consider potential changes in forest vegetation that could occur as a result of climate change (e.g., Gärtner et al. 2008). Identify reference conditions relative to the landscape’s ecological setting and the range of future climate scenarios. For example, the historical range of variability could be derived from landscape reconstructions (e.g., Hessburg et al. 1999, Blackwell et al. 2003, Gray and Daniels 2006)” (p. 91).

Plan alternatives were analyzed using a landscape evaluation that considered reference conditions relative to the landscape’s ecological settings and the range of future climate scenarios, considering the interaction

of vegetation management, wildland fire, and possible effects on fragmentation of habitat. Effects of vegetation management associated with each alternative set of management areas, combined with modeling of natural processes such as wildfires, insects/disease, and forest succession, were modeled by Ecosystem Research Group (ERG) in 2015. ERG modeled the effects of several future scenarios for comparison purposes, including a warmer/drier climate over the next five decades that resulted in more acres burned (due to expected climate change), as well as continuing the current level of fire suppression into the future. Effects were modeled using the SIMPPLLE model (which simulates future pathways of natural vegetation change across the Forest) and the Spectrum model (which simulates future vegetation management associated with an alternative and its mix of management areas across the Forest). The SIMPPLLE and Spectrum models provide a probalistic assessment of the subset of federal actions that provide a programmatic framework for vegetation management activities across the forest over a 50-year future time period. However, since the exact location, extent, and timing of future fires, timber harvest, thinning, and planting are unknown, future site-specific actions would be subject to the requirements of section 7 of the Endangered Species Act at a future time.

ERG's modeling used the GIS layer of modeled and mapped lynx habitat for the Flathead National Forest. ERG conducted two analyses for lynx to assess their habitat requirements: (1) a stand initiation habitat analysis and (2) a potential multistoried habitat analysis. Stand initiation hare habitat was modeled as any cover types within grand fir or subalpine fir/spruce habitat types (often mixed with other species). On the Forest, grand fir (although not abundant) was included because it occurs in close juxtaposition to subalpine fir/spruce lynx habitat and is known to produce snowshoe hares. Stand initiation hare habitat was modeled as the seedling/sapling size class with a canopy cover class of 40–100 percent and 20 or more years since the previous stand-replacing disturbance (high-severity fire or regeneration harvest). VMap canopy cover classes greater than or equal to 40 percent accounted for eighty-five percent (5,515 of 6,505) of Squires's lynx telemetry locations on the Forest, and forest that is at least 20 years old generally has trees

Modeled multistoried habitat is limited to cover types that contain subalpine fir or Engelmann spruce (which may be mixed with other species) within subalpine fir/spruce habitat groups. Multistoried lynx habitat is provided by forests with a high proportion of trees in the 7-11" and 11"+ diameter classes (J. R. Squires et al., 2010; J. R. Squires et al., 2006), so all diameter classes with an average above 10" and at least 40 percent VMap canopy cover were included. VMap canopy cover classes greater than or equal to 40 percent accounted for 85 percent (5,515 of 6,505) of lynx telemetry locations on the Flathead National Forest. In addition, the following assumptions were made. Although snowshoe hares require a dense understory, the SIMPPLLE model is dependent on R1-VMap classes and did not allow the incorporation of understory density.

Additionally, all cover types with presence of subalpine fir/Engelmann spruce (which may be mixed with other species) were identified as potential habitat to disclose how much of that potential habitat currently has subalpine fir or spruce and is in either a stand initiation or multistoried condition. If potential habitat is currently forested with western larch (typical seral species on warmer subalpine fir habitat types) or is in a single-storied, dense stem exclusion condition, that habitat is considered "potential" but may not provide snowshoe hare habitat in its current condition.

Over the next 50 years, the SIMPPLLE model predicts that subalpine fir presence will be maintained on the Forest. Available Forest data sets are not able to estimate horizontal cover associated with snowshoe hare and lynx habitat, but overall density can be estimated based upon FIA field measurements of canopy cover. A large portion of the forest—about 65 percent of the area in the Cool Moist Broad PVT (biophysical setting) is currently in a moderate- to high-density class. Over the first three decades, modeling estimates that this proportion remains steady but then declines but the proportion of low-density

forest increases. In the model, lower forest densities are largely driven by natural disturbances (fire, insect, disease) which converts large areas to early successional forest in the latter modeled decades, with temporarily less canopy cover. The increasing proportion of forest with low canopy cover may temporarily reduce the quality and connectivity of lynx habitat; however, it would improve over time with development of vegetation in the understory and midstory.

According to modeling of NRV, fire cycles affecting the amount of multistoried and stand initiation habitat have probably occurred in the past and are likely to occur in the future in the mid- to high-elevation subalpine fir and spruce forests of the Forest. This is a natural fluctuation over time associated with the characteristic fire regimes and disturbance processes. On the Forest, where conifer growth is rapid in the moist habitats providing lynx habitat and stand-replacing fire intervals are fairly infrequent, the acres of modeled stand initiation habitat fluctuate up and down. Modeling of vegetation management that would occur under the preferred alternative, in combination with natural processes, shows that stand initiation habitat is expected to stay within the natural range of variation.

ERG also modeled multistory forest that provides snowshoe hare and lynx habitat. The model is not able to discern whether a dense understory is present or not, so this should be interpreted as areas with a potential to provide winter snowshoe hare and lynx habitat. What the model depicts is the trend in forest stands that are most likely to have a multistoried structure, high canopy closure, and presence of subalpine fir and spruce. The range between maximum and minimum NRV is very large, almost 650,000 acres. Since the model reduces harvest based upon lynx standard VEG S6 and applies fire suppression logic as well as forest succession for all alternatives, levels of modeled multistoried lynx habitat slightly exceeds the maximum range of NRV for the first two decades. By the third decade, modeled levels of fire and/or insects and disease increase, consistent with projected changes in climate by mid-century. If insects/disease kill scattered patches of trees in the overstory of multistoried forests, it could increase the density of the understory, creating multistoried stands after a lag time of a few decades, provided the loss of canopy cover is not too great. In contrast, stand-replacing wildfires would create more stand initiation habitat after a lag time of a few decades.

Despite plan components to maintain or increase multistoried hare and lynx habitat, modeled declines below current levels are projected to occur by the end of five decades. This suggests that the current level of modeled multistoried habitat may be unsustainable based on inevitable and unavoidable natural disturbances, which were modeled as increasing with a warmer, drier summer climate. Modeling of vegetation management that would occur under the preferred alternative, in combination with natural processes, shows that although it would decline, potential multistory hare and lynx habitat is expected to stay within the natural range of variation.

Modeling results discussed above are believed to be a “worst-case scenario”. The Flathead National Forest planning team made updates to the SIMPPLLE model between the draft EIS and the final EIS based upon input from scientists that the model may have projected too much effect from spruce bark beetle and Douglas-fir beetle infestation. This resulted in differences in future projected conditions for some of the vegetation attributes. In regards to lynx habitat, outputs of the initial model run showed that multistoried habitat would increase during the first two timesteps (2 decades). This increase might be less than modeled, however, because if fewer spruce are killed, fewer canopy gaps are created, and there is less opportunity for a dense understory to grow. The decline in multistoried habitat by the fourth and fifth timesteps would likely be less as well because the extent of tree mortality from Douglas-fir beetle and spruce bark beetle would be decreased across about 150,000 acres average per decade. In the updated modeling, an increase in the combined medium, large, and very large size classes occurs as well as an increase in the amount of moderate and high canopy cover classes. There would be fewer large dead trees falling down, so higher canopy cover would be maintained. In the updated modeling, the Forest also

tested the effects of an earlier increase in stand-replacing wildfire. This resulted in stand-replacing wildfire occuring on about 80,000 more acres. This would initially create more temporarily unsuitable habitat for Canada lynx for about the first two timesteps, followed by an increase in stand initiation hare habitat for the subsequent timesteps. However, the amount of additional fire in the updated model is not enough to offset the favorable effects of reduced Douglas-fir and spruce bark beetle in creating multistoried habitat.

Effects of management area (MA) plan components in potential lynx habitat

Management area plan components and delineation provides the on-the-ground framework guiding which allowable uses may occur. Table 9 summarizes approximate acres and the percentage of management areas in lynx habitat. The following section characterizes the MAs in Canada lynx habitat and discusses the effects of the resulting management direction on the species. A more detailed description of the MAs begins on page 17 of the Introduction.

Table 9. Canada lynx habitat in each Forest management area (MA).

Management Area (MA)	Approximate Lynx Habitat Acres	Percentage of Potential Lynx Habitat
1a Designated wilderness	771,082	43
1b Recommended wilderness	155,820	9
2a Designated wild and scenic rivers	4,294	< 1
2b Eligible wild and scenic rivers	13,364	1
3b Special areas	1,001	< 1
4a Research natural areas	4,673	< 1
4b Experimental and demonstration forests	8,782	< 1
5a Backcountry nonmotorized year-round	122,511	7
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	45,047	3
5c Backcountry: motorized over-snow vehicle use	95,822	5
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	8,583	< 1
6a General forest low	106,027	6
6b General forest medium	255,311	14
6c General forest high	166,672	9
7 Focused recreation areas	36,578	2
Total	**1,795,567**	

Wilderness (MA1a): The Forest manages approximately 771,082 acres of potential lynx habitat in existing wilderness in the Mission Mountains and Bob Marshall wilderness complex—a total of about 43 percent of the Forest's lynx habitat acreage (Table 9). Planned and natural ignitions are allowed under current and proposed action direction and contribute to desired vegetation conditions in these areas. This MA maintains large, remote, and secure habitats for lynx that are likely to have a lower amount of human presence due to the lack of wheeled or over-the-snow motorized use and limited nonmotorized access. The wilderness MA provides habitat connectivity with Glacier National Park and then to the international border with Canada, helping to provide linkage with lynx populations in British Columbia and Alberta. Periodic wildfires create a mosaic of forest conditions.

Recommended Wilderness (MA1b): Approximately 155,820 acres of potential lynx habitat, distributed across 46 of the Forest's 109 lynx analysis units, is located in this MA (Table 9). Planned and natural

ignitions are allowed under current and proposed action direction and contribute to desired vegetation conditions in these areas. Like wilderness, this MA maintains large, remote, and secure habitats for lynx that are likely to have a lower amount of human presence due to management area direction that does not allow wheeled or over-the-snow motorized use and limits management actions to those that maintain wilderness character. The wilderness MA provides habitat connectivity with Glacier National Park and then to the international border with Canada, helping to provide linkage with lynx populations in British Columbia and Alberta. The recommended additions to the Bob Marshall, Great Bear, and Scapegoat wilderness areas provide habitat for lynx in 38 LAUs. The recommended Tuchuck addition helps provide a large block of secure habitat in 7 LAUs in close proximity to lynx habitat in Canada, contributing to habitat connectivity as well as genetic connectivity. Periodic wildfires create a mosaic of forest conditions.

Designated and Eligible Wild and Scenic Rivers (MA2): Approximately 17,658 acres of potential lynx habitat is located within these MAs (Table 9). The Forest has one designated river with three forks (the North, Middle, and South Forks of the Flathead), and an additional 21 rivers are eligible. Wild and scenic river segments are free of impoundments and have shorelines that are essentially primitive, and recreation segments are accessible by road or railroad and have some shoreline development. Timber harvest is not allowed in wild river segments. Scenic and recreational river segments are not suitable for timber production, but timber harvest may be allowed to meet desired social, economic, or ecological conditions. MA2 management direction helps to maintain wide forested corridors along major waterways that may facilitate lynx movement through the landscape, providing connectivity.

Special Areas (MA3b): Approximately 1,001 acres of potential lynx habitat is located within this MA (Table 9). This MA provides protection for areas with unique botanical features such as fens, sloughs, *Howellia* sites, and groves of cedar, larch, or ponderosa pine. This MA is not suitable for timber production, nor is it suitable for commercial use of non-timber forest products. Vegetation management may be allowed to maintain desired ecological conditions and values. A variety of sites occur in this MA and in their natural state; these areas may or may not provide the kind of vegetation conditions that provide lynx foraging, denning, or habitat connectivity.

Research Natural Areas (MA4a): Approximately 4,673 acres of potential lynx habitat is located within this MA (Table 9). The Forest has six research natural areas (RNAs) in three geographic areas. RNAs are generally natural appearing, and ecological processes have limited human influence that is guided by the Rocky Mountain Research Station. This MA is not suitable for timber production. Vegetation management may be allowed for study and research purposes or if needed to protect the values for which the RNA was designated. Although very limited in their number and size, RNAs help provide a continuum of security habitat and connectivity for lynx.

Experimental Forest and Demonstration Forest (MA4b): Approximately 8,782 acres of potential lynx habitat are located within this MA (Table 9). The Forest has one experimental forest in the Hungry Horse geographic area and one demonstration forest in the Salish geographic area. In experimental forests and demonstration forests, vegetation management for research purposes is likely, wheeled motorized travel may occur on designated routes, and motorized over-snow use may occur, subject to other forestwide plan components. Periodic wildfires, prescribed fires, and other types of vegetation management, including timber harvest, precommercial thinning, commercial thinning, and planting, may create a mosaic of forest conditions.

Backcountry (MA5): Approximately 271,963 acres of potential lynx habitat is located within this MA (Table 9). In MA5a, motorized use is not allowed. Year-round motorized use is allowed in MA5b, over-snow motorized use is allowed in MA5c, and summer wheeled motorized use is allowed in MA5d. Motorized use in MA5d is generally dispersed trail use, whereas over-snow use in MA5c includes

dispersed trail use as well as larger areas. Mechanized uses (e.g., mountain bikes, game carts) are allowed in this MA. Although lynx are generally tolerant of human presence and the types of uses that occur in backcountry areas, over-the-snow disturbance may be great enough to cause disturbance or displacement of individual lynx in some circumstances. The proposed action limits areas where motorized over-snow use can occur, reducing the risk of population-level effects (see also the discussion under forestwide plan components, modification to HU G11). This MA is not suitable for timber production, but timber harvest may be allowed to meet desired ecological, social, or economic conditions. Because most of MA5a is in inventoried roadless areas where road building is not allowed, timber harvest would be likely to occur at low levels. Periodic wildfires, prescribed fires, and other types of vegetation management, including precommercial thinning, commercial thinning, and planting, may contribute to a mosaic of forest conditions.

General Forest (MA6): Approximately 528,010 acres of potential lynx habitat is located within the general forest MAs (Table 9, Figure B-13). Potential lynx habitat located within the general forest MAs provide a mosaic of successional stages in a roaded environment due to past road construction and timber harvest. In this MA, active management activities, including prescribed fire, timber harvest, fuels reduction, precommercial thinning, commercial thinning, and planting, are most likely to create a mosaic of forest conditions. Within MA6, riparian management zones are not suitable for timber production, providing an interconnected network that contributes to habitat connectivity for lynx. In the North Fork, Hungry Horse, and Swan Valley geographic areas, some of MA6a and MA6b is located in areas along putative travel corridors identified by Squires and others (2013). MA6a is anticipated to have the lowest intensity of timber harvest, followed by MA6b, which also contributes to habitat connectivity in key areas for lynx. Much of the MA6c area is in the wildland-urban interface, where timber harvest intensity is anticipated to be higher. MA6c is where exemptions to the vegetation standards for lynx are most likely to result in short-term adverse effects but long-term benefits to hare habitat by creating a mosaic of successional stages. Grizzly bear management direction prescribes no net increase to baseline densities of roads open to public motorized use during the non-denning season, which would also reduce the potential for disturbance to lynx. In the grizzly bear recovery zone/primary conservation area, total road densities would also be subject to a standard of no net increase to baseline densities, and there would be no net decrease in secure core, providing large areas of relatively high habitat security.

Focused Recreation Area (MA7): Approximately 36,578 acres of potential lynx habitat is located within this MA (Table 9, Figure B-9). Focused recreation areas typically have recreation uses such as a large lake or reservoir, large campgrounds, or trail systems for featured recreational activities such as hiking, mountain biking, cross-country skiing, and/or off-road vehicle use. There are two developed ski areas or year-round resorts in this MA. Focused recreation areas may have a relatively high level of human activities and associated infrastructure. There will generally be roads, utilities, and trails, as well as signs of past and ongoing activities of actively manage forest vegetation in these areas. Although individual lynx may be adversely affected by recreation developments, the management direction in the NRLMD would reduce potential impacts and avoid an appreciable reduction in the reproduction, numbers, and distribution of lynx.

Summary of key differences in management areas between the existing forest plan and the proposed action

- Compared to the current plan, recommended wilderness would increase by about 91,900 acres under the proposed action, bringing the area managed for wilderness character to about 53 percent of the Forest when combined with existing wilderness. Timber harvest would not be allowed in recommended wilderness, but planned and unplanned ignitions could occur. As a result of increasing recommended wilderness, the area managed in backcountry management areas would decrease by about 83,300 acres.

- Compared to the current plan, management areas suitable for timber production (MAs 6b, 6c, 4b, and portions of MA7) would be reduced in potential lynx habitat by approximately 41,507 acres under the proposed action. Even within these management areas, riparian management zones would not be suitable for timber production. Timber harvest would only be allowed in the inner portion of RMZs to benefit aquatic and riparian-dependent resources. Timber harvest would be allowed in the outer RMZ, but there would be a guideline limiting distance to cover, which would benefit Canada lynx by contributing to habitat connectivity.

Summary and conclusion for alternative B modified

Under alternative B modified, implementation of the revised forest plan is anticipated to maintain or improve lynx habitat in the long term, although some short-term adverse effects may occur, primarily due to the reduction of snowshoe hare habitat allowed under the exemptions and exceptions to the vegetation standards. Reductions in snowshoe hare habitat due to fuels treatments and precommercial thinning could lead to lowered reproduction and survival of lynx. However, the adverse effects are limited in their extent and distribution, as discussed above. A maximum of 6 percent of the 1.8 million acres of lynx habitat on the Forest could be affected by the exemption for fuels reduction in the wildland-urban interface, and less than 1 percent of lynx habitat could be affected by the exceptions allowing precommercial or noncommercial thinning for other resource objectives. Except for defensible space, the exceptions may not be used in lynx analysis units that have more than 30 percent in stand initiation structural stage that does not yet provide winter snowshoe hare habitat, reducing the potential for cumulative effects of wildfire, prescribed fire, and vegetation management activities.

The Northern Rockies Lynx Management Direction would remain in place with two Forest-specific changes. There would be an additional exception to standard VEG S6 with some additional minor adverse effects from felling of trees within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. This effect would occur on about 4,400 acres (less than 0.01 percent) of lynx habitat and is likely to be distributed in no more than 18 lynx analysis units out of 109 lynx analysis units on the forest.

In 7 lynx analysis units, there would be an increase in the area suitable for over-snow vehicle use, which would be offset by a reduction in 5 other LAUs. The change to HU G11 would result in no net increase in the area suitable for over-snow vehicle use on the Forest, but areas would be shifted. The effects of the increased suitable areas are anticipated to be minor based upon findings by Squires et al. (2010) and Kolbe et al. (2007). There may be a small benefit to lynx because some areas that would become unsuitable provide higher quality habitat than some areas that would become suitable (see figure 1 in Squires et al. (2013) (Kuennen, 2017a).

On the whole, modified alternative B would promote conservation of the Canada lynx population because (1) the regulatory framework provided by the Northern Rockies Lynx Management Direction would remain in place, with two Forest-specific modifications that would have minor effects, (2) plan components for vegetation in the broad potential vegetation groups that include boreal forest habitat types would support lynx habitat diversity over the long term, and (3) management area designations and their effects have been modeled for lynx habitat (based on a “worst-case scenario” with respect to modeled changes in climate over 5 decades following plan implementation), and modeling has shown that anticipated combined effects would remain within the range of natural variation of the Forest’s historically fire-dominated landscape.

Landscape-scale effects on Canada lynx habitat

Vegetation Management

On national forests during the last decade, timber harvest practices have been more favorable for lynx as a result of forest plan amendments, with fewer acres impacted by temporary loss of multistory stands that provide snowshoe hare and lynx habitat. Outside the wildland-urban interface, the reduction in traditional precommercial thinning practices has also been more favorable for lynx, with fewer acres experiencing short-term reductions in snowshoe hare habitat due to excessive reductions in horizontal cover providing hare and lynx habitat. Effects of vegetation management on adjacent national forests, Glacier National Park, and the Flathead Indian Reservation within the area occupied by Canada lynx are as follows:

- On the Kootenai National Forest, the maximum acres of lynx habitat that could be affected by exemptions for fuels management in the wildland-urban interface is no more than 57,052 acres, according to the NRLMD biological opinion. Exceptions for precommercial thinning projects for resource benefits could affect another approximately 11,862 acres. Thus far, the level of effects related to vegetation management on the national forests is substantially lower than what was anticipated in the 2007 record of decision for the Northern Rockies Lynx Management Direction and the USFWS biological opinion. From 2007-2012, approximately 7,271 acres were burned by wildfires in lynx habitat within lynx analysis units on the Kootenai National Forest (J. Anderson, pers. comm., August 9, 2013).
- On the Helena National Forest, the maximum acres of lynx habitat that could be affected by the wildland-urban interface exemption is 26,400 acres, according to the NRLMD biological opinion. Exceptions for precommercial thinning projects for resource benefits are limited to 730 acres. Combined, the exemptions and exceptions could affect about 6 percent of the lynx habitat on the Forest. To date, the level of effects to lynx are substantially lower than what was anticipated in the record of decision for the Northern Rockies Lynx Management Direction as the actual amount of treatments on the Helena National Forest total only about 200 acres under the wildland-urban interface exemption (D. Pengeroth, pers. comm., March 29, 2016).
- On the Lolo National Forest as a whole, the maximum number of acres of lynx habitat that could be affected by exemptions for fuels management in the wildland-urban interface is no more than 16,900 acres, according to the NRLMD biological opinion. Exceptions for precommercial thinning projects for resource benefits could affect another approximately 2,200 acres of lynx habitat. To date, the level of effects to lynx are substantially lower than what was anticipated in the record of decision for the Northern Rockies Lynx Management Direction as the actual amount of treatments on the Lolo National Fprest total only about 300 acres under the wildland-urban interface exemption (E. Roberts, pers. comm., April 26, 2016).
- Management of Glacier National Park and the forest management plan for the Flathead Indian Reservation (CSKT) incorporate the conservation measures of the 2013 Lynx Conservation Assessment and Strategy. Glacier National Park does not conduct commercial timber sales but does use fire as a vegetation management tool. Vegetation management in lynx habitat on the Flathead Indian Reservation is similar to that on the national forests. This serves to minimize adverse effects to lynx and to promote consistency in habitat management approaches.

Future climate change

The preliminary Northern Region Adaptation Partnership risk assessment for the Canada lynx (McKelvey & Buotte, in press) states that lynx have little or no adaptive capacity to live in areas lacking snow and limited ability to shift their diet away from snowshoe hares. The authors estimate the likelihood of future climate change effects is high, with a moderate magnitude of effects by 2030 and a high magnitude of

effects by 2050. There is a potential for climate change to reduce the extent of deep snow habitats preferred by lynx. McKelvey et al. (2011) estimated that contiguous areas of spring snow cover would become smaller and more isolated throughout the Columbia River Basin, with greatest losses at the southern periphery but possible increases in snow at higher elevations in the lynx core (including the Flathead National Forest). Regardless of snow depth, the timing of snowmelt has been occurring about two weeks earlier in recent decades. Mills and Johnson (2013) used an ensemble of locally downscaled climate projections and forecasted that annual average duration of snowpack will decrease by 29–35 days by midcentury. Unless snowshoe hares show enough plasticity to adapt to earlier snowmelt, the reduced snow duration will increase the number of days that white hares will be mismatched on a snowless background. This lack of camouflage coloration may make lynx more successful in detecting their primary prey, but in the long term it may also reduce snowshoe hare numbers, especially at relatively lower elevations where snow reductions in the northern Rockies are anticipated to be greatest.

Large wildfires in lynx habitat are also believed to be strongly associated with changing climate factors. Westerling et al. (2006) compiled information on large wildfires in the western United States from 1970–2004 and found that large wildfire activity increased suddenly and markedly in the mid-1980s, with higher frequency of large wildfire, longer wildfire durations, and longer wildfire seasons. The greatest increases occurred in mesic, middle- and high-elevation forest types in the northern Rocky Mountains. Westerling stated that fire exclusion (suppression) has had little impact on natural fire regimes of these higher-elevation forest types in this area; instead, climate appears to be the primary driver of forest wildfire risk.

As discussed above, stand-replacing wildfires on the Forest have created a greater amount of early stand initiation habitat in recent decades. Increases in wildfire may initially create more habitat that is temporarily unsuitable for snowshoe hares and lynx foraging but may greatly increase suitable habitat after a few decades. The Forest modeled what is believed to be a worst-case scenario with respect to stand-replacing wildfire. Fuels reduction programs have ramped up in recent years and are expected to continue on most federal, state, tribal, and private lands within the boundaries of Forest geographic areas. Plan components for fire would allow the Forest to adapt its future management to changing conditions.

Cumulative effects analysis area

For lynx, the area selected for analysis of cumulative effects is the area identified by J. R. Squires et al. (2013) as the current distribution of lynx in northwestern Montana. The cumulative effects analysis area in northwest Montana spans about 13,900 mi^2 (8.9 million acres) of the Northern Rockies and generally encompasses forested areas with recent evidence of lynx presence on portions of the Kootenai, Helena-Lewis and Clark, and Lolo National Forests. Lynx habitat on these national forests is managed through implementation of a consistent set of forest plan objectives, standards, and guidelines (see Flathead National Forest revised forest plan, appendix A). Two national forests make up the bulk of the lands in this area, the Flathead and the Kootenai National Forests. There are 47 LAUs on the Kootenai National Forest, encompassing about 1,151,000 acres of lynx habitat (i.e., boreal forest habitat types). The Kootenai National Forest has consulted on its 2013 revised forest plan. To the south, the Seeley Lake District on the Lolo National Forest and the Lincoln District on the Helena National Forest also provide lesser amounts of lynx habitat in the area.

The cumulative effects analysis area also includes lands managed by Glacier National Park, the State of Montana, the tribes, and private lands. This area was delineated by Squires and others (2013) based upon lynx radiotelemetry location data from 1998-2007. The locations of lynx captured on the Forest from 2009-2015 and non-invasive detections of lynx on the forest also lie within this area. Consideration of the Northern Rockies Geographic Area, a region encompassing 18 national forests and an estimated 18.5

million acres of lynx habitat in Montana, Idaho, Wyoming and Utah, and adjoining areas in Canada, is also provided for context.

Cumulative effects to Canada lynx

Cumulative effects under the Endangered Species Act include state, tribal, local, or private actions that are reasonably certain to occur in the action area. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in cumulative effects analysis in this biological assessment.

As described previously, the 2013 Lynx Conservation Assessment and Strategy identified four anthropogenic influences (the upper tier) as being of greatest concern to the conservation of the lynx: climate change, vegetation management, wildland fire management, and fragmentation of habitat. These are therefore considered in some detail in this section to evaluate the potential for cumulative adverse effects. The "lower tier" of anthropogenic influences include recreation, minerals and energy management, forest/backcountry roads and trails, grazing by domestic livestock, and mortality due to incidental trapping or illegal shooting. Although the lower tier activities could affect individual lynx, they are not expected to have a substantial effect on the overall lynx population and are unlikely to cause cumulative adverse effects. Therefore, they are not discussed in detail.

Vegetation management and wildland fire management

In the past, timber harvest removed all size classes of trees, snags, and down logs in mixed species forests containing spruce-subalpine fir, resulting in loss of multistory stands as well as fragmentation of cover. On cool-moist habitat types, forests regenerated in the 1950s and 1960s, including those that had precommercial thinning following harvest, are now developing into forests with a multistory canopy structure that in some cases contain a dense understory. During the same time period, an extensive insect and disease outbreak killed large-diameter spruce. Removal of scattered mature spruce trees allowed a dense understory of subalpine fir and shrubs to grow in many of these areas.

State lands

Within the Forest analysis area, the Montana Department of Natural Resources and Conservation (DNRC) manages the Stillwater State Forest, the Coal Creek State Forest, and the Swan State Forest, as well as sections acquired from Plum Creek Timber Company in the Swan Valley. In their record of decision on the proposed issuance of a permit to DNRC authorizing incidental take of endangered and threatened species on forested trust lands in western Montana, the Service concluded that removal of winter foraging habitat from scattered DNRC parcels in occupied habitat would not result in adverse effects on lynx for the following reasons: (1) scattered parcels in occupied lynx habitat support about 13 percent (11,600 acres) of the total winter foraging habitat in the project area, (2) the anticipated 230 acres of annual harvest of winter foraging habitat would be spread across more than 11,600 acres of winter foraging habitat on scattered parcels in occupied habitat, (3) the amount of occupied habitat treated would likely represent a small proportion of a lynx home range and would not be enough to measurably reduce snowshoe hare productivity in the home range, and (4) viable lynx habitat would be retained through implementation of DNRC commitments under their habitat conservation plan, combined with the availability of habitat on adjacent LAUs where standards on federal lands regulate treatments of winter foraging habitat in multistoried stands. Where practicable, DNRC will consider harvest unit designs at the project level to maintain a connected network of suitable lynx habitat along riparian areas, ridge tops, and saddles that connect third-order drainages. Measures for grizzly bears that will limit the size of forest openings that can be created through timber harvesting, as well as measures for secure cover, will also provide habitat connectivity for Canada lynx.

Private lands

Private lands represent a small fraction of lynx habitat, and the final rule listing the lynx as a threatened species did not find that present conditions on private lands threaten the lynx. Most private lands within the Forest geographic areas are at elevations too low to be lynx habitat, but lynx do cross through these areas. There is a potential for future management to have negative effects on lynx, although the Service (USFWS, 2007b) concluded that some of the negative effects would be moderated by federal land management within the large landscapes inhabited by an individual lynx. Fuels treatments and fire suppression that occurs in lower montane forests where many private lands occur can help to control wildfires that have the potential to spread up in elevation into lynx habitat.

There are some private parcels in the Middle Fork and North Fork of the Flathead River, as well as in the Swan Valley and Stillwater Valley near Olney, at elevations suitable for lynx. Some of these landowners are clearing vegetation to reduce the risk of wildfire, which may reduce the potential for lynx foraging, although whether lynx would forage in close proximity to human dwellings, dogs, etc. is unknown. Formerly, Plum Creek Timber Company managed lands in lynx habitat and a large portion of their acreage was regenerated in the last few decades. Since 1996, lands in the Swan River geographic area have been acquired by the Forest Service or DNRC through the Montana Legacy Project and other acquisitions. Acquisition by the Forest Service ensures that these lands will not be subdivided for permanent human development and will be managed according to applicable standards and guidelines to conserve lynx habitat (see grizzly bear section for more details on Legacy lands and their distribution). Former Plum Creek Timber Company lands in the Stillwater River watershed are now managed by Weyerhauser. In this watershed, vegetation management, including timber harvest and precommercial thinning, is likely to continue. These activities may or may not decrease habitat quality for Canada lynx, depending upon the specific location, rate, and type of treatment.

Canada lynx habitat connectivity

Linkage areas are intended to allow for movement of animals between blocks of habitat that are otherwise separated by intervening non-habitat areas such as basins, valleys, and agricultural lands or to maintain habitat connectivity where habitat naturally narrows due to topographic features (Claar, Bertram, Naney, Warren, & Ruediger, 2003). Several linkage areas that intersect the Flathead National Forest were identified in the Northern Rockies Lynx Management Direction FEIS, figure 1-1 (USDA, 2007b).

Subsequently, Squires and others (2013) identified lynx travel corridors connecting Canada and northwest Montana using least-cost path modeling. A primary corridor was identified that extended from the Whitefish Range in the north, then along the western front of the Swan Range, and ended near Seeley Lake. A second modeled corridor extended along the east side of Glacier National Park southward through the Bob Marshall Wilderness Complex.

Crossing of highways by lynx has not been studied in the northern Rocky Mountains, but Baigas and others (2017) modeled behavior of Canada lynx crossing two-lane highways in the southern Rocky Mountains, based on 593 highway crossings documented with GPS telemetry. Lynx mostly crossed highways at night and early dawn when traffic volumes were low (Baigas et al., 2017). State Highway 83 bisects the Swan Valley, but radio-collared lynx have been documented to cross this highway and it does not appear to impede their movements (J. R. Squires & Laurion, 2000). Radio-collared lynx have also been documented crossing State Highway 2 between the Flathead National Forest and Glacier National Park (Squires 2013, unpublished data). Since 2000 when Canada lynx were listed, there have been three documented mortalities in the state of Montana due to collision with vehicles on paved two-lane or four-lane highways with high traffic volumes or road speeds of 70 miles per hour (Broderdorp, 2016). There are no four-lane highways in the cumulative effects analysis area, and lynx are known to cross the existing two-lane highways. Given that increased traffic and urbanization are projected for the northern

Rockies (A. J. Hansen et al., 2005), mitigation measures such as land transfers and conservation easements may be necessary to preserve connectivity among lynx populations. If traffic volume greatly increases, the construction of wildlife crossing structures could be considered (Clevenger & Waltho, 2005; J. R. Squires et al., 2013).

Continuing development of private lands to support increased human populations will likely increase habitat fragmentation and may reduce habitat connectivity between blocks of public lands. NRLMD standard ALLS1, objective LINK 01 and objective HU 05 apply. In addition, to address potential changes on private lands, the preferred alternative includes a forestwide desired condition (FW-DC-LSU-01) stating that land ownership adjustments, through purchase, donation, exchange, or other authority, will be considered to improve national forest management by consolidating ownership, reducing wildlife-human conflicts, providing for wildlife habitat connectivity, improving public access to public lands, and retaining or acquiring key lands for wildlife and fish and within wild and scenic river corridors. Because these actions require a willing landowner, it is difficult to predict when or where effects may actually occur. Cities and towns and/or broad expanses of agricultural lands without cover may deter lynx movements. Although lynx are known to cross openings, Squires and others found that lynx generally use habitat within about 300 feet of cover (J. R. Squires et al., 2013). Most of northwest Montana is heavily forested, with the largest non-cover areas occurring in cities, towns, and agricultural valleys (such as the Flathead Valley). The preferred alternative includes desired conditions for connectivity (FW-DC-TE&V-20, FW-DC-WL DIV-02, GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06,07; GA-SM-DC-03, GA-SV-DC-09) and pathogens and actions on private lands; it is difficult to predict when or where effects would occur.

Connectivity to source populations of lynx in Canada is considered critical to persistence of populations in most parts of the range in the United States (J. R. Squires et al., 2013; USFWS, 2003). Connectivity from the Forest to Canada is currently high, with cover conditions that facilitate lynx travel and only two-lane gravel roads within the cumulative effects area. Currently there is no evidence that there are significant impediments to lynx movements or that genetic isolation is occurring in western Montana (Squires et al. 2013).

Recreational activities

Scientific evidence to date indicates that most recreational activities pose a low risk of having negative effects on lynx (ILBT, 2013).Within the cumulative effects analysis area outside of the Forest, there is one ski area on the Kootenai National Forest (Turner Mountain). This is a very small ski area with only one lift and very little development at the base. The ski area affects about 263 acres of lynx habitat, with 164 acres of cleared ski runs and 98 acres of gladed skiing. Summer activities such as hiking are also provided. The Montana Snowbowl is located on the Lolo National Forest and affects about 1,190 acres of lynx habitat in the Rattlesnake lynx analysis unit. Over 90 percent of this lynx analysis unit is within the Rattlesnake National Recreation Area and Wilderness. Although the Turner Mountain and Snowbowl ski areas may have some local adverse effects, they would not be expected to contribute to cumulative adverse effects on the lynx population.

There is a potential for snowmobile use to increase in the cumulative effects analysis area, which could indirectly increase mortality risk to lynx due to incidental trapping or shooting. However, many areas of lynx habitat have limited accessibility for off-route snowmobiling due to high tree densities and rugged topography. On the Kootenai National Forest, there are approximately 120 miles of groomed over-snow motorized routes and approximately 46 more miles of designated routes in lynx habitat within lynx analysis units. Additionally, there are approximately 5 miles of groomed cross-country ski trails in lynx habitat within lynx analysis units and another 5 miles that are designated for cross-country ski use. These mileages are less than what was analyzed in the Northern Rockies Lynx Management Direction FEIS due

to better mapping and some routes being dropped due to lack of snow (M. Laws, personal communication, September 17, 2012 (USDA, 2013)). There are no designated "play areas" on the Kootenai National Forest, although it is likely that some areas receive concentrated use.

Minerals and energy exploration and development

On the Kootenai National Forest, no leasable minerals (e.g., oil, gas, coal, geothermal resources, etc.) are being produced. As on the Flathead National Forest, all leases are currently suspended in accordance with the 1985 court decision Conner v. Burford (848 F.2d 1441 (9th Cir. 1988).

The Troy copper/silver mine was in operation for over 20 years on the Kootenai National Forest and affects approximately 50 acres on National Forest System lands and an additional 400 acres of private lands (USFS 2003). In 2006 the USFWS issued a biological opinion for the re-start of the Troy silver mine that concluded that the mine would not have adverse effects on lynx. However, the Troy Mine has now been shut down and is moving into the reclamation phase. Various analyses have also been completed for the Rock Creek Mine, which also determined the mine is not likely to adversely affect lynx or lynx habitat. There are no plans of operation or notices of intent to explore or operate any commercial mines in lynx habitat on the Lolo National Forest, The Cotter Basin Mine on the Helena National Forest produced copper and silver in the past.

In its 2007 biological opinion on the Northern Rockies Lynx Management Direction, USFWS concluded that the application of the amendment guidelines would result in no or only minor adverse effects to lynx due to minerals and energy development. No adverse cumulative effects are anticipated.

Forest roads

Much of the lynx habitat on the Kootenai, Lolo and Helena National Forests overlaps with grizzly bear habitat, where road construction and motorized use is constrained. The objectives and guidelines contained in the forest plans for lynx reduce or minimize any potential adverse effects (USFWS, 2007b), and no adverse cumulative effects are anticipated.

Livestock grazing

The effects of livestock grazing were anticipated to be minimal under the 2007 Northern Rockies Lynx Management Direction, and no new information suggests that this has changed. No adverse cumulative effects are anticipated.

Trapping

The state of Montana prohibits trapping of lynx; however, legal trapping of other species occurs in Montana and lynx could be unintentionally injured or killed. Poaching may also occur. As explained in the affected environment section, since more strict trapping regulations were implemented in 2008, the magnitude of this effect has been much less. Some lynx home ranges overlap the international border, making those lynx susceptible to harvest because Canada has a legal trapping season for lynx.

In summary, management actions on national forests within the area occupied by Canada lynx in Montana are expected to support conservation and recovery of the Canada lynx. Glacier National Park and the Confederated Salish and Kootenai Tribe incorporated the Lynx Conservation Assessment and Strategy into their management plans, and DNRC manages in accordance with their habitat conservation plan, all of which helps to minimize adverse effects on those lands. There is little potential for adverse cumulative impacts to lynx on private lands because only a small fraction of lynx habitat occurs on private lands. Mortality due to incidental trapping or illegal shooting has the potential to cause cumulative adverse effects, but the magnitude of this mortality is unknown and MFWP has implemented several programs

and regulations aimed at reducing this risk. Climate change has the most potential for adverse cumulative effects due to larger and more frequent disturbances than were typical in the past and the potential reduction in the amount and persistence of deep snow. At this time, the magnitude of effects of future climate change is unknown. Future climate change is expected to impact lynx habitat by further reducing the cold climatic conditions that create and maintain boreal forests as lynx habitat. Reduced snowpack and earlier snow melt may also reduce the lynx's competitive edge as a predator of snowshoe hares in deep, fluffy snow. Warmer temperatures may lead to a reduction in available habitat for lynx as subalpine forests recede to even higher elevations.

Canada Lynx—determination of effects and rationale

Summary and conclusion regarding landscape scale effects on the Canada lynx

In its 2007 biological opinion, the Service concluded that the objectives, standards and guidelines in the amended forest plans provide comprehensive conservation direction adequate to reduce and/or avoid most adverse effects to lynx from forest management on National Forest System lands and would not result in jeopardy to the lynx distinct population segment. Continuing to implement this set of direction, with two minor modifications, is expected to contribute to the conservation of the lynx because the upper tier of anthropogenic influences identified in the Lynx Conservation Assessment and Strategy (ILBT, 2013) that are of greatest concern to the conservation of the lynx (climate change, vegetation management, wildland fire management, and fragmentation of habitat) would be addressed by plan components.

Summary and conclusion regarding Forest-scale effects on the Canada lynx

The proposed action may affect and is likely to adversely affect the Canada lynx.

Rationale for Determination

The biological assessment analyzes changes that could occur in Canada lynx habitat (see Figure B-9) on the Flathead National Forest over the anticipated life of the revised forest plan, considering (1) the context of the natural range of variation and potential changes in climate; (2) the amount and distribution of vegetation treatments that could occur in the wildland-urban interface to protect communities at risk, based upon community protection plans adopted under the Healthy Forest Restoration Act; (3) the amount and distribution of vegetation treatments that could occur using exceptions to the vegetation standards, and (4)habitat connectivity.

Timber harvest, precommercial thinning, fuels reduction and other fire management activities that may occur under the proposed action—particularly in the General Forest management area—have the potential to adversely affect Canada lynx and their habitat. At the project level, all activities would be subject to plan components, including standards and guidelines (see Appendix D) designed to avoid or minimize adverse effects to individual lynx and the habitats they occupy on federal lands. Given that we cannot predict exact locations of future projects that may use exceptions or wildland-urban interface exemptions to the vegetation standards and, consequently, adversely affect lynx and their habitat, we conclude that the proposed action may affect and is likely to adversely affect the Canada lynx. Forest-specific changes to standard VEGS6 and guideline HU G11 are anticipated to have minor effects at the Forest and cumulative effects scale. Similarly, updated estimates of treatments that could occur using exceptions and exemptions to the vegetation standards are anticipated to have minor effects at the Forest and cumulative effects scale. There may be localized adverse effects to lynx habitat, but these would be limited by standards VEGS1 and VEGS2. These standards are adaptive to climate change and wildland fire because they limit vegetation management in adjacent lynx analysis units and limit vegetation management in lynx analysis units that have 30 percent or more of their lynx habitat that is not yet hare habitat, whether due to

management or wildfire. Even in the wildland urban interface, fuel treatment projects may not result in more than three adjacent LAUs exceeding standard VEGS1, thus limiting detrimental effects from fuel treatment projects. In addition, VEGS1 limits the amount of vegetation management that can occur in lynx habitat on NFS lands in any one decade to promote sustainability of diverse vegetation conditions over time. The desired conditions described in the revised forest plan consider new science regarding habitat quality, distribution, and connectivity. With respect to the second tier of anthropogenic activities (recreation, minerals/energy management, forest/backcountry roads and trails, grazing by domestic livestock, and mortality due to incidental trapping or illegal shooting), plan components for management activities are integrated to promote conservation of lynx.

Canada Lynx Critical Habitat

Introduction

On September 12, 2014, the Service issued a final rule revising the critical habitat designation and the distinct population boundary for the contiguous United States distinct population segment of the Canada lynx (USFWS, 2014a). Under the Endangered Species Act, specific areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features that (1) are essential to the conservation of the species and (2) may require special management considerations or protection. Areas outside the geographical area occupied by the species at the time it is listed could also be designated as critical habitat if a designation limited to its current range would be inadequate to ensure the conservation of the species.

In its designation of critical habitat, the Service stated, "we consider lynx habitat to include forested areas with the potential, through natural succession, to produce high-quality snowshoe hare habitat, regardless of their current stage of forest succession" (Federal Register / Vol. 79, No. 177 / Friday, September 12, 2014 / Rules and Regulations pg. 54808). This is consistent with the Flathead's mapping and modeling of potential lynx habitat. The Service also stated,

> when determining critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack physical or biological features necessary for lynx. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Given the scale of the lynx critical habitat units, it was not feasible to completely avoid inclusion of water bodies, including lakes, reservoirs, and rivers; grasslands; or human-made structures such as buildings, paved and gravel roadbeds, parking lots, and other structures that lack the PCE for the lynx. These areas, including any developed areas and the land on which such structures are located, that exist inside critical habitat boundaries are not intended to be designated as critical habitat. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this final rule have been excluded by text in this rule. Therefore, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the physical or biological features in the adjacent critical habitat. (USFWS, 2014a, p. 54823)

Affected Environment—critical habitat

The Flathead National Forest lies within critical habitat unit 3. Lynx critical habitat unit 3 consists of about 9,783 mi2 in the Northern Rocky Mountains (Figure B-14). Lynx are known to be widely distributed throughout this unit, and breeding has been documented in multiple locations. Lynx critical habitat unit 3 coincides with the lynx core area in northwestern Montana/northeastern Idaho. Lynx critical

habitat unit 3 overlaps the NCDE recovery zone/primary conservation area for the grizzly bear to a large extent. According to the USFWS, this area appears to support the highest density lynx populations in the Northern Rockies. It likely acts as a source population and provides connectivity to other portions of the lynx's range in the Rocky Mountains. This area contains the physical and biological features essential to the conservation of the lynx (the primary constituent elements and its components) laid out in the appropriate quantity and spatial arrangement.

The designation of critical habitat does not prohibit development or forest management activities, but federal agency actions must not result in destruction or adverse modification of critical habitat. The federal action must be separately evaluated for effects on the species and on its critical habitat.

Key indicators

To determine if the action would result in destruction or adverse modification of critical habitat, this analysis of resource elements important to Canada lynx critical habitat focuses on the primary constituent element.

The USFWS determined that the primary constituent element for lynx critical habitat is

1. Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:

    a. Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface;

    b. Winter snow conditions that are generally deep and fluffy for extended periods of time;

    c. Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and

    d. matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

    In matrix habitat, activities that change vegetation structure or condition would not be considered an adverse effect to lynx critical habitat unless those activities would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range, or if they would adversely affect adjacent foraging or denning habitat.

Natural disturbance processes historically played an important role in maintaining a mosaic of boreal forest successional stages (primary constituent element 1; PCE1) that provides habitat for both snowshoe hare and Canada lynx. Glacier National Park occupies portions of critical habitat between the Bob Marshall Wilderness Complex and Canada. In these areas there is a high potential for natural disturbance processes to play a continued role in maintaining a vegetation mosaic, supporting lynx, and providing connectivity to Canada. In Glacier National Park, an increase in wildfires since about 1990 has affected about 12 percent of critical lynx habitat. These burned areas will provide PCE1a, described above, once trees and shrubs have grown tall enough and dense enough to support snowshoe hares and lynx. Wildfires, insects, and disease are likely to provide abundant down trees for denning in Glacier National Park and other forested lands.

Critical habitat occurs on about 3,425 mi^2 of Flathead NFS lands, which is about 35 percent of critical habitat unit 3 (Figure B-14). About 49 percent of the critical habitat on the Flathead National Forest is in wilderness. There are only two lynx analysis units on the Flathead National Forest that do not include some critical habitat: the Haskill Mount and Blacktail lynx analysis units west of Flathead Lake and Highway 93.

New and ongoing federal projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to the PCE of lynx critical habitat. In its final rule designating lynx critical habitat, USFWS identified the following federal actions that potentially could adversely modify critical habitat. Briefly, these are:

1. Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx. These activities could significantly reduce the quality of snowshoe hare habitat such that the landscape's ability to produce adequate densities of snowshoe hares to support persistent lynx populations is at least temporarily diminished.

2. Actions that would cause permanent loss or conversion of the boreal forest on a scale proportionate to the large landscape used by lynx. Such activities could eliminate and fragment lynx and snowshoe hare habitat.

3. Actions that would increase traffic volume and speed on roads that divide lynx critical habitat. These activities could reduce connectivity within the boreal landscape for lynx, and could result in increased mortality of lynx.

Effects of the framework programmatic action– Canada lynx critical habitat unit 3

The Northern Rockies Lynx Management Direction was completed in 2007, prior to the final designation of critical habitat, and therefore did not include an analysis of the effects on critical habitat. Nevertheless, the NRLMD amendment to 18 national forest plans adopted plan components that maintain the physical and biological features that provide critical lynx habitat and directly or indirectly contribute to the primary constituent element, the key indicator for analysis of critical habitat. Table 10 below shows how the management components of the Northern Rockies Lynx Management Direction contribute to or support the critical habitat primary constituent element. A detailed discussion of these plan components and their effects can be found in the section above on Canada lynx.

Table 10. Canada lynx critical habitat primary constituent element in relation to Northern Rockies Lynx Management Direction (NRLMD).

Primary Constituent Element	Primary Constituent Element Description	Associated NRLMD Objective, Standard, and/or Guideline
1.	*Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:*	VEG O1, VEG O2, VEG O3, VEG O4
a	Presence of snowshoe hares and their preferred habitat conditions, including dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow and mature multistoried stands with conifer boughs touching the snow surface;	VEG O1, VEG O2, VEG O3, VEG O4; VEG S1, VEG S2, VEG S5 and VEG S6; VEG G1, VEG G4, VEG G5 and VEG G10; GRAZ G1, GRAZ G2, GRAZ G3, and GRAZ G4; HU G1, HU G2, HU G8 (and VEG G10 in WUI).
b	Winter snow conditions that are generally deep and fluffy for extended periods of time;	VEG G4; HU G4, HU G11, and HU G12

Primary Constituent Element	Primary Constituent Element Description	Associated NRLMD Objective, Standard, and/or Guideline
c	Sites for denning that have abundant coarse woody debris (downed trees and root wads);	VEG O1; VEG G11; HU G1
d	Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.	ALL 01, ALL S1, ALL G1; GRAZ G4; HU G3 and HU G7; LINK 01, LINK S1 and LINK G1

Primary Constituent Element 1a (PCE1a)

Critical habitat unit 3 includes the Kootenai National Forest, Flathead National Forest, Seeley District of the Lolo National Forest, and Lincoln District of the Lewis & Clark/Helena National Forest where critical habitat is managed to provide boreal forest landscapes supporting a mosaic of differing successional forest stages and containing presence of snowshoe hares and their preferred habitat conditions. These Forests also follow management direction in the NRLMD. As a result, they may treat some areas of critical habitat using the exceptions and/or exemptions to the NRLMD vegetation standards. Table 11 shows the acres of exceptions or exemptions used by these Forests through 2016.

Table 11. Acres of hare habitat treated in critical habitat unit 3.

Exception or Exemption category	Flathead NF acres	Kootenai NF acres	Seeley RD-Lolo NF acres	Lincoln RD-Lewis & Clark/Helena NF acres
VEGS5 exceptions	940	1860	0	0
WUI exemptions	6456	3095	0	954

Lands where active vegetation management occurs cover a minority of the Forest (about 20 percent); however, they are unevenly distributed across the Forest area. Conservatively, areas where regeneration timber harvest has occurred since 1990 may not yet have developed dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow. About 2 percent of lynx critical habitat on the Forest has had regeneration timber harvest since 1990 (including lands in the wildland-urban interface as well as lands outside it. In addition, areas that have been burned by wildfire since 1990 may not yet have developed dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow. About 24 percent of critical habitat on the Forest has been burned by stand-replacing wildfires since 1990, temporarily reducing PCE1a.

The revised forest plan standard VEGS1 limits vegetation management activities in an LAU if wildfire creates a situation where more than 30 percent of an LAU does not yet provide hare habitat, helping to ensure actions that would reduce or remove understory vegetation within boreal forest stands do not occur on a scale proportionate to the large landscape used by lynx. The revised forest plan standard VEGS2 promotes development of PCE1a but limits regeneration harvest on NFS lands to 15 percent of lynx habitat in each LAU per decade to provide for distribution of hare habitat over time and space.

Alternative B modified would protect existing lynx habitat that provides primary constituent element 1a except for allowed exemptions to the vegetation standards within the wildland-urban interface and allowed exceptions for other resource purposes listed under VEG S5 and VEG S6. Exemptions to standards VEGS1 and VEGS2 are allowed for fuel treatment projects within the wildland-urban interface

(WUI) as defined by HFRA, subject to a cumulative limit of no more than 6 percent of lynx habitat on the Forest under the incidental take estimate for the 2007 NRLMD. Additionally, fuel treatment projects may not result in more than three adjacent LAUs exceeding the standards. This requirement helps to ensure actions that would remove understory vegetation and reduce the quantity or quality of hare habitat within boreal forest stands do not occur disproportionately in one portion of Canada lynx critical habitat. Figure B-18 displays critical habitat in relation to the current wildland-urban interface within the geographic areas of the revised Flathead National Forest plan.

The wildland-urban interface (WUI; see glossary) is defined by the Healthy Forests Restoration Act. An analysis of these WUI boundaries and critical habitat on the Forest shows that much of the WUI is at lower elevation and is modelled as relatively low quality habitat (Kuennen, 2017c). The maximum WUI exemption estimate is 103,800 acres for the Flathead National Forest out of approximately 2.2 million acres of critical habitat on NFS lands on the Forest. National Forest System lands in the Salish Geographic area that are west of Kalispell and south of Highway 2 are not in critical habitat, so cumulative WUI exemptions could be used on a maximum of about 5 percent of critical habitat across the Forest. As of 2015, about 0.4 percent of critical habitat had been affected by WUI exemptions. Fuel treatments under the WUI exemption may affect critical habitat by causing temporary reductions in PCE1a in areas where high quality habitat, dense understory vegetation, and the WUI overlap, but are not likely to occur on a scale proportionate to the large landscape used by lynx. Vegetation management activities would undergo additional site-specific consultation at the project level.

Lands that are suitable for timber production are most likely to have regeneration harvest. These lands comprise 21 percent of critical habitat distributed across 68 of 109 LAUs on the forest. Timber harvest could also occur on lands that are not suitable for timber production but where timber harvest is allowable. All timber harvest must be consistent with desired conditions, standards, and guidelines of the revised forest plan. On the heavily forested Flathead National Forest, vegetation management activities are not likely to result in a loss of boreal forest landscapes supporting a mosaic of differing successional forest stages with preferred habitat conditions for snowshoe hares at the large landscape scale discussed in the critical habitat rule. Additional site-specific consultation would occur at the project level. With the proposed action alternative B modified, 57 percent of critical habitat distributed across 78 of 109 LAUs, would be in wilderness or recommended wilderness where no commercial timber harvest would occur (some LAUs have both suitable timber lands and either wilderness or recommended wilderness).

The Forest proposes that the acreage that could be treated under the existing exceptions to VEG S5 and VEG S6 (based upon incidental take determined during NRLMD consultation) may be increased under alternative B modified, compared to estimates provided in 2007. Under Alternative B modified, exceptions to the vegetation standards would be estimate to occur on up to 15,460 acres, compared to about 1,460 acres that were estimated for purposes of incidental take in the 2007 biological assessment. This figure includes acres that could be treated with existing exceptions to vegetation standards VEGS5 and VES6 but that cannot be specifically identified at the present time. For planning purposes, potential treatment needs, updated in 2016, are as follows:

- about 500 acres for defensible space (VEG S5/S6 exception 1)
- about 1,510 acres for research studies and genetic tree tests (VEG S5/S6 exception 2)
- about 1,800 acres for conifer removal or daylight thinning of aspen (VEG S5 exception 4)
- about 4,750 acres for daylight thinning of planted, rust-resistant western white pine (VEG S5 exception 5)

- about 2500 acres to restore whitebark pine in wildfire areas and forests with sapling-size trees (VEG S5 existing exception 6)

Under alternative B modified, the listed vegetation exceptions under existing forest plan would remain in place with one forest-specific change. An additional exception to VEG S6 would allow the felling of trees within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. This new exception to VEGS6 would be anticipated to remove understory vegetation and reduce the quality of hare habitat within about 4,400 acres of boreal forest stands, affecting about 0.2 percent of Canada lynx critical habitat, a minor amount.

As previously analyzed during the consultation for the NRLMD, the Forest anticipates that the overall acres will be constrained but that there will be flexibility as to which exception categories are used in order to respond to changing conditions and needs. Use of exceptions to standards VEGS5 and VEGS6 would require additional site-specific consultation at the project level. The range of acres anticipated for treatment under all exceptions to standards VEGS5 and VEGS6 represents about 0.5 to 0.7 percent of critical habitat on the Flathead National Forest, a minor amount. Standards VEGS1 and VEGS2 limit the amount of habitat that can be treated at any given time and also limit the distribution of treatments.

Connectivity of mature forest, percent composition of young regenerating forest, low perimeter-area ratio of young regenerating forest patches, and adjacency of mature to young regenerating forest types are important for lynx reproduction and survival at the scale of a lynx home range (Kosterman 2014). The perimeter-area ration of young regenerating forest patches is anticipated to be highly variable across the Forest's critical habitat, depending upon whether patches are created by wildfire or by vegetation management activities such as timber harvest. With the proposed action alternative B modified, standard ALL S1 and guideline ALL G1, as well as proposed management areas (MAs) and their distribution (see table 3 and Figure B-2), help to provide connectivity of mature forest at the critical habitat scale. Plan components for old growth and riparian management zones, integrated with plan components for vegetation management, help to provide for adjacency of mature to regenerating forests at the scale of a lynx home range, such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

Primary Constituent Element 1b (PCE1b)

It is not possible to reliably predict effects of future winter climate change on deep, fluffy snow at the Forest scale (see discussion below for the scale of critical habitat unit 3). The effects of proposed changes in winter recreation plan components on deep, fluffy snow are discussed. With alternative B modified, there would be new, integrated plan components to replace Amendment 24 adopted in 2006 and a new forest-specific guideline to replace the previous NRLMD guideline HU G11 adopted in 2007. Amendment 24 designated specific areas, routes and seasons of use for over-snow vehicle use. Seasons of use would not be changed under alternative B modified and many of the areas and routes suitable for motorized over-snow use would not be changed, but some routes and areas suitable for motorized over-snow use would be changed to respond to changing conditions and public input (Kuennen, 2017b).

As described in detail in the section on Canada lynx, the proposed new guideline FW-GDL-REC-04 states,

> To limit the risk of cumulative impacts to Canada lynx, there should be no net increase in miles of designated motorized over-snow vehicle routes, groomed routes, or areas where motorized over-snow vehicle use would be suitable, in lynx habitat on NFS lands at a forestwide scale. This guideline does not apply inside permitted ski area boundaries to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by guideline HU G12. (Specific locations of routes or areas suitable for motorized over-snow vehicle use are specified in Figure B-44 in this BA.)

Under the 2012 planning rule, guidelines must be met unless the objective of the guideline can be met using other methods. The proposed guideline would allow the Forest to shift areas to meet changing vegetation conditions and needs, but would not allow a net increase in the suitable area or miles. Changes in routes, groomed routes, or areas open to over-snow motorized use would undergo additional site-specific consultation at the project level and would need to be consistent with motorized over-snow suitability, as explained in the section on Canada lynx. In the future, there may be shifts in areas where motorized over-snow use occurs, but impacts to the total area providing PCE1b on the Forest would not increase, so there are not likely to on impacts at a scale proportionate to the large landscape used by lynx.

Nonmotorized over-snow use also occurs across the Forest but is generally dispersed, except in designated cross-country ski areas. Designated cross-country ski areas are now included in management area 7. Two of these areas, Round Meadow and Essex, are located in Canada lynx critical habitat. The boundaries of these areas are not proposed to change with alternative B modified so at the critical habitat scale, deep fluffy snow would not be affected.

Motorized over-snow use would be suitable on approximately 28 percent of critical habitat and designated cross-country ski areas would occur on <1 percent of Canada lynx critical habitat. Although snow compaction would occur, maintaining the miles and acres where these uses are currently allowable would be expected to have minor effects on critical habitat. Based upon the findings of Squires and others (2010) as well as Kolbe and others (2007) for northwest Montana, proposed changes in management direction for over-snow use are anticipated to have minor effects. Much of the Flathead National Forest is not accessible to motorized over-snow use due to wilderness or recommended wilderness designation. Even in areas where motorized over-snow use is suitable, dense forest cover precludes use. Deep, fluffy snow would continue to be available in critical habitat at the large landscape scale discussed in the critical habitat rule.

Primary Constituent Element 1c (PCE1c)

Lynx dens in northwest Montana are typically found in mature multistory stands of spruce-fir forests with dense horizontal cover and abundant coarse woody debris although they may also be located in mid-seral, regenerating stands (J. R. Squires et al., 2008). Young stands that are either naturally sparse or mechanically thinned were seldom used for denning. Denning habitat is generally abundant across the coniferous forest landscape of northwest Montana and is not likely to be limiting for lynx (J. R. Squires et al., 2008, 2010; J. R. Squires & Kennedy, 2006). Downed wood is highly variable in amount, sizes, species, and stages of decay, both across the landscape and over time. Recent fires have likely increased the amount of down wood in parts of the forest, and as the snags fall, there will be a period of time where downed woody material will be especially high in these fire areas. About 20-30 years following a wildfire on the Forest (on average), dense horizontal cover is also abundant. The majority of Forest lands are within management areas where natural ecological processes and disturbances will be the primary factor affecting snag and downed wood conditions. These natural processes are expected to create an abundance of snags and downed wood at the forestwide scale, with amounts within desired ranges.

The revised forest plan desired condition for downed wood is to maintain amounts that contribute to forest structural diversity, soil ecological function, and habitat for animal species associated with down wood for feeding, denning, reproduction, and shelter. Table 12 displays the current and desired conditions for the amount of downed wood across the biophysical settings that have the potential to provide boreal forest landscapes supporting a mosaic of differing successional forest stages (critical habitat PCE).

Table 12. Current conditions and desired range in average total tons per acre of downed wood, as averaged across all forested acres within each biophysical setting on the Forest

Broad PVT (biophysical setting)	Current estimate (total tons per acre) [1]
Cool Moist	18.6
Cold	12

1- Source: FIA data using R1 Summary database (Hybrid 2011) analysis tools.

With the proposed action alternative B modified, 57 percent of critical habitat distributed across 78 of 109 LAUs, would be in wilderness or recommended wilderness where no commercial timber harvest would occur (some LAUs have both suitable timber lands and either wilderness or recommended wilderness). Wilderness and recommended wilderness areas have had stand-replacing wildfires as well as trees killed by insect or disease activity, creating abundant denning habitat as trees fall down. Many of the forests in areas suitable for timber production and within wildland-urban interface areas would typically be managed in ways that maintain relatively vigorous trees and limit losses due to insects, disease and fire where possible. This would tend to result in lower tree mortality rates, and a potentially lower density of down wood across these areas over time as compared to areas less influenced by human actions and affected more by natural disturbances (such as wilderness). Salvage harvest of dead trees would also reduce down woody material. However, even in areas suitable for timber production, forestwide guideline FW-GDL-TE&V-10 provides for retention of down woody material in harvest units, where available. Exceptions may occur, for example when there is insufficient material of suitable size prior to harvest, within developed recreation sites, or where fuel reduction is desired to decrease expected fire behavior (e.g., within wildland-urban interface). In addition, guideline VEG G11 addresses the distribution of denning habitat for Canada lynx and ensures that it would be assessed site-specifically during project level consultation in critical habitat. On the heavily forested Flathead National Forest, management activities are not likely to result in a shortage of denning habitat at the large landscape scale discussed in the critical habitat rule. Plan components would support denning habitat at a scale proportionate to the large landscape used by lynx.

Primary Constituent Element 1d (PCE1d)

Matrix habitat, by definition, is habitat that is important to lynx for movement. However, the vegetative condition and structure of matrix habitat is not relevant to its value. Therefore, in matrix habitat, activities that change vegetation structure or condition would not be considered an adverse effect to lynx critical habitat unless those activities would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range (USFWS, 2014a).

Forest-specific plan components for habitat connectivity (detailed in the Canada lynx section above), standards ALL S1 and LINK S1, and guideline ALL G1 and LINK G1 would provide for matrix habitat. ALL S1 requires that new or expanded permanent development and vegetation management projects must maintain connectivity in an LAU and/or linkage area and ensures that connectivity would be assessed site-specifically during project level consultation in critical habitat. Guideline ALL G1 states that methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. In addition, several new desired conditions and guidelines in the proposed action that are designed to promote connectivity for multiple species, would allow continued movement of lynx along the putative travel corridors identified by Squires and others in 2013. Plan components that would apply to summer corridors identified by Squires and others (such as Guideline FW-GDL-IFS-13, GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06, GA-NF-DC-07, GA-SM-DC-04, and GA-SV-DC-08) may also address objectives of matrix habitat by facilitating long-distance movements (Squires et al.

2013). Plan components would support habitat connectivity at a scale proportionate to the large landscape used by lynx.

Actions that have the potential to adversely modify critical habitat

Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx.

At the Forest scale, the amount and distribution of timber harvest and forest road building is limited by management areas under alternative B modified, including existing and proposed wilderness areas (management area 1), inventoried roadless areas (located within management areas 5a or 4a), some special areas (management area 3b), inner riparian management zones located in a variety of management areas, and other proposed management areas (such as MA6a, which is not suitable for timber production). On the heavily forested Flathead National Forest, there are no actions contemplated under management areas for alternative B modified that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx.

Table 13 displays the acres and percentage of Canada lynx critical habitat in each Forest management area. The effects for each management area are described in detail in the section on Canada lynx.

Table 13. Acres and percentage of Canada lynx critical habitat in each Forest management area

Management Area	Critical Lynx Habitat Acres	Percentage of Critical Lynx Habitat
1a Designated wilderness	1,069,992	49
1b Recommended wilderness	189,705	9
2a Designated wild and scenic rivers	5,349	< 1
2b Eligible wild and scenic rivers	14,392	1
3b Special areas	1,165	< 1
4a Research natural areas	5,544	< 1
4b Experimental and demonstration forests	9,357	< 1
5a Backcountry nonmotorized year-round	144,301	7
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	49,491	2
5c Backcountry: motorized over-snow vehicle use	109,973	5
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	9,668	< 1
6a General forest low	112,128	5
6b General forest medium	271,341	12
6c General forest high	166,542	8
7 Focused recreation areas	32,963	2
Total	**2,191,912**	

Permanent loss or conversion of boreal forest. There are no actions contemplated under alternative B modified that would cause permanent loss or conversion of boreal forest at the large landscape scale discussed in the critical habitat rule. There is no locatable mineral or leasable energy development activity occurring on the Flathead National Forest. Much of critical habitat is subject to a "no surface occupancy" stipulation or is withdrawn from mineral development.

Traffic volume and speed. Alternative B modified does not contemplate increasing traffic volume or speed on roads that divide critical habitat. The revised forest plan includes a guideline stating that

methods to avoid or reduce the effects on lynx in lynx habitat should be used when upgrading unpaved roads to maintenance levels 4 or 5 if the result would be increased traffic speeds and volumes or a foreseeable contribution to increases in human activity or development in lynx habitat. There are no actions contemplated under alternative B modified that would increase traffic volume or speed at the large landscape scale discussed in the critical habitat rule.

Cumulative effects to Canada lynx critical habitat unit 3

Cumulative effects under the Endangered Species Act include state, tribal, loca, or private actions that are reasonably certain to occur in the action area. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in the cumulative effects analysis in this biological assessment.

PCE1a: Tribal lands within the proposed Critical Habitat Unit 3 include about 370 square miles of the Flathead Reservation in Montana, managed by the Confederated Salish and Kootenai Tribes. In their 2014 *Final Environmental Assessment: Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx*, the USFWS (USFWS, 2014d) stated:

> In accordance with Secretarial Order 3206, "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act" (June 5, 1997); the President's memorandum of April 29, 1994, "Government-to-Government Relations with Native American Tribal Governments" (59 FR 22951); Executive Order 13175 "Consultation and Coordination with Indian Tribal Governments;" and the relevant provision of the Departmental Manual of DOI (512 DM 2), the Service believes that fish, wildlife, and other natural resources on Tribal lands are better managed under Tribal authorities, policies, and programs than through Federal regulation wherever possible and practicable. We excluded Tribal lands from the final designation in 2009, and we are again considering excluding Tribal lands from the final revised designation. (p. 46)

PCE1b: There is a potential for future changes in climate to reduce the extent of deep snow habitats preferred by lynx. According to the Canada lynx species status assessment (2016), climate models project that the northwest Montana/northeast Idaho unit will maintain snow into the future. McKelvey et al. (2011) estimated that contiguous areas of spring snow cover would become smaller and more isolated throughout the Columbia River Basin, with greatest losses at the southern periphery, but with possible increases in snow at higher elevations in the core. In addition, spring snowmelt is already occurring about two weeks earlier in recent decades. Mills and Johnson (2013) forecasted that annual average duration of snowpack will decrease by 29–35 days by midcentury. This may result in a contraction of the area where lynx have a competitive advantage in deep snow. Downscaled winter climate and precipitation models have a higher level of uncertainty than summer climate models (Joyce, Talbert, Sharp, Morissette, & Stevenson, in press).

PCE1c: Denning habitat is not limited in critical habitat unit 3.

PCE1d: There are several two-lane highways within critical habitat on the Flathead National Forest. Federal transportation-related projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to the PCE of lynx critical habitat as well as effects to the species. Consultation for projects within designated critical habitat would need to specifically evaluate the PCE. For projects where there is no federal nexus, critical habitat designation does not impose rules or restrictions on land use (USFWS, 2014d).

Development of private lands will likely continue and may reduce habitat connectivity across valleys that are located between blocks of lynx habitat on public lands.

Canada lynx critical habitat determination of effects and rationale

The proposed framework programmatic action *may affect, is likely to adversely affect* designated Canada lynx critical habitat.

Rationale for Determination

The biological assessment analyzes changes that could occur in Canada lynx critical habitat unit 3 on the Flathead National Forest over the anticipated life of the revised Forest plan (see Figure B-14). Within Canada lynx critical habitat unit 3, the proposed action contributes to boreal forest landscapes with a mosaic of differing forest successional stages providing the physical or biological features essential to the conservation and recovery of the Canada lynx population.

Timber harvest, precommercial thinning, fuels reduction and other fire management activities that may occur under the proposed action—particularly in the General Forest management area—have the potential to adversely affect Canada lynx critical habitat. Given that we cannot predict exact locations of future projects, we conclude that the proposed action may affect and is likely to adversely affect Canada lynx critical habitat. At the project level, activities would be subject to plan components, including standards and guidelines (see Appendix D) designed to avoid or minimize adverse effects. On the heavily forested Flathead National Forest, management activities are not likely to create a barrier or impede lynx movement between foraging and denning habitat at the large landscape scale discussed in the critical habitat final rule. The revised forest plan requires that new or expanded permanent developments and vegetation management projects in a lynx analysis unit and/or a linkage area must maintain habitat connectivity, and it has numerous plan components designed to facilitate habitat connectivity that consider all lands. There are no actions contemplated under alternative B modified that would cause permanent loss or conversion of boreal forest at the large landscape scale discussed in the critical habitat rule. Alternative B modified does not contemplate increasing traffic volume or speed on roads that divide critical habitat. The revised forest plan includes a guideline stating that methods to avoid or reduce the effects on lynx in lynx habitat should be used when upgrading unpaved roads to maintenance levels 4 or 5 if the result would be increased traffic speeds and volumes or a foreseeable contribution to increases in human activity or development in lynx habitat.

Grizzly Bear

Background

This biological assessment is being written in concert with the development of the final grizzly bear conservation strategy for the NCDE, incorporating habitat-based recovery criteria that will be appended to the NCDE chapter of the Grizzly Bear Recovery Plan (USDA, 2016b, 2016c). In Fund for Animals v. Babbitt, 967 F. Supp. 6 (D.D.C. 1997), the Court ruled that the Service needed to "establish a threshold of minimal habitat values to be maintained within each Cumulative Effects Analysis Unit in order to ensure that sufficient habitat is available to support a viable population." The Service began working with multiple agencies in the NCDE in 2009 to develop a habitat management strategy to support a viable population of grizzly bears in the NCDE. The Service then gathered public comments on the draft Grizzly Bear Conservation Strategy (GBCS) and the habitat-based criteria it contained. The public comment period for the draft GBCS began on May 2, 2013. On May 11, 2016, a notice was published in the Federal Register notifying scientists and other interested parties that they would have the opportunity to submit oral or written comments on the habitat-based recovery criteria for the NCDE grizzly bear population. On July 7, 2016, the Service conducted a workshop with oral presentations by the public and also accepted written comments during July.

The process in the NCDE cumulative effects analysis area is similar to the process used in the Greater Yellowstone Ecosystem (USFWS, 2013e). Following a public workshop, the USFWS appended the Yellowstone chapter of the Grizzly Bear Recovery Plan to include three objective and measurable criteria within the recovery zone, including a secure habitat standard, a developed site standard, and a livestock allotment standard (USFWS, 1993). Similar objective and measurable criteria were included in the draft GBCS for the NCDE, recognizing differences in the two ecosystems, their grizzly populations, and their stressors.

The draft NCDE GBCS includes measurable criteria for motorized access and secure habitat, developed recreation sites, livestock allotments, minerals management, and vegetation management. The conservation strategy also addresses measures to maintain or enhance connectivity between grizzly bear ecosystems and the proper storage of food and attractants. The draft GBCS for the NCDE states:

> For grizzly bear conservation to be successful, providing habitat on the landscape is not enough. For grizzly bears to survive, people must accept the grizzly as a cohabitant of the land. Tolerance can be maintained when the public has confidence in management agencies to respond quickly and appropriately to grizzly bear-human conflicts and the public is equipped with the knowledge to understand and avoid grizzly bear-human conflicts. The objective of conflict management is to maximize human safety and minimize property losses while maintaining a viable population of grizzly bears. (p. iv)

Multiple agencies work with the public towards this end.

Development of the Draft NCDE Grizzly Bear Conservation Strategy

In preparation for delisting, a conservation strategy often is developed to ensure that appropriate protections will be in place to maintain the recovered population into the future. The Grizzly Bear Recovery Plan (USFWS, 1993) specifically called for development of a conservation strategy so that continuity and consistency of management would be provided following delisting. Representatives of Montana Fish, Wildlife and Parks, the Montana Department of Natural Resources and Conservation, the Blackfeet Nation, the Confederated Salish and Kootenai Tribes, Glacier National Park, the U.S. Forest Service, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, and the Bureau of Land Management were appointed as members of the Interagency Conservation Strategy Team. Their goal was to describe the management and monitoring programs that would maintain a recovered grizzly bear population in the NCDE.

In May 2013, a draft conservation strategy for the NCDE was released to the public for review and comment (Federal Register vol. 78, no. 86, p. 26064, May 2, 2013). The draft conservation strategy was designed by the Interagency Conservation Strategy Team to

- describe and summarize the coordinated strategies, standards, and guidelines to manage the grizzly bear population, grizzly bear-human conflicts, and grizzly bear habitat, such that continued conservation of the grizzly bear population in the NCDE will be ensured;
- document the regulatory mechanisms, legal authorities, policies, management documents, and monitoring programs that are needed to maintain a recovered grizzly bear population in the NCDE;
- document the commitments agreed to by the participating agencies.

When finalized, the conservation strategy will not change the legal status of grizzly bears in the NCDE. The intent is to support delisting from the Endangered Species Act by demonstrating the agencies' ongoing commitment to conserve the species. Once the grizzly bear is delisted under the Endangered Species Act, the Forest Service will evaluate the NCDE grizzly bear for management as a Regional

Forester sensitive species, and a determination of whether this status is warranted will be made at that time. The Forest Service will consider the NCDE grizzly bear as a potential species of conservation concern during any plan revision within the range of the NCDE grizzly bear as required by FSH 1909.12 Ch. 10, 12.52(d)(2)(b). This paragraph requires consideration of species that were from the Federal list of threatened or endangered species within the past 5 years. In addition, national forests will continue to follow direction established in existing land management plans until amended or revised.

Ongoing grizzly bear conservation actions by the Forest Service

Over the years, the Forest Service has undertaken substantial actions both inside and outside the NCDE recovery zone to maintain or improve grizzly bear habitat and to reduce grizzly bear-human conflicts on the national forests. These actions will continue under all of the alternatives. Following are examples of some of those conservation actions.

Issuance of food and attractant storage orders and regulations

Food storage orders require that food, garbage and other attractants are stored properly so that grizzly bears cannot obtain access to them. This prevents food-conditioning of bears, which usually leads to grizzly bear-human conflicts, injuries, or fatalities. Food storage orders have been issued and implemented in the NCDE since the mid to late 1980s. The Kootenai National Forest implemented a forestwide food storage order in 2011, which covers their portion of the NCDE recovery zone/primary conservation area and the Cabinet-Yaak recovery zone. In 2010, the Flathead, Helena, Kootenai, Lewis and Clark, and Lolo National Forests jointly issued a food storage order that covered the portions of the forests that are within the NCDE recovery zone/primary conservation area. Over time, as more grizzly bears were observed outside the recovery zone/primary conservation area, attractant storage orders have been extended to other portions of the Forests to prevent or minimize grizzly bear-human conflicts. In addition, the Forest Service has coordinated with communities, counties, and organizations on implementation of local ordinances regarding food and garbage storage on lands adjacent to the national forests.

Bear-resistant containers and facilities

Bear-resistant containers and facilities include bear-resistant food storage boxes and panniers, garbage containers, meat hanging poles, etc. National forests within the NCDE have provided bear-resistant facilities at campgrounds, trailheads, dispersed campsites, and other areas both within and, in some cases, outside of the recovery zone/primary conservation area. Some national forests have programs to loan or rent bear-resistant containers for short-term uses. The Forest Service has fenced or closed garbage dumps, in coordination with local communities, to further reduce conflicts with grizzly bears.

Information and education

A variety of informational and educational materials (e.g., pamphlets, brochures, signs, videos, etc.) and programs are provided to the public at Forest Service offices. Signs and brochures about proper behavior and safety procedures in bear country are placed at campgrounds, trailheads, dispersed recreation sites, picnic areas, etc. The Forest Service has cooperated with Montana Fish, Wildlife and Parks and other cooperating institutions and individuals in giving presentations and offering workshops that address bear identification; safe camping, hiking, hunting, and working procedures to use in bear habitat; the use of electric fencing to reduce conflicts between bears and livestock (e.g., chickens, pigs, beehives, sheep, cattle); and the proper use of bear-deterrent pepper spray. Wilderness rangers and other backcountry patrols have been used to inform and educate the public on food storage orders and to check on compliance with these orders. Field patrols have been used during hunting seasons to reduce hunter-caused conflicts and grizzly bear mortalities.

Special grizzly bear requirements in contracts and permits

Many contracts and special-use permits in the NCDE contain provisions requiring protection of the grizzly bear and its habitat, as well as proper storage of food and attractants. Some contract and permit provisions require temporary or permanent cessation of permitted activities to resolve grizzly bear-human conflicts. Timber sale prescriptions and contracts incorporate provisions to protect grizzly bear habitat. For example, silvicultural prescriptions are designed to maintain or enhance food sources, timing provisions are aimed at reducing the potential for grizzly bear-human conflicts, and specific contract provisions require proper food storage and temporary or permanent cessation of permitted activities to resolve grizzly bear-human conflicts.

Livestock grazing

Existing livestock grazing permits may include special provisions such as proper storage of food and attractants as well as carcass removal. Annual monitoring of livestock allotments is performed to check on compliance and assess any conflicts. Disposal of animal carcasses has been emphasized to reduce conflicts with grizzly bears.

Land adjustments

Important grizzly bear habitat has been acquired through land exchanges and acquisitions on the NCDE national forests. The cooperative "Legacy Land" acquisition of Plum Creek Timber Company lands by the Nature Conservancy, Flathead National Forest, and Lolo National Forest is a landmark example, to name just one.

Motorized route management and monitoring

During recent decades, motorized routes have been restricted in some areas in order to provide security for grizzly bears and other wildlife. Annual monitoring is performed to evaluate compliance with access restrictions and to provide information and education to the public. Monitoring also helps to identify when repairs are needed to keep road closures effective.

Highway and railroad mortality

For many years, the Forest Service has coordinated with transportation agencies and railroad companies to seek to reduce the risk of collisions with grizzly bears. For example, in 1991, the Great Northern Environmental Stewardship Area (GNESA) was formed through an agreement with the Burlington Northern Santa Fe Railroad and multiple state, federal and tribal partners for the rail line that traverses the Middle Fork Flathead River Corridor. The GNESA agreement established a conservation trust fund and identified several railroad operation and maintenance procedures that would be followed to minimize train-bear incidents and ensure a rapid response and removal of attractants from the railroad right-of-way. The Forest Service maintains the Wildlife Crossings Toolkit website (https://www.fs.fed.us/wildlifecrossings/index.php) which was developed in partnership with the National Park Service, Federal Highway Administration and the American Association of State Highway and Transportation Officials. This website provides state-of-the-art information for biologists, engineers, and transportation professionals to assist in reducing wildlife mortalities and maintaining or restoring habitat connectivity across transportation infrastructure on public lands.

Ongoing and anticipated management actions on other federal lands

Glacier National Park lands represent about 19 percent of the primary conservation area. The Bureau of Land Management, USFWS, and Bureau of Reclamation collectively manage a very small fraction (0.4 percent) of the primary conservation area. Under the Endangered Species Act, all federal agencies are directed to use their authorities to seek to conserve endangered species and threatened species and must

consult with the USFWS if their actions may affect a listed species or its critical habitat. Federal land management is guided by agency land-use plans, the Interagency Grizzly Bear Guidelines, and the requirements of biological opinions. Management of grizzly bear habitat on federal lands has been an important factor leading to the recovery of the NCDE grizzly bear population.

The expectation in developing the NCDE conservation strategy is that the signatories will incorporate the relevant set of habitat standards and guidelines into their respective management plans, consistent with their own requirements. All federal agencies would manage motorized access within the primary conservation area so that (1) there is no net decrease in secure core from the baseline and no net increase in open and total motorized route densities; (2) the number and capacity of developed recreation sites are limited; (3) there is no net increase in the number of livestock allotments and no net increase in the number of sheep from the baseline; (4) vegetation management will be conducted in a way that is compatible with grizzly bear habitat needs; and (5) mineral and energy development will be designed to avoid, minimize, or mitigate adverse impact to grizzly bears.

Within Glacier National Park, food storage regulations (pursuant to 36 CFR 2.10 (d)) prohibit anyone from leaving food unattended or stored improperly where it could attract or otherwise be available to wildlife. On Bureau of Land Management land within the NCDE recovery zone/primary conservation area, the NCDE food storage guidelines are incorporated into Bureau of Land Management contracts. The NCDE food storage guidelines are also incorporated into contracts in areas that are outside the recovery zone/primary conservation area) but in an area known to be occupied by grizzly bears. The National Bison Range complex is located within the NCDE and administered by USFWS. These refuges are day use only, with no overnight camping allowed. Users are expected to pack out their trash; there are no garbage receptacles anywhere on the refuges. All federal agencies are making efforts to prevent or reduce grizzly bear-human conflicts.

The network of federal lands in northwestern Montana provides a high degree of landscape permeability for grizzly bears. Federal agencies have been cooperating in improving habitat connectivity and mitigating impacts of highways and other developments that impede movement by wildlife, including grizzly bears.

Relationship between Endangered Species Act listing and the Grizzly Bear Conservation Strategy

The USFWS completed a 5-year status review of the grizzly bear in 2011. Part of the status review involved an assessment of the adequacy of regulatory mechanisms, which was one of the factors that led to the listing of the grizzly bear as a threatened species. The USFWS concluded that the existing regulatory mechanisms in the lower 48 states were incomplete. With regard to National Forest System lands, regulatory mechanisms were found lacking or incomplete with respect to incorporating motorized access direction into the forest plans, and portions of some national forests lacked food storage orders, which will become increasingly important to grizzly bear conservation as grizzly bear and human populations both expand.

The grizzly bear recovery plan acknowledges that maintenance of a healthy, recovered grizzly bear population will depend on effective, coordinated management. The draft NCDE grizzly bear conservation strategy provides up-to-date scientific information and a comprehensive set of management recommendations to sustain the grizzly bear population in the NCDE. Each of the signatories to the conservation strategy will contribute and cooperate as appropriate to its mission and jurisdiction.

Adoption of the draft NCDE grizzly bear conservation strategy includes acknowledging the following management zones on National Forest System lands in the NCDE (see Figure B-5):

- **Primary conservation area –** the same as the recovery zone identified in the Grizzly Bear Recovery Plan (USFWS, 1993)
- **Management zone 1 –** a defined area surrounding the primary conservation area, within which the grizzly bear population status and trend would be monitored
- **Salish demographic connectivity area –** a portion of zone 1 with specific habitat measures to allow female grizzly bear occupancy and eventual dispersal to other ecosystems in the lower 48 states (i.e., the Cabinet-Yaak and Bitterroot ecosystems)
- **Management zone 2** – an area where grizzly bears would be expected to be present at low densities, which would provide the opportunity for grizzly bears, particularly males, to move the longer distance between the NCDE and the Greater Yellowstone Ecosystem
- **Management zone 3 –** areas where grizzly bears do not have enough suitable habitat to support long-term survival and occupancy; the management emphasis would be on conflict response. No additional forest plan components are needed or would be proposed for zone 3.

NFS lands would no longer be designated as **management situations 1**, **2** or **3**.

Affected Environment—Occupied grizzly bear habitat at a landscape scale

There are six identified grizzly bear ecosystems located in the states of Wyoming, Washington, Idaho, and Montana, including the Greater Yellowstone Ecosystem, Northern Continental Divide Ecosystem (NCDE), Bitteroot Ecosystem, Cabinet-Yaak Ecosystem, Selkirk Ecosystem, and Northern Cascades Ecosystem. The recovery zone/primary conservation area for the NCDE grizzly bear encompasses about 5.7 million acres. Lands managed by the USFS make up approximately 60.9 percent (3,840,415 acres) of the grizzly bear recovery zone/primary conservation area within the NCDE. Regulations for planning land and resource management (36 CFR 219), adopted in 1982 and modified in 2012 (77 FR 21162, April 9, 2012), require the USFS to manage habitats to support viable populations. The national forests in the NCDE (Flathead, Kootenai, Helena-Lewis and Clark, and Lolo) each have individual forest plans that provide management direction for grizzly bear habitat. Two of these national forests have now officially been consolidated, but their two plans will be amended until a decision is made on the revised Helena-Lewis and Clark National Forest Plan (see the amendment BA).

This biological assessment assesses the effects of the programmatic management framework to be implemented on the Flathead National Forest, and a separate biological assessment addresses the effects of the programmatic management framework to be implemented on the other four national forests in the NCDE. The programmatic management framework is based upon management zones delineated by the draft Grizzly Bear Conservation Strategy (USFWS, 2013c), which encompass the area currently occupied by NCDE grizzly bears, as well as additional areas to provide connectivity to other grizzly bear ecosystems (see Figure B-5 and Figure B-17). Management direction for the five forests in the NCDE is consistent except where there are unique management zones for a particular forest. Acreage in each management zone for each national forest in the NCDE is displayed in table 14.

Table 14. Acres of National Forest System land included within the NCDE recovery zone/primary conservation area (PCA); zone 1, including the demographic connectivity areas (DCAs); zone 2; and zone 3. The percent of total acres across all ownerships in each management zone is shown in parentheses.

National Forest	Recovery zone/PCA	Zone 1 including DCAs	Zone 2	Zone 3
Flathead	2,136,536 ac (37%)	231,548 ac (5%)	-	-
Helena	183,758 ac (3%)	149,207 ac (3%)	642,786 ac (14%)	5,792 ac (< 1%)

National Forest	Recovery zone/PCA	Zone 1 including DCAs	Zone 2	Zone 3
Kootenai	118,770 ac (2%)	283,302 ac (6%)	-	-
Lewis and Clark	777,963 ac (14%)	6 ac (<1%)	2 ac (< 1%)	972,612 ac (8%)
Lolo	268,390 ac (5%)	386,274 ac (8%)	38 ac (< 1%)	-

Grizzly bear population ecology, biology, habitat descriptions, and relationships identified by research are described in detail in the literature cited. The following description of the affected environment provides a summary in the context of the NCDE, focusing on the Flathead National Forest and information that is necessary to understand the consequences of the proposed federal action.

NCDE grizzly bear population, distribution, and status

In each grizzly bear recovery zone, the Grizzly Bear Recovery Plan established minimum population goals that ensure a population of grizzly bears that is; 1) adequately distributed throughout the zone, 2) reproducing, and 3) can sustain existing levels of human-caused mortality (USFWS 1993, as amended, p. 26). The Grizzly Bear Recovery Plan identified a minimum NCDE-wide grizzly bear population of 391 bears. In 2004, Kendall and others (2009) conducted a genetic capture/recapture study that encompassed the entire recovery zone/PCA and adjacent areas thought to be inhabited by bears. The mean population estimate was 765 bears (95 percent confidence interval [CI]: 715–831), including all age classes. The male population estimate was estimated to be 295 individuals (95 percent CI = 276–324) and the female population estimate was 471 individuals (95 percent CI: 427–531), well exceeding recovery goals. In 2014, the population estimate for the NCDE was 960 grizzly bears (Costello et al., 2016).

All estimates indicate that the NCDE grizzly bear population is growing. Costello's analyses result in estimates that differ slightly from Mace and others (2012) and led to a slightly lower estimate of the annual rate of population growth ($\lambda = 1.023$, or about 2 percent) for the NCDE grizzly bear population than that previously reported ($\lambda = 1.031$, or about 3 percent) (R. D. Mace et al., 2012). Costello and others stated, "We do not believe the observed difference in the two estimates is a result of actual population change. Our current models include a covariate for trend, and no negative trend was observed in any of the vital rates. Rather, we believe that the differences between Mace et al. (2012) and this report can be attributed to: (1) an increase in sample sizes for estimation of all vital rates; (2) better representation of conflict females in the estimation of vital rates; and (3) subtle but significant differences in methods of analysis."

Boyce et al. (2002) estimated the probability of the NCDE population persisting for 100 years as 0.94–0.99, based on an estimated population size of 400 grizzly bears and an estimate of 500 for carrying capacity. Only two years later, DNA sampling documented a minimum population size of 550 grizzly bears and an estimated population size of 765 bears (Katherine C. Kendall et al., 2009). Therefore, the probability of persistence is likely slightly higher than this estimate. Using demographic parameters from several populations in the northern Rocky Mountains, Weilgus (2002) estimated that minimum population sizes of 200–250 grizzly bears were needed to minimize extinction probability (i.e., < 0.05 probability of the population dropping below 100 individuals within 20 years). This time frame of 20 years was much shorter than the 100 years considered by Boyce et al. (2002). Nonetheless, population estimates for the NCDE (Costello et al., 2016; Katherine C. Kendall et al., 2009) indicate the grizzly bear population is 3–4 times higher than these minimum thresholds.

To facilitate the assessment of grizzly bear population recovery objectives, the NCDE grizzly bear recovery zone was subdivided into smaller units called bear management units (Figure B-16). Twenty-

three bear management units were delineated in the NCDE, and 12 of these are located on or partially on the Flathead National Forest.

There is wide distribution of grizzly bears across the NCDE bear management units (Katherine C. Kendall et al., 2009; R. D. Mace & Roberts, 2011). Costello and others evaluated occupancy of the 23 bear management units in the NCDE by females with offspring during 2004–2014. Using the 6-year running tally as set forth in the Recovery Plan (USFWS, 1993), they documented full occupancy of the recovery zone/primary conservation area starting in 2009 and continuing until 2014. In addition, using similar methods, they documented full occupancy throughout areas of zone 1 (Costello et al., 2016).

The population subgoals for the NCDE grizzly bear recovery zone was listed in the Recovery Plan (USFWS, 1993, p. 59) as:

- 10 females with cubs inside Glacier National Park (GNP) and 12 females with cubs outside GNP over a 6-year running average both inside the recovery zone and within a 10-mile area immediately surrounding the recovery zone;
- 21 of 23 BMUs occupied by females with young from a running 6-year sum of observations with no two adjacent BMUs unoccupied;
- Known human-caused mortality not to exceed 4 percent of the population estimates based on the most recent 3-year sum of females with cubs, and no more than 30 percent of the 4 percent mortality limit shall be females;
- These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved;
- Occupancy in the Mission Mountains portion of the ecosystem.

However, as described in the five-year status review of the grizzly bear (USFWS 2011 p. 16), sightability of females with young has always been a challenge in this heavily forested ecosystem. For this reason, USFWS discontinued recording the number of females with cubs and their distribution in the NCDE as of 2004. Instead, USFWS has relied on new science and techniques developed through an extensive DNA-based population estimate (Kendall et al. 2009) and a study of radio-collared bears sampled proportionately to relative population density, enabling calculation of reproductive rates, survival rates, and population trend (Mace et al. 2012). Subsequent work by Costello et al. (2016) has further refined the methods used for monitoring and reporting population distribution, vital rates (including an estimate of unreported mortalities), and population trend. The following summarizes the findings of these and related studies of population size, distribution and trend in the NCDE.

Multiple measures indicate that the NCDE grizzly bear population has expanded, both in numbers and in distribution.. Using a 6-year running tally, the demographic standard of 21 of 23 BMUs occupied by females with young was met each year beginning in 2006. Using the 6-year running tally, the demographic standard of no two adjacent BMUs unoccupied was met each year beginning in 2009.

Grizzly bears are well distributed across the NCDE and their distribution continues to expand beyond the recovery zone identified in the recovery plan. Mace and Roberts (2011) mapped the distribution of grizzly bears in the NCDE (Figure B-17). The grizzly bear population has now expanded well beyond the recovery zone/primary conservation area, another indication of population growth. The current distribution is 21,313 square miles, covering the entire recovery zone/primary conservation area, most of zone 1, and parts of zones 2 and 3 (Costello et al., 2016). The Mission Mountains and Salish connectivity areas are known to be occupied by grizzly bears, and grizzly bear distribution now encompasses about 63 percent of the Ninemile connectivity area established by the draft Grizzly Bear Conservation Strategy.

Using all of the verified grizzly bear locations from 2004–2014 (N= 210,126) Costello and others (2016) estimated the total distribution area for grizzly bears had increased 139 percent from the area of the recovery zone/PCA where bear distribution was estimated prior to 1993 (USFWS, 1993).

On the Forest, grizzly bears occupy an area of the recovery zone/primary conservation area (PCA) totaling over 2.1 million acres and an area outside the recovery zone/primary conservation area totaling about 231,000 acres (see table 15 above), including the Salish demographic connectivity area in zone 1 (figure b-17). Grizzly bears continue to expand into other portions of zones 1, 2, and 3 as well.

In summary, available information documents increases in grizzly bear distribution, population size, and genetic diversity. The estimated population size was 765 bears in 2004 (Kendall et al. 2009), more than double the target of 391 bears based on sightings of females with cubs. Occupancy of bear management units has been documented (Costello et al. 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al. 2016).

Grizzly bear reproduction, survival, and mortality

To maintain a healthy (recovered) grizzly bear population in the NCDE, it is necessary to have a balance between reproduction and mortality (USFWS, 2013e). Grizzly bear mortality and survival in the NCDE affects population growth and is influenced by age, sex, reproductive status, and home range location (e.g., proximity to human developments). The average age of first reproduction in the NCDE is 5.4 years but can vary from 3-8 years of age (R. D. Mace et al., 2012). Mean litter size in the NCDE is about two cubs, with a range from one to four cubs (R. D. Mace & Waller, 1997b; C. C. Schwartz, Miller, & Haroldson, 2003). Cubs are born in the den in late January or early February and remain with the female for 1.5 to 2.5 years, making the average time between litters in the NCDE 3.0 years (R. D. Mace & Waller, 1997a; C. C. Schwartz et al., 2003). Teisberg and others studied grizzly bear population health and body condition, finding that adult females across all ecoregions of the NCDE enter dens at mean fat levels above those thought to be critical for cub production. They stated that there is no evidence to conclude that the widely varying food resources across the NCDE are inadequate to meet the needs of reproductively active adult females. As truly opportunistic omnivores, grizzly bears in all regions of the NCDE exploit diverse combinations of food items to arrive at productive body conditions (Teisberg, Madel, Mace, Servheen, & Robbins, 2015). Costello and others (2016) also estimated the number of annual grizzly bear mortalities during 2004–2014 as a sum of (1) management removals; (2) radio-marked losses; and (3) estimated total reported and unreported losses of non-radioed bears. Mortalities have a variety of causes and fluctuate from year to year, but despite mortalities, the survival rate for adult females (the most important group affecting population trend) is high, at 0.947 with a 95 percent confidence interval of 0.919–0.972 (Costello et al., 2016).

To ensure population stability or growth, Costello's analysis suggested that total estimated mortality of independent bears should not exceed 5.3 percent (or 2.3 percent for females and 3 percent for males). During 2004–2014, 71 percent of the total estimated mortality of independent bears was known human-caused mortality. So, assuming 71 percent, then the human-caused mortality threshold would be approximately 1.6 percent for females (0.71*2.3 percent) and 2.1 percent for males (0.71*3.0 percent), for a total of 3.7 percent. This number is very close to the 4 percent indicated in the recovery plan. During Costello's 11-year study period, mortality thresholds were not exceeded during any two consecutive years (Costello et al., 2016). In the NCDE, the most frequent known causes of documented human-caused mortalities of independent-aged grizzly bears during 2004–2014 were listed as management removals, poaching/malicious kills, and defense of life. Accounting for the fact that management removals were documented with 100 percent accuracy whereas other deaths often go unreported, Costello and others (2016) estimated that poaching/malicious kills likely accounted for the highest proportion of total

independent bear mortality (27 percent), followed by management removals (16 percent), illegal defense of property (11 percent), and natural causes (9 percent). The majority of management removals result from conflicts at sites associated with frequent or permanent human presence (USFWS, 2013c). Unsecured grizzly bear attractants on private lands such as chicken coops, garbage, human foods, pet/livestock foods, bird food, livestock carcasses, wildlife carcasses, barbeque grills, compost piles, orchard fruits, or vegetable gardens are usually the source of these conflicts. Walters and Holling (1990) stated that managing human-caused mortality, monitoring both population and habitat parameters (e.g., road access), and responding when necessary with adaptive management are the best ways to ensure a healthy grizzly population (see monitoring section of the revised forest plan for monitoring of habitat parameters on the Flathead National Forest).

Population monitoring and management of human-grizzly bear conflicts is under the authority of Montana Fish, Wildlife and Parks (MFWP). MFWP has several bear management specialists in the NCDE, including one who manages human-bear conflicts on the Forest who works with and educates the public to reduce mortality.

Legal hunting of grizzly bears has not occurred in Montana since 1991 (Pac & Dood, 1998), but it has occurred in Canada. In Montana, grizzly bears are occasionally killed by poachers, are mistakenly killed during the black bear hunting season, and are killed in self-defense (Costello et al., 2016). As a result, Montana instituted a mandatory black bear hunter testing and certification program to help educate hunters in distinguishing species and reducing mistaken identity and, therefore, reducing grizzly bear mortalities.

Within the Forest's geographic areas, the number of grizzly bear mortalities on NFS lands per decade has declined from about 100 in the decade from 1976-1985 to 28 in the most recent decade from 2006-2015. Within the Forest's geographic areas, the number of grizzly bear mortalities on lands other than NFS lands has increased from about 20 in the decade from 1976-1985 to 55 in the most recent decade from 2006-2015. These totals do not include bears that were determined to have died of natural causes or those that were counted as mortalities because they were trapped by professional bear managers for purposes such as augmentation of the Cabinet-Yaak grizzly bear ecosystem.

Management by MFWP may include regulated hunting in the future, once the NCDE grizzly population is delisted. Should hunting be part of grizzly bear management, there are currently no known factors that would limit regulation of harvest on the Forest. MFWP would monitor mortality due to hunting and its effects on the NCDE grizzly bear population. Grizzly bear population density and home ranges within the NCDE

Grizzly bear densities within the NCDE vary but are generally highest in Glacier National Park and on adjacent national forest lands (including the Flathead National Forest), decreasing toward the southern portion of the ecosystem (Katherine C. Kendall et al., 2009). Grizzly bears are large animals with high metabolic demands during the non-denning season. Adequate nutritional quality and quantity are important factors for successful reproduction. Mace and Roberts (2013) found that grizzly bear diets include more animal matter towards the southern and eastern periphery of the NCDE and include more plant matter in the northern and western portions of the NCDE. This pattern is presumed to reflect, at least in part, natural environmental gradients across the NCDE that influence habitat productivity.

Grizzly bear home ranges overlap and change seasonally, annually, and with reproductive status. The grizzly bear population density estimate inside Glacier National Park is approximately one bear per 8,154 acres (Katherine C. Kendall et al., 2008). Mace and Roberts (2012) evaluated home ranges of 34 female grizzly bears that lived in or adjacent to Glacier Park, based upon data collected from 2004-2011. Most home ranges (59 percent) straddled the Park boundary, overlapping lands managed by the Flathead

National Forest, the Helena-Lewis and Clark National Forest, and the Blackfeet tribe. Home ranges were, on average, smallest for bears that lived 100 percent within the Park and larger for females that straddled the Park boundary. Portions of the Kootenai National Forest and Lolo National Forest were also part of the study area.

Genetic connectivity in the NCDE

Genetic connectivity of grizzly bear populations has been examined at multiple scales. At an international scale, Proctor and others (2015) studied connectivity between the United States and Canada using genetic testing and movement data from radio-collared grizzly bears, with data gathered between 1979 and 2007. Both male and female grizzlies moved freely across the U.S./Canada border on the northern edge of the NCDE (including the Forest). The authors concluded there is currently little risk of significant reduction in the present high levels of genetic diversity in the NCDE grizzly bear population. Within the NCDE, few barriers to grizzly bear genetic exchange appear to exist. Both male and female movements have been documented across existing highway corridors. Researchers concluded that habitat connectivity is within levels that ensure both demographic and genetic connectivity (Miller & Waits, 2003; Waller & Servheen, 2005).

The draft Grizzly Bear Conservation Strategy also addresses genetic connectivity between U.S. grizzly bear ecosystems. The Flathead National Forest is located within the northwest Montana portion of the NCDE on the west side of the Continental Divide. Zone 1 on the Flathead National Forest contains a portion of the Salish demographic connectivity area (Figure B-5). The Salish demographic connectivity area has an objective of providing genetic connectivity between the NCDE and the Cabinet-Yaak Grizzly Bear Ecosystem to the west through occupancy by female bears but at a lower density then in the primary conservation area. The Salish demographic connectivity area is currently occupied by female grizzly bears (Costello et al., 2016).

Grizzly bear habitat

In total, grizzly bear habitat on the Flathead National Forest comprises nearly 40 percent of the NCDE grizzly bear recovery zone/primary conservation area ((USFWS, 2013c), distributed across six geographic areas identified in the revised forest plan (see Figure B-1). Table 15 displays the approximate acreage in each geographic area on the Flathead National Forest within grizzly habitat management zones, totaling about 2.4 million acres (see Figure B-5)

Table 15. Grizzly management zones within geographic areas (GAs) on the Flathead National Forest

Grizzly Habitat Classification	North Fork Flathead River GA	Middle Fork Flathead River GA	South Fork Flathead River GA	Hungry Horse GA	Salish Mountains GA	Swan Valley GA	Total Forest
Primary Conservation Area	319,998	370,156	789,074	286,229	6,781	490,824	2,136,534 (90%)
Zone 1: Salish Demographic Connectivity Area	0	0	0	0	95,840	0	95,840 (4%)
Zone 1 outside DCA	43	0	0	5	135,516	143	135,702 (6%)

Grizzly bear habitat provides diverse foods, cover, denning habitat, and space for this wide-ranging species. Diversity provides a wide range of vegetation types required to produce a varied food supply (USFWS, 1993)(as amended). The quantity and quality of grizzly bear habitat within the Forest consists

of a diverse, ever-changing vegetation and landscape mosaic providing a variety of foods, cover conditions, vast areas providing habitat security, and habitat connectivity. Grizzly bear habitat on the Flathead National Forest and elsewhere in the NCDE includes a variety of coniferous forests, deciduous forests, wetland and riparian areas, and grass/forb/shrub patches found in areas such as meadows, avalanche chutes, burned areas, and logged areas. The natural range of grizzly bear habitat variation has been affected by ecological processes in the past (e.g., fire, floods, avalanches, insects, and disease) and will continue to be affected by these processes in the future. Grizzly bear habitat is also affected by a variety of human activities. Gibeau and others (2002) concluded that there were significant differences in grizzly bear response to roads, trails, and major development features based upon the bear's sex, age class, proximity of high quality habitat, and time of day. Gibeau and Stevens (2005) reported that bears took advantage of high-quality habitat near development when humans were inactive by using roads, trails, and human facilities at night or when unoccupied.

As stated in the Grizzly Bear Recovery Plan, the impacts of logging, mining, livestock grazing, and many forms of recreation in grizzly bear habitat can be mitigated through well-designed management programs (USFWS, 1993, p. 22). As stated in the draft Grizzly Bear Conservation Strategy (USFWS, 2013c):

> The available habitat for bears is determined largely by people and their activities. Human activities are the primary factor impacting habitat security. Human activities and the social structure and relationships among resident bears are the two major influences on the accessibility of available foods for bears. The question of how many grizzlies can live in any specific area is a function of overall habitat productivity (e.g., food distribution and abundance), the availability of habitat components (e.g., denning areas, cover types), the levels and types of human activities, grizzly bear social dynamics, learned behavior of individual grizzly bears, and stochasticity. Because carrying capacity in such an omnivorous and opportunistic species can vary annually and even day to day, there is no known way to deductively evaluate habitat components to calculate the maximum number of grizzly bears a landscape can support. Therefore, controlling human-caused mortality, monitoring both population and habitat parameters, and responding when necessary with adaptive management (Walters and Holling 1990) are the best ways to ensure a healthy grizzly population. The USFWS defines adaptive management as "a method for examining alternative strategies for meeting measurable biological goals and objectives, and then, if necessary, adjusting future conservation management actions according to what is learned." This Conservation Strategy allows for modification of management practices in response to new or changing conditions. (p. 18)

Grizzly bear habitat and grizzly bear foods

The search for energy-rich food appears to be a driving force in grizzly bear behavior and habitat selection. Grizzly bears are known to switch foods according to which foods are available (Aune & Kasworm, 1989, p. in USFWS 2013; Katherine C Kendall, 1986; LeFranc Jr., Moss, Patnode, & Sugg III, 1987; R. D. Mace & Jonkel, 1986; Martinka & Kendall, 1986; Servheen, 1981). Grizzly bears will consume almost any food available, including living or dead mammals or fish, insects, worms, plants, berries, human-related foods, and garbage (Knight, Blanchard, & Mattson, 1988; D. J. Mattson, Blanchard, & Knight, 1991; C. C. Schwartz et al., 2003). Mattson and others (1991) hypothesized that grizzly bears are always sampling new foods in small quantities so that they have alternative options in years when preferred foods are scarce.

High-energy food items used by grizzly bears occur across a range of habitats, so if ecosystem processes or changes in climate make one food item less available, other food items are likely to become more available. For example, wildfire and avalanches are ecosystem processes that have been found to benefit grizzly bear habitat. Hamer and Herrero (1987) suggested that forest disturbance-created conditions for

diverse early successional plant communities benefitted grizzly bear foraging in Alberta. In northwest Montana, Zager and others (1983) found that grizzly bears foraged in fruit-producing shrubfields in post-fire habitats disproportionately in the summer/autumn. Nielsen and others (2004) reported on average fruit production for six fruit-bearing species used by grizzly bears and stated that there was a nonsignificant difference between clearcut and uncut forests in their study area. Two huckleberry species (*V. caespitosum* and *V. membranaceum*) had higher fruit production in clearcuts, one species had greater fruit production in forests, and no difference in fruit production between clearcuts and forests was evident for the remaining species. Overall, Nielson and others found that clearcuts provided a diverse array of food resources for grizzly bears, particularly roots and tubers, herbaceous materials, and ants. They suggested that forest design and silviculture consider strategies that maximize grizzly bear food abundance while minimizing human access (S. E. Nielsen et al., 2004).

Several items appear to comprise a significant portion of grizzly bear diet in all areas (S. Anderson, 2010; IGBC, 1986; LeFranc Jr. et al., 1987, p. 11). A significant portion of grizzly bear diet is comprised of

- *Equisetum Sp. and grasses* (grasses and sedges are found in burned areas and moist riparian habitats that are abundant on the Forest)
- *Heracleum lanatum*, *Trifolium sp., and Taraxicum sp.* (early seral species that are also found in burned areas, logged areas, and riparian areas)
- roots of *Hedysarum* are dug in northern Montana; where *Hedysarum* is absent, roots of *Lomatium sp., Erythronium sp.*, and *Perideridia sp.* are dug (abundant in avalanche chutes)
- The fruit of two shrub taxa, *Vaccinium sp.* and *Shepherdia sp.,* are the primary sources of energy and fat during the mid and late seasons in much of the continental interior, whenever available. The overwintering berries of *Arctostaphylos sp.* are an important early-season diet item in the northern ecosystem of Montana (early seral species found in portions of the Forest where the tree canopy is sufficiently open to allow enough light for berry production, such as burned areas and logged areas).
- The nuts of *Pinus albicaulis* are important only in the most southern portion of grizzly bear range (not within the NCDE).
- Local concentrations of large ungulates are an important source of protein wherever available. Rodents (primarily ground squirrels and microtines) supplement the annual diet of the grizzly bear throughout much of continental North America (ungulates and rodents are distributed across the Forest during the non-denning season when grizzly bears are foraging). In contrast to the Greater Yellowstone Ecosystem, in Glacier National Park and adjacent national forest lands, meat accounts for a smaller proportion of the grizzly bear diet (IGBC, 2016).

Because the grizzly bear eats a wide variety of foods, with availability that is constantly changing due to factors such as wildfire, avalanches, plant succession, and annual changes in production due to weather, carrying capacity and food production cannot be calculated. In addition, increasing bear density influences access to food resources and foraging efficiency, and thus bear populations are likely limited by social factors rather than any limitation of food biomass itself (Bruce N. McLellan, 1994).

Grizzly bears are an omnivorous and opportunistic species that has adapted to the natural range of variation in foods (USFWS, 2013c). Habitat on the Forest provides a high diversity of bear foods that meet the needs of grizzly bears as the seasons and available foods change, so they are not reliant on any one food. A mosaic of vegetation providing forage and cover is desirable, but the complexity described

above makes it difficult to quantify a desired landscape composition. The following paragraphs provide a summary of seasonal changes on the Forest and adjacent areas.

Upon den emergence in the spring, bears in the NCDE may search avalanche chutes for animal carcasses buried by the snow before descending to lower elevations to seek newly emerging vegetation (Aune & Kasworm, 1989; Katherine C Kendall, 1986; LeFranc Jr. et al., 1987; R. D. Mace & Jonkel, 1986; Martinka & Kendall, 1986; Servheen, 1981). As snow melts, grizzly habitat use extends to higher elevations. In the western portion of the NCDE, including the Flathead National Forest, riparian and wetland habitats (Ruby, 2014) and avalanche chutes continue to be important to bears during summer, and autumn (R. D. Mace & Waller, 1997a). Avalanches regularly occur on the Forest and adjacent areas of the NCDE, restoring conditions that are favorable for grizzly bears (Weaver, 2014).

Graves and others (2011) created an avalanche chute distribution map for the NCDE by assigning each grid cell with three or more chutes visible on remote imagery (Figure B-20). Examination of the study area indicated that the cutoff of three provided a good discrimination of areas with many versus almost no avalanche chutes. Another Glacier National Park study (Reardon, Pederson, Caruso, & Fagre, 2008) assessed trends in avalanches using combined historic and tree-ring records for 27 avalanche years in the 1910–2003 time period. The study found that the mean avalanche return period in Glacier National Park was 3.2 years and that avalanche years were associated with positive snow water equivalent anomalies at a nearby snow course. Minimum avalanche extent was highly variable but not associated with snowpack anomalies. The findings suggest that changes in Pacific climate patterns that influence snowfall could also alter the frequency of natural snow avalanches in the montane forests of the Park and surrounding areas. According to the draft Grizzly Bear Conservation Strategy, "Decreased snowpack could lead to fewer avalanches thereby reducing avalanche chutes, an important habitat component to grizzlies, across the landscape. However, increases in 'rain on snow' events may decrease the stability of snowpack resulting in increases in avalanches" (USFWS, 2013c, p. 31). Avalanches are widely distributed and abundant in the NCDE, with the majority of acres occurring in Glacier National Park as well as in two adjacent Forests: the Flathead and the Lewis and Clark.

During summer, grizzlies may feed on army cutworm moths and ladybird beetles on the rocky talus areas at high elevations of the Forest, as well as on the adjacent Lewis and Clark National Forest, CSKT tribal lands, and Glacier National Park lands (Aune & Kasworm, 1989; Craighead & Mitchell, 1982; Klaver et al., 1986; Servheen, 1983; Sumner & Craighead, 1973; J. White, Don, Kendall, & Picton, 1998). Once berries become available in the summer, grizzlies consume a wide variety of berries found on the Forest and elsewhere in the NCDE, including huckleberries, buffaloberries, serviceberries, hawthorn berries, chokecherries, and, to a lesser degree, alderleaf buckthorn berries and mountain ash (Katherine C Kendall, 1986; LeFranc Jr. et al., 1987; R. D. Mace & Jonkel, 1986; Martinka & Kendall, 1986; Bruce N. McLellan & Hovey, 1995; Servheen, 1981). These diverse berry-producing shrubs provide ripe fruit at various times throughout the summer and fall months, ripening at lower elevations first and progressing upslope. The amount and species of berries in bear diets vary annually based on annual fruit production and distribution (Bruce N. McLellan & Hovey, 1995).

In northwest Montana, production of berries is affected by forest canopy cover, temperature, and soil moisture conditions, which can vary considerably from low to high elevations and from year to year. Because most of the Forest is heavily forested, wildfire, timber harvest, and other vegetation management activities that affect canopy cover also affect grizzly bear food production. Areas burned by wildfire in recent decades are widely distributed across the NCDE, including the Flathead National Forest, and generally provide high-quality habitat for grizzly bear foraging for a few decades (Figure B-21). Prolonged drought (which can increase acres burned by wildfire and reduce production of some species of

berries) has also occurred during the time period that the grizzly bear population has met recovery goals. Grizzly bears have adjusted to these changes affecting food availability.

Prior to the spread of white pine blister rust, grizzlies in the NCDE fed on whitebark pine seeds from late summer through fall when and where they were available (Aune & Kasworm, 1989; Katherine C. Kendall & Arno, 1990; R. D. Mace & Jonkel, 1986; Shaffer, 1971). However, data on whitebark pine mortality rates from the early to mid-1990s indicated that 42–58 percent of all whitebark pine trees surveyed within the NCDE were dead (Katherine C. Kendall & Keane, 2001) and no longer produced seeds. Recent remeasurement of a subset of the 1990s plots showed that mortality of whitebark pine trees has more than doubled in the past two decades (Halofsky et al., in press). Despite this loss, the grizzly bear population is increasing, illustrating the flexibility of grizzly bear diets and high habitat diversity in the NCDE (USFWS, 2013c).

Grizzly bears are also known to feed on animals and hunter-discarded gut piles, especially in the fall. Teisberg and others found that fall diets of NCDE grizzly bears consist of higher amounts of meat (32 percent for adult males, 21 percent for adult females) (Teisberg et al., 2015). Adult male grizzly bear diets shifted from 3 percent to 33 percent meat from summer to fall in the northwest portion of the NCDE (lower Swan, lower South Fork of the Flathead, North Fork of the Flathead, and Whitefish Range). Adult female bears also shifted their diet, but not as much as males (R. D. Mace & Roberts, 2013).

To examine grizzly bear abundance in relation to bear foods and other habitat factors, Graves and others studied an area spanning the NCDE that was centered over Glacier National Park. Bear abundance was determined based upon genetic detection using rub trees and hair traps. The authors used a grid of 19.76 x 19.7 km cells, representing median male home range size for males (Graves et al., 2011). They then calculated the number of individual bears detected in each grid cell and summarized 15 variables within each grid cell. The authors developed indices of vegetation by assigning habitat variables to each grid cell within their study area. Mesic habitat was derived from a remote sensing-based LANDFIRE cover type classification. The cover type map incorporates terrain and climate data (indirect indices of the vegetative component of habitat), describes sub-canopy vegetation, uses most vegetative bear foods as indicator species for the ecological classifications, and should be available for monitoring at 10-year intervals. To calculate the percentage of mesic habitat, the authors extracted riparian and mesic cover types which are known to contain bear foods. They also included precipitation (based on DAYMET climate models; https://daymet.ornl.gov/) because this is monitored and is expected to be directly influenced by climate change (Graves et al., 2012).

Graves and others (2012) found that amount of mesic habitat, historical presence of bears, and bear management level (as defined by experts) were most closely associated with both male and female grizzly bear abundance. In addition, the amount of meadow and shrub habitat was closely associated with female grizzly bear abundance (see table 3 in Graves et al., 2012). Their distribution of mesic habitats and meadow/shrub habitats is shown in Figure B-22 and Figure B-23

Grizzly bear habitat and cover

Cover helps to reduce the risk of grizzly bear disturbance or displacement and also supports habitat connectivity. Figure B-24 shows areas with at least 25 percent cover of trees greater than 5 inches d.b.h. (source: 2012 VMap GIS layer for the Flathead National Forest). On the Flathead National Forest, trees in this d.b.h. category generally provide shade and cover. Areas lacking in trees over 5 inches d.b.h. (displayed in white on Figure B-24) are considered temporary because most are due to recent wildfires or tree harvest. Persistent grass/shrub/non-forest openings (displayed in yellow on Figure B-24) are considered more permanent because they are due to biophysical factors (such as presence of rocky ridges) or human development. Lynx standards for vegetation management, which apply to most of the Forest,

ensure that dense horizontal cover, the rate of regeneration harvest, and habitat diversity are considered when planning management activities, also benefitting grizzly bears.

The greatest temporary impact on forest connectivity in the Flathead National Forest GAs, considering all land ownerships, is wildfire (Figure B-21). A high percentage of the South Fork Flathead and North Fork Flathead GAs have been burned by wildfire (about 20 percent of all land ownerships), whereas a low percentage of the Swan Valley and Salish Mountains GAs has been burned by wildfire (about 3 percent of all land ownerships). As of 2000, the most recent year for which LANDFIRE data was available, the Salish Mountains GA had the highest percentage of area recently harvested (about 9 percent of all land ownerships), the Swan Valley GA had a moderate amount (about 6 percent of all land ownerships), and the Middle Fork GA had the lowest (less than 1 percent of all land ownerships). The Hungry Horse and North Fork GAs each had about 2 percent of their land area recently harvested on all ownerships.

Grizzly bear habitat and connectivity

Human activities during the non-denning season can affect habitat availability and connectivity for grizzly bears as well as the risk of human disturbance and/or human-caused mortality. Schwartz and others (2010) found that grizzly bear survival in the Greater Yellowstone Ecosystem declined as road density, number of homes, and site developments increased. Habitat availability and connectivity can affect grizzly bears at multiple scales—between grizzly bear ecosystems, within ecosystems, and within a home range. The following section addresses habitat at the scale of the Flathead National Forest as a whole and at larger scales. Habitat security at the home range scale is discussed in the section on grizzly bear habitat security below.

At a landscape scale, effects to habitat connectivity occur with respect to "habitat permeability" and the "developed human footprint" on other land ownerships, including communities, highways, land converted to agriculture, and other factors (TNC, 2016). Table 16 displays the percent of each GA affected by more permanent human developments (source: Montana Natural Heritage Program database query for all land ownerships, based upon 1999–2000 Landsat imagery used for the original ReGAP and Landfire products, which is the most recent data for all land ownerships).

Table 16. Human ecological systems by percent of area within geographic areas on the Forest (source: (MHP-MTFWP, 2013)

Ecological System	Hungry Horse	Middle Fork	North Fork	Salish Mts.	South Fork	Swan Valley
Developed, Open Space	0.624	0.088	0.377	3.023	0.000	1.557
Low Intensity Residential	0.323	0.049	0.311	1.485	0.000	0.626
High Intensity Residential	0.015	0.017	0.017	0.134	0.000	0.024
Commercial / Industrial	0.141	0.024	0.187	0.717	0.000	0.072
Railroad	0.035	0.181	0.042	0.089	0.000	0.000
Major Roads	0.061	0.162	0.090	0.293	0.000	0.158
Other Roads	1.028	0.115	1.460	3.316	0.042	2.201
Quarries, Strip Mines and Gravel Pits	0.009	0.007	0.000	0.099	0.015	0.012
Pasture/Hay	0.427	0.040	0.104	2.356	0.000	0.451
Cultivated Crops	0.532	0.000	0.014	5.207	0.000	0.631
Introduced Upland Vegetation—Perennial Grassland and Forbland	0.000	0.001	0.000	0.000	0.000	0.000
Total Human Ecological Systems	3.195	0.682	2.604	16.719	0.057	5.734

As shown in Table 16 and Figure B-24, the developed "human footprint" ranges from less than 1 percent in the South Fork and Middle Fork Flathead River Geographic Areas (GAs) up to about 17% of the Salish Mountains GA. The Swan Valley GA has a moderate but more dispersed human development footprint compared to the Salish GA. In other words, 83-99% of each geographic area on the forest is largely uninhabited by people. Grizzly bears generally avoid the "developed human footprint" in and around Kalispell, but may be drawn to residences in smaller rural communities and valley bottoms if attractants are present. For grizzly bears, areas with higher levels of permanent human development may be associated with avoidance during certain seasons or times of day or higher grizzly bear mortality due to conflicts with humans.

At a larger landscape scale, The Nature Conservancy mapped landscape permeability for the Pacific Northwest (McRae et al., 2016), including the area from the NCDE to the Greater Yellowstone Ecosystem (Figure B-25); areas with high permeability are shown in blue, areas with moderate permeability are shown in yellow, and areas of low permeability are shown in brown. Overall, the network of federal lands in northwestern Montana provides a moderate to high degree of landscape permeability for grizzly bears, and connectivity is not impaired (Kuennen, 2015). Federal agencies have been cooperating in improving habitat connectivity and mitigating impacts of highways and other developments that impede movement by wildlife, including grizzly bears.

Proctor and others (2015) and Weaver (2013) modeled and mapped preferred "linkage habitats" for grizzly bears along highways within the Flathead National Forest and adjacent areas (including Canada) in order to inform management of connectivity; see also Proctor (2015). Their models and maps were based upon resource selection functions that indicate relative habitat importance. Waller and Servheen studied grizzly bear habitat connectivity along the Highway 2 corridor between Glacier National Park and the Flathead National Forest, evaluating trans-highway movements of 42 grizzly bears and relating them to highway and railroad traffic volumes as well as other corridor attributes (Waller & Servheen, 2005). They found that grizzly bears strongly avoided areas within 0.31 mile of the highway and that highway crossing frequency was negatively related to highway traffic volume. Most highway crossings occurred at night when highway traffic volume was lowest (Waller & Servheen, 2005). Waller and Miller also found that traffic volumes had increased when they compared the 1999-2001 study periods and the 2012-2013 periods (Waller & Miller, 2015). Traffic volume increases were most dramatic during the hours in which grizzly bears were most likely to cross the highway, thus suitable highway crossing opportunities have declined along the Highway 2 corridor between Glacier National Park and the Flathead National Forest.

Northrup and others studied grizzly bear response to traffic levels on the entire road network in southwestern Alberta. Bears selected areas near roads traveled by fewer than 20 vehicles per day and were more likely to cross these roads. Bears avoided roads receiving moderate traffic (20–100 vehicles per day) and strongly avoided high-use roads (> 100 vehicles per day) at all times (Northrup, Stenhouse, & Boyce, 2012). They also found that traffic patterns caused a behavioral shift in grizzly bears, with increased use of areas near roads and movement across roads during the night when traffic was low.

Despite higher levels of avoidance along some of the highway corridors and higher mortality associated with some permanent human developments, the grizzly population continues to grow and expand (Costello et al., 2016). The Grizzly Bear Conservation Strategy addresses connectivity from the NCDE to the Cabinet-Yaak Ecosystem in the Salish demographic connectivity area (DCA) that occurs on the Flathead and Kootenai National Forests. Management direction for the Salish DCA is described in the preferred alternative and analyzed in the section of this biological assessment on effects of the framework programmatic action.

Grizzly bear habitat security

Maintaining large areas of secure habitat is important to the survival and reproductive success of grizzly bears, especially females (R. D. Mace et al., 1999; C. C. Schwartz et al., 2010), and is a major goal of the draft NCDE grizzly bear conservation strategy. Throughout the NCDE, wilderness areas provide a high degree of habitat security for grizzly bears. The NCDE contains large acreages of congressionally designated wilderness, totaling about 1.1 million acres within the Forest portion of the recovery zone/primary conservation area (see Figure B-26 and Figure B-27). The Wilderness Act of 1964 precludes a variety of activities, including road construction, motorized use or mechanized transport, and permanent human habitation (except as specifically allowed by the enabling legislation, such as the Schafer airstrip). New livestock allotments, new mining claims, new oil and gas leases, or other developments that would impair wilderness character are also prohibited. The NCDE also contains substantial acreage of inventoried roadless areas (see Figure B-3), as well as other lands that have little or no permanent human presence or road development. On the Flathead National Forest, a total of about 1.6 million acres inside the primary conservation area is currently designated as wilderness, inventoried roadless areas, or other backcountry management areas that contribute to high levels of habitat security for grizzly bears.

Grizzly bear habitat security has been modeled and mapped using a variety of methods at a variety of scales (Kuennen & Warren, 2015). One indicator of habitat security is the pattern of security core habitat across the Flathead National Forest portion of the PCA and within subunits representing female home ranges. On NFS lands, security core levels are high in most places within the Forest's recovery zone/primary conservation area (see Figure B-26) (USDA, 2014c). The following sections discuss habitat security at the scale of grizzly bear subunit.

At its peak in the late 1980s, the Forest had about 2,934 miles of open roads (

Figure 4). From the end of 1994 to the end of 2011, about 694 miles total miles of system road were reclaimed or decommissioned (see definitions in Amendment 19 of the 1986 Flathead National Forest Plan). Additional seasonal and yearlong restrictions to existing roads also occurred during this time period. About 348 miles of open road were also restricted between 1995 and 2010. By 2010, the average open road density had decreased to about 0.4 mile per square mile. An influx of funds provided by the American Recovery and Reinvestment Tax Act of 2009 allowed the Forest to complete much-needed road management work, but funding has declined since.

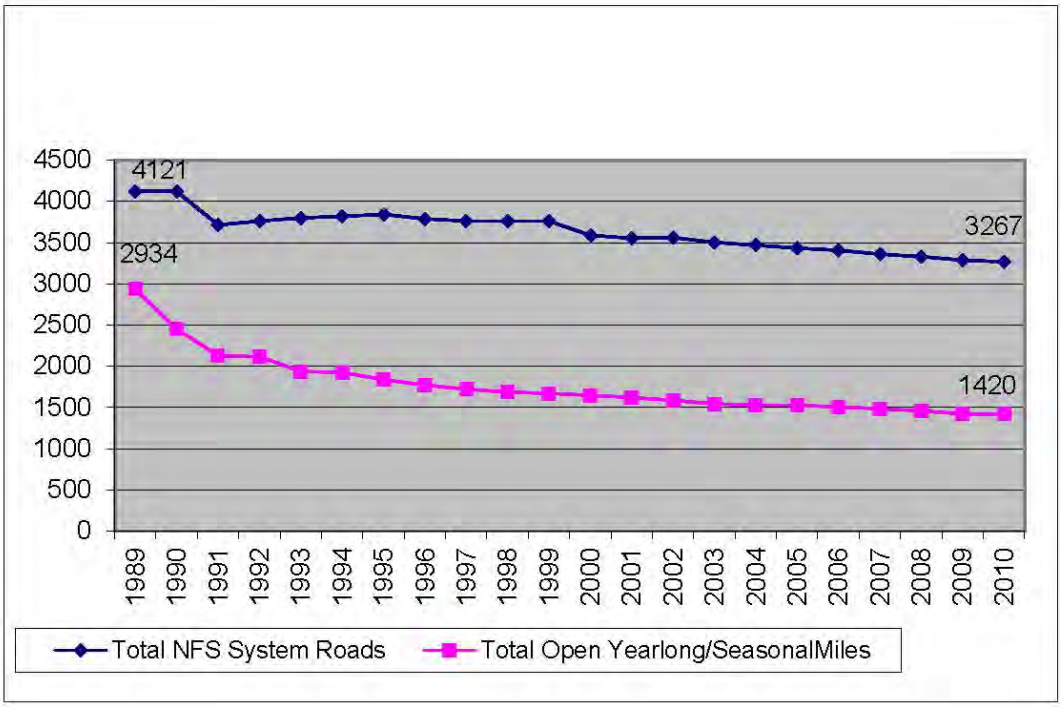


Figure 4. Trend in road miles on the Flathead National Forest

McLellan (2015) studied the interaction of roads, human activities, and food sources for grizzly bears over a 30-year time period in a multiple-use landscape in British Columbia that had high levels of human activity (including logging, gas exploration, and grizzly bear hunting). McClellan stated that a significant implication of his study is that the abundance of a high-energy food source growing in undisturbed portions of his study area enabled the grizzly bear population to increase in spite of intense industrial development and the highest density of hunter-killed grizzly bears in British Columbia. Once the high-energy food source declined, the grizzly bear population declined. He stressed that managers should identify which high-energy foods are important in various ecosystems and try to maintain or enhance these foods while reducing human access into habitats where they are abundant. Research studies have used a variety of methods to assess the effects of human access on habitat security and grizzly bear use.

Ruby (2014) studied grizzly bear habitat use along Montana Highway 83 in the Swan Valley portion of the Forest. Ruby (2014) used location data from 24 grizzly bears instrumented with GPS collars using the Swan Valley of the Forest from 2000 to 2011 to characterize grizzly bear movement and habitat-use patterns. Use of GPS collars enabled grizzly bears to be tracked on a 24-hour basis. Ruby found that grizzly bears that grizzly bears exhibited little negative selection for high open road densities within the Swan Valley study area, using high-quality habitats around human developments. Even though road density parameters in the Swan Valley subunits did not meet 19 percent OMAD, 19 percent TMAD, and 68 percent security core, grizzly bears continued to use Swan Valley habitats. Bears adopted movement patterns in close proximity to open roads and homes so that they were active during night time-periods when human activity was lowest. Although human activity associated with human site development in the rural landscape of the Swan Valley did not affect habitat selection, Ruby (2014) noted that it can result in human encounters resulting in grizzly bear mortality or management-related removals from the

population, citing the work of Delibes et al. published in 2001, Mattson et al. in 1990, Neilson et al. in 2004, and C. C. Schwartz et al. in 2010.

Numerous studies using various methods have documented that excessive road density in grizzly bear habitat affects behavior and habitat use and lowers bears' survival rate during the non-denning season (Boulanger & Stenhouse, 2014; D. J. Mattson, Knight, & Blanchard, 1987; M. Mattson, 1996; Bruce N. McLellan & Shackleton, 1988; Waller & Mace, 1997). Some older studies looked at motorized road use based upon data obtained with weekly telemetry flights, and some newer studies used satellite technology to track a bear's location each half hour or hour. Some studies assessed effects to grizzly bears of all sex, age, and reproductive classes, and others assessed effects on each class. Some studies analyzed roads based on a "moving window analysis" method and others analyzed linear road densities. The terms "motorized access" or "motorized routes" are used to encompass both roads and trails that receive motorized use. The effects of motorized trails on grizzly bears were not part of the Swan Mountain Range study by Mace and others (R. D. Mace, Waller, Manley, Lyon, & Zuuring, 1996) and have not been well studied.

In summary, although research methods and findings have changed over the years, numerous studies have documented that excessive open road densities in grizzly bear habitat during the non-denning season lowers their survival rate (Boulanger & Stenhouse, 2014; D. J. Mattson et al., 1987; M. Mattson, 1996; Bruce N. McLellan & Shackleton, 1988; Waller & Mace, 1997).

Motorized access in the primary conservation area—moving window analysis method

Research findings from the Swan Mountain Range of the Flathead National Forest have been used to evaluate the effects of motorized access on grizzly bears in the NCDE. Mace and others (1996) converted a linear road map to a total road density map using a 1 km^2 (0.39 mi^2) moving window analysis and reported the following relationships to road density:

- Road density was lower within the composite of the multiannual home ranges of 14 adult and subadult female grizzly bears (1.1 km/km^2 or 0.95 mi/mi^2) than was road density outside the composite home range (1.1 km/km^2 or 1.7 mi/mi^2);
- As total road density increased, the probability of selection by grizzly bears declined;
- 56 percent of the composite female home range was unroaded compared to 30 percent outside the composite home range;
- Within seasonal ranges, grizzly bears were more likely to use areas with higher road densities during spring than during other seasons;
- Selection for habitats within a 0.5 km (0.31 mile) buffer around roads decreased as traffic volume increased.

Based on these findings, the Interagency Grizzly Bear Committee (IGBC) established definitions and procedures for analyzing the effects of motorized use, delineating analysis areas that were equivalent to the average size of a female grizzly bear home range. In the NCDE, these were called bear management unit (BMU) subunits. The moving window analysis method has been used to evaluate the effects of motorized route density in grizzly bear subunits across the NCDE recovery zone/primary conservation area. Under the alternatives being considered for the Flathead revised forest plan and the amendments of the Helena, Kootenai, Lewis and Clark, and Lolo National forest plans, this method would continue to be used to assess effects on grizzly bears in the NCDE recovery zone/primary conservation area. The IGBC recommended criteria for open and total road densities, as well as core habitat within a grizzly bear

subunit, to support conservation and recovery of grizzly bears (IGBC, 1998). These recommendations were used as the basis for open and total motorized access density and security core objectives for the Flathead forest plan amendment 19, adopted in 1995. The Forest's amendment 19 considers both motorized roads and motorized trails.

The Forest's 12 bear management units in the recovery zone/primary conservation area were further subdivided into 73 subunits (Figure B-30). The amendment 19 decision applies management direction to 54 of the 73 subunits because it does not apply to un-roaded subunits in wilderness. Three subunits in the Stillwater River portion of the recovery zone/primary conservation area were not included in amendment 19 because they have very little NFS land acreage.

Flathead National Forest Plan amendment 19 adopted the moving window analysis method and established limits for total motorized access density (no more than 19 percent with density exceeding 2 mi/mi^2), open motorized access density (no more than 19 percent with density exceeding 1 mi/mi^2), and security core (at least 68 percent) within each of the 54 bear management subunits (where amendment 19 applies) with more than 75 percent National Forest System lands (unless amended). In bear management subunits with less than 75 percent National Forest System lands, no net increase in the percentage of open or total motorized access density was allowed, and no net decrease in the percentage of security core in a subunit was allowed (USDA, 1995b).

In 1998, the NCDE access task group, a group of grizzly bear experts, suggested that (1) the basic premise of managing open and total road densities as well as security core areas during the non-denning period is valid; (2) although amendment 19 is considered effective for managing access in grizzly bear habitat to support recovery of the species, other strategies may also be effective; and (3) seasonal road closures to protect seasonally important grizzly bear habitat can be useful and effective. Since 1998, many other studies of grizzly bear habitat use in relation to roads have been conducted, using a variety of definitions, methods, and statistical techniques.

Summary of habitat security trends in the primary conservation area during the non-denning season

In 1995, there were many more miles of open and total roads than there are today. In 1995, 16 of the Forest's 40 subunits with > 75 percent NFS lands met or exceeded 68 percent security core habitat. By 2016, the number of subunits exceeding the minimum of 68 percent security core had greatly increased and a total of about 731 miles of road had been decommissioned (see the 2016 amendment19 annual report of conditions thru 2015 for more details) (USDA, 2016a). Between 1995 and 2016, habitat conditions for grizzly bears on the Flathead National Forest had greatly increased the availability of secure grizzly bear habitat as well as its connectivity, benefitting the grizzly bear population.

On-the-ground conditions for grizzly bears continue to improve, but the reporting required under A19 has changed. The number of subunits with > 75 percent NFS lands has now changed because the Forest has acquired more than 45,000 acres of former Plum Creek Timber Company lands through the Legacy Project and other land acquisitions (see Figure B-42 and Figure B-43). The Nature Conservancy (TNC) and the Trust for Public Land agreed to purchase lands from Plum Creek Timber Company (PCTC) and then sell or donate these lands to Federal, State, and private owners. This land transfer is known as the Legacy Project. The vast majority of these lands have come under Federal (USFS) or State (DNRC) management, and any lands that were sold to private owners have safeguards (e.g., conservation agreements) attached to them so that the integrity of wildlife habitat is maintained. The Legacy Project transfer of lands to the Flathead NF was completed by 2016.

At the time amendment 19 was adopted, 14 subunits had less than 75 percent NFS lands (USDA, 1995b, p. 6). These 14 subunits were not required to meet 19 percent OMAD (open motorized access density, also called OMRD or open motorized route density), were not required to meet 19 percent TMAD (total motorized access density, also called TMRD or total motorized route density), and were not required to meet 68 percent security core. Instead, these subunits were managed for "no net increase" in OMAD or TMAD and "no net loss" of security core. As a result of the Legacy land acquisition and a district court decision related to the Glacier Loon and Buck Holland subunits (USDC-Missoula, 2014), the Forest is now reporting conditions in relation to A19 motorized access for 47 rather than 40 subunits because the Forest manages greater than or equal to 75 percent of the land. The seven subunits with Legacy Project acquired lands are: Buck Holland, Cold Jim, Glacier Loon, Hemlock Elk, Lion Creek, Meadow Smith, and Piper Creek. In these subunits, roads on acquired lands are now classified as NFS roads in the INFRA database, also increasing the miles of roads managed by the Flathead National Forest. The Forest does not have complete knowledge of all roads on the acquired lands, so field road logs are being completed to get information such as the type and location of closure devices.

The status of the 47 grizzly bear subunits is shown in Table 17and Figure B-31 and Figure B-32. (USDA, 2016a, 2016d). Table 17 shows OMAD, TMAD or security core percentages in parentheses if projects have gone through section 7 consultation and are expected to be implemented in the near future. In summary:

- Thirty-seven of 47 subunits with > 75 percent NFS lands would meet or are less than 19 percent OMAD or meet site-specifically amended standards (5 subunits),
- Thirty-two of 47 subunits with > 75 percent NFS lands would meet or are less than 19 percent TMAD or meet site specifically amended standards (2 subunits),
- Thirty-one of the 47 subunits with > 75 percent NFS lands meet or are over 68 percent CORE (27 subunits) or meet site specifically amended standards (4 subunits).

Table 17. Status of bear management unit (BMU) subunits where NFS lands > 75% and where amendment 19 applies (draft 2016 A19 report)[1].

#	BMU Subunit	Open Motorized Access Density (%)	Total Motorized Access Density (%)	Security Core (%)
1	Frozen Lake	10	4	80
2	Ketchikan	14	3	73
3	Upper Trail	14	4	88
4	Lower Whale (amended 37-19-47)	36	17	50
5	Upper Whale Shorty	12	11	86
6	Red Meadow Moose	25	17	68
7	Hay Creek	25	16	55
8	Coal and South Coal	15	19	73
10	Werner Creek (amended 29-19-63)	29	20	63
11	Lower Big Creek	18	19	71
12	Canyon McGinnis (amended 19-33-53)	19	32	50
17	Peters Ridge	52	25	34
19	Swan Lake	39	26	45

#	BMU Subunit	Open Motorized Access Density (%)	Total Motorized Access Density (%)	Security Core (%)
22	Lion Creek	18	47	41
23	Meadow Smith	20 (18)	53	42
24	Buck Holland	24	41	40
25	Crane Mountain	31	58	25
27	Piper Creek	19	45 (43)	55
28	Cold Jim	18	57 (54)	43 (44)
29	Hemlock Elk	6	30 (29)	64
30	Glacier Loon	22	41	48
31	Beaver Creek	6	26 (25)	66
32	Doris Lost Johnny (amended 57-19-36)	57	19	36
33	Wounded Buck Clayton (amended 27-30-65)	27	30	65
35	Emery Firefighter	19	20 (19)	58 (68)
36	Riverside Paint	18	16	71
37	Jewel Basin Graves	19	19	68
38	Wheeler Quintonkon (amended 25-19-68)	25	19	68
39	Logan Dry Park	30	36	51
40	Lower Twin	9	2	92
41	Twin Creek	0	0	100
42	Moccasin Crystal	8	1	81
43	Stanton Paola	8	3	81
44	Dickey Java	9	0	81
45	Long Dirtyface	0	0	100
46	Tranquil Geifer	0	2	85
47	Skyland Challenge	20	17	65
48	Plume Mtn Lodgepole	0	0	97
49	Flotilla Capitol	0	0	99
50	Ball Branch	7	12	84
51	Kah Soldier	19	19	68
52	Spotted Bear Mtn	19	18	68
53	Big Bill Shelf	11	6	80
54	Jungle Addition	19	19	68
55	Bunker Creek	5	3	92
56	Gorge Creek	0	0	90
57	Harrison Mid	1	0	95

[1] – There are 16 subunits with >75% NFS lands that are completely within the wilderness and not included in Amendment 19.

The Forest expects to continue to inventory its roads and the results will probably cause shifts in percentages. In addition, Appendix TT to the 1986 forest plan (as amended) states that roads are considered fully reclaimed if all stream-aligned culverts are removed. Reclaimed roads that fully satisfy the definition of a reclaimed road are not included in calculations of total motorized access density

(TMAD). Because the Forest does not have complete knowledge of its road system and is uncertain whether stream-aligned culverts remain on some of the roads classified as "impassable" in the INFRA database, we have modeled total motorized access density in two ways in order to depict the existing condition:

1. assuming there are no stream aligned culverts on impassable roads
2. assuming there are stream-aligned culverts on impassable roads

Table 18 shows total motorized access density (TMAD) for 18 out of 47 amendment 19 subunits where these assumptions make a difference in the percentages. Figure B-38 displays the status of the amendment 19 units.

Table 18. Total motorized access density percentages that change based upon assumptions

Subunit Name	TMAD % assuming no stream-aligned culverts	TMAD % assuming stream-aligned culverts present
Ball Branch	12	14
Buck Holland	41	42
Bunker Creek	3	10
Canyon McGuinness	32	38
Cedar Teakettle (<75% NFS lands)	27	30
Coal and South Coal	19	27
Cold Jim	55	56
Crane Mountain	58	61
Doris Lost Johnny	20	27
Frozen Lake	4	5
Jewel Basin Graves	19	20
Lower Whale	17	18
Meadow Smith	53	54
Porcupine Woodward (<75% NFS lands)	73	75
Red Meadow Moose	17	19
South Fork Lost Soup (<75% NFS lands)	47	50
State Coal Cyclone (<75% NFS lands)	25	27
Wounded Buck Clayton	30	31

While the difference in assumptions makes a difference in the TMAD percentage, it does not change the on-the-ground condition. The roads in question have been determined to be impassable because they are brushed in or have had the first portion of the road (typically 200 to 600 feet) treated in such a manner so as to preclude its use as a motorized or non-motorized travel way during the non-denning season. From the standpoint of grizzly bear security, if the road is impassable, it likely does not matter whether stream-aligned culverts remain. The Forest is conducting inventories of the roads in question to determine whether stream-aligned culverts are present or not. The Forest will update the baseline as field road surveys are completed and the INFRA database is updated.

Habitat security in the Swan Valley Grizzly Bear BMU Subunits

Additional habitat management direction applies to some of the grizzly bear subunits in the Swan Valley because of its history of intermingled land ownership. The Swan Valley Grizzly Bear Conservation Agreement (SVGBCA) is a collaborative document that has guided management of multiple-use lands

managed by the Forest Service, Montana Department of Natural Resources and Conservation, and lands formerly owned and managed by Plum Creek Timber Company. The purpose of the agreement is to "establish an ecosystem-based management plan throughout the Conservation Area which allows affected Parties to realize economic and recreational benefits of their ownership while helping conserve the bear and other species." Under the agreement, motorized access and timber harvest in 11 Swan Valley grizzly bear subunits were cooperatively managed. Conditions in the Swan Valley have changed since amendment 19 and the SVGBCA were adopted. The acquisition of former Plum Creek Timber Company lands by state and federal agencies totals about 66,000 acres throughout the 230,000-acre Swan River watershed.

During the two decades from 1996-2015, Plum Creek Timber Company (PCTC), in conjunction with the fiber agreement with the Nature Conservancy (TNC) that was enacted during the Legacy land transfer, harvested a large portion of its lands in the agreement area. The "fiber agreement" between Plum Creek Timber Company and the Nature Conservancy has now ended. Table 19 displays the acres of harvest in the 11 Swan Valley grizzly bear subunits managed under the SVGBCA from 2006-2015 (Ruby, Baty, & Kloetzel, 2016).

Table 19. Acres of timber harvest from 1996 to 2015 in Swan Valley grizzly bear subunits by landowner[1]

Swan Valley Grizzly Bear BMU Subunit	Timber Harvest DNRC 1996-2005 (acres)	Timber Harvest DNRC 2006-2015 (acres)	Timber Harvest PCTC/TNC 1996-2005 (acres)	Timber Harvest PCTC/TNC 2006- 2015 (acres)	Timber Harvest USFS 1996-2005 (acres)	Timber Harvest USFS 2006-2015 (acres)	Total Timber Harvest 1996-2015 (acres)
Goat Creek	1,345	501	4,369	0	0	10	6,215
Lion Creek	778		1,249	524	0	796	3,347
Piper Creek		120	2,620	2,141	16	19	4,786
Porcupine Woodward	485	2,000	3,690	0	0	0	6,175
South Fork Lost Soup	1,587	3,097	66	0	0	0	4,750
Meadow Smith			518	2,631	256	2,262	5,667
Buck Holland			110	984	450	2,247	3,791
Cold Jim			1,045	4,459	149	0	5,653
Hemlock Elk			1,007	1,843	252	523	3,625
Glacier Loon			1,543	376	717	104	2,740
Beaver Creek			1,044	546	303	5	1,898

1 PCTC/TNC = Plum Creek Timber Company/The Nature Conservancy;
DNRC = Department of Natural Resources and Conservation.
The DNRC data has the following important qualifiers:
Harvested acres were sorted by sale date, not actual harvest date. Harvest date unknown.
Does not include Plum Creek lands acquired in the Swan through the Legacy Project. This data is not known.
No major timber sales occurred in the DNRC Swan River State Forest between 1996 and 2002.
Does not include most small-volume timber permits or small-scale thinning/salvage projects.

The only remaining parties to the Swan Valley Grizzly Bear Conservation Agreement are the USFS and the Montana Department of Natural Resources and Conservation (DNRC). DNRC manages a large block of lands in four grizzly bear subunits: Goat Creek, Lion Creek, Porcupine Woodward, and South Fork Lost Soup (about 55,900 acres out of 124,362 acres, or about 45 percent of the lands in these four subunits). In these four subunits, about 32,090 acres are in inventoried roadless areas (IRAs) managed by the Forest. Other private lands in these subunits total less than 2 percent of the subunit acreage. Table 20 displays OMRD, TMRD, and security core for three subunits where DNRC and the USFS continue to share land management and where the Forest Service manages *less than* 75 percent of the acreage (see table 17 for grizzly bear subunits where the Forest manages 75 percent *or more* of the acreage).

Table 20. Open motorized access density, total motorized access density, and security core habitat for subunits shared by USFS and DNRC, with less than 75% NFS lands (2016 annual A19 report).

Subunit Name	Open Motorized Access Density (%)	Total Motorized Access Density (%)	Security Core (%)
Goat Creek	23	59	39
Porcupine Woodward	27	73	15
South Fork Lost Soup	25	47	37

Both DNRC and the Forest Service have closed roads in the Swan Valley grizzly bear subunits to benefit wildlife, including grizzly bears, as displayed in Table 21.

Table 21. Miles of restricted and historical roads per subunit on DNRC and USFS lands located in the Swan Valley (excluding public highways, county roads, and roads on small private lands). All values are miles of road to the nearest mile.

Subunit Name	DNRC Gated	DNRC Physical Barrier	DNRC Historic/ Reclaimed	USFS Gated[1]	USFS Physical Barrier[2]	USFS Historic/ Reclaimed[3]
Beaver Creek	---	---	---	52	5	8
Buck Holland	---	---	---	38	20	1
Cold Jim	---	---	---	81	42	10
Glacier Loon	---	---	---	46	28	6
Goat Creek	86	21	9	0	9	9
Hemlock Elk	---	---	---	54	18	2
Lion Creek	17	7	0	32	18	3
Meadow Smith	---	---	---	63	48	1
Piper Creek	0	0	0	48	30	0
Porcupine Woodward	117	29	13	12	23	32
South Fork Lost Soup	44	28	8	6	4	5

[1] Gated roads are closed by a locked gate and considered available for administrative use; considered a restricted road.

[2] Physical barrier roads are closed by various types of physical barriers and generally are not available for motorized administrative use; considered a restricted road.

[3] Historical or reclaimed roads are no longer used by the cooperator, no longer exist, and/or are not on the cooperator's system.

Grizzly bear habitat security in BMU subunits *outside* the Swan Valley Grizzly Bear Conservation Agreement Area where NFS lands total less than 75% of the acreage

In four of the Forest's 73 subunits in the PCA, the Forest Service now manages less than 75% of the acreage and "no net loss" in road densities and "no net decrease" in security core apply (see table 22).

Table 22. Existing status of BMU Subunits that are not included in the Swan Valley Grizzly Bear Conservation Agreement where NFS lands total < 75%.

#	BMU Subunit	RD	Open Motorized Access Density (%)	Total Motorized Access Density (%)	Security Core (%)
9	State Coal Cyclone	GV	29	25	58
13	Cedar Teakettle	GV	25	27	24
18	Noisy Red Owl	SL	20	16	52
34	Coram Lake Five	HH	26	46	14

Note. GV = Glacier View, TL = Tally Lake, SL = Swan Lake, HH = Hungry Horse.

In summary, the grizzly bear population in the NCDE is stable to increasing and expanding in distribution even though there are grizzly bear subunits that do not meet 19% OMAD, 19% TMAD, or 68% security core and even with a high level of timber harvest activity and road use in the subunits with intermingled ownership that occurred in the Swan Valley from 1996-2015. Because there are many acres of young forest that will not be suitable for additional harvest for many decades, and because PCTC (now Weyerhaeuser)/TNC no longer manage lands in the eleven subunits shown in Table 21, the level of harvest and harvest-related activities (including road use) is likely to be much lower in the near future. Cover is becoming established in the areas that were harvested in the past. The acquisition of lands formerly owned by Plum Creek Timber Company has several benefits for grizzly bears. It ensures that the acquired private lands will not be sold or subdivided for permanent human development, reducing the risk of grizzly bear food conditioning, habituation, and fragmentation that can be associated with private land development. It also reduces the need for coordination of timber harvest activities in 11 grizzly bear subunits and helps to maintain or improve habitat quality for grizzly bears and other wildlife species (see Figure B-42 and Figure B-43). In their biological opinion on the effects of the revised implementation schedule for the Flathead National Forest's amendment 19 (USFWS, 2014c), the USFWS concluded, "In summary, the existing access management conditions are good to very good for grizzly bears in the NCDE, with a few site specific exceptions. It is our opinion that motorized access is managed across the NCDE at levels that are evidently conducive to grizzly bear population growth and conserve grizzly bear habitat."

Administrative use of roads

Amendment 19 of the forest plan addressed motorized administrative use of closed routes in the grizzly bear recovery area (PCA), and appendix TT of the forest plan clarified allowable levels of administrative use. Appendix TT stated that outside of security core areas, motorized administrative use is acceptable at low intensity levels as defined by either (1) existing cumulative effects analysis models (which defined low-intensity levels as one to six vehicles/week) or (2) minor activities that do not exceed 30 days duration. Administrative use of reclaimed roads may not occur during the non-denning season other than over-snow vehicle use, which can occur during the period of time when public over-snow vehicle use is allowed. Based upon the findings of Mace and Waller (1996), the administrative use of roads allowed under amendment 19 would not cause avoidance or underutilization of habitat by grizzly bears.

Grizzly bear habitat security and motorized use in zone 1

A moving-window analysis was used for establishing plan components and analyzing effects of motorized use in the primary conservation area, but a different method for establishing plan components and analyzing the effects of motorized use was selected for zone 1 (including the Salish demographic connectivity area) in recognition of the differing grizzly bear management objectives. Instead of a moving window analysis, the linear density of roads or routes open to public motorized use was applied. The evaluation of effects of linear density on grizzly bears was based on research by Boulanger and Stenhouse

(2014). This research is the best available science on the effects of roads on grizzly bears of different sex and age classes (C. Servheen, USFWS, pers. comm. to R. Kuennen, 2015).

Boulanger and Stenhouse (2014) studied 142 grizzly bears monitored in Alberta from 1999-2012. They found that sex and age class survival was related to road density. The roads in the Alberta study area were almost entirely (96.5 percent) gravel secondary roads associated with settlements and industrial resource extraction activities. In Alberta, for the most part, resource roads are all-weather gravel roads that are open for public use year round (Stenhouse & Boulanger, 2016). We believe all these roads would meet our definition of "open for public use during the non-denning season." More recently there have been efforts at gating, but these have not yet formed part of Boulanger and Stenhouse's ongoing research. They are now looking at how effective these access control measures may be in terms of both human and grizzly bear behavior. The authors did not include motorized trails in their model.

In the Alberta study, demographic modeling found strong spatial gradients in the grizzly bear population trend based upon road density. Threshold values for road density needed to ensure population stability were estimated to refine targets for population recovery of grizzly bears in Alberta. A summary of the threshold values and how they were used in the NCDE is shown in Table 23.

Table 23. A summary of the threshold values and their use in the analysis for NCDE zone 1 based on Boulanger and Stenhouse (2014).

Objective described in the Alberta study (Boulanger & Stenhouse, 2014)	Reported density km/km^2	Converted tomiles/sq. mi.[1]	Where applied in the analysis
Grizzly bear presence – Distribution of collared bears shows most bears occurred in areas with road densities of 1.5 km/km^2 or less (p. 10)	1.5 km/km^2	2.4 mi/mi^2	Used to evaluate the ability to support occupancy and movement by grizzly bears of any age, sex, or reproductive status in zone 1.
Occupancy by females – Modeling results suggested that the threshold of road density depended heavily on assumptions. Adult females occupied habitat with road densities of 1.25 km/km^2 or less, unless higher mortality of females with dependent young is assumed.	1.25 km/km^2	2.0 mi/mi^2	Used to evaluate the ability of the Salish demographic connectivity area to support occupancy and movement by female grizzly bears. The Salish demographic connectivity is not intended to provide core habitat. Density calculation included both roads and trails open for public motorized use in the non-denning season.
Grizzly bear mortality risk – Most grizzly bear mortalities occurred at road densities greater than 1.0 km/km^2 except for adult males, whose mortalities occurred across all road densities (p. 10)	1.0 km/km^2	1.6 mi/mi^2	Used to evaluate grizzly bear mortality risk in the Salish demographic connectivity area. Density calculation included both roads and trails open for public motorized use in the non-denning season.
Alberta core conservation area – Allows for survival rates of females with dependent offspring high enough to ensure an increasing population (p. 18)	0.75 km/km^2	1.2 mi/mi^2	NA [see moving window analysis method used in the recovery zone/primary conservation area, where the management objective is to function as a core conservation area].

[1] Formula: 1 km = 0.6214 mi; 1 km^2 = 0.3861 mi^2

Outside the recovery zone/primary conservation area, the 1986 forest plan identified geographic units and a range of public open road densities for each. Table 24 shows the linear density of roads open to public motorized use (during all or a portion of the non-denning season) within the portions of zone 1 under management authority of the Flathead National Forest, updated as of 2015 each (USDA, 2015). Geographic units are not the same as grizzly bear management subunits and no subunits were identified in zone 1.

Table 24. Density of roads open to the public motorized vehicle use by geographic unit

Geographic Unit[1]	Density of roads open to public motorized vehicle use (avg. linear mile/mile^2 of NFS lands)
Swan Lake Ranger District	
Island Geographic Unit	1.7
Tally Lake Ranger District	
Olney-Martin Creek Geographic Unit	1.6
Upper Good Creek Geographic Unit	1.3
Sylvia Lake Geographic Unit	1.0
Star Meadow-Logan Creek Geographic Unit	1.5
Tally Lake-Round Meadow Geographic Unit	1.8
Mountain Meadow-Rhodes Draw Geographic Unit	1.6
Upper Griffin Geographic Unit	0.9
Ashley Lake Geographic Unit	1.9

[1] See map of Salish geographic units (USDA, 2015).

This level of motorized access has supported expansion of the grizzly bear population, including females, into zone 1, including the Salish demographic connectivity area (Figure B-5) (USFWS, 2012a). In all geographic units, linear densities of roads open to public motorized use are at levels that support occupancy and survival of both males and females (Boulanger & Stenhouse, 2014) and are below the upper thresholds established by the 1986 forest plan, but mortality risk is elevated in some geographic units for some grizzly bear sex and age classes.

Grizzly bear habitat and dispersed recreation

Quinn and Chernoff (2010) prepared a report on the effects of recreation activities on wildlife. The authors stated that response of wildlife to different disturbance activities is largely a function of

- detection distance – the distance between humans and wildlife at which human presence is first detected.
- the sensitivity of a given species to human presence (including previous experience with human activity).
- the zone of influence associated with a given activity (determined by noise generated, speed of travel, intensity of use).
- timing of the effect (e.g., life stage of the animal, breeding season, dispersal season)

Grizzly Bear habitat and recreation: denning season

Grizzly bears hibernate in dens during the winter months. Both males and females have a tendency to use the same general area to hibernate year after year, but the same den is rarely reused by an individual (Linnell, Swenson, Andersen, & Barnes, 2000). The average elevation of 252 grizzly bear dens in the

NCDE ranged from 6,427 to 6,906 feet (R. Mace, 2014). It has been estimated that about 47 percent of National Forest System lands in the primary conservation area provides potential denning habitat (R. Mace, 2014). The availability of denning habitat is not likely to be a limiting factor for grizzly bears in this area (USFWS, 2013c).

The impacts of winter recreation activities on denning bears are not well studied, but there is no evidence to indicate that current levels of nonmotorized or motorized over-snow vehicle use are inhibiting the recovery of the grizzly bear population in the NCDE (R. Mace, MFWP, pers. comm., 2015). In the draft GBCS, the USFWS (2013c) stated that the available data about the potential for grizzly bear disturbance or den abandonment from nearby snowmobile use is extrapolated from studies examining the impacts of other human activities and is identified as "anecdotal" in nature (Swenson, Sandegren, Brunberg, & Wabakken, 1997), with sample sizes so small they cannot be legitimately applied to assess population-level impacts (Harding & Nagy, 1980; Hegg, Murphy, & Bjornlie, 2010; Reynolds, Reynolds, & Follmann, 1986).There are no reports of den abandonment by grizzlies in the lower 48 states due to snowmobiling activity (Hegg et al., 2010; Servheen & Cross, 2010). The draft GBCS stated that current levels of snowmobile use are not appreciably reducing the survival or recovery of grizzly bears (USFWS, 2013c).

Areas open to motorized over-snow vehicle use on the Flathead National Forest is limited by the winter use provisions of the Flathead's Winter Motorized Recreation Plan (amendment 24) (USDA, 2006). The purpose and need for Amendment 24 was to clarify management direction regarding over-snow motorized use and meet the requirements of a settlement agreement resulting from a lawsuit challenging over-snow motorized use on the Flathead National Forest. The selected alternative responded to the purpose and need by establishing a Winter Motorized Recreation Management Plan that clarified where, when, and under what conditions over-snow vehicles were allowable on the Flathead National Forest and amended the forest plan to be consistent with that management plan. This decision identified areas and routes suitable for motorized over-snow vehicle use, including four "late-season areas" within the primary conservation area where motorized over-snow vehicle use is allowable in the areas defined by amendment 24 as follows; Canyon Creek groomed route corridor until April 15; Six Mile until April 30; Skyland Challenge until May 15; Lost Johnny until May 31 (USDA, 2006, p. appendix A).

Mace did a GIS assessment of the distribution of 252 verified grizzly bear dens in the NCDE as of 2014 with respect to areas open to motorized over-snow vehicle use or closed to motorized over-snow vehicle use (R. Mace, 2014). He found that 25 percent of the 252 dens were in designated wilderness (19 percent of the 25 percent are female grizzly bears), 15 percent of the dens were in Glacier National Park (13 percent of the 15 percent are female grizzly bears), 31 percent of the dens were in areas open to motorized over-snow vehicle use until April 1 (27 percent of the 31 percent are female grizzly bears), 5 percent of the dens were in areas known as "late season areas"—open to motorized over-snow vehicle use after April 1 (4 percent of the 5 percent are female grizzly bears), and 24 percent were in other areas closed to motorized over-snow vehicle use on the Forest (23 percent of the 24 percent are female grizzly bears) (Ake, 2015). The percentage of den locations is proportional to the amount of modeled denning habitat in each category (Kuennen, 2015).

Grizzly bear habitat and recreation: den emergence time period

Bear research scientists and managers have suggested that in the period shortly before or after den emergence in the spring, a female with cubs may be particularly vulnerable to disturbance by people because cubs have limited mobility after den emergence and the females and their cubs have high energetic needs (Haroldson, Ternent, Gunther, & Schwartz, 2002; R. D. Mace & Waller, 1997a). However, such effects have never been documented and there are no known scientific papers supporting this potential impact.

Some members of the public expressed a concern that changes in climate may cause grizzly bears to emerge from their dens earlier, increasing the potential for conflicts with nonmotorized or motorized over-snow use. The draft GBCS established dates for the denning season. West of the Continental Divide on the Flathead National Forest, the denning season is defined as December 1-March 31. Mace collected data on known dens in the NCDE and on the Flathead National Forest through 2014. On the Flathead National Forest, den emergence dates ranged from April 16-May 29, with the exception of one bear emerging on April 4 of one year, so April 1 is a conservative date for den emergence. In 2015, a year with lower than average snowfall overall, the earliest known bear emergence date on the Flathead National Forest was April 23 for males and April 28 for females (R. Mace, pers. comm., 2015). Mace did not detect shifts in den emergence of the NCDE grizzly bear population associated with changes in climate (Costello et al., 2016).

Nonmotorized use on the Forest is not restricted during the denning or den emergence time periods. Table 25 and table 26 show current areas and routes open to motorized over-snow vehicle use in the primary conservation area according to season (denning season for grizzly bears and den emergence time period). During the denning season, about 22 percent of the primary conservation area on the Forest is suitable for motorized over-snow vehicle use. During the non-denning season, which includes the time period when grizzly bears may be emerging from their dens, motorized over-snow vehicle use is suitable on about 2 percent of the acreage within the primary conservation area (see Figure B-31 and

Figure B-32). Note that miles and acres displayed in table 25 and table 26 reflect the amendment 24 decision, but numbers may be different due to realignment of data layers and GIS updates.

Table 25. Miles/acres suitable for motorized over-snow vehicle use within the primary conservation area (PCA)

Area	Motorized Over-Snow Vehicle Routes Open Dec. 1 to March 31[1]	Motorized Over-Snow Vehicle Areas Open Dec. 1 to March 31[1]	Motorized Over-Snow Vehicle Routes Open April 1 to Nov. 30)[2]	Motorized Over-Snow Vehicle Acres Open April 1 to Nov. 30)[2]
PCA	872 miles	513,134 acres	661 miles	59,017 acres

[1] This includes all routes and areas open during this time period.

[2] This includes all routes and areas open during this time period.

The Forest's annual amendment 19 report displays open and total route density and security core figures for the two-month season of April-May (see table 26).

Table 26. Late spring open and total route density and security core percentages (USDA, 2016a).

#	BMU Subunit	RD	Open Route Density		Total Route Density		Security Core	
			Late Spring	Non-denning	Late Spring	Non-denning	Late Spring	Non-denning
Canyon Creek Area								
10	Werner Creek (amended)	GV	18	29	23	20	61	63
11	Lower Big Creek	GV	15	18	same	19	70	71
12	Canyon McGinnis (amended)	GV/TL	24	19	33	32	41	50
13	Cedar Teakettle (< 75% NFS land)	GV	15	25	same	27	24	24
Lost Johnny Area								
32	Doris Lost Johnny (amended)	HH	79	57	77	19	17	36

33	Wounded Buck Clayton (amended)	HH	51	27	62	30	34	65
17	Peters Ridge	HH/SL	14	52	18	25	66	34
Sixmile Area								
19	Swan Lake	SL	27	39	24	26	54	45
38	Wheeler Quintonkon (amended)	HH/SB	20	25	23	19	64	68
18	Noisy Red Owl (< 75% NFS land)	SL	13	20	15	16	60	52
50	Ball Branch	SB	2	7	14	12	89	84
Challenge/Skyland Area								
47	Skyland Challenge	HH	51	20	50	17	31	65
46	Tranquil Geifer	HH	7	0	7	2	81	85

In the Table 26 above, where the open and/or total route density decreased, those subunits either had (1) roads closed during April-May that were open in the summer or (2) wheeled motorized trail traffic is assumed to not occur due to spring conditions. Where the open and/or total route density increased, those subunits either (1) contained "play" areas with density assumed to be > 2.0 mi/mi^2 or (2) had additional over-snow routes not present as open roads in other seasons. Where security core increased, it was assumed wheeled motorized traffic was not occurring due to spring conditions, so those motorized trails were not buffered. Where security core decreased, those subunits either (1) contained "play" areas, which were buffered 500 meters and the area plus the buffer is not considered CORE or (2) contained route corridors (100 feet either side of route), which were buffered 500 meters and the route corridor plus the buffer is not considered core.

The USFS and MFWP have monitored motorized over-snow use as well as known den locations and bears emerging from their dens and reported this information to the USFWS (A. H. Jacobs, 2013). The agencies have not detected any conflicts due to over-snow use on the Flathead National Forest. The grizzly bear population in the NCDE has grown and expanded in distribution with the level of over-snow use that has been occurring. The draft GBCS stated that monitoring would continue to support adaptive management decisions about snowmobile use.

Grizzly bear habitat and recreation during the non-denning season

Table 27 shows the different types of allowable trail uses on the Forest by approximate miles and recreation type; trails can have multiple types of use on them so the miles displayed are overlapping, not additive. In the primary conservation area, motorized trails are included in calculations of OMRD, TMRD, and secure core. In the Salish demographic connectivity area, motorized trails are counted in the linear density of motorized routes. The effects of motorized trails are included in the section on grizzly bear habitat security above. The following section focuses on effects of nonmotorized trails.

Table 27. Allowed summer trail use on the Flathead National Forest in miles

Bicycle	Hiking	Pack and Saddle	Wheeled Motorized
806	2,053	2,012	226

Nonmotorized trails

Several studies have investigated the behavioral response of bears to nonmotorized trails (Jope, 1985; Kasworm & Manley, 1990; R. D. Mace & Waller, 1996; MacHutchon, 2014; B. N. McLellan & Shackleton, 1989; D. White, Kendall, & Picton, 1999). These studies vary considerably in study design, trail use levels, grizzly bear sample sizes, and conclusions as to the impacts of nonmotorized trails on bears.

In Glacier National Park, bears more than 500 feet away from trails generally did not respond to hikers by fleeing (Jope, 1985, p. 34), and in 45 percent of all cases bears showed no movement in response to hikers. Hiker group size did not significantly affect initial bear behavior, and the relationship between group size and subsequent behavior was similarly weak. The higher presence of bear bells among larger groups may have influenced bear response.

McLellan and Shackleton (1989) reported that bears showed a stronger response to people on foot than in motor vehicles in "low human-use" areas. However, less than half of bears showed any response (walked or ran away) to stimulus greater than 250 feet away. McLellan and Shackleton also reported that grizzlies fled further in response to unexpected off-trail foot travel than to motorized use (p. 274). Similarly, Mace and Waller (1996) reported that bear response to off-trail hikers was greater than that observed for other types of disturbances.

White and others (1999) documented grizzly bear displacement from feeding sites in Glacier National Park in response to hikers. Kasworm and Manley (1990) reported that grizzly bears used habitats within 100 meters (328 feet) of trails less than expected but used habitats 100-1,000 meters (3,281 feet) from trails in proportion to their availability.

Grizzly bear response to human disturbance may differ between seasons or habitats. Jope (1985) noted that grizzly bears were more likely to respond to hikers through flight or charges in spring and early summer than later in the year, possibly due to habituation once human use became more common during the summer season. Kasworm and Manley (1990) found that bears used habitat within 400 feet of trails less than expected in spring and fall. Conversely, Mace and Waller (1996) found that distance to trails and/or lakes with campsites were significant variables only in summer and autumn.

Nonmotorized recreation uses (hiking, horseback riding, mountain biking) also affect the risk of grizzly-bear human conflicts (S. Herrero & Higgins, 1999). These conflicts can pose risks to human safety, as well as, safety to grizzly bears.

Herrero (1985) was one of the first researchers to report on the causes of bear attacks and how to avoid them. Based upon his study of bear attacks in Canadian national parks, Herrero reported that 68 out of 135 grizzly bear incidents in which the party's activity prior to the bear attack was known, hiking was the most common activity. Herrero reported that 75 percent of encounters he classified as "sudden" were known to involve bear mothers, with females and cubs of the year being most dangerous. Sudden encounters are the most likely situation to result in a grizzly bear-inflicted injury (S. Herrero, 1985). Attacks by bears on humans in North America are disproportionately more frequent in national parks, most being the result of sudden encounters between hikers and grizzly bears that react defensively to protect young or a food source (S. Herrero, 1985; MacHutchon, 2014). Fortin and others (2016) reported that most defensive attacks result from surprise encounters involving humans hiking off-trail, in the backcountry, and in areas of natural food abundance for grizzly bears.

Various studies have analyzed the contribution of human behavior in bear attacks and concluded that activities where people may be moving quickly and/or quietly enough to surprise a bear before the bear detects them is an important factor. This can include activities such as mountain biking (if cyclists are traveling quietly at high speed) or hiking while hunting (if an individual is moving quietly through the forest or is in close proximity to an animal carcass).

Quinn and Chernoff (2010) conducted a literature review of the ecological effects of mountain bikes. A database of 33 grizzly bear-bicyclist encounters or confrontations within western North America revealed that in 95 percent (20 of 21) of encounters where the distance apart was estimated, the bear was 165 feet or less away. Schmor (1999) interviewed 41 mountain bikers in the Calgary region who cycled in the

Rocky Mountains and concluded that the speed and relative silence of mountain bikes, especially when combined with environmental factors (e.g., dense vegetation, hilly terrain, running water), likely contributed to mountain bikers approaching bears closer than 50 meters (164 feet) before being detected by the bear. These factors make it less likely that an encounter can be avoided. MacHutchon (2014) stated that an alert mountain biker making sufficient noise and traveling at slow speed (e.g., uphill) would be no more likely to have a sudden encounter with a bear than would a hiker.

In Glacier National Park, conflicts and grizzly bear mortalities are rare and are related almost exclusively to campgrounds and other developed human-use areas (D. White et al., 1999). In the Swan Mountains, Mace and Waller (1996) reported there were no historic or recent records of grizzly bear-human conflict in their study area. The authors suggested that avoidance by bears of heavily used human trails may increase grizzly bear survival.

In 1994 and 1998, the Interagency Grizzly Bear Committee chartered a task force to create standard definitions and procedures for managing motorized access in grizzly bear recovery zones. At that time, the task force recommended that the impacts of "high intensity use" *nonmotorized* trails be considered in calculations of "core" habitat in the grizzly bear recovery area (IGBC, 1998, p. 4). Because there were no data or literature available to determine the threshold number of parties defining a "high intensity use" trail or how high-use trails might relate to grizzly bear population parameters, the threshold value to be used to for a trail's influence on security core was determined by a panel of experts. The panel recommended that trails receiving > 20 parties per week be considered "high intensity use" and that an influence zone would be used that was the same as motorized routes, for the purpose of deducting from the effectiveness of security core habitat (IGBC, 1998, p. 4). Amendment 19 uses a definition of 20 parties per week for at least one month.

The Forest has about 2,041 miles of national forest system trails in the primary conservation area, and about 275 miles of this total were considered to be "high use" using the IGBC criteria. Figure B-28 shows the distribution of trails modeled as "high use" in the NCDE. As this data shows, the majority of trails that have been modeled as "high use" are in Glacier National Park.

Because of the lack of studies demonstrating population-level impacts associated with nonmotorized trails, the subjective method of establishing the threshold value of 20 parties per week and their influence zone, and the lack of available objective data to quantify nonmotorized use levels, the NCDE conservation strategy team recommended removing consideration of high-intensity use nonmotorized trails to define core habitat effectiveness (USFWS, 2013d).

Strategies recommended to reduce the risk of sudden encounters between grizzly bears and people include (1) visitor education regarding safe practices in bear country (e.g., expect to meet bears, look ahead, slow down, make lots of noise), (2) managing recreation to occur more predictably in space and time, and (3) designing or locating recreation trails to increase the distance at which bears can detect people and to avoid habitats with concentrated bear food resources (Fortin et al., 2016; J. Herrero & Herrero, 2000; Quinn & Chernoff, 2010).

Although a variety of methods can be used to reduce the risk of grizzly bear-human conflicts due to nonmotorized uses, Herrero and Herrero (2000) emphasized that none of them can entirely remove the risk of hiking or mountain biking in grizzly bear habitat. When grizzly bear-human conflicts do occur in the NCDE (whether associated with nonmotorized trail use, off-trail backcountry use, developed recreation sites, or private or other agency lands), MFWP, in cooperation with land management agencies and the USFWS, monitors the conflict situation and determines the appropriate conflict response based on established Interagency Grizzly Bear Guidelines. No population-level effects of nonmotorized trails have been demonstrated, and there are relatively few "high intensity use" trails on NFS lands.

Grizzly bear habitat and developed recreation sites

Developed recreation sites are sites or facilities on federal lands with features that are intended to accommodate public use and recreation. Examples include campgrounds, trailheads, rental cabins, fire lookouts, summer homes, and visitor centers. Developed recreation sites include those designed for overnight use and those designed for day use (see definition in NCDE glossary, appendix D).

Developed recreation sites that support overnight public use have a higher potential to increase both the levels of bear attractants and grizzly bear mortality risk (USFWS, 2013c). Summarizing the findings of a number of studies, the draft GBCS stated, "Developed sites are generally associated with frequent, overnight or prolonged human use that may increase both the levels of bear attractants and grizzly bear mortality risk. Developed sites can impact bears through temporary or permanent habitat loss and displacement but the primary concern regarding developed sites is direct bear mortality or removal from the ecosystem due to bear/human conflicts caused by unsecured bear attractants, habituation, and food conditioning" (USFWS, 2013c, pp. 24-25). The draft GBCS concluded that "securing potential attractants is the single most effective way to prevent bears from becoming food conditioned and displaying subsequent unacceptable aggressive behavior" (p. 96). Food storage orders requiring proper storage of attractants are in place on all Forest lands.

Grizzly bear-human conflicts have occurred at developed recreation sites on NFS lands, although efforts such as food storage orders, bear-resistant containers, and public education have been implemented to help reduce the risk of conflicts. Most of the grizzly bears killed or removed by management agencies in the NCDE in the past had been involved in conflicts related to unsecured attractants such as garbage, bird feeders, pet/livestock feed and human foods. Although the majority of these mortalities occurred on private lands, the risk of grizzly bear mortality at developed recreation sites on public lands in the primary conservation area remains of concern.

Although food storage orders are highly effective, the draft NCDE GBCS includes measures to further reduce the risk of grizzly bear-human conflicts at overnight developed recreation sites by limiting increases in their number and capacity within the primary conservation area. Because the draft GBCS focuses on developed recreation sites with frequent, overnight, or prolonged human use, the grizzly bear analysis also focuses on these sites.

On the Forest, there are 63 campgrounds, 63 recreation residences, and 20 lookouts/cabins/lodges designed for overnight use on NFS lands in the primary conservation area (see table 28 for the number of sites and table 29 for their capacity).

Table 28. Number of developed recreation sites designed for overnight use in the primary conservation area on the Flathead National Forest

Area	Number of Developed campgrounds	Number of cabins, lodges, lookouts with overnight use	Recreation Residences
PCA	63	20	63

Table 29. Capacity of developed recreation sites designed for overnight use in the primary conservation area on the Flathead National Forest

Area	Capacity of Developed campgrounds	Capacity of cabins, lodges, lookouts with overnight use	Capacity Recreation Residences
PCA	552	68	63

The Forest also has one developed resort on NFS lands in the primary conservation area, the Whitefish Mountain Resort, as well as an unknown number of dispersed recreation sites. The Forest has consulted

with USFWS on the effects of various resort expansion projects since 1989 (USDA-USFWS, 2016; USFWS, 1989, 1995a, 2007a, 2011b, 2012b, 2013b, 2015a). The Forest has one developed ski resort that operates during the grizzly bear denning season—Blacktail Mountain, in zone 1 outside the Salish demographic connectivity area. Food storage orders are also effective at reducing the risk of grizzly-bear human conflicts at these resorts.

Management direction for recreation is described in the preferred alternative and analyzed in the section of this biological assessment on effects of the framework programmatic action.

Grizzly bear habitat and livestock allotments

Although grizzly bears frequently coexist with large livestock (such as adult cattle) without preying on them, grizzly bears will often kill smaller animals such as calves, domestic sheep, goats, or chickens when they encounter them (C. R. Anderson, Ternent, & Moody, 2002; Knight & Judd, 1983; Orme & Williams, 1986). If repeated depredations occur, managers may relocate bears or remove them from the population (counted as a grizzly bear mortality). Because of the increased risk to grizzly bears posed by actions taken to protect sheep and other small livestock, the 1986 Interagency Grizzly Bear Guidelines emphasized the reduction of livestock allotments on public lands. Grizzly bear predation on small animals (especially chickens) continues to be a source of grizzly bear-human conflicts on private lands, but multiple agencies and non-government organizations (NGOs) are making concerted efforts to reduce this source of grizzly bear mortality.

Between 1980 and 2008, there were only three grizzly bear mortalities related to livestock depredations on public land in the NCDE, and none of these occurred on the Flathead National Forest. This accounts for less than 1 percent of all known grizzly bear mortalities during this time in the NCDE. At their current levels, livestock allotments on public land within the NCDE are not a threat to grizzly bears in the lower 48 states. As stated in the draft GBCS, "Current levels of grazing on permitted livestock allotments in forested environments are not displacing grizzly bears in significant ways and are not likely to affect vegetation structure enough to result in direct competition for forage species on public lands within the NCDE, as evidenced by the increasing population trend in the NCDE" (USFWS, 2013c, p. 25). As a result, the draft GBCS included measures to keep livestock grazing at or below the baseline levels.

No sheep grazing and very limited cattle grazing occurs on the Flathead National Forest. The Forest currently has seven active cattle allotments—four in the Salish geographic area outside the recovery zone/primary conservation area and three in the Swan Valley geographic area inside the recovery zone/primary conservation area (see Figure B-33 and Figure B-34).

Current allotment acreage represents approximately 3 percent of NFS lands, consisting of about 81,500 acres. Authorized grazing on the Flathead National Forest has declined over the last several decades. Current animal unit months authorized for grazing totals about 1,078. Because livestock grazing has been declining, the risk of conflicts on the Forest has also declined.

There have been no known livestock-related grizzly bear mortalities on the Flathead National Forest. According to the draft GBCS, "Indirect impacts on grizzly bears due to attractants associated with livestock can be effectively minimized with requirements to securely store and/or promptly remove attractants associated with livestock operations (e.g., livestock carcasses, livestock feed, etc.)" (USFWS, 2013c, p. 25) Livestock carcasses are promptly removed and livestock feed is properly stored on Forest lands, as required by the attractant storage orders that are in place (USDA, 2010b, 2011a).

There are permitted grazing operations on NFS land for horses and mules in the NCDE, primarily associated with outfitter and guide operations or Forest Service administrative use. The food storage order addresses attractants associated with horses or mules, and there is no evidence of conflicts with bears due

to depredation, attractants, or forage competition related to horse and mule grazing permits. Honeybees, classified as livestock in Montana (MCA 15-24-921), can be attractants to some grizzly bears. There are no permitted honeybee operations on the Forest.

Management direction for livestock allotments is described in the preferred alternative and analyzed in the section of this biological assessment on effects of the framework programmatic action.

Grizzly bear habitat and vegetation management

Timber harvest, wildfire, prescribed fire and other vegetation management activities may alter the amount and arrangement of cover and forage. Grizzlies in the NCDE occupy numerous types of habitat, including those with forest cover and those without (Aune & Kasworm, 1989; R. D. Mace & Waller, 1997a). Vegetation management can increase the quantity and quality of grizzly bear foods through increased growth of grasses, forbs, and berry-producing shrubs (Kerns, Alexander, & Bailey, 2004; Zager et al., 1983).

In the dense forests of the Forest, thick growth of conifers provides high levels of cover but may reduce the availability of key bear foods. Mace and Waller (1997a) studied grizzly bear habitat use in the Swan Mountain Range of the Forest and found that the highest grizzly bear densities obtained over time were in those locations with ≤ 40 percent overstory tree canopy. They stated that vegetal foods used by grizzly bears (including grasses, forbs, and shrubs) were more common in open to open timbered habitats and that available foods in timber harvest units were used by grizzly bears provided there was restriction of vehicular traffic. They found that grizzlies were more likely to use cutting units harvested 30-40 years ago than older or newer cutting units and that these were the most preferred habitats during summer (R. D. Mace & Waller, 1997a). Mace and Waller reported that grizzly bears avoided lower-elevation, more accessible harvested areas as well as areas less than 30–40 years following regeneration harvest where cover was not available.

In a recent Alberta study, Stewart and others assessed habitat selection near edges created by human activities as well as natural edges based upon GPS telemetry data from 26 grizzly bears. These authors found that there was no selection of edges associated with human activities in the spring, but they found that both male and female grizzly bears selected for edges associated with human activities (roads and timber harvest) in summer and fall and were not displaced. They attributed this selection to increased food resources at transitions between harvested areas dominated by shrubs, and conifer stands providing cover. Their study area has high levels of timber harvest as well as oil and gas exploration, with forest harvest edge accounting for about 52 percent of all edges. Although they did not observe displacement, they cautioned that use of edges created by humans can result in higher mortality risk to grizzly bears. Therefore, they recommended limiting access to habitat that is heavily selected by bears during the fall ungulate hunting season when human use is extensive and grizzly bear mortality from human self-defense or illegal kills is highest (Stewart et al., 2013).

Mace and others (1999) also described the seasonal relationship between vegetation, human activity, and habitat use by female grizzly bears, considering all land ownerships, in their Swan study area. During spring, female grizzly bears used low-elevation habitats, where winter snow melted first and succulent vegetation favored by bears appeared. These lower-elevation habitats also contained most of the human activities and roads, so reductions in habitat use from potential were highest during spring. Areas with a high density of high traffic-volume roads were strongly avoided, and no bears were observed near high-impact human activity points. These authors suggested that there is value in road closures aimed at minimizing traffic on roads within important seasonal habitats (R. D. Mace et al., 1999).

Ruby (2014) studied grizzly bear habitat use along Montana Highway 83 in the Swan Valley and found that grizzly bears exhibited little negative selection for high open road densities within the Swan Valley study area. The study area has forest roads and residences relatively well distributed throughout the valley bottom intermixed with quality bear habitat. Ruby (2014) used location data from 24 grizzly bears instrumented with GPS collars using the Swan Valley of the Forest from 2000 to 2011 to characterize grizzly bear movement and habitat-use patterns. Use of GPS collars enabled grizzly bears to be tracked on a 24-hour basis. Ruby found that grizzly bears use high-quality habitats around human development and are not completely displaced. Rather, bears adopted movement patterns in close proximity to open roads and homes so that they were active during nighttime when human activity was lowest. Although human activity associated with human site development in the rural landscape of the Swan Valley did not affect habitat selection, Ruby noted that it can result in human encounters resulting in grizzly bear mortality or management-related removals from the population (S. E. Nielsen et al., 2004; Ruby, 2014; C. C. Schwartz et al., 2010). Where resources are not limiting, grizzly bear movement patterns that avoid periods of human activity may be an important strategy for limiting mortality risk to grizzly bears.

Table 30 and Figure 5 display the approximate forestwide acres and trend of timber harvest from 1960 through 2012 (USDA, 2014b). Commercial timber harvest has affected a total of approximately 17 percent of the NFS lands on the Flathead National Forest. In total, about 46 percent (304,750 acres) of the suitable land base on the Forest has been affected by commercial timber harvest since the 1940s. Though some harvest records date back to 1918, it wasn't until the early 1940s that harvesting on NFS lands became more prevalent and accurate record-keeping began.

Table 30. Acres of NFS lands affected by commercial harvest activity by decade.

Decade of Harvest	Intermediate Harvest[1] (acres)	Regeneration Harvest[2] (acres)	Total Acres
< 1950	854	4,721	5,575
1950-1959	6,567	21,626	28,193
1960-1969	15,943	63,162	79,105
1970-1979	32,530	67,729	100,259
1980-1989	19,538	64,296	83,834
1990-1999	10,318	33,107	43,425
2000-2012	28,176	25,679	53,855
Total	113,927	280,320	394,247

[1] Intermediate harvest = removal of portion of the trees in a stand (e.g., commercial thin, overstory removal cut, salvage cut)

[2] Regeneration harvest = removal of nearly all the trees in the stand (e.g., clearcut, seedtree cut, shelterwood cut)

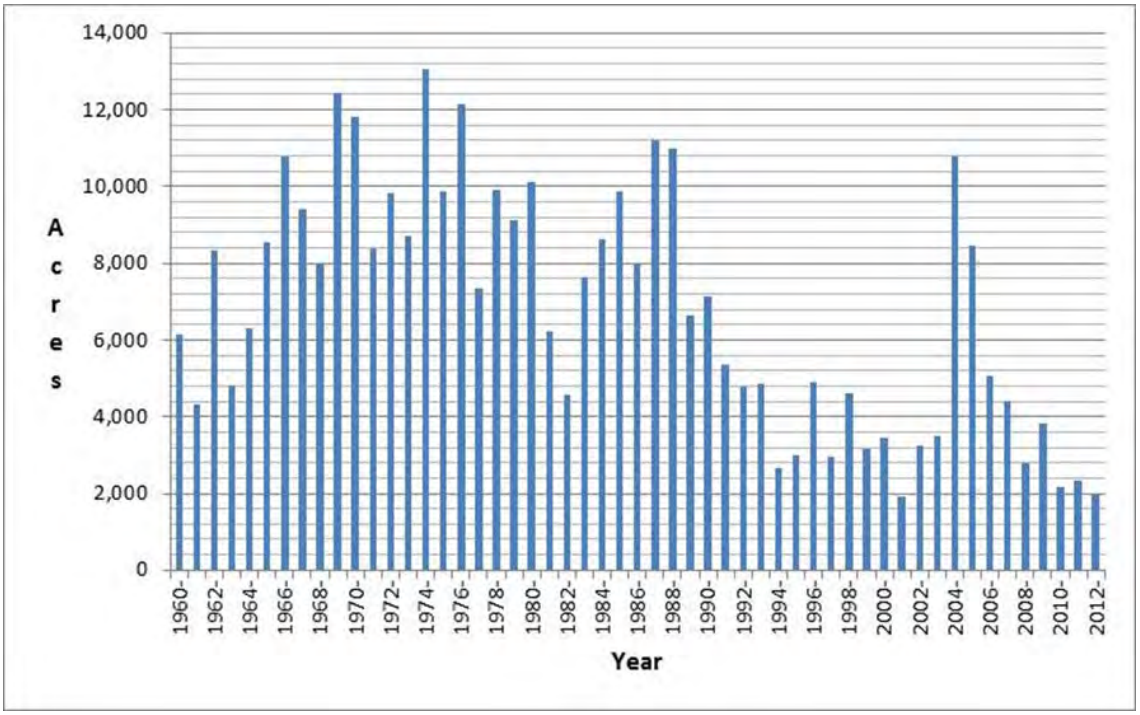


Figure 5. Approximate acres of past commercial timber harvest on the Forest by year from 1960-2012.

Table 31 displays the approximate acres harvested for each of the six geographic areas on the Flathead National Forest from 1960-2012. The majority of the Salish geographic area, where the highest amount of timber harvest has occurred, is outside of the grizzly bear primary conservation area.

Table 31. Approximate acres and percent of NFS lands affected by commercial harvest activity by geographic area (GA) 1960-2012

GA	Total NFS lands in GA (acres)	Sum of Harvest Acres (percent)
Hungry Horse	286,234	67,943 (24%)
South Fork	789,074	14,287 (2%)
Middle Fork	370,156	7,367 (2%)
North Fork	320,004	82,219 (26%)
Salish Mountains	262,859	122,016 (46%)
Swan Valley	364,440	100,415 (28%)
Total	2,392,807	394,247 (16%)

The Interagency Grizzly Bear Guidelines addressed vegetation management activities, and these guidelines were incorporated into the 1986 Flathead Forest plan for timber management in grizzly bear management situations 1 and 2, which has guided management for the last 30 years. The draft GBCS (USFWS, 2013c) includes many similar strategies for vegetation management that are designed to increase grizzly bear foods, limit the impacts of road use associated with projects, and protect seasonally important habitats. Grizzly bear distribution is known to have expanded since 1992.

Management direction for vegetation management is described in the preferred alternative and analyzed in the section of this biological assessment on effects of the framework programmatic action.

Grizzly bear habitat and leasable, locatable, and salable mineral activities

Mineral and oil and gas development have the potential to increase grizzly bear mortality risk from associated motorized use, habituation, and/or increased grizzly bear-human encounters and conflicts. Permanent habitat loss, habitat fragmentation, and displacement from habitat may also occur.

Management of mineral and energy resources has been defined by federal laws, regulations, and legal decisions. Thus, certain laws, regulations, and polices pertain to specific mineral and energy resource types. The land status of a specific location further dictates the applicable laws, regulations, and policy. The mineral and energy resource authority to manage lands within NFS lands is jointly shared by the Department of Interior (Bureau of Land Management) and the Department of Agriculture (Forest Service).

The three systems that govern federal mineral and energy resources from NFS lands include the mining, salable and leasing laws and regulations. The mineral or energy resources falling within each system are known as locatable, salable, and leasable. The Forest Service has management authority over the surface resource impacts resulting from locatable mineral activity and has full discretionary authority over disposal of salable mineral material. For leasable commodities on NFS lands, the BLM issues all leases with Forest Service consent. Locatable mineral development refers to surface and underground hardrock mining of metallic minerals and nonmetallic minerals. Salable minerals include materials such as common varieties of sand, stone, and gravel. Leasable mineral development includes the production of materials such as oil and natural gas.

Locatable Minerals: Currently, there are no authorized locatable mineral activities such as exploration or development operations for locatable minerals within the boundaries of the Flathead National Forest planning area. Based on the results of a February 2, 2014, query of the BLM mining claim database, one active mining claim (MMC195448) is located within the planning area. The Mary Dee II lode claim is located in the Hungry Horse geographic area. The Forest has low potential for locatable minerals as displayed in Figure B-35.

Saleable Minerals: The Forest's use of mineral material, such as gravel, riprap, and crushed aggregate includes maintenance and/or new construction of roads, recreation sites, and trailheads. Other uses include Forest contract work (i.e., timber sales), culvert replacement, and repair of damage caused by fire, floods, and landslides. The mineral material utilized by the Forest is primarily derived from Forest Service pits and quarries located in the planning area. The type, volume, and source location of in-service mineral material varies year by year according to need. In addition, free use permits (FUPs) can be issued to state or federal agencies, municipalities, county road districts, nonprofit associations, or individuals (36 CFR 228.57). For example, the Forest has issued free-use permits to Flathead County for maintenance and improvement of the North Fork Road. The Forest issued 78 FUPs in 2013.

Leasable Minerals: The production of oil and natural gas is conducted through a leasing process. Forest plan standards and guidelines provide guidance for authorizations and stipulations that are determined at the project level. At this time, there is no leasable mineral exploration or development on the Forest. The BLM suspended the oil and gas leases in 1985 after the Conner v. Burford district court decision (Conner v. Burford, 605 F.Supp. 107 [D.Mont.1985]) (Figure B-36). The court found the environmental "effects analysis" supporting lease issuance on the Flathead National Forests to be inadequate. The court specified that no activity could take place on the leases until an environmental impact statement (EIS) is completed. The 9th Circuit Court of Appeals upheld the district court decision to require an EIS prior to any post-leasing activities in a January 13, 1988, decision, as amended July 1, 1988.

The Forest has low potential for locatable minerals and low to high potential for leasable minerals. However, most NFS lands on the Forest are withdrawn from mineral entry (Figure B-37). The type of lands withdrawn from mineral entry and leasing in the Flathead National Forest plan area include:

- administrative sites such as campgrounds;
- Forest lands within the boundaries of a ski area permit;
- the Bob Marshall, Great Bear, and Mission Mountains Wilderness Areas;
- sections of the North, South and Middle Forks of the Flathead River.
- portions of the Forest withdrawn from mineral development by the North Fork Watershed Protection Act of 2013

Withdrawal of these large areas reduces the risk of grizzly bear habitat loss, disturbance, displacement, and mortality. All withdrawals are subject to valid existing rights. The Forest Service does not have the discretion to deny the exercise of an outstanding mineral right. However, the developer does not have unrestricted rights, as the developer's rights are limited to use only as much of the surface as is reasonably necessary to explore, develop, and transport materials. The developer must provide an operating plan to the Forest, and the Forest has some ability to manage surface resources. FSM 2832 provides direction for administration of an outstanding mineral right (source of minerals information is volume 2 of the Flathead National Forest assessment (USDA, 2014b), as updated by the 2015 leasing withdrawal).

Management direction for minerals is described in the preferred alternative and analyzed in the section of this biological assessment on effects of the framework programmatic action.

Trends at the NCDE scale

In its 5-year status review in 2011, the USFWS explained that the IGBC was created in 1983 to coordinate and implement management efforts across multiple federal lands and different states within the various recovery zones. Since 1986, national forest and national park plans have incorporated the guidelines (IGBC, 1986) to manage grizzly bear habitat in the lower 48 states. The guidelines defined five management categories for Federal lands within which grizzly bear habitat could be managed differently depending on its importance to the population. These different management categories favored grizzly bear uses over human uses to varying degrees while emphasizing actions that contributed to recovery and conservation (IGBC, 1986).

The USFWS concluded that management improvements made as a result of the guidelines include but are not limited to (1) federal and state agency coordination to produce nuisance bear guidelines for quick response, resolution, and minimization of grizzly bear/human confrontations; (2) reduced motorized access route densities through restrictions, decommissioning, and closures; (3) highway design considerations to facilitate population connectivity; (4) closure of some important habitat areas to all human access in national parks or tribal wilderness areas during certain seasons that are particularly important to grizzlies; (5) closure of many areas to oil and gas leasing, or implementing restrictions such as no surface occupancy; (6) reduction and/or elimination of sheep allotments; and (7) expanded education programs to reduce the number of grizzly mortalities caused by preventable grizzly bear/human conflicts.

Overall, adherence to the guidelines has changed land management practices on federal lands to increase security and to maintain or improve habitat conditions for the grizzly bear. The USFWS stated that the issue of human population growth is best addressed through access management, limitations on site development, and educational outreach. The USFWS stated, “With these mitigation measures in place, we do not consider human population growth to be a threat to grizzly bear populations in the lower 48 States” (USFWS, 2011c, p. 36).

Timber harvest has decreased on all five national forests within the NCDE from approximately 450 million board feet in 1975 to 100 million board feet in recent years (2003-2008). There are currently 31 oil and gas leases within the NCDE: 30 on the Lewis and Clark National Forest and 1 on the Helena National Forest. In 1997, the Lewis and Clark National Forest decided to no longer allow surface occupancy for oil and gas. In 2006, these lands on the Lewis and Clark National Forest and some areas of the Flathead National Forest were permanently withdrawn from any future leasing under the mining laws and mineral leasing laws by Public Law 109-432, the Tax Relief and Health Care Act of 2006.

In the NCDE as a whole, there are 23 BMUs and 126 BMU subunits. In 2008, the average portion of each subunit in the NCDE containing OMAD greater than 1 mile per square mile was 14 percent; the average portion of each subunit containing TMAD greater than 2 miles per square mile was 14 percent; and an average of 70 percent of each subunit provided security core habitat (USFWS, 2011c). Access conditions in the recovery zone/primary conservation area continued to improve since 2008.

Climate change

On October 6-7, 2009, the Wildlife Conservation Society and the USFWS held a workshop entitled "Climate Change Impacts on Carnivores in the Northern U.S. Rockies: Strategies for Conservation." Participants included a diverse group of scientists and managers from government agencies, universities, and conservation science non-governmental organizations, including MFWP, Idaho Fish and Game, U.S. Forest Service, U.S. Geological Survey, USFWS, National Park Service, Wildlife Conservation Society, The Nature Conservancy, National Wildlife Federation, and the University of Montana.

Participants discussed the relationship between the rate of climate change, the types of change in bear foods and habitats that might result from these changes, and the ability of bears to adjust their food habits and perhaps seasonal ranges. It was hypothesized that a more rapid rate of change could challenge adaptive success but that this could vary depending on the particular food economies used by individual bears.

The group of workshop participants recommended monitoring potential effects of climate change on grizzly bears and the every-changing availability of bear foods by monitoring grizzly bear body condition using methods such as stable isotope analysis and body fat measurements. Teisberg and others (2015) studied grizzly bear population health and body condition and concluded that grizzly bears in all regions of the NCDE exploit diverse combinations of food items to arrive at productive body conditions (Teisberg et al., 2015). The draft GBCS states that monitoring would be conducted to assess the adequacy of food production and the types of foods grizzlies use across the landscape each year by monitoring grizzly bear body condition and food habits using the most appropriate and available technology.

Nielsen and others (2013) evaluated the importance of six different factors on springtime body size patterns in grizzly bears of Alberta, Canada. The six factors we examined were (1) regional habitat productivity, (2) inter-annual variability in productivity, (3) habitat quality, (4) human footprint and activity, (5) rate of landscape change, and (6) density dependence. The authors stated, "Given the short season associated with high-alpine environments, such as the Rocky Mountains in Alberta, we hypothesize that individuals with a limited growing season and temperature-limited ecosystems, such as interior grizzly bears, might actually benefit from increases in season length associated with climate change. This prediction is largely consistent with observed body size and seasonality patterns in grizzly bears across North America, but may be dependent on sufficient snow cover during the denning period" (Scott E. Nielsen et al., 2013)

With respect to shifts in the denning season, the draft NCDE grizzly bear conservation strategy defined denning season dates and stated that dates will be adjusted if the 10-year average den emergence data for

females or females with offspring shows a shift of at least a week. Denning in the NCDE has been monitored and the analysis of effects of alternatives on denning habitat uses modeled denning habitat provided by Mace (2014), which is the best available scientific information.

Reduced snowpack or shorter winter season could improve over-winter survival of bears, assuming that sufficient bear foods are available later in the fall and earlier in the spring. However, a shorter denning period could increase the potential for spring and fall encounters between grizzly bears and hunters and/or recreationists, which in turn would increase the risk of mortality to grizzly bears.

The extent of and rate at which individual plant species or plant communities will be impacted by climate change is difficult to foresee with any level of confidence (Fagre, Peterson, & Hessl, 2003; Walther et al., 2002). However, there is general consensus that grizzly bears are flexible enough in their diet that they will not be impacted directly by plant community changes in response to climate change (Servheen & Cross, 2010).

Fire frequency and severity are predicted to increase in the western United States as a result of climate change. Large, uncharacteristically severe wildfires that convert mature forest to early successional condition alter the availability of grizzly bear foods and cover, potentially changing how bears use the landscape. Decreases in forest cover could benefit grizzly bears by increasing the production of shrubs, berries, and root crops in the years following large fires (Blanchard & Knight, 1996).

The potential positive and negative effects of climate change would likely be variable across the ecosystem and are difficult to predict. Grizzly bears are habitat generalists and opportunistic omnivores, which may make them less susceptible to changes in plant communities than some other species of wildlife. The high degree of uncertainty emphasizes the importance of long-term monitoring of the grizzly bear population so that any necessary adjustments can be made.

The draft GBCS states, “Most grizzly bear biologists in the U.S. and Canada do not expect habitat changes predicted under climate change scenarios to directly threaten grizzly bears . . . . These changes may even make habitat more suitable and food sources more abundant. However, these ecological changes may also affect the timing and frequency of grizzly bear/human interactions and conflicts (Servheen & Cross, 2010)” (p. 92).

Effects of the framework programmatic action

One of the ways in which the Forest Service provides guidance for the conservation of federally listed species and their habitats is through the forest plans, which provide a programmatic framework for management. This can be a particularly effective approach for wide-ranging species such as the grizzly bear. Updating forest plans with the habitat-related elements in the conservation strategy that are relevant to management of NFS lands would provide a consistent set of management direction across the national forests in the NCDE recovery zone/primary conservation area. The Flathead National Forest’s revised plan incorporates this consistent set of management direction but also makes other changes to the Forest’s management direction that are assessed for their effects. A separate biological assessment for the amendment forests (Helena-Lewis and Clark, Kootenai, Lolo) also assesses effects on the NCDE grizzly bear population.

For purposes of the Endangered Species Act, “effects of the action” refers to the effects of the programmatic framework detailed in the revised forest plan for the Flathead National Forest on the species and/or its designated critical habitat. The environmental baseline includes the past and present impacts of actions and human activities in the action area, considering the anticipated impacts of proposed

federal projects in the action area that have already undergone section 7 consultation, and the cumulative impact of state or private actions that are contemporaneous with the consultation in process.

This section considers the effects to the NCDE grizzly bear population and its habitat as guided by the plan components (desired conditions, objectives, standards, and guidelines applied forestwide, to management areas and/or to geographic areas). This analysis addresses how the specific components targeted for grizzly bear (appendix D), as well as key plan components not targeted for the grizzly bear, have the potential to affect its persistence and recovery. Monitoring items will help make the plan adaptive.

As is typical of forest plans, this revised forest plan does not prescribe site-specific actions, so this document does not provide an analysis of site-specific projects. Because this is a broad-scale analysis of actions that could potentially result in effects on the grizzly bear and its habitat, the Flathead National Forest is responsible for section 7 consultation on future projects (conducted under the revised forest plan) while the grizzly bear remains a listed species. The revised plan is intended to provide the regulatory framework that would apply on NFS lands in the NCDE for grizzly bears if and when the bear is delisted.

Key indicators for analysis

The Grizzly Bear Recovery Plan (USFWS, 1993) identified adequate effective habitat as the most important element in grizzly bear recovery. Effective habitat is a reflection of an area's ability to support grizzly bears based on the quality of the habitat and the type/amount of human disturbance associated with it. Effective habitat allows for sufficient space for grizzly bears to roam and use available habitats. The draft NCDE GBCS (USFWS, 2013c) provides a management framework that identifies different levels of emphasis by management zone. Six key habitat features and conditions associated with human activities with the greatest potential to impact grizzly bears are identified in the draft conservation strategy. These are (1) the amount and distribution of secure core habitat, (2) motorized route densities, (3) developed recreation sites, (4) livestock allotments, (5) vegetation management, and (6) mineral and energy development.

To assess key habitat features and conditions, key indicators for analysis of effects of the revised forest plan for the Flathead National Forest related to risk factors and habitat effectiveness are displayed Table 32.

Table 32. Key indicators for assessing effects to grizzly bears

Resource Element	Indicator
Grizzly bear habitat security—influence on habitat quality/availability in the primary conservation area	Percentage of each bear management unit subunit in secure core, percent with open motorized route density more than 1 mi/mi^2, and percent with total motorized route density more than 2 mi/mi^2 during the non-denning season. Potential impacts due to temporary reductions to allow for projects or administrative use.
Grizzly bear habitat diversity and climate change	Forestwide plan components for aquatic and terrestrial ecosystems
Grizzly bear habitat connectivity	Forestwide plan components that support habitat connectivity
Vegetation management and human-caused disturbance/ displacement	Forestwide plan components to minimize adverse effects of vegetation management in the primary conservation area

Resource Element	Indicator
Recreation activities and the potential for disturbance or grizzly bear–human conflicts	Plan components to limit the number and capacity of sites with overnight use in the primary conservation area and limit grizzly bear-human conflicts Forestwide food storage orders Forestwide plan components to reduce the risk of disturbance and grizzly bear-human conflicts
Livestock grazing allotments—potential for conflicts or mortality risk	Plan components to limit the number of cattle allotments and history of conflicts within primary conservation area, zone 1, and the DCA
Oil, gas and mineral development—potential habitat loss, disturbance/displacement, mortality risk, grizzly bear-human conflicts	Mineral withdrawals, no surface occupancy stipulations, potential for development in the PCA and zone 1, forestwide plan components to minimize adverse effects

Summary of effects of forestwide plan components

Under the existing forest plan, the Interagency Grizzly Bear Guidelines (1986) are applied to the portion of the Flathead National Forest located within the NCDE recovery zone. About 99 percent of the acres within the recovery zone on the Forest are management situation 1 or 2, which gives the most stringent protection to grizzly bear habitat and about 1 percent are management situation 3, which gives more consideration to human uses and development (1986 forest plan appendix OO). Management of grizzly bears outside the recovery zone has been addressed through site-specific consultation.

Under the revised forest plan, the recovery zone/primary conservation area totals about 90 percent of the total Forest area. Areas that were previously outside the recovery zone/primary conservation area would be designated as zone 1 (totaling about 10 percent of the total Forest area). Zone 1 includes the Salish demographic connectivity area (Figure B-5).

Under the proposed action, specific reference to the Interagency Grizzly Bear Guidelines, including the delineation of management situations, would no longer be part of the revised forest plan. However, much of the existing forest plan management direction that is based on the Interagency Grizzly Bear Guidelines would be retained, as shown in appendix D. Similarly, previous amendments to the forest plan (e.g., amendments 19 and 24) would no longer be part of the revised forest plan, but many of the past actions that have created the current environmental baseline would be retained, such as the attractant storage orders and standards for "no net change" to the baseline (see NCDE glossary in appendix D) for open motorized access density, total motorized access density, motorized effects to secure core habitat, linear road density in zone 1, and motorized over-snow use) as well as administrative use of restricted roads. Additional desired conditions, standards, guidelines, and monitoring items would be added for vegetation, connectivity, recreation, livestock grazing, and minerals (including those for zone 1 in the Salish Mountains geographic area). In summary, the forest plan revision would add components (desired conditions, objectives, standards, guidelines, and monitoring items) aimed at maintaining conditions that contribute to supporting recovery of the NCDE grizzly bear population and providing connectivity with other grizzly bear recovery zones. Effects of the proposed action (alternative B modified) are described in detail in the following sections.

Grizzly bear habitat security

Primary conservation area

Desired condition NCDE-DC-IFS-01 would establish the intent to manage open motorized route density, total motorized route density, and secure core in a manner that contributes to sustaining the recovery of

the NCDE grizzly bear population. Three key standards and two key guidelines would implement this desired condition.

Forestwide standard FW-STD-IFS-02 would maintain on-the-ground conditions that have contributed to the growth and expansion of the NCDE grizzly bear population. FW-STD-IFS-02 states, "In each bear management subunit within the NCDE primary conservation area, there shall be no net decrease to the baseline (see glossary) for secure core and no net increase to the baseline for open motorized route density or total motorized route density on National Forest System lands during the non-denning season (see NCDE glossary in appendix D). The following conditions are not considered a net increase/decrease from the baseline:

- administrative use (see NCDE glossary in appendix D);
- temporary use of a motorized route for a project (see "project (in grizzly bear habitat in the NCDE)" that meets the conditions stipulated in FW-STD-IFS-03);
- mining activities (as authorized under the Mining Law of 1872) and oil and gas activities (as authorized under the Federal Onshore Oil and Gas Leasing Reform Act of 1987) conducted in accordance with valid existing rights and applicable standards and guidelines listed under NCDE-MIN;
- updated/improved data on a motorized route without an actual change on the ground;
- changes in technology or projections resulting in changed open motorized route density, total motorized route density, or secure core values without actual change on the ground (e.g., a switch the North American Datum of 1927 to the North American Datum of 1983 geodetic reference system);
- a road closure location is moved a short distance to a better location (e.g., to the nearest intersection or turnout) to allow a turn-around providing for public safety, to reduce vandalism, or to improve enforcement of the closure;
- the agency exchanges, acquires, buys, or sells lands with motorized routes;
- a change in a motorized route is necessary to comply with federal laws;
- a change in a motorized route is necessary to address grizzly bear-human conflicts, human safety concerns, or resource damage/concerns (e.g., a road paralleling a stream may be decommissioned and replaced by a new upslope road to reduce water quality impacts);
- a change is made by an adjacent non-federal landowner that decreases the percentage of secure core or increases OMRD or TMRD values on adjacent national forest;
- use of a motorized route for emergency situations as defined by 36 CFR 218.21;
- temporary roads (see NCDE glossary in appendix D).

During the time period that the NCDE grizzly bear population was growing and expanding in distribution, changes to OMAD, TMAD, and security core percentages occurred as a result of the items listed in the bullets above under FW-STD-IFS-02 (USDA, 2014a, 2016a). Many of these changes in numbers resulted in no change in on-the-ground conditions for grizzly bears or were minor or short-term changes. For example, the Forest has had temporary changes in OMAD, TMAD, and security core numbers for emergency situations such as wildfires, but the baseline numbers in the grizzly bear subunit were subsequently restored. When the Forest acquired the Legacy lands in the Swan Valley, OMAD and TMAD numbers increased and security core numbers decreased, even though conditions had not changed on the ground. With standard FW-STD-IFS-02, the Forest is clarifying that these situations do not result

in a net change to baseline habitat conditions for the grizzly bear population. The Forest is also clarifying its definitions of roads with respect to on-the-ground conditions for grizzly bears.

The draft grizzly bear conservation strategy also adopted new procedures for calculation access density. With the proposed action, high-use nonmotorized trails would no longer be deducted from security core percentages (see section on nonmotorized trails for the rationale). Table 33 provides a comparison of security core with a deduction for high-use trails included in the percentages and secure core, with no deduction for high use trails.

Table 33. Comparison of grizzly bear habitat security percentages with and without deductions for high use non-motorized trails.

Subunit Name	Security Core Percentage	Secure Core Percentage
Albino Pendant	88	100
Big Salmon Holbrook	87	100
Black Bear Mud	84	100
Brushy Park	85	100
Buck Holland	40	49
Burnt Bartlett	92	100
Hungry Creek	88	100
Little Salmon Creek	98	100
White River	74	100
Big Bill Shelf	80	87
Gorge Creek	90	100
Harrison Mid	95	99
Lion Creek	41	51
Pentagon	94	100
Silvertip Wall	97	100
Wounded Buck Clayton	65	66
Dickey Java	81	85
Stanton Paola	81	83
Glacier Loon	48	52
Jewel Basin Graves	68	75
Swan Lake	45	46
Flotilla Capitol	99	100
Plume Mtn Lodgepole	97	100
Tranquil Geifer	85	90
Basin Trident	85	100
Gordon Creek	82	100
Jumbo Foolhen	89	100
Youngs Creek	92	100

This change in the calculation of percentages does not result in a change in on-the-ground conditions for the grizzly bear. As shown in Figure B-28, many of the high-use nonmotorized trails in the NCDE are in Glacier National Park or in wilderness areas. Additionally, calculations of grizzly bear management subunit percentages for open motorized access density and total motorized access density under

amendment 19 did not include management situation 3 lands, but these lands are now included in calculations. Roads that meet the definition of impassable do not count in TMRD calculations (see road categories in the NCDE glossary, appendix D). To avoid confusion, the draft GBCS uses the terms open motorized route density (OMRD), total motorized route density (TMRD), and secure core to reflect the revised definitions and calculation procedures. We have adopted the same terminology and procedures for discussing the effects of the proposed action for the forest plan revision.

The proposed action, alternative B modified, would apply to all 73 bear management subunits on the Forest. Table 34 shows OMRD, TMRD and secure core percentages for all 73 subunits with Flathead National Forest lands; 63 of these now have greater than or equal to 75% NFS lands and 10 (shaded in the table) have less than 75% NFS lands. Some subunits have projects that are nearing completion and others have gone through recent consultation but are not yet near completion. The draft grizzly bear conservation strategy identified the baseline as a subunits access conditions as of December 31, 2011 but also recognized that the percentage calculations would be updated. As outlined in FW-STD-IFS-02, there may be changes in percentages with no change in on-the-ground conditions (e.g. due to updates in the data recorded in various databases, spatial re-alignments of GIS layers, a change in a motorized route by another landowner, and/or acquisition of lands by the Forest Service). As outlined in FW-STD-IFS-02, these changes can cause an increase in OMRD or TMRD percentages or a decrease in the secure core percentage with no on-the ground change. In these instances, the baseline percentages are updated, but are not considered a net increase in OMRD or TMRD nor a decrease in secure core. On-the-ground changes due to implementation of projects that have gone through consultation with the USFWS also update the baseline, as specified in FW-STD-IFS-02. In most cases, changes due to implementation of projects that have gone through consultation have resulted in improved on-the-ground conditions for grizzly bear habitat security. The exception is the Werner Creek subunit, where a decision was made to seasonally open a gated road following consultation, increasing the open motorized access density. Of the 73 Flathead National Forest subunits, 41 would meet all three motorized access percentages and 28 have had a percentage value change of 1 percent or more since 2011 (see table 34).

Based upon definitions and procedures for calculations under the revised forest plan, the summary of baseline access conditions across the Forest is as follows (existing condition, with decisions that have gone through recent consultation but are not yet fully implemented shown in parentheses):

- 16 (17) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have greater than 19% OMRD

- 10 of 10 subunits where NFS lands are less than or equal to 75% of total subunit acres have greater than 19% OMRD

- 16 (17) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have greater than 19% TMRD

- 9 of 10 subunits where NFS lands are less than or equal to 75% of total subunit acres have greater than 19% TMRD

- 20 (21) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have less than 68% secure core

- 10 of 10 subunits where NFS lands are less than or equal to 75% of total subunit acres have less than 68% secure core

Table 34. Status of motorized access for the proposed action. status of Motorized Access for NCDE BMU Subunits.

Subunit Name	OMRD Percentage	TMRD Percentage	Secure Core Percentage
Albino Pendant	0	0	100
Big Salmon Holbrook	0	0	100
Black Bear Mud	0	0	100
Brushy Park	0	0	100
Buck Holland	24	41	49
Burnt Bartlett	0	0	100
Hungry Creek	0	0	100
Little Salmon Creek	0	0	100
Meadow Smith	20 (18)	54 (53)	42
White River	0	0	100
Big Bill Shelf	11	6	87
Bunker Creek	5	3	92
Goat Creek	23	59	39
Gorge Creek	0	0	100
Harrison Mid	1	0	99
Jungle Addition	19	19	68
Lion Creek	18	47	51
South Fork Lost Soup	25	47	37
Spotted Bear Mountain	19	18	68
Pentagon	0	0	100
Silvertip Wall	0	0	100
Strawberry Creek	0	0	100
Trilobite Peak	0	0	100
Coram Lake Five	30	46	14
Doris Lost Johnny	57	20	36
Emery Firefighter	19	20 (19)	58 (68)
Peters Ridge	52	25	34
Riverside Paint	18	16	71
Wounded Buck Clayton	28	30	66
Dickey Java	9	0	85
Moccasin Crystal	8	1	81
Stanton Paola	8	3	83
Canyon McGinnis	18	31	50
Cedar Teakettle	35	36	24
Lower Big Creek	18	19	71
Werner Creek	29	20	63
Beaver Creek	6	26 (25)	66
Cold Jim	18	57 (54)	43 (44)
Crane Mountain	28	53	25
Glacier Loon	22	41	52

Subunit Name	OMRD Percentage	TMRD Percentage	Secure Core Percentage
Hemlock Elk	6	30	64
Piper Creek	19	45	55
Porcupine Woodward	27	74	15
Lazy Creek	68	62	10
Stryker	37	33	50
Upper Whitefish	34	57	54
Ball Branch	8	12	84
Jewel Basin Graves	20	19	75
Kah Soldier	19	19	68
Logan Dry Park	30	36	51
Lower Twin	9	2	92
Noisy Red Owl	20	13	59
Swan Lake	40	23	46
Twin Creek	0	0	100
Wheeler Quintonkon	25	19	68
Flotilla Capitol	0	0	100
Long Dirtyface	0	0	100
Plume Mtn Lodgepole	0	0	100
Skyland Challenge	20	17	65
Tranquil Geifer	0	2	90
Coal & South Coal	15	19	73
Frozen Lake	10	4	86
Hay Creek	25	16	55
Ketchikan	14	3	73
Lower Whale	36	17	50
Red Meadow Moose	25	17	68
State Coal Cyclone	29	25	58
Upper Trail	14	4	88
Upper Whale Shorty	12	11	86
Basin Trident	0	0	100
Gordon Creek	0	0	100
Jumbo Foolhen	0	0	100
Youngs Creek	0	0	100

Further reductions in motorized access would not be required in the future, so there may be negative effects on individual bears, particularly females, due to disturbance, displacement, or mortality risk. Although additional road closures are not required by the grizzly bear standards, the Forest has a forestwide objective (FW-OBJ-IFS-01) to decommission an additional 30-60 miles of roads or place them into intermittent stored service (see glossary) to meet multiple resource goals. This objective would improve access conditions for grizzly bears. Available information documents increases in grizzly bear distribution, population size, and genetic diversity. The estimated population size was 765 bears in 2004 (Kendall et al. 2009), more than double the target of 391 bears based on sightings of females with cubs.

Occupancy of bear management units has been documented (Costello et al. 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al., 2016; Mikle et al., 2016), even though 19 percent OMAD, 19 percent TMAD, 68 percent security core has not been met in every BMU subunit. Habitat security conditions would be monitored by the Forest, and the grizzly bear population would be monitored by MFWP.

Another standard addresses temporary changes in road densities due to projects. It would allow temporary changes in road access due to projects within a bear management subunit, up to a limit of 5 percent increase in OMRD, 3 percent increase in TMRD, and 2 percent decrease in secure core calculated by a 10-year running average (see FW-STD-IFS-03 for details). Each project should be planned so that implementation does not exceed 5 years (see NCDE-GDL-IFS-01 for details), and pre-project road access conditions would generally be restored within 1 year of project completion (see NCDE-GDL-IFS-02 for details). These are guidelines because, for example, Forest Service timber contracts allow extension of contract term lengths under specific conditions. Compliance with these guidelines would be monitored and reported (see monitoring items in appendix D).

Most of the activities that qualified as "projects in grizzly bear habitat" have been timber harvest projects and associated activities. The temporary changes allowed to OMRD, TMRD, and secure core under FW-STD-IFS-03 are based on an analysis of six projects on federal land. This includes five projects that occurred on the Flathead National Forest and one on the Lolo National Forest, affecting 18 subunits. The projects were reviewed and allowed through consultation with the USFWS. Projects included post-fire salvage, timber harvest, and use of closed roads. They occurred between 2003 and 2010, a period during which the NCDE grizzly bear population is known to have been increasing (Costello et al., 2016; Katherine C. Kendall et al., 2009; R. D. Mace et al., 2012). Therefore, the duration of these projects and the associated increases in OMRD and TMRD are believed to be compatible with an increasing grizzly bear population in the NCDE. During the life of these six federal projects, the OMRD temporarily increased an average of 5.4 percent, the TMRD temporarily increased an average of 2.9 percent, and the secure core temporarily decreased by 2 percent.

Although the standards above would allow temporary changes in habitat security due to projects, including some activities in secure core, there would be no temporary decreases in secure core due to vegetation management projects over most of the recovery zone/primary conservation area. The Forest has about 1.7 million acres in secure core habitat and only about 12 percent of secure core is likely to have temporary changes because it is outside of wilderness and inventoried roadless areas, so high levels of habitat security would continue to be maintained (see table 35 and

Figure B-29 for grizzly bear secure core). In addition, with the proposed action, some of the inventoried roadless areas would be added as recommended wilderness where timber harvest would not be allowed (see discussion in management area section below).

Table 35. Primary conservation area, secure core, and temporary changes in habitat security due to projects

PCA and Secure Core	Alt. B modified
Acres in the primary conservation area on the Forest	2,124,316 acres
Acres in secure core habitat	1,672,877 acres
Percentage of secure core habitat where a temporary decrease in secure core may occur	12%

Based upon new procedures for calculations and temporary increases in the 10-year running average of 5%, 3% and 2% that may occur under the revised forest plan, the summary of subunits that meet 19-19-68

under the baseline but could exceed 19% OMRD, 19% TMRD or have less than 68 percent secure core on a temporary basis are as follows:

- 11 (12) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet 19% OMRD on a temporary basis.
- 10 (11) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet 19% TMRD on a temporary basis.
- 5 (6) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet 68% secure core on a temporary basis.
- 2 (3) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet all 3 numeric parameters on a temporary basis.
- 27 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have over 50% wilderness where it is anticipated that 19-19-68 would continue to be met and there would be few or minor temporary changes.

The proposed action also addresses administrative use. FW-STD-IFS-01 states, "Within the NCDE primary conservation area, motorized use of roads with public restrictions shall be permitted for administrative use (see glossary), as long as it does not exceed either 6 trips (3 round trips) per week *or* one 30-day unlimited use period during the non-denning season (see glossary). Exceptions to this standard include:

- Emergency situations as defined by 36 CFR 218.21.
- Note: Administrative use is not included in baseline calculations and is not included in calculations of net increases or decreases. If the level of administrative use exceeds this standard, the use is counted as a project (see "project (in grizzly bear habitat in the NCDE)".

During the time period that the NCDE grizzly bear population was growing and expanding in distribution, administrative use was allowed on gated roads if it met the criteria listed under standard FW-STD-IFS-01. Limited administrative use was also allowed in security core if it was necessary to remove culverts to improve habitat conditions for bull trout, following project-specific consultation. In most cases, it is not possible to do culvert work, road best management practice work, or weed control work during the denning season. In the past, if a subunit did not meet 19-19-68, gated roads had a "red lock" and administrative use was more restricted, but could still be approved by one of the Forest's decision-makers. Bermed and gated roads were also used for emergency purposes such as firefighting.

The Forest is clarifying that administrative use is needed to benefit multiple species and that the proposed action standard FW-STD-IFS-01 would allow administrative use on gated roads and also on roads in secure core habitat. Mace and others (1996, pp. 1395-1404)studied grizzly bear use of areas within a 0.5 kilometer (about 0.31 mile) influence zone of roads in the Swan Mountains of the Forest. Most grizzly bears exhibited either neutral or positive selection for this zone if it surrounded closed roads or roads receiving less than 10 vehicles per day, but avoided this influence zone if it surrounded roads having greater than 10 vehicles per day. The six trips per week that is allowed under administrative use is far less than the threshold of 10 vehicles per day reported by Mace and others, so disturbance to grizzly bears is expected to be minor. Unlimited use for one 30-day time period could disturb bears or cause avoidance in the affected area if it exceeded 20 vehicles per week, but this level of administrative use is unlikely and is administratively controlled by the Forest Service, and the total length of time a road can be temporarily opened for administrative use is restricted to a short period to minimize adverse impacts to grizzly bears. In contrast to public use, administrative use is authorized and managed by the Forest's decision-makers, so the risk of human-caused mortality to grizzly bears would be low.

By adding standards FW-STD-IFS-01 and FW-STD-IFS-03, allowances made for project implementation would permit some adverse impacts to individual bears as a result of human disturbance in a project area but would provide limits on the amount of disturbance per subunit as well as limit the duration of the disturbance. These impacts have been and would continue to be managed to provide for the needs of the grizzly bear. In addition, projects with temporary changes to OMRD, TMRD, or secure core will be monitored by the USFS (see monitoring items in appendix D), and the grizzly bear population will be monitored by MFWP. The forest plans are intended to be adaptive; they can be revised or amended in the future if monitoring indicates that changes to the allowable levels of temporary increases to TMRD or OMRD or temporary decreases to secure core are needed.

FW-STD-IFS-04 applies to temporary use of roads by the public. This standard states, "within the NCDE primary conservation area, a restricted road may be temporarily opened for public motorized use to allow authorized uses (such as firewood gathering), provided the period of use does not exceed 30 consecutive days during one non-denning season and occurs outside of spring and fall bear hunting seasons. However, temporary public use of a restricted road shall not be authorized in secure core (see glossary)." This standard would allow temporary use of restricted roads for motorized use by the public for purposes such as firewood gathering as long as it is not in secure core. There would be some increase in disturbance and the risk of grizzly bear mortality in areas outside of secure core, but the risk is minimized by limiting the duration and season when this could occur. Gated roads on the Forest have been temporarily opened for periods of up to 30 days to allow firewood gathering during the time period when the NCDE grizzly bear population was growing, with no apparent population-level effects.

Over the long term, the proposed action (alternative B modified) would maintain baseline levels of OMRD, TMRD, and secure core in the primary conservation area during the non-denning season that would provide for continued recovery of the NCDE grizzly bear population.

Zone 1

Grizzly bear demographic connectivity

For zone 1, the draft conservation strategy established a goal to maintain grizzly bear occupancy but at a lower density than in the primary conservation area. Zone 1 is not intended to provide core habitat for the NCDE grizzly bear population. Desired conditions for zone 1 emphasize connectivity and limiting the density of roads open to motorized public use. Within the portion of zone 1 defined as the Salish demographic connectivity area, the draft conservation strategy established a goal to provide for female grizzly bear occupancy and addressed genetic interchange with the Cabinet-Yaak Ecosystem. This goal is supported by the following desired conditions:

GA-SM-DC-01 Within the Flathead National Forest portion of NCDE zone 1 (including the Salish demographic connectivity area) (see figure B-01), roads provide for public and administrative access to National Forest System lands. The demographic connectivity area provides habitat that can be used by female grizzly bears and allows for bear movement between grizzly bear ecosystems.

GA-SM-DC-03 In areas between the primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. ***See also*** **FW-DC-LSU-01.** NFS lands in the Swift Creek-Stillwater connectivity area (see figure B-54) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges.

In recognition of the differing grizzly bear management objectives for Zone 1 and the demographic connectivity areas, a different method for analyzing the effects of motorized use during the non-denning

season was used, as explained in the affected environment section. A summary of the modeled threshold values, and how they were used in the analysis of effects for Zone 1, is shown in table 36 below.

Table 36. Linear road density analysis for zone 1

Objective described in the Alberta study (Boulanger & Stenhouse, 2014)	Reported density km/km^2	Converted tomiles/sq. mi.[2]	Where applied in the analysis
Grizzly bear presence – Distribution of collared bears shows most bears occurred in areas with road densities of 1.5 km/km^2 or less (p. 10)	1.5 km/km^2	2.4 mi/mi^2	Used to evaluate the ability to support occupancy and movement by grizzly bears of any age, sex, or reproductive status in zone 1.
Occupancy by females – Modeling results suggested that the threshold of road density depended heavily on assumptions. Adult females occupied habitat with road densities of 1.25 km/km^2 or less, unless higher mortality of females with dependent young is assumed.	1.25 km/km^2	2.0 mi/mi^2	Used to evaluate the ability of the Salish demographic connectivity area to support occupancy and movement by female grizzly bears. The Salish demographic connectivity is not intended to provide core habitat. Density calculation included both roads and trails open for public motorized use in the non-denning season.
Grizzly bear mortality risk – Most grizzly bear mortalities occurred at road densities greater than 1.0 km/km^2 except for adult males, whose mortalities occurred across all road densities (p. 10)	1.0 km/km^2	1.6 mi/mi^2	Used to evaluate grizzly bear mortality risk in the Salish demographic connectivity area. Density calculation included both roads and trails open for public motorized use in the non-denning season.

To be conservative, we analyzed the effects of both roads and motorized trails in zone 1, even though the study by Boulanger and Stenhouse did not include motorized trails. If both roads and motorized trails are included, the Salish demographic connectivity area has an open linear motorized route density of 1.5 miles per square mile as of 2015, below the modeled threshold of 2.0 miles per square mile needed for female occupancy, which is thus consistent with the goals of the draft grizzly bear conservation strategy. . Open road densities less than or equal to 1.6 mi/mi^2 not only supported occupancy but also provided lower levels of grizzly bear mortality in their study area (see table 36 and table 37). In the portion of zone 1 outside the Salish demographic connectivity area, the density of motorized routes open to public use is about 1.9 miles per square mile as of 2015, less than the modeled threshold of 2.4 miles per square mile that supports grizzly bear occupancy, but resulting in a higher risk of grizzly bear mortality. The standard would allow temporary increases in access for projects by Forest Service personnel and contractors, which may also result in disturbance, displacement or increased grizzly bear mortality risk to individual bears, but guidelines FW-TE&V-04, FW-GDL-WL-01 and 02 and contractual requirements would reduce this risk.

[2] Formula: 1 km = 0.6214 mi; 1 km^2 = 0.3861 mi^2

Table 37. Public open motorized access for all roads/trails on NFS lands (includes highways and county/city and private roads/trails) from the 2015 calendar year roads/trails dataset.

NCDE Management Zone	Open Roads (miles)	Motorized Trails (miles)	Total Miles	NFS Square Miles	Miles/Mile^2 Public Open Motorized Roads only	Miles/Mile^2 Public Open Motorized Roads and Trails
Zone 1, Salish DCA	217	14	231	150	1.4	1.5
Zone 1, outside DCA	338	64	402	212	1.6	1.9

In the last decade, MFWP has also translocated grizzly bears from the NCDE to the Cabinet-Yaak Ecocystem in order to facilitate genetic interchange. In recent years, the number of documented grizzly bear reports in the area outside the recovery zone/primary conservation area has been increasing as the population in the NCDE has increased. More grizzly bears are exploring new territory further to the west (R. D. Mace & Roberts, 2012). The proposed action would maintain the baseline linear density of open motorized routes that has supported a grizzly bear population that has expanded into areas outside the recovery zone/primary conservation area (see Figure B-17) and contributed to habitat connectivity.

Grizzly bear habitat connectivity

The proposed action would provide for grizzly bear habitat connectivity because it includes the following key plan components:

- Revised Forest Plan Appendix A: standards and guidelines for lynx connectivity and linkage areas ALL 01, ALL S1, ALL G1, LINK 01, LINK S1, LINK G1, G2 for Canada lynx;
- Plan components for riparian connectivity (desired condition FW-DC-WTR-02, suitability FW-SUIT-RMZ-01, standards FW-STD-RMZ-01, 05, 06; guidelines FW-GDL-RMZ-08, 09, 11 through 15);
- Plan components for vegetation connectivity (desired conditions FW-DC-TE&V-15, FW-DC-TE&V-19, MA6 a,b,c-DC-02; standards FW-STD-TE&V-01, 02; guidelines FW-GDL-WL DIV-06, FW-GDL-TE&V-03, 07);
- Plan components for infrastructure including standard FW-STD-IFS-02 and guideline FW-GDL-IFS-12, which states that within areas specifically identified as being important for wildlife connectivity across highways (see table 18), the USFS should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety;
- Geographic area desired conditions GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06, 07; GA-SM-DC-03, and GA-SV-DC-09. For example, GA-HH-DC-03 states that the Coram connectivity area (see figure B-29) provides habitat connectivity for a north-south movement corridor for wide-ranging species (e.g., grizzly bear, Canada lynx, wolverine) moving between the southern and northern watersheds on the Forest;
- Desired condition for lands FW-DC-LSU-01, which states that land ownership adjustments, through purchase, donation, exchange, or other authority improve national forest management by consolidating ownership, reducing wildlife human conflicts, providing for wildlife habitat connectivity, improving public access to public lands, and retaining or acquiring key lands for wildlife and fish within wild and scenic river corridors.

These desired conditions and guidelines benefit grizzly bears in the primary conservation area and zone 1, including the Salish demographic connectivity area.

Grizzly bear habitat and recreation

Developed ski areas and/or developed year-round resorts

There is one developed year-round resort in the primary conservation area that has operated as a ski area since the 1940s and has operated during the non-denning season since the 1980s. As discussed in previous biological assessments, the Whitefish Mountain Resort likely causes disturbance and/or displacement of grizzly bears, but there have been no known grizzly bear mortalities. The Whitefish Mountain Resort has had mitigation measures in place to reduce grizzly bear-human conflicts during the non-denning season for decades. The following standards and guidelines would apply under alternative B-modified.

Standard FW-STD-REC-04 states, "Within the NCDE primary conservation area, new or reauthorized permits for ski areas on NFS lands that operate during the non-denning season shall include measures to limit the risk of grizzly bear-human conflicts (e.g., a requirement to store garbage in a bear-resistant manner)".

Guideline GA-SM-MA7-Big Mtn-GDL-01 states, "To reduce grizzly bear-human conflicts the Whitefish Mountain Resort during the non-denning season, existing mitigation measures for grizzly bears regarding food/garbage handling, odor control, and grizzly bear education at the summit house should be retained".

Desired condition GA-SM-MA7-Big Mtn-DC- states, "Year-round recreational opportunities in an alpine setting exist at the Whitefish Mountain Resort on Big Mountain. Winter recreation opportunities occur in all portions of the Whitefish Mountain Resort permit area. During the grizzly bear non-denning season, developed recreation opportunities are provided on the south facing slope in the Whitefish Mountain Resort permit area. The portion of the upper Hellroaring watershed below the Taylor Creek Road (NFS Road 9790 provides higher levels of grizzly bear habitat security".

These plan components would benefit the grizzly bear by limiting the risk of grizzly bear disturbance or displacement or grizzly-bear human conflicts.

There is one developed ski area in Zone 1, the Blacktail Ski Area. This ski area is not currently operated during the non-denning season, but forestwide standard FW-STD-REC-04 would apply to this area as well.

Motorized over-snow use

At the time amendment 24 was adopted, the Forest was revising its plan and there was a stated intention to carry Amendment 24 forward into the revised plan. However, the Forest halted plan revision due to a lawsuit on the proposed planning rule and is now revising its plan again under the 2012 planning rule. Based upon new public input on its revised forest plan, the Forest proposes to change some of the areas suitable for motorized and non-motorized over-snow use. Proposed changes in the revised forest plan would provide integrated management direction that responds to new science, uses updated habitat modeling and mapping, and addresses the 2012 planning rule requirements for ecological, social, and economic sustainability. The discussion of recreation effects is focused on the den emergence season because this is the time period with the highest risk of disturbance, particularly to female grizzly bears with dependent offspring.

With alternative B modified, about 60 percent of modeled grizzly bear denning habitat occurs within existing wilderness areas where motorized use is prohibited. About 13 percent of modeled denning habitat

is within recommended wilderness areas, and about 13 percent of modeled denning habitat is in other areas that are not suitable for motorized over-snow use. In these areas, individual grizzly bears may be disturbed by nonmotorized uses, such as back-country skiing or snowboarding, during the den emergence time period, but there would generally be low levels of human disturbance and population level effects are not anticipated. Inside the primary conservation area, alternative B modified would not increase the percentage of the Forest open to motorized over-snow vehicle use during the den emergence time period nor the dates that areas are open to motorized over-snow vehicle use. The USFWS wrote in their 5-year review for grizzly bear, "Our best information suggests that current levels of snowmobile use are not appreciably reducing the survival or recovery of grizzly bears" (USFWS, 2011c, p. 38). The NCDE population has been increasing and is likely headed towards delisting, so current levels of motorized over-snow vehicle use do not appear to be preventing the population from recovering. Because there is uncertainty regarding the potential effects of motorized over-snow use on females with cubs during the den-emergence time period and because this use could increase in the future, alternative B modified adopts standard FW-STD-REC-05, which states, "Within grizzly bear denning habitat modeled by MTFWP in the NCDE primary conservation area, there shall be no net increase in percentage of area or miles of routes designated for motorized over-snow vehicle use on NFS lands during the den emergence time period (see glossary)".

Currently, late-season snowmobile areas that are open during the den emergence time period occur in about 3 percent of modeled grizzly bear denning habitat on the Forest, a minor amount. There are about 19 miles of routes open to motorized over-snow use in modeled grizzly bear denning habitat after April 1, which could occur during the den emergence time period. Because very little modeled denning habitat is open when den emergence may be occurring and because many females with cubs are known to exit their dens during the latter part of the time period when these areas may be open to motorized over-snow use, the risk of disturbance is anticipated to be minor. Standard FW-STD-REC-05 would provide assurance that potential impacts to bears, particularly females with cubs, would not increase over time in the primary conservation area. Outside the primary conservation area, motorized over-snow vehicle use would be managed according to desired conditions for the winter recreational opportunity spectrum. Most areas outside the PCA are currently open to motorized over-snow use and would not have restrictions on this use in the future. There is a minimal amount of modeled grizzly bear denning habitat in the area outside the PCA, so the risk of disturbance or displacement to grizzly bears (including females with cubs) is very low.

Developed recreation sites with overnight use

Developed recreation sites are of concern because frequent or prolonged human occupancy may result in increased bear attractants, increasing the risk of grizzly bear-human conflicts or grizzly bear mortality. The proposed action includes standard FW-STD-WL-01 which states that within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), food/wildlife attractant storage special order(s) shall apply to all NFS lands. Food storage orders are in effect across the Forest and are very effective in reducing grizzly bear-human conflicts on NFS lands. The orders are updated over time as new information and new technologies become available but would continue to be guided by the Interagency Grizzly Bear Committee or a similar group of experts.

The draft grizzly bear conservation strategy stated that the main concern with developed recreation sites has to do with overnight use. Under alternative B modified, two desired conditions and one standard address developed recreation sites designed and managed for overnight use. Within the primary conservation area, the number, capacity, and improvements of developed recreation sites will provide for user comfort and safety while minimizing the risk of grizzly bear–human conflicts on NFS lands (FW-DC-REC-01). Increases in the number and capacity of developed recreation sites on NFS lands that are designed and managed for overnight use during the non-denning season will be at levels that contribute to

sustaining the recovery of the grizzly bear population in the NCDE (FW-DC-REC-02). The revised plan includes a standard stating that within the NCDE primary conservation area, the number and capacity of developed recreation sites on NFS lands that are designed and managed for overnight use by the public during the non-denning season (e.g., campgrounds, cabin rentals, huts, guest lodges, recreation residences) shall be limited to one increase above the baseline (see glossary) in number or capacity per decade per bear management unit (see FW-STD-REC-01 for details). Guideline FW-GDL-REC-01 states, "Within the NCDE primary conservation area, if the number or capacity of day use or overnight developed recreation sites is increased, the project should include measures to reduce the risk of grizzly-bear human conflicts in that bear management unit (e.g., with additional public information and education; by providing backcountry food-hanging poles or bear-resistant food or garbage storage devices; by including design criteria that would limit capacity increases to those needed for public health and safety; by increasing law enforcement and patrols)".

This set of plan components is consistent with what has occurred on the Forest through consultation during the time period when the NCDE grizzly bear population was stable to increasing and expanding in distribution (Costello et al. 2016). Although there may be an increased risk of grizzly-bear human conflicts as a result of some increase in developed recreation sites with overnight use in the future, the risk of mortality for grizzly bears would be limited under the proposed action. Implementation and monitoring of the food storage orders, public education, and increases in the availability of bear-resistant food storage devices have all helped to reduce the number of grizzly bear-human conflicts on the Forest in recent decades. In addition, concerted efforts by MFWP to respond to grizzly-human conflicts, both on and off NFS lands, have greatly reduced the risks to both bears and people.

There are 11 bear management units within the primary conservation area on the Flathead National Forest, not counting the Stillwater bear management unit. Out of these 11, 6 are shared with other Forests or agencies (e.g., National Park Service). Therefore, in the next 10 years, the Flathead National Forest has the ability to increase 5 to 11 overnight developed recreation sites in the primary conservation area. Outside of the primary conservation area, the limitation on overnight developed recreation sites is not applied.

The draft GBCS states that "The intent of the developed recreation site standard is to not increase the number of developed sites or capacity at most overnight developed sites on public Federal lands within each BMU above levels known to have occurred at a time when there was a stable to increasing grizzly bear population" (USFWS, 2013c, p. 59). Although the NCDE grizzly bear population was listed as threatened under the Endangered Species Act, there were occasional increases in developed sites that were approved through consultation with the USFWS. To allow a similar level of increase in developed site numbers or capacity that occurred under listed status, one increase in the capacity or number of developed sites would be allowed per BMU per 10 years.

The Forest has one developed ski area (Whitefish Mountain Resort) in the primary conservation area, and it does not have overnight capacity on NFS lands. The Blacktail Mountain Ski Area is located in zone 1. No limits on developed recreation sites would occur in zone 1 with alternative B modified. Grizzly bear-human conflicts are monitored by MFWP and would continue to be monitored in the future so that adaptive changes could be made, if warranted.

Nonmotorized trail use

As stated in the affected environment section, individual grizzly bears may avoid nonmotorized trails or have conflicts with people on nonmotorized trails. But there are no demonstrated population-level effects to the NCDE grizzly bear as a result of nonmotorized trail uses. As a result, high use non-motorized trails are no longer deducted from security core percentages. The grizzly bear subunits meeting 68 percent

secure core do not change as a result of this change (see table 34). As stated in the draft GBCS, "If research demonstrates that high intensity use non-motorized trails do significantly impact grizzly bear populations or that there are areas of significantly higher mortality risk near high intensity use nonmotorized trails (as opposed to other trails or roads), this new information will be appropriately considered and incorporated through an adaptive management approach" (USFWS, 2013c, p. 23). In the future, grizzly bear population monitoring would be conducted by MFWP to determine if any population level effects of human uses are occurring. The proposed action includes plan components to reduce the risk of bear-human conflicts, benefiting grizzly bears.

Desired condition FW-DC-IFS-09 states, "The Forest's trail system provides a variety of high-quality motorized and nonmotorized recreational opportunities during summer and winter. Forest system trails access destinations, provide for loop opportunities that connect to a larger trail system, provide linkage from local communities to the Forest, and are compatible with other resources."

Desired conditions applicable to all MA7 management areas state:

> MA7-DC-01. Focused recreational opportunities are provided in specific areas in response to increasing demand. Local communities can readily access these areas for a variety of motorized and nonmotorized experiences.
>
> MA7-DC-02. These areas provide opportunities for large groups that may have higher levels of social interaction, as well as competitive and non-competitive events.

Because there may be some future effects to individual bears due to the above desired conditions of alternative B modified, alternative B modified includes the following guidelines to reduce potential effects to grizzly bears:

> FW-GDL-IFS-15. When developing, constructing, or reconstructing system trails, pertinent public information on how to avoid and respond to bear-human encounters should be posted at trailheads. In addition, site-specific trail design should include one or more methods to limit the risk of bear-human conflicts such as, but not limited to:
>
> - locating trails outside of riparian management zones or avalanche chutes, unless it is necessary to cross or to access an existing developed recreation site,
> - designing and maintaining trails to increase sight distance and/or to address speed of travel consistent with site-specific conditions for the managed use of the trail.
>
> FW-GDL-REC-05. To reduce or mitigate potential conflicts between wildlife and event participants as well as with other recreationists, recreation events, group use permits, and commercial activities should include permit measures that address potential conflicts such as, but not limited to location of the event, timing of the event, party size, and education on reduction of human-wildlife conflicts.

Grizzly bear habitat and livestock allotments

Cattle grazing is a relatively minor use of NFS lands on the Forest, and there are no sheep grazing allotments. Existing cattle grazing allotments have been compatible with an NCDE grizzly bear population that is stable to increasing and expanding in distribution (Costello et al. 2016).. Based on the lack of history of conflicts, the risk of grizzly bear mortality associated with livestock grazing is low. Desired conditions for grazing support continued recovery of the grizzly bear.

> FW-DC-GR-01.Within the NCDE primary conservation area, the number of, capacity of, and improvements on grazing allotments support ecologically sustainable grazing, and temporary grazing permits are used for effective management of noxious weeds, while minimizing the risk of human-bear conflicts on National Forest System lands. See also FW-DC-WL-01 and FW-DC-WL-02.

Although the Flathead National Forest has not had conflicts between cattle and grizzly bears, the proposed action, alternative B modified, includes the following standards which would result in reduced risk of future conflicts.

> FW-STD-GR-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), new or reauthorized grazing permits and annual operating plans shall incorporate requirements to reduce the risk of grizzly bear–human conflicts (e.g., food/wildlife attractant storage special order). New or reauthorized permits shall include a clause providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve a grizzly bear–human conflict situation.
>
> FW-STD-GR-03. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), permits for livestock grazing shall include a provision that requires reporting livestock carcasses within 24 hours of discovery, which shall be followed by proper disposal of the carcass. Bone yards shall not be established on National Forest System lands.
>
> FW-STD-GR-04. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), there shall be no net increase in the number of active sheep allotments on NFS lands. Note: The Flathead National Forest does not have any sheep allotments.FW-STD-GR-05. Within the NCDE primary conservation area, there shall be no net increase in the number of active cattle grazing allotments above the baseline (see glossary) on NFS lands. Note: Existing cattle allotments may be combined or divided as long as that does not result in grazing allotments in currently unallotted lands.
>
> FW-STD-GR-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), temporary permits for grazing by small livestock for purposes such as controlling invasive exotic weeds or reducing fire risk, or for trailing of small livestock across NFS lands, shall not result in an increase in bear/small livestock conflicts. See also FW-STD-GR-01.

Guideline FW-GDL-GR-01 provides management direction on grazing practices and measures to protect key grizzly bear food production areas in order to reduce conflicting use by livestock in the primary conservation area. The following additional guideline would promote consistency across the NCDE and minimize the potential for conflicts on NFS lands in the primary conservation area.

> FW-GDL-GR-02. Within the NCDE primary conservation area, an allotment management plan and plan of operations should specify any needed measures to protect key grizzly bear food production areas (e.g., wet meadows, stream bottoms, aspen groves, and other riparian wildlife habitats) from conflicting and competing use by livestock (this varies on a site-specific basis).

As stated in the draft Grizzly Bear Conservation Strategy, “Current levels of grazing intensity [on permitted livestock allotments] in forested environments are not displacing grizzly bears in significant ways and are not likely to affect vegetation structure enough to result in direct competition for forage

species on public lands within the NCDE, as evidenced by the increasing population trend in the NCDE" (USFWS, 2013c, p. 25). As a result, the draft Grizzly Bear Conservation Strategy included measures to keep livestock grazing at or below baseline levels. The 2011 baseline was selected because available information documents increases in grizzly bear distribution, population size, and genetic diversity. The estimated population size was 765 bears in 2004 (Kendall et al. 2009), more than double the target of 391 bears based on sightings of females with cubs. Occupancy of bear management units has been documented (Costello et al. 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al. 2016).

In addition, in order to reduce the cost of administering very small livestock allotments, the revised forest plan includes a site-specific guideline for the Swan Valley geographic area (GA-SV-GDL-06) that would reduce cattle grazing allotments if opportunities arise with a willing permittee. This management direction is not associated with the Draft Grizzly Bear Conservation Strategy but would further reduce risks to grizzly bears in the future.

In zone 1 in the Salish Mountains geographic area (see Figure B-5), the Flathead National Forest currently has active cattle grazing allotments but also has an attractant storage order that reduces the risk of grizzly bear-human conflicts associated with livestock. According to the draft GBCS (2013c), "impacts on grizzly bears due to attractants associated with livestock can be effectively minimized with requirements to securely store and/or promptly remove attractants associated with livestock operations (e.g., livestock carcasses, livestock feed, etc.)" (p. 25). Continued implementation of the Forest's attractant storage orders is expected to result in minimal risk of grizzly bear-livestock conflicts.

Grizzly bear habitat and vegetation management

As stated in the "affected environment" section, the grizzly bear is a habitat generalist that is adaptable to these changing vegetative conditions and the resulting changes in the availability of foods and cover. The proposed action provides for grizzly bear habitat diversity, considering the modeled effects of climate change that are anticipated to occur over the next 50 years. Because the grizzly bear uses a wide variety of habitats across the Forest, a specific model was not developed for this species. Rather, the discussion below is a summary of all modeled vegetation changes on the Forest. Grizzly bear habitat and its use by grizzly bears would vary across time and space due to natural processes (e.g., succession, wildfires, insects/disease) and vegetation management activities (timber harvest, planting, precommercial thinning). On the heavily forested Flathead National Forest, changes in successional stages and other vegetation characteristics are indicative of bear foods, cover, and connectivity.

SIMPPLE modeling for alternative B-modified shows that grass/forb/shrub communities would increase by the fifth decade, corresponding closely to the amount of high and moderate severity wildfire and prescribed fire. These increases are likely to provide increases in bear foods, such as berry-producing shrubs and grasses that need more light. A downward trend occurs for the amount of area in the "small" forest size class, while there will be strong increase in the amount of area in the large classes by the fifth decade forestwide. These size classes provide cover and forested connectivity, as well as some forage. In the warm dry and warm moist broad potential vegetation types, the very large size class will also increase. Vegetative succession is responsible for majority of changes in the size classes, as trees grow and advance into larger forest size classes. However, low intensity prescribed fire and commercial thinning also is influencing this change to larger size classes by removal of smaller trees in favor of larger. In contrast, a downward trend in the very large forest size class is modeled forest wide for the cool moist-moderately dry and cold biophysical broad potential vegetation types. Stand-replacing wildfire, as well as Douglas-fir and spruce bark beetle, likely account for most of the loss of the very large forest size class and affect far

more area than timber harvest in the cool moist-moderately dry and cold biophysical broad potential vegetation types.

Changes in vegetation would be monitored at a forestwide and ecosystem-wide scale, using analysis tools such as FIA plots and VMAP, that classify all lands (see revised Flathead forest plan appendix A, plan monitoring questions and indicators for terrestrial ecosystems and vegetation as well as monitoring questions and indicators for wildlife. Vegetation management activities would also continue to be assessed through project-specific NEPA analysis as conditions change.

Inside the primary conservation area, desired conditions for the grizzly bear include:

> FW-DC-TE&V-01. Within the NCDE primary conservation area, the amount, type and distribution of vegetation provides for the ecological, social, and economic sustainability of NFS lands while also providing habitat components that contribute to sustaining the recovery of the grizzly bear population in the NCDE. See also FW-DC-WL-02.
>
> FW-DC-TE&V-02. Within the NCDE primary conservation area, there is a mosaic of successional stages to provide for grizzly bear habitat needs over the long term.

Inside the primary conservation area, the following guidelines, similar to the IGBC guidelines, would apply:

> FW-GDL-TE&V-01. Within the NCDE primary conservation area, measures to reduce the risk of disturbance to the grizzly bear population should be incorporated into vegetation and fuels project design criteria, which vary on a site-specific basis (e.g., some activities should be restricted in spring habitat during the spring time period; areas with low levels of human activity should be provided adjacent to areas with high levels of disturbance). Note: Management activities such as precommercial thinning, burning, weed spraying, and implementation of road best management practices may need to be completed during the spring time period in order to meet resource objectives (especially if needed to prevent resource damage), in which case other measures should be used to reduce the risk of disturbance (e.g., limiting the duration of the activity or limiting use of closed roads).
>
> FW-GDL-TE&V-02. Within the NCDE primary conservation area, vegetation management activities should be designed to avoid detrimental effects on the grizzly bear population and to include one or more measures to protect, maintain, increase, and/or improve grizzly habitat quantity or quality (e.g., promoting growth of berry-producing shrubs, forbs, or grasses known to be bear foods) in areas where it would not increase the risk of grizzly bear–human conflicts. See also FW-GDL-WL-01.
>
> FW-GDL-TE&V-03. Within the NCDE primary conservation area, measures to retain cover (where present) along a portion of grass/forb/shrub openings, riparian wildlife habitat, or wetlands should be incorporated in project design criteria (this varies on a site-specific basis).
>
> FW-GDL-TE&V-04. Within the NCDE primary conservation area, vegetation management projects (including timber sales and other non-commercial vegetation management contracts) should include a clause providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation.
>
> FW-GDL-TE&V-05. To reduce the risk of grizzly-bear human conflicts within the NCDE primary conservation area, vegetation management activities designed to enhance grizzly habitat (e.g., increased huckleberry production) should not occur in or next to campgrounds,

administrative facilities, or other developed recreation sites that operate during the non-denning season.

These guidelines would benefit the grizzly bear because they promote a mosaic of successional stages; restrict logging activities in time and space as needed; design projects to maintain or improve grizzly bear habitat quality or quantity where it would not increase the risk of grizzly bear-human conflicts; and retain cover as needed along grass, forb, and shrub openings.

In addition to vegetation guidelines for the primary conservation area that are specific to the grizzly bear, other standards and forestwide plan components would benefit the grizzly bear. FW-DC-TE&V-11 states that the forest groundcover consists of a variety of grass, forb, and shrub species, including berry-producing species that provide forage for grizzly bears and other wildlife species (e.g., huckleberries (*Vaccinium globulare*, *Vaccinium membranaceum*), serviceberries (*Amalanchier alnifolia*), mountain ash (*Sorbus scopulina*), and buffaloberry (*Shepherdia Canadensis*). This desired condition may be met in wildfire areas, prescribed burn areas, or areas managed to produce timber. Lynx management standards VEGS1, VEGS2, VEGS5, and VEGS6 in the Northern Rockies Lynx Management Direction (see the revised forest plan, appendix A) apply across about 1.8 million acres of the Forest and would limit vegetation treatments in each LAU on the Forest as well as in three adjacent LAUs. Because there is a great deal of overlap in the Forest's LAUs and grizzly bear subunits, these limitations on vegetation management would also provide cover for grizzly bears. Forestwide, riparian management zones total about 427,320 acres and are not suitable for timber production, although timber harvest may occur under specific conditions (see bull trout section of the biological assessment for more details), so key wetland and riparian habitats used by grizzly bears would be managed to continue to support their needs.

Although there are known, usually short-term impacts to individual bears from vegetation management activities and associated road use, these impacts have been and would continue to be managed to support the NCDE grizzly bear population. In summary, available information documents increases in grizzly bear distribution, population size, and genetic diversity. The estimated population size was 765 bears in 2004 (Kendall et al. 2009), more than double the target of 391 bears based on sightings of females with cubs. Occupancy of bear management units has been documented (Costello et al. 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al. 2016). The NCDE grizzly bear population would continue to be monitored by MFWP, including grizzly bear population trend, body condition (an indicator of food availability), survival, mortality, and grizzly bear-human conflicts.

Grizzly bear habitat and mineral/energy development

Mineral development can affect grizzly bears by causing long-term loss of habitat, increasing vehicle collisions, increasing grizzly bear disturbance/displacement, and increasing grizzly bear-human conflicts at camps. The proposed action has many standards and guidelines addressing minerals mitigation measures for grizzly bears. The Flathead National Forest currently has no leasable or locatable mineral activity, and there is a very low risk of effects due to mineral activities. Standards FW-STD-E&M-01 through 08 reduce the risk that any future developments would have adverse impacts on the NCDE grizzly bear population. Most relevant at the present time are two guidelines that would address the primary saleable mineral activity that occurs on the Forest, These guidelines reduce the risk of grizzly bear-human conflicts and grizzly bear disturbance or displacement.

FW-GDL-E&M-05. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), carrying bear deterrent spray should be recommended to mineral permittees, lessees, and operators to reduce the risk of grizzly bear-human conflicts.

FW-GDL-E&M-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), available resources at existing gravel pits should be used before constructing new pits to reduce the risk of grizzly bear disturbance or displacement associated with the blasting of rock or crushing of gravel.

Although the Forest has very low potential for oil and gas leasing, the proposed action would lower the risk of grizzly bear habitat loss and increased mortality risk even further because NCDE-STD-MIN-08 would require that no surface occupancy stipulations be applied to any new oil and gas leases in the primary conservation area. No activity can take place on suspended oil and gas leases until an EIS is completed. A leasing decision will not be a part of this forest plan revision.

Geographic area plan components

Swan Valley

As detailed in the existing condition section, land ownership in the Swan Valley geographic area has changed substantially since the current forest plan and the Swan Valley Grizzly Bear Conservation Agreement were adopted. As a result, the Forest now proposes to manage all of its BMU subunits with the same forestwide set of management direction and would terminate the previous agreement. Nevertheless, the Forest has stated its intention to continue to coordinate with others to support continued recovery of threatened and endangered species. As stated in desired condition FW-DC-P&C 03, "Recovery of threatened and endangered species is accomplished through cooperation with the U.S. Fish and Wildlife Service (including section 7 consultation, as required), state agencies, other federal agencies, tribes, counties, interested groups, and interested private landowners."

In addition to forestwide plan components for the grizzly bear, vegetation, forest vegetation products, lands and special uses, recreation, forest infrastructure, partnerships and coordination, watersheds, riparian management zones, and non-native plants, additional plan components would provide benefits for the grizzly bear in the Swan Valley. Alternative B modified includes the following plan components that would continue to improve the habitat quality for grizzly bears in the Swan Valley:

Desired condition GA-SV-DC-08 states, "The portion of the Seeley Clearwater connectivity area from Condon south to the boundary of the Swan Valley geographic area and from the south end of Swan Lake to Lost and Porcupine Creeks (see Figure B-10) provides habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, and wolverine) moving between the Swan and Mission Mountain Ranges."

GA-SV-OBJ-04 states, "Decommission or place into intermittent stored service 10 to 30 miles of roads. Priorities are roads causing resource damage in priority watersheds, roads on acquired lands in the Swan Valley that are not needed for fire protection or other resource management, and/or roads within desired nonmotorized recreation opportunity spectrum settings and/or roads within bull trout watersheds."

As explained in the affected environment section, most of the Legacy Project land acreage was regenerated prior to being acquired by the Forest and would not be large enough to be merchantable for decades. As a result, the level of timber harvest and associated road use that occurred on these lands over the last decade would not occur in the near future. Some road access would continue to be needed for activities such as restoration work, access to other ownerships, or fire protection but the high density of roads in the former Plum Creek Timber Company sections would be reduced. The Forest has made its best programmatic estimate of the range of miles of road that could be decommissioned or placed into intermittent stored service, but specific roads would be assessed during site-specific project planning.

These plan components would benefit grizzly bears in the Swan Valley by continuing to emphasize connectivity in management of the linkage zone south of Condon and improving habitat security on lands acquired through the Legacy Project.

Salish Mountains

The Salish Mountains geographic area has specific grizzly bear management direction that applies to zone 1, including the Salish demographic connectivity area (see section on zone 1 above). Additional plan components would provide benefits for the grizzly bear in the Salish Mountains with alternative B modified.

Desired condition GA-SM-DC-04 states, "In areas between the primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. NFS lands in the Swift Creek-Stillwater connectivity area (see Figure B-24) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges."

Guideline GA-SM-GDL-01 states, "In order to provide elk habitat security, access management actions should not result in a decrease in total acres of NFS lands within the geographic area that are at least 250 contiguous acres and at least one half mile from roads open to wheeled motorized use by the public (see appendix C). If vegetation management occurs in elk security habitat, a mosaic of cover and forage should be provided, in consideration of the site-specific topography and vegetation types. Roads may be temporarily opened, after consultation with a forest wildlife specialist, for up to 30 days during July and August to allow for activities such as firewood gathering".

These plan components would benefit grizzly bears in the Salish Mountains by emphasizing linkage of habitat in the Salish demographic connectivity area and providing elk habitat security in zone 1, which would indirectly benefit the grizzly bear population.

Management area plan components

The lynx section of the biological assessment describes the effects of specific management areas. Table 38 shows the distribution of MAs with respect to grizzly bear management zones.

Table 38. Distribution of revised forest plan alternative B-modified management areas for the grizzly bear management zones.

Management Area	Primary Conservation Area	Zone 1, Salish DCA	Zone 1, Outside DCA
1a Designated wilderness	50%		< 1%
1b Recommended wilderness	9%		
2a Designated wild and scenic rivers	1%		
2b Eligible wild and scenic rivers	1%	< 1%	1%
3a Administrative areas	< 1%		< 1%
3b Special areas	< 1%	< 1%	< 1%
4a Research natural areas	< 1%	6%	
4b Experimental and demonstration forests	< 1%	5%	
5a Backcountry nonmotorized year-round	7%		
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	2%		

Management Area	Primary Conservation Area	Zone 1, Salish DCA	Zone 1, Outside DCA
5c Backcountry: motorized over-snow vehicle use	5%		< 1%
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	< 1%		
6a General forest low	6%	1%	3%
6b General forest medium	13%	21%	1%
6c General forest high	4%	65%	83%
7 Focused recreation areas	2%	1%	12%

In the PCA, the majority of lands (over 66%) are in nonmotorized management areas (MA1a, MA1b, MA5a, as well as some of MA2a, MA2b, and MA3b), providing an interconnected network habitat with high levels of security. There would be no commercial timber harvest in wilderness or recommended wilderness. Timber management opportunities are also expected to continue to be limited within inventoried roadless areas that are outside of recommended wilderness (in management areas such as MA5) due to the high cost of harvesting timber where there are no roads. These areas would have high levels of levels of habitat diversity, primarily provided by wildand or prescribed fire.

In zone 1, the majority of lands (87%) are in general forest Management area 6. These areas would have high levels of successional stage and habitat diversity, primarily provided by timber harvest, fuels reduction, pre-commercial, and commercial thinning. In order to place more emphasis on demographic connectivity, a continuous area of MA6b is designated in the Salish DCA along the north and west boundary of the Tally Lake Ranger District, contiguous with a research natural area which is unroaded (MA3b). In zone 1, forestwide standards would apply that would reduce indirect effects of timber harvest, as described above. Timber salvage is likely to occur in MA6 if trees are burned by wildfire or killed by insects/disease, but the location of such areas is very unpredictable. Timber harvest, salvage harvest, fuels reduction, and precommercial thinning would be subject to forestwide desired conditions, standards and guidelines which would reduce indirect effects of timber harvest that may be detrimental to grizzly bears, regardless of management area designation, as discussed in the effects sections above.

Cumulative effects on the grizzly bear

Cumulative effects under the Endangered Species Act include state, tribal, local, or private actions that are reasonably certain to occur in the action area. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in the cumulative effects analysis in this biological assessment.

Context for analysis of cumulative effects

The analysis of cumulative effects provides a larger context in which to evaluate the effects of the five forest plans by considering conditions across all land ownerships within the NCDE. In 2013, the USFWS announced the availability of a draft grizzly bear conservation strategy for the NCDE population for public review and input. Both the grizzly bear recovery plan and the draft NCDE conservation strategy emphasized the need to coordinate management across multiple land ownerships and jurisdictions to sustain the NCDE grizzly bear population through time. This section addresses the cumulative impacts of (1) management by state agencies, tribes, and private landowners on NCDE-wide habitat quality, (2) grizzly bear-human conflicts on lands not managed by the Forest Service, and (3) the effects of land management on connectivity between the NCDE and adjacent grizzly bear ecosystems.

When finalized, the conservation strategy will become the post-delisting management plan for NCDE grizzly bears and their habitat. The management of grizzly bears and the habitats they require for survival are dependent upon the laws, regulations, agreements, and management plans of the state, tribal, and federal agencies in the NCDE. Laws, regulations, and agreements provide the legal basis for coordinating management, controlling mortality, providing secure habitats, managing grizzly bear/human conflicts, regulating hunters and hunting seasons, limiting motorized access where necessary, controlling livestock grazing, regulating oil and gas development, mitigating large-scale mining operations, maintaining education and outreach programs to prevent conflicts, monitoring populations and habitats, and requesting management and petitions for relisting when necessary.

Delisting of the grizzly bear would remove the regulatory certainty provided by the Endangered Species Act that prohibits the take of grizzly bears and the requirement that federal agencies consult with the USFWS on projects that may affect grizzly bear habitat. In the absence of this regulatory framework, the USFWS must demonstrate that

3. Adequate regulatory mechanisms are available for protecting grizzly bears after delisting;
4. These mechanisms will be effective in maintaining the recovered status of the grizzly bear; and
5. Any selected mechanisms will be carried forward into the foreseeable future with reasonable certainty.

The conservation strategy documents the regulatory mechanisms and conservation framework that would maintain a recovered grizzly bear population in the NCDE. Regulatory mechanisms relevant to grizzly bears consist primarily of federal laws, regulations, USFS and BLM resource management plans, Glacier National Park's Superintendent's compendium, Montana Department of Natural Resources and Conservation's *Habitat Conservation Plan*, and state laws. Other conservation mechanisms include tribal and state grizzly bear management plans and other guidelines that coordinate management, population monitoring, and mortality control.

National forest and BLM resource management plans, the Glacier National Park Superintendent's compendium, the Montana Department of Natural Resources and Conservation's *Habitat Conservation Plan*, tribal forest management plans, Montana Code Annotated (MCA), and Administrative Rules of Montana (ARM) are regulatory mechanisms that are legally enforceable. These dictate how grizzly bear population and habitat management will occur, and, in doing so, they serve to ensure against excessive grizzly bear mortality by minimizing human-caused mortality risk. Signatories of the NCDE Grizzly Bear Conservation Strategy (USFWS, 2013c) represent the land management agencies that have incorporated the habitat management direction described in the conservation strategy into their respective management plans, based upon each agency's rules, regulations, and requirements.

At one time, a cumulative effects model was completed for BMUs in the NCDE. A cumulative effects model baseline was completed in 1998 and a comparison was completed in 2008 using 2005 land imagery. The cumulative effects model results reflect changes in greenness of vegetation brought about by fire or other vegetation management, changes in access management, and changes in human facilities. The cumulative effects model is no longer updated, but this biological assessment provides updated information on the environmental baseline for fire and other vegetation management, changes in access management, and changes in human facilities. As described in the monitoring section of the preferred alternative for the revised forest plan for the Flathead National Forest, as well as the monitoring section for the amendment forests, monitoring of changes in access management and human facilities will continue to be required across the NCDE. Changes in vegetation will be monitored through use of the Forest Inventory and Analysis (FIA) database and through updated mapping using classifications such as VMap.

Cumulative effects

Montana Department of Natural Resources and Conservation

Montana Department of Natural Resources and Conservation lands comprise about 3.6 percent of the primary conservation area and 6.2 percent of zone 1. In 2011, the Montana Department of Natural Resources and Conservation in conjunction with the USFWS completed a habitat conservation plan, which has a 50-year term (MTDNRC, 2011). This is a comprehensive program to conserve federally listed species and minimize incidental take during ongoing forest management activities in western Montana. Within the area delineated as the primary conservation area, zone 1 and zone 2, the Montana Department of Natural Resources and Conservation manages about 574,000 acres of state trust lands. Of this, approximately 204,000 acres are located within the primary conservation area.

Since 1995, the Swan River State Forest has been a party to the Swan Valley Grizzly Bear Conservation Agreement along with Plum Creek Timber Company, the Flathead National Forest, and USFWS. This agreement coordinated timber harvest activities and associated road management across the multiple land ownerships in the Swan Valley in a manner that contributed to the recovery of the grizzly bear population. Under this agreement, three years of rest (during which low-intensity administrative activities may occur but public access is restricted) must be provided after three years of management activities; areas with open road density > 1 mi/mi^2 must not exceed 33 percent of each bear management subunit; road closure devices are maintained; and seasonal road closures are implemented (Plum Creek et al., 1997).

Recently, a land transfer known as the Legacy Project was completed in the Swan Valley. The Nature Conservancy and the Trust for Public Land agreed to purchase lands from Plum Creek Timber Company and then sell or donate these lands to federal, state, and private owners. The vast majority of these lands have become federal (USFS) or state (Montana Department of Natural Resources and Conservation). Any lands that were sold to private owners have safeguards (e.g., conservation agreements) attached to them so that the integrity of wildlife habitat is maintained. The "fiber agreement" that was part of the Legacy Project and necessitated coordination of timber harvest on Legacy lands has now ended. In the foreseeable future, the Montana Department of Natural Resources and Conservation may be managing their lands in the Swan Valley using their *Habitat Conservation Plan* rather than the conservation agreement.

On lands under the habitat conservation plan, the Montana Department of Natural Resources and Conservation is committed to minimizing construction of new open roads in riparian area wetlands and avalanche chutes. Motorized activities are suspended within 0.6 mile of a known active grizzly bear den. Visual cover is retained in riparian and wetland areas. Information is provided to contractors, and training is provided to employees about living and working in bear habitat.

Within the primary conservation area and zone 1 (zone 1 is called "non-recovery occupied habitat" in the habitat conservation plan), the Montana Department of Natural Resources and Conservation agreed to minimize new open roads; prohibit commercial forest management activities, pre-commercial thinning, and heavy equipment slash treatments April 1–June 15 in spring bear habitat; minimize helicopter operations requiring flights lower than 500 meters in seasonally important grizzly bear habitat; limit the number of active gravel pits; and discourage new domestic sheep grazing allotments. Restrictions are implemented on spring habitat in the Stillwater, Coal Creek, and Swan State Forests. Currently, the Montana Department of Natural Resources and Conservation has very few grazing licenses on very limited ownership in the NCDE. Fewer than 9,000 acres within the primary conservation area and about 30,700 acres in the non-recovery occupied habitat are grazed by livestock. Information and education programs and other measures are being taken to avoid and minimize the risk of human-bear conflicts. Prompt removal of livestock carcasses also minimizes risk of bear-livestock conflicts.

Additional protective measures apply to the primary conservation area, including capping the miles of open and restricted roads in the Stillwater block of lands managed by Montana Department of Natural Resources and Conservation and Swan River State Forest. The Stillwater Block will maintain 22,007 acres of security zones where management and administrative uses are prohibited during the non-denning season. The Swan Habitat Conservation Plan strategy is that 4 years of activity must be followed by 8-year rest periods across 5 management subzones. The impacts to important grizzly bear habitats are minimized; all primary road closure devices are examined and repaired annually; and no new grazing licenses for sheep and other small livestock will be authorized. The transportation plan for the Stillwater and Coal Creek State Forests capped road construction at 19.3 more miles of permanent road, and reduced the miles of road open year-round by 15 percent.

Under the *Habitat Conservation Plan* and the transportation plan for the Swan River State Forest, new permanent roads would be capped at 70 miles (none open to the public) and an additional 41 miles of road would be restricted to commercial forest activities during the spring season. The Montana Department of Natural Resources and Conservation has no commitments to manage secure core habitat for grizzly bears on the Swan River State Forest.

Food and attractant storage programs for Montana Department of Natural Resources and Conservation staff and contractors reduce the risk of human-bear conflicts. On Department lands within the NCDE recovery zone/primary conservation area, contract language requires the removal of garbage from work sites daily. Outside the NCDE recovery zone/primary conservation area, but in known occupied grizzly bear habitat, timber sale contract language requires the removal of garbage from work sites daily. For Department lands outside the recovery zones and outside known occupied grizzly bear habitat, precautions are taken on a case-by-case basis if known bear activity occurs. Recreationists are expected to pack out their trash. Montana Department of Natural Resources and Conservation, in cooperation with others, has placed bear-resistant dumpsters at state land locations where bear-attractant conflicts have been known to occur. The Department provides its cabin lessees a brochure that explains measures that should be taken to minimize bear-human conflicts. Montana Department of Natural Resources and Conservation employees or contractors have not been involved in a grizzly bear-human conflict that resulted in a management action or death of a grizzly bear.

Although there could be some short-term adverse effects on a few individual bears, implementation of the habitat conservation plan is not likely to cause cumulative adverse effects on the NCDE grizzly bear population.

Montana Department of Fish, Wildlife, and Parks

A very small proportion of the land within the primary conservation area (0.6 percent) and zone 1 (1.2 percent) is managed by the Montana Department of Fish, Wildlife and Parks. Montana's wildlife management areas are managed with wildlife and wildlife habitat conservation as the primary concern, along with providing for enjoyment by the public. Some wildlife management areas are open for hunting or camping, and others are not. Several are closed to the public during the winter and spring periods. The Montana Department of Fish, Wildlife and Parks is very active in providing public information and education about conserving grizzly bears and their habitat.

Given the agency's mission to conserve wildlife and its small holdings with the primary conservation area and zone 1, no adverse cumulative effects on the NCDE grizzly bear population are anticipated due to habitat management actions of the Montana Department of Fish, Wildlife and Parks.

Grizzly bear management plans establish goals and strategies to manage and enhance grizzly bear populations and to minimize the potential for human-grizzly bear conflicts. The Department completed a

grizzly bear management plan for western Montana in 2006 and a grizzly bear management plan for southwestern Montana in 2013. These documents establish goals and strategies to manage and enhance grizzly bear populations and to minimize the potential for human-grizzly bear conflicts. A long-term goal is to allow the populations in western and southwestern Montana to reconnect through the intervening, currently unoccupied habitats.

The Department also employs several bear management specialists to work with landowners and educate the public in an effort to avoid or resolve grizzly bear-human conflicts and to reduce grizzly bear mortalities. Food storage guidelines are in place in some state parks and wildlife management areas, and bear-resistant dumpsters are in place in most state parks.

The State of Montana allows regulated hunting for black bears and other wildlife species. There is a potential for grizzly bear mortality by hunters to occur as a result of mistaken bear identification or self-defense, especially in proximity to the carcasses of harvested animals. Montana Department of Fish, Wildlife and Parks provides a variety of public information and education programs, including a mandatory black bear hunter testing and certification program to help educate hunters in distinguishing species, which are aimed at reducing human-caused mortalities. Black bear hunting seasons have also been shortened in recent years, reducing the potential for mistaken identity. These efforts have helped to decrease legal and illegal shooting mortalities.

Hunting of grizzly bears has not been allowed in Montana since 1991. In a recovered, delisted population of grizzly bears, the Department would assume management responsibility for the grizzly bear population. Management could include regulated hunting in the future, when and where appropriate. If this occurs it would result in mortality of individual grizzly bears but could potentially increase support for grizzly bears among some segments of the public. The Department would monitor the level of mortality due to hunting and its effects on the NCDE grizzly bear population.

Tribal lands

The Blackfeet Indian Reservation represents about 4.5 percent of the primary conservation area and about 5.6 percent of zone 1. Within the Blackfeet Indian Reservation, there are about 175,000 forested acres. These are managed under the Blackfeet Nation Forest Management Plan, which is expected to be in effect until 2030. Nearly all of the acres under the forest management plan occur within the primary conservation area or zone 1. Under the forest management plan, no net increase in overall road density levels is allowed. The Blackfeet Nation with the Bureau of Indian Affairs are currently soliciting interest in the Land Buy-Back Program. Purchase offers have been generated for nearly 7,000 landowners with fractional interests at the Blackfeet Indian Reservation through the Land Buy-Back Program for Tribal Nations (formerly called the Cobell Land Consolidation Program). The Land Buy-Back Program is part of the Indian Trust Settlement resulting from the Cobell v. Salazar class action lawsuit. If successfully completed, the purchases could transfer a substantial amount land from private to tribal ownership.

All lands within the primary conservation area on the Blackfeet Indian Reservation are currently allotted for livestock grazing. A bear management specialist(s) works with livestock producers to minimize and manage bear-livestock conflicts. Existing sheep allotments will be monitored, evaluated, and phased out if the opportunity arises with willing permittees. Although there has been a history of grizzly bear mortalities related to livestock on the Blackfeet Indian Reservation, the rate of increase of the grizzly bear population indicates that the level of mortality has been sustainable. The Blackfeet Indian Reservation has a food storage order in in place under the Blackfeet Fish and Wildlife Code of Regulations (chapter 3, section 17) that applies to all lands within the exterior boundaries of the reservation that are designated as normally occupied by bears. The regulations govern food storage and sanitation in camping and nonresidential situations and also govern the removal of livestock carcasses that may attract bears into

conflict situations. In addition, beekeepers in bear country are encouraged to install electric fencing around beehives.

On the Flathead Indian Reservation, there is a food storage order for backcountry areas in the primary conservation area. As warranted, residents are notified of bear activity and precautionary measures that should be taken to reduce bear-human conflict. Tribal biologists provide assistance in mitigating situations where food and attractant storage is an issue.

Lands managed by the Confederated Salish and Kootenai Tribes comprise about 2.5 percent of the primary conservation area and nearly 11 percent of zone 1. Of the acreage that is within the primary conservation area, about 91 percent of reservation lands are in the Mission Mountains Tribal Wilderness Area or the South Fork Jocko Primitive Area. No commercial forest activities occur in these areas. There will be no permanent increase in open or total road densities and no permanent decreases in secure core within the wilderness area. In the South Fork Jocko Primitive Area, there will be no net increase in open roads. The forest management plan (CSKT, 2000) provides the following guidance for motorized access management on the remaining lands: open road densities shall not exceed 4 mi/mi^2; total road miles shall remain at or below what existed in 1999; total road densities will be reduced over the life of the plan by removing 15 percent of road spurs; and roads in timber sale areas shall be closed after timber harvest is completed. Vegetation management direction in the primary conservation area restricts the locations and methods of harvest in some areas; hiding cover is retained along major highways near identified crossing areas; and during the duration of a timber sale and for two years afterward, adjacent drainages must remain undisturbed. On the Flathead Indian Reservation, there is no livestock grazing within the primary conservation area. Under the conservation agreement, the standards for management of livestock grazing would be the same as for the federal agencies.

The Blackfeet Nation and the Confederated Salish and Kootenai Tribes have taken actions, such as hiring bear management specialists and providing information and education, to reduce grizzly bear-human conflicts. Existing management direction on tribal lands has been in place during the period when the NCDE grizzly bear population was stable to increasing. There may be some adverse effects on individual grizzly bears, for example, due to high road densities outside of tribal wilderness areas. However, the overall suite of management direction along with efforts of tribal bear management specialists will minimize adverse effects. Cumulative adverse effects to the NCDE population are not expected as a result of management actions on tribal lands.

Private lands

Privately owned lands comprise about 10 percent of the 5.7-million-acre primary conservation area, nearly 48 percent of zone 1. Privately owned lands occur within and adjacent to NFS lands throughout the NCDE.

The human population in northwest Montana has grown at a relatively high rate during the past few decades, and growth is expected to continue. Increasing residential development and demand for recreational opportunities can result in habitat loss, habitat fragmentation, and increases in grizzly bear-human conflicts. These impacts are likely to intensify, although appropriate residential planning, outreach about how to minimize adverse effects, and assistance in resolving conflicts can help mitigate these impacts.

Increasing development on private lands has the potential to have cumulative adverse effects on the NCDE grizzly bear population. Monitoring of population status will provide a mechanism to identify areas of concern so that appropriate preventive or corrective actions can be taken. Private lands continue to account for a disproportionate number of conflicts and grizzly bear mortalities in the NCDE. These

impacts are likely to intensify, although appropriate residential planning, outreach and information about how to avoid conflicts, tools such as bear-resistant containers, electric fencing, and assistance in resolving conflicts can help mitigate these impacts. Walters and Holling (1990) stated that managing human-caused mortality, monitoring both population and habitat parameters and responding when necessary with adaptive management are the best ways to ensure a healthy grizzly population.

The USFS does not have authority to manage grizzly bear-human conflicts or human-caused mortality on private lands. Population monitoring and management of human-grizzly bear conflicts is under the authority of Montana Fish Wildlife and Parks and the tribes. Montana Fish Wildlife and Parks, the Confederated Salish and Kootenai Tribes, and the Blackfeet Nation employ bear specialists who work with private landowners in an effort to reduce risks to grizzly bears and humans on private, public, or tribal lands. Bear specialists provide information and assistance to landowners on appropriate ways to secure food and attractants from grizzly bears, and respond to reports of conflicts with nuisance black and grizzly bears. These programs have been successful in informing the public, reducing the availability of attractants to grizzly bears on private and public lands, and reducing human-caused mortalities of grizzly bears. These programs and their positive results are expected to continue for the foreseeable future.

Effects of management and development on connectivity with adjacent grizzly bear ecosystems

State lands

Under the habitat conservation plan, maintenance of eight security zones comprising 22,007 acres in the Stillwater Block and adherence to seasonal restrictions in that transportation plan would facilitate important linkage between the Whitefish and Salish Mountain Ranges (including the Salish demographic connectivity area). Between the Swan and Mission Ranges, the Swan Valley Grizzly Bear Conservation Agreement provides a framework for cooperative management, and it would continue to facilitate effective linkage across the valley while it is in effect. The Montana Department of Natural Resources and Conservation's habitat conservation plan also has provisions that help to maintain the integrity of linkages in the Swan valley to provide for movement between suitable habitats and recovery zones, if it goes into effect in this area. Thus, under either strategy into the future, effective linkage is likely to be maintained on state trust lands.

The sale or other disposal of some state lands is allowed. However, under the *Habitat Conservation Plan*, removal of lands is capped at 5 percent of the baseline acreage of certain areas including the grizzly bear NCDE recovery zone/primary conservation area.

The Department management direction contributes to maintaining or improving connectivity, and adverse cumulative effects are not anticipated.

Montana Department of Fish, Wildlife and Parks

Grizzly bear management plans establish goals and strategies to manage and enhance grizzly bear populations and to minimize the potential for human-grizzly bear conflicts. A long-term goal is to allow the populations in western and southwestern Montana to reconnect through the intervening habitats. No adverse cumulative impacts on connectivity are anticipated.

Tribal lands

On the Flathead Indian Reservation lands within the Ninemile demographic connectivity area, the above-mentioned requirements under the forest management plan also apply. A tribally designated wilderness, Sleeping Woman, and tribally designated roadless areas, Burgess and the Ravalli Valley complex, help to facilitate grizzly bear occupancy and movements within the demographic connectivity area. In a 54-mile stretch of Highway 93 between Evaro and Polson, more than 50 wildlife crossing structures have been

constructed. Hiding cover is retained on the reservation adjacent to Highway 93 at Evaro and in the Ravalli Corridor to provide conditions that facilitate movement of wildlife. No adverse cumulative impacts on connectivity are anticipated as a result of tribal actions.

Canada

Grizzly bear populations in the lower 48 states are not separated biologically from grizzly bears in Canada. However, there are distinct differences in population status, habitat management, and regulatory mechanisms between the two countries. Overall, Canada supports approximately 27,000 grizzly bears in relatively contiguous populations (Ross, 2002). Grizzly bears are listed as a species of "special concern" under the Canadian Species at Risk Act, but this designation is given to any species that is sensitive to human activities, and does not indicate an extinction risk (USFWS, 2011c). The Forest has a boundary along the Canadian border and some grizzly bears use the area along this boundary (R. D. Mace & Roberts, 2012).

In contrast to the United States, there is no national land management agency that establishes and implements habitat management programs across Canada. The national parks and provincial parks have uniform habitat protections in place for grizzly bears. Provincial management plans have been developed for grizzly bears in British Columbia and Alberta. In Canada immediately north of the NCDE, the main human activities that have impacted grizzly bears and their habitat are timber harvesting, oil and gas exploration and development, coal mining, and the proliferation of roads and other human developments related to these industries. On February 18, 2010, the premier of British Columbia announced that mining, oil, gas, and coal development were no longer permissible land uses in the Canadian portion of the North Fork of the Flathead River Basin, removing a substantial threat to the NCDE population (USFWS, 2011c).

There is no evidence to suggest that adverse impacts to the NCDE grizzly bear population are now occurring or will occur due to management activities in Canada.

Grizzly bear determination of effects and rationale

The proposed action may affect and is likely to adversely affect the grizzly bear.

Rationale for Determination

The proposed action has the potential to adversely affect the grizzly bear because not all subunits in the recovery zone/primary conservation area provide habitat security conditions that are supportive of individual female grizzly bears and their offspring. In addition, there could be temporary increases in OMRD and TMRD or secure core due to projects (particularly in the general forest management area) that have the potential to adversely affect individual grizzly bears due to increased human disturbance/displacement and habitat alternation. The amendments would establish consistent definitions and direction in the forest plans relative to temporary use of roads for projects, administrative use, temporary use by the public outside of secure core, and limits on project duration. Implementation of these standards may also result in short-term adverse effects to individual bears. The proposed action would incorporate direction to maintain baseline levels, which would support continued recovery of the grizzly bear population as a whole. At the project level, activities would be subject to plan components, including standards and guidelines, designed to avoid or minimize adverse effects to individual grizzly bears and the habitats they occupy on federal lands.

Plan components for terrestrial and aquatic ecosystems on the Forest would benefit the grizzly bear by providing for habitat diversity and ecological conditions to sustain the NCDE population. Given that we cannot predict the exact locations of future projects and that there are not restrictions on the distribution

of effects spatially, we cannot discount the potential for localized, short-term adverse effects to individual grizzly bears.

In summary, available information documents increases in grizzly bear distribution, population size, and genetic diversity. The estimated population size was 765 bears in 2004 (Kendall et al. 2009), more than double the target of 391 bears based on sightings of females with cubs. Occupancy of bear management units has been documented (Costello et al. 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al. 2016).This has occurred even though there have been and would continue to be some short-term adverse effects to individual bears.

The proposed action would add desired conditions in zone 1 and a standard requiring no net increase from the baseline in motorized routes (roads and trails) open to public motorized use in the Salish demographic connectivity area and no net increase from the baseline in roads open to public motorized use on NFS lands in the rest of zone 1. These forest plan components would help to limit mortality risk in zone 1, support occupancy by female bears, and support movement to the Cabinet-Yaak recovery area.

The proposed action adds plan components for recreation that would be supportive to grizzly bear conservation in light of increases in population and increased recreational use of the Forest. The proposed action limits the risk of disturbance and mortality of grizzly bears. Although the Forest has very little livestock grazing or mineral exploration and development, the proposed action also limits the risk of future adverse effects to the NCDE grizzly bear population.

Wolverine

When the Forest's assessment was published (April 2014), the USFWS had published a proposed rule to list the North American wolverine distinct population segment (DPS) in the contiguous United States (USFWS, 2013a). However, on August 13, 2014, the USFWS withdrew its previous proposal (USFWS, 2014b). On April 14, 2016, the Court remanded the matter to the U.S. Fish and Wildlife Service for further consideration consistent with order CV 14-246-M-DLC (Consolidated with Case Nos.14-247-M-DLC and 14-250-M-DLC). The wolverine is now listed as a proposed threatened or endangered species for the Flathead National Forest, pending completion of a status review by the USFWS. The USFWS is currently preparing a Species Status Assessment (SSA) report that will incorporate additional information about the species from several new studies, as well as new climate modeling results for Glacier National Park (adjacent to the Forest) that includes a fine-scale assessment of snow extent and depth.

Affected environment

Population, life history, and distribution

Wolverines are year-round residents across Alaska and Canada. The southern portion of the species' range extends into high-elevation alpine portions of Washington, Idaho, Montana, Wyoming, California, and Colorado. Wolverines occur at low densities, range widely, inhabit remote and rugged landscapes away from human populations, and are difficult to detect, so conducting research on wolverines is challenging (IDFG, 2014). Wolverine populations in Montana were heavily trapped in the early 1900s and were near extinction by 1920. However, numbers increased in the western part of the state from 1950 to 1980 (Hornocker & Hash, 1981). Wolverine population growth and expansion has been documented in the North Cascades and northern Rocky Mountains (USFWS, 2013a). The Western Association of Fish and Wildlife Agencies is currently conducting a multi-state occupancy study to address conservation of the wolverine including restoring, connecting, and monitoring wolverine populations and their habitat in the U.S. Rocky Mountains and Cascade Mountains. Preliminary results for the 2016/17 monitoring season

indicate there were 157 detections of wolverine in grid cells across Montana, Idaho, Wyoming, and Washington, but genetic identification of individuals has not yet been completed.

According to the USFWS (2013a), "Wolverine records from 1995 to 2005 indicate that wolverine populations currently exist in the northern Rocky Mountains and that the bulk of the current population occurs here. Within the area known to currently have wolverine populations, relatively few wolverines can coexist due to their naturally low population densities, even if all areas were occupied at or near carrying capacity. Given the natural limitations on wolverine population density, it is likely that historic wolverine population numbers were also low" (p. 7868).

Wolverine populations fluctuate in response to prey availability, juvenile dispersal, and mortality of adult females. The USFWS stated that the northern Rocky Mountains portion of the North American wolverine distinct population segment is thought to be the largest subpopulation and the most genetically resilient of the current subpopulations within the United States (USFWS, 2013a). Inman and others (2013) estimated the current population as well as the population capacity for regions of the western U.S. The Forest is in the Northern Continental Divide region. Inman and others (2013) estimated that current population in the Northern Continental Divide region is at its capacity, with the highest capacity in the Bob Marshall Wilderness.

Current information for wolverine occurrence on the Forest is based on (1) reported trapping records; (2) non-invasive monitoring, including remote cameras and DNA analysis of hair or scat; and (3) observations/sightings of either the species or tracks recorded in Forest or State databases (USDA, n.d.). Wolverine detections are distributed across suitable habitats on the Forest (USDA, n.d.). No recent research that would estimate population levels has been conducted for wolverine on the Forest. The Forest and other cooperators detected a minimum of 13 individual wolverines within Forest geographic areas (based upon genetic analysis of samples collected during non-invasive carnivore monitoring in areas accessible by snowmobile from 2012-2015) (Curry et al., 2016; Pilgrim & Schwartz, 2015; Ruby et al., 2016; Swanson, 2017; SWCC, 2014, 2015).

Hornocker and Hash conducted telemetry research on 24 individual wolverines over a five-year period within a study area making up about 1,300 square kilometers of the Flathead National Forest (Hornocker & Hash, 1981). Their study area was primarily located in the South Fork of the Flathead River watershed and, secondarily, portions of the Sun, Swan, and Middle Fork of the Flathead River watersheds. About one half of the study area had timber harvest and a wide variety of types of recreation, and the other half was wilderness. Hornocker and Hash found wolverines at relatively high densities in the South Fork of the Flathead River watershed, and they concluded the population was stable (Hornocker & Hash, 1981). Research on wolverines has been conducted in the last decade or so in Glacier National Park (adjacent to the Forest)(Copeland & Yates, 2006; J. R. Squires, Copeland, Ulizio, Schwartz, & Ruggiero, 2007). Wolverines are constantly on the move and are known to make long-distance movements that are not impeded by topography or deep snow (Copeland & Yates, 2006; J. R. Squires et al., 2007). Copeland and Yates estimated that adult female wolverines have home ranges averaging 55 square miles. Adult males ranged over an even larger area, including lands outside the park, with home ranges that averaged 193 square miles (Copeland & Yates, 2006). Home range boundaries are dynamic, as are population demographics.

Habitat

For wolverine habitat across the western U.S., Inman and others reported that in general, wolverines are distributed in areas of higher elevation, where there is steeper terrain, more snow, fewer roads, less human activity, and in areas closer to high elevation talus, tree cover, and snow cover persisting to April 1 (Inman et al. 2013). Year-round habitat includes rocky alpine habitats, glacial cirque basins, and avalanche chutes

that provide food sources such as marmots, voles, and carrion (Copeland et al., 2007; Hornocker & Hash, 1981; Robert M. Inman et al., 2007; Magoun & Copeland, 1998). Wolverines appear to rely on the cold and snow to cache carrion (Robert M. Inman, Magoun, Persson, & Mattisson, 2012). Wolverines also travel through the area where snow persists and they minimize travel through low-elevation habitat (McKelvey et al., 2011). Persistent spring snow cover is also correlated with gene flow because this is where the wolverine's within-home-range movements and dispersal occurs year-round (M. K. Schwartz et al., 2009). The area modeled by Inman and others (2013) as providing for male dispersal encompasses the whole Forest, while the area modeled as providing for female dispersal is more limited.

Magoun and Copeland (1998) described two types of reproductive dens: natal dens where young are born and maternal dens where the mother may move the kits if conditions are no longer suitable at the natal den. Abandonment of natal and maternal dens may be a preemptive strategy that confers an advantage to females if prolonged use of the same den makes a den more evident to predators (USFWS, 2013a). Sites used for maternal dens are often close to the natal den and have a similar structure. Prior to the Glacier National Park study, not much was known about the den sites of reproductive female wolverines in Montana because den sites are often in remote terrain that is very difficult to study. During the first three years of the study, data was collected for 19 wolverines, and information about reproductive dens was obtained for two adult females that raised four offspring (kits). Copeland and others found that dens were excavated in the snow and were on upper slopes in sparse timber beneath downed woody debris or rocks. Dens are typically used through late April or early May. Females used two to three different dens prior to the weaning of kits at six to seven months of age. Kits gather at rendezvous sites that are primarily in boulder, talus, and cliff areas (Copeland et al., 2010). Survival of young was low, even in the national park setting where trapping is not allowed and motorized disturbance does not occur in winter or spring. Wolverine den sites may not occur in the same exact spot year after year, and specific maternal and/or natal den sites on the Forest are unknown.

Primary wolverine habitat is also characterized by low levels of human development (Copeland, 1996; Hornocker & Hash, 1981; Krebs, Lofroth, & Parfitt, 2007; USFWS, 2013a). This negative association with frequent human presence is sometimes interpreted as active avoidance of human disturbance, but it may reflect the wolverine's preference for cold, snowy, and high-elevation habitat that humans do not often develop. The USFWS assessed the effects of a variety of human activities that can affect wolverines and their use of habitat. The USFWS stated:

> Few effects to wolverines from land management actions such as grazing, timber harvest, and prescribed fire have been documented. Wolverines in British Columbia used recently logged areas in the summer and moose winter ranges for foraging (Krebs et al., 2007, pp. 2189-2190). Males did not appear to be influenced strongly by the presence of roadless areas (Krebs et al., 2007, pp. 2189-2190). In Idaho, wolverines used recently burned areas despite the loss of canopy cover (Copeland, 1996). . . .
>
> Intensive management activities such as timber harvest and prescribed fire do occur in wolverine habitat; however, for the most part, wolverine habitat tends to be located at high elevations and in rugged topography that is unsuitable for intensive timber management. . . . Wolverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities are a threat to the conservation of the species. (USFWS, 2013a, p. 7879)

The USFWS also stated that it is unlikely that wolverines avoid the type of low-use forest roads that generally are found in wolverine habitat. Based on the best available science, the USFWS concluded that wolverines do not avoid human development of the types that occur within suitable wolverine habitat and

that there is no evidence that wolverine dispersal is affected by infrastructure development (USFWS, 2013a).

Krebs and others (2007) modeled male vs. female wolverine habitat selection in British Columbia, hypothesizing that food, predation risk, and human disturbance affected habitat selection. Krebs and others based their model on 39 adult wolverines (23 females and 16 males) that were located a total of 2,125 times within two study areas. These authors modeled selection in two time periods: winter and nonwinter. The winter season was defined as the period when there was persistent snow cover at treeline. Human use variables included in the models they tested included those associated with winter recreation activity, roads, and timber harvesting. Winter recreation data included estimates of snowmobile primary use sites, locations of runs for two helicopter skiing companies in the Columbia Mountains study area, and backcountry ski use centered on the Trans-Canada Highway corridor within and adjacent to Mount Revelstoke and Glacier National Parks. These authors stated that extensive timber harvesting had occurred within a large portion of the study area. Krebs and others (2007) concluded that male wolverines were most closely associated with food availability in both summer and winter. Moose winter ranges, valley bottom forests, and avalanche terrain were positively associated with winter male wolverine use. The authors stated:

> Habitat associations of females were more complex; combinations of variables supporting food, predation risk, or human disturbance hypotheses were included in most supported models from both summer and winter in both study areas. Females were associated with alpine and avalanche environments where hoary marmot and Columbia ground squirrel prey are found in summer. Roaded and recently logged areas were negatively associated with female wolverines in summer. In the Columbia Mountains, where winter recreation was widespread, females were negatively associated with helicopter and backcountry skiing. Moose winter ranges within rugged landscapes were positively associated with females during winter. Our analysis suggests wolverines were negatively responding to human disturbance within occupied habitat. The population consequences of these functional habitat relationships will require additional focused research. Our spatially explicit models can be used to support conservation planning for resource extraction and tourism industries operating in landscapes occupied by wolverines. (abstract)

Recreational use in wolverine habitat

The threshold for the amount of human activity that can occur before it affects male and female wolverine habitat selection is unknown. Some scientists have expressed concern about the effects of human activities on female wolverines with young kits during the mid-February to mid-May time period because food resources are scarce for foraging females. As the kits mature, the mother will leave them for longer periods of time to find food, but until the kits are at least 10 weeks old, they cannot travel with their mother. If a female needs to move kits to a new location, or to another den, she must carry them in her mouth. If the female needs to move the kits very far, the probability of kits dying increases. Reproductive females and kits are at risk of predation (Magoun & Copeland, 1998), and, according to Persson in 2005, females are most vulnerable to energetic pressures due to the high cost of lactation during this period (Krebs et al., 2007). The predominant activity in some portions of wolverine habitat during this time period is backcountry recreation.

Winter backcountry recreation opportunities in the northern Rocky Mountains include snowshoeing, snowboarding, skiing, snowcat- or trackster-assisted skiing and snowboarding, snow bikes, and snowmobiling. Heinemeyer and Squires (2015) are investigating winter recreational use (primarily skiing, snowboarding, and snowmobiling) in wolverine habitat in central Idaho and the Yellowstone region of Idaho, Montana, and Wyoming. Heinemeyer and Squires stated that wolverines appear to tolerate many types of winter recreation in their home ranges. Wolverines have been documented to persist and

reproduce in habitats with high levels of human use and disturbance, including developed alpine ski areas and areas with motorized snowmobile use (Heinemeyer, 2012; Heinemeyer & Squires, 2013). Heinemeyer and Squires (2014) stated, "Wolverines appear to tolerate winter recreation in their home ranges, including denning females. Based on our preliminary findings, potential wolverine habitats that have even high levels of winter recreation may support resident wolverines despite the potential human disturbance" (p. 4). This suggests that wolverines can survive and reproduce in areas that experience human use and disturbance; however, there is uncertainty with respect to the amount, type, and timing of human recreational use and its effects on female wolverines.

Heinemeyer and Squires (2014) indicated there may be increasing avoidance of winter recreation areas as the amount of an individual wolverine's home range affected by winter recreation increases. They also noted that the reproductive status of the females may affect their potential response to winter recreation, with reproductive females having higher movement rates when in a high-use recreation zone. In their 2015 annual report, Heinemeyer and Squires (2015) stated that the field data collection for the wolverine winter recreation project was completed and they were focused on analyzing the responses of wolverines to winter recreation (p. 12). The response of individual wolverines to human disturbance is still being analyzed.

The Flathead National Forest has approximately 1.4 to 1.7 million acres of modeled wolverine habitat, depending upon which model is used (USFWS, 2013a, 2014b; Woods, Morey, & Mitchell, 2014). The majority of the modeled habitat occurs in the Bob Marshall Wilderness Complex in the South Fork and Middle Fork geographic areas, with lesser amounts in the Swan and Mission Mountain portions of the Swan Valley geographic area as well as the Whitefish Range portion of the North Fork and Salish Mountains geographic areas. On the Forest, about 59-64 percent of modeled wolverine habitat is in designated wilderness, where motorized uses (including snowmobiling, helicopter-assisted skiing or snowboarding, and trackster-assisted skiing or snowboarding) are not allowed. Nonmotorized uses such as backcountry skiing are not restricted, but because much of the wilderness area on the Forest is large and remote, it is also difficult to access for nonmotorized winter recreation. Wilderness areas provide habitat where the risk of human disturbance to wolverines is very low during the time period when females have dependent young. In addition, about 25 percent of modeled wolverine habitat is in inventoried roadless areas, where road building is not allowed and timber harvest is restricted. Glacier National Park, adjacent to the Forest, provides over 1 million acres that is closed to motorized over-snow vehicle use. In combination with wilderness areas on the Forest to the south, there are over 2 million acres of habitat available to wolverines where there is no motorized over-snow vehicle use allowed and where ungulates are present to provide sources of carrion. I

Some of the modeled wolverine habitat on the Forest has developed recreation and motorized access. Much of Whitefish Mountain Resort is in modeled wolverine habitat and skiers riding the lift observed a wolverine as it fed on carrion. Outside wilderness areas, restrictions on motor vehicle and motorized over-snow vehicle use provide habitat for wolverines with a low risk of human disturbance during time periods when wolverines may be sensitive—particularly in the North Fork geographic area, where use of motorized over-snow vehicles is restricted to specific routes in much of the area (Figure B-31 and Figure B-32). In areas open to motorized over-snow vehicle use, the amount of use has likely increased over the last few decades due to technical advances in motorized over-snow vehicles and human population growth in the Flathead Valley. Backcountry skiing has also increased in popularity.

Connectivity and wolverine habitat:

Inman and others (2013) reported that the Northern US Rockies include most of the major core areas, the majority of the current population, and connections to larger populations in Canada. They identified six regions that can likely function as major population cores where primary habitats exist as large blocks of

relatively contiguous, publically-owned lands that include significant portions of designated wilderness or national park and are capable of supporting 50 or more wolverines; these were the Northern Cascade, Northern Continental Divide, Salmon-Selway, Greater Yellowstone, Southern Rockies, and Sierra-Nevada Regions. Recent research in Glacier National Park has demonstrated that habitat connectivity between Glacier National Park, the Forest, and Canada currently provides for wolverine movement (Copeland & Yates, 2006).

Effects of the Framework Programmatic Action

For assessing effects to wolverine habitat, we used models which incorporated the work of two groups of scientists (Copeland et al., 2010; R. M. Inman et al., 2011)for wolverine habitat across the United States (USFWS, 2013a, 2014b) (Figure B-19), as refined by Inman and others (2013).

As described in the affected environment section above, research results suggest that wolverines are generally tolerant of human disturbance associated with recreation developments and activities (Heinemeyer & Squires, 2014, p. 4). The thresholds for the amount of development or human recreational use that individual wolverines will tolerate in their home ranges is unknown but is being investigated. Plan components would support key ecosystem characteristics for wolverines because about 59-64 percent of modeled wolverine habitat is in designated wilderness (the range varies based upon which model is used). In designated wilderness, the risk of human disturbance is low because motorized uses and mechanized transport such as snowmobiling, helicopter-assisted skiing or snowboarding, and snow bikes are not allowed. Nonmotorized and non-mechanized transport on the Forest are not restricted, but because much of the designated wilderness area on the Forest is remote, it is difficult to access for nonmotorized and nonmechanized winter recreation.

To assess effects of the risk of human disturbance to female wolverines with young, the Forest used the model developed by Copeland and others to model maternal denning habitat (2010). Modeled maternal denning habitat encompasses about 655,000 acres or about 27 percent of all Forest lands. In comparison with the environmental baseline, there would be a slight net decrease in modeled maternal denning habitat that is suitable for motorized over-snow vehicle use. The proposed action, alternative B modified, would change an area in Big Creek to suitable for motorized over-snow vehicle use, but the majority of the area added is not in modeled maternal denning habitat. An area in Sullivan Creek would become unsuitable and is in modeled maternal denning habitat.

The revised forest plan also includes guidelines that would benefit the wolverine by limiting the risk of human activities that might cause disturbance in modeled maternal denning habitat in the future. FW-GDL-WL-04 states, “New projects or activity authorizations involving low-altitude helicopter flights or landings in areas of modeled wolverine maternal denning habitat (identified in cooperation with USFWS and the USFS Rocky Mountain Research Station) should not occur from February 15 to May 15 unless they include strategies or design features to mitigate disturbance to wolverines. Exceptions to this guideline may occur for public health and safety, emergency activities, or other approved administrative activities, such as site maintenance.” FW-GDL-REC-04 states, “To limit the risk of cumulative impacts to female wolverines with dependent young, there should be no net increase in percentage of modeled wolverine maternal denning habitat where motorized over-snow vehicle use would be suitable on NFS lands at a forestwide scale. Specific locations of routes or areas suitable for motorized over-snow vehicle use are specified in figure B-11.”

Under alternative B modified, about 15 percent of modeled wolverine maternal denning habitat is in recommended wilderness (management area 1b) and it would not be suitable for motorized uses or mechanized transport. In summary, scientific information about the effects of human disturbance indicates that wolverines are generally tolerant of many types of human recreational developments and use, as

described in the affected environment section. The thresholds for levels of human disturbance in habitats where female wolverines give birth to and raise dependent offspring are unknown at this time, but plan components for all alternatives would limit the risk of human disturbance.

Plan components support habitat connectivity for the wolverine by: 1) designating management areas that form large contiguous blocks of habitat with low levels of human development to provide for potential range shifts of this species, 2) providing for ecological conditions that meet subsistence and movement needs in connectivity areas, 3) limiting mortality risk through management of motorized access, 4) working with adjacent landowners and other interested parties to improve connectivity and linkage opportunities across multiple jurisdictions (e.g., cooperative agreements, highway approaches/ crossings, and land consolidations, exchanges, acquisitions, easements). Some of the key plan components include:

- Infrastructure standard FW-STD-IFS-02 limits increases in motorized access, and guideline FW-GDL-IFS-12 specifies that within areas specifically identified as being important for wildlife connectivity across highways (see table 18), the Forest should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety.

- Energy and minerals standards FW-STD-E&M-08 and 09 contribute to connectivity. For example, new leases for leasable minerals in the grizzly bear recovery zone/primary conservation area shall include a no surface occupancy stipulation and development is not allowed in areas withdrawn from mineral entry.

- Desired condition FW-DC-LSU-01 specifies that land ownership adjustments, through purchase, donation, exchange, or other authority, improve national forest management by consolidating ownership, reducing wildlife-human conflicts, providing for wildlife habitat connectivity, improving public access to public lands, and retaining or acquiring key lands for wildlife and fish and lands within wild and scenic river corridors.

- Desired condition FW-DC-P&C-01 specifies that the Forest work towards an all-lands approach to management, in cooperation with other land managers, such as by mitigating threats or stressors, providing for wildlife and fish habitat connectivity, and providing social, economic, and ecological conditions that contribute to mutual objectives.

- Several geographic area plan components provide for connectivity, incorporating areas where connectivity across highways is emphasized in several models: GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06 and 07, GA-SM-DC-03, and GA-SV-DC-09, GA-MF-OBJ-01, GA-NF-OBJ-03, and GA-SM-OBJ-04.

- Management area suitability also contributes to connectivity. For example, management areas 1a, 1b, 2a, 2b, 4a, 5a, and 5c are not suitable for permanent road construction, wheeled motor vehicle use, or timber production (see revised forest plan table 34 for more details).

Cumulative effects on the wolverine

Cumulative effects under the Endangered Species Act include state, tribal, local, or private actions that are reasonably certain to occur in the action area. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in the cumulative effects analysis in this biological assessment.

The wolverine trapping harvest during the 30 years prior to 2007 was considered stable, with a statewide average of 10.5 wolverines taken annually during this time period (Giddings, 2009, pp. 35-39). Then, based on research findings by Squires and others (J. R. Squires et al., 2007), wolverine trapping quotas were adjusted downward for the two large ecosystems in the state; the Northern Continental Divide Wildlife Management Unit (WMU 1) and the Greater Yellowstone (WMU 3). Further analysis tied to the genetic make-up of the Montana wolverine population, the issue of maintaining population connectivity, and recognizing the core population areas of three major ecosystems (now including the central Idaho wilderness area) led to additional regulation changes in 2008. These adjustments included delineating four wildlife management units and reducing quotas to a statewide total of five animals, with a central Montana wildlife management unit quota of 0, to promote population connectivity among the three major ecosystems in the state where harvest is allowed (Giddings, 2009, pp. 35-39). In December 2012, a state district court judge in Helena granted a temporary restraining order that blocked the opening of Montana's 2012–13 wolverine trapping season, and it remained closed with a quota of "0" in 2013–14 and 2014–15. The future of wolverine trapping is unknown. The Forest is within wolverine management unit 1 (WMU 1) (northwest Montana), which had a quota of three wolverines (with a maximum of one female) in 2010 and has had a quota of 0 since then (MTFWP, 2015). Since trapping was suspended in 2011, there has been one wolverine trapped accidentally (T. Thier, MFWP, personal communication, 2016). Glacier National Park, encompassing about one million acres adjacent to the Forest, is closed to trapping. Any cumulative effects to the wolverine resulting from trapping and winter recreation access on all lands are highly uncertain at this time, but investigations are ongoing. Management on the Forest has supported wolverine populations in the past and is expected to continue to do so in the future.

Lands managed by the Confederated Salish and Kootenai Tribes include the Mission Mountains Tribal Wilderness Area and the South Fork Jocko Primitive Area. Cumulative adverse effects to the wolverine are not expected as a result of management actions on tribal lands.

Private lands do not generally occur in modeled wolverine habitat on the Flathead National Forest. The human population in northwest Montana has grown at a relatively high rate during the past few decades, and growth is expected to continue. Increasing residential development along highways that cross wolverine habitat and demand for recreational opportunities can result in disturbance or habitat fragmentation,

With respect to connectivity and highways on the Forest, there is one high-elevation paved highway along the border between the Forest and Glacier National Park. Since 2011, there have been two wolverines killed by vehicles in MFWP Region 1 (T. Thier, MFWP, personal communication, 2016). Squires and others concluded that wolverine movements are unpredictable and are not well suited for planning structural highway mitigation projects. They suggested that connectivity for wolverines may be facilitated by limiting permanent developments through conservation easements and land purchases (J. R. Squires et al., 2007). The Forest and Montana DNRC recently completed the Legacy land acquisition in the Swan Valley geographic area of the Forest. This acquisition and other conservation easements on private lands may benefit wolverines in the future by limiting the density of permanent human developments and facilitating movement between mountain ranges.

Wolverine determination of effects and rationale

The proposed action may affect and is not likely to jeopardize the wolverine.

Rationale for Determination

The wolverine is proposed for listing. Five factors are utilized to determine if a species should be listed under the Endangered Species Act (Federal Register at 7874):

A. the present or threatened destruction, modification, or curtailment of its habitat or range;
B. overutilization for commercial, recreational, scientific, or educational purposes;
C. disease or predation;
D. the inadequacy of existing regulatory mechanisms; and
E. other natural or man-made factors affecting its continued existence.

Factor A is the primary factor relevant to the proposed programmatic action. Under factor A, the USFWS recognized the following categories of impacts to wolverine habitat: (1) climate change, (2) habitat impacts due to human use and disturbance, (3) dispersed recreation activities, (4) infrastructure development, (5) transportation corridors, and (6) land management. Effects of climate change and human use and disturbance are described in the affected environment section. As detailed in previous sections, the set of plan components in the revised forest plan limit potential impacts due to human use and disturbance, dispersed recreation activities, infrastructure development, and land management, considering anticipated future climates.

The northern Rocky Mountains portion of the North American wolverine distinct population segment is thought to be the largest subpopulation and the most genetically resilient of the current subpopulations (USFWS, 2013a). Key ecosystem characteristics for the wolverine include high elevations with persistent spring snow, habitat for dispersal, and features such as rocky alpine areas, glacial cirque basins, and avalanche chutes that provide food sources such as marmots, voles, and ungulate carrion. Maternal and natal denning habitat with relatively low levels of human development are important, although the thresholds are unknown. The proposed action has plan components, including standards and guidelines, to maintain, improve, and restore ecological conditions within the plan area to contribute to conservation of the wolverine. In their concurrence letter for the programmatic biological assessment on the North American wolverine for the USDA Forest Service Northern Region, the USFWS (2014e) concurred that potential projects routinely conducted on National Forest Service lands are not likely to jeopardize the wolverine. The proposed action for the Flathead National Forest includes specific plan components for the wolverine that would reduce the risk of future adverse impacts due to recreation activities on the Forest in light of a changing climate and uncertainty of future climate effects. Plan components beneficial to grizzly bear and Canada lynx would also benefit the wolverine. Monitoring items MON-WL-14 and 17 address the wolverine and its habitat (see chapter 5 of the revised plan for more details).

Aquatic Species

This section of the programmatic biological assessment addresses the effects of implementing the revised forest plan for the Flathead National Forest on bull trout.

Bull Trout

Habitat and Life History

Bull trout have more specific habitat requirements than most other salmonids. Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, substrate for spawning and rearing, and migratory corridors. Bull trout are found in colder streams and require colder water than most other salmonids for incubation, juvenile rearing, and spawning. Spawning and rearing areas are often associated with cold-water springs, groundwater infiltration, and/or the coldest streams in a watershed. Bull trout typically spawn from August to November during periods of decreasing water temperatures. However, migratory bull trout frequently begin spawning migrations as early as April and have been known to move upstream as far as 155 miles to spawning grounds (Fraley & Shepard, 1989).

Throughout their lives, bull trout require complex habitats for cover, including large woody debris, undercut banks, boulders, and pools (USFWS, 2002). Bull trout exhibit three life history types—adfluvial, fluvial, and resident—and all require cold-water temperatures, typically less than 60 °F, during portions of their life cycle to persist. Bull trout are opportunistic feeders with food habits primarily a function of size and life history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Donald & Alger, 1993). Adult migratory bull trout are primarily piscivorous, known to feed on various fish species (Fraley & Shepard, 1989).

For spawning and early rearing, bull trout require loose, clean gravel relatively free of fine sediments. Because bull trout have a relatively long incubation and development period within spawning gravel (greater than 200 days), transport of bedload in unstable channels may kill young bull trout. Bull trout use migratory corridors to move from spawning and rearing habitats to foraging and overwintering habitats and back. Different habitats provide bull trout with diverse resources, and migratory corridors allow local populations to connect, which may increase the potential for gene flow and the support or refounding of populations.

Maintaining bull trout habitat requires stream channel and flow stability (B. Rieman & McIntyre, 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (James & Sexauer, 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel during winter through spring (Karen L. Pratt, 1992; K. L. Pratt & Huston, 1993).

Status and Distribution

Bull trout in the coterminous United States were listed as threatened on November 1, 1999 (USFWS, 1999). Earlier rulemakings had listed the Columbia River distinct population segment of bull trout as threatened on June 10, 1998 (USFWS, 1998a). The Columbia River distinct population segment occurs throughout the entire Columbia River basin within the United States and its tributaries, excluding bull trout found in the Jarbidge River, Nevada. Critical habitat was designated for bull trout in 2010 (USFWS, 2010).

Relatively widespread, though not spatially ubiquitous, populations that have declined in overall range and numbers of fish represent the Columbia River bull trout distinct population segment. A majority of Columbia River bull trout occur in isolated, fragmented habitats that support low numbers of fish and are inaccessible to migratory bull trout. The few remaining bull trout "strongholds" in the Columbia River Basin tend to be found in large areas of contiguous habitats in the Snake River Basin of the central Idaho mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon (USFWS, 1998a).

According to Lee et al. (1997), bull trout are widely distributed across the Columbia River Basin, although their current range is about 60 percent of historic distribution. Although many populations of native aquatic species are stable or improving, bull trout are considered to be in decline across their range. Migratory life histories have been lost or are limited throughout the current range due to the introduction of non-native species and intensive land management activities such as road construction and timber harvest that have affected habitat conditions for the species (USFWS, 1998a).

Bull Trout Critical Habitat and Primary Constituent Elements (PCEs)

The USFWS designated bull trout critical habitat on current knowledge of the life history, biology, and ecology of the species. The extent of bull trout designated critical habitat within the activity area includes 596 stream miles across the Forest, within the three core areas identified in the recovery plan (USFWS, 2015c). The Service determined the characteristics of the habitat necessary to sustain the essential life history functions of the species and identified the following primary constituent elements (PCEs) for bull trout critical habitat (USFWS, 2010).

Within the designated critical habitat areas, the PCEs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. Based on current knowledge of the life history, biology, and ecology of this species and the characteristics of the habitat necessary to sustain its essential life-history functions, the following PCEs are essential for the conservation of bull trout and may require special management considerations or protection:

The relationship between the matrix of pathway indicators (MPIs) (USFWS, 1998b) and PCEs is provided for in Appendix E.

(1) Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.

(2) Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

(3) An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

(4) Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates to provide a variety of depths, gradients, velocities, and structure.

(5) Water temperatures ranging from 2-15 °C (36-59 °F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat; and local groundwater influence.

(6) Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount (e.g., less than 12 percent) of fine substrate less than 0.85 mm (0.03 in.) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.

(7) A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, they minimize departures from a natural hydrograph.

(8) Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

(9) Few or no non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.

Bull Trout Status

The following discussion is taken from the *Western Montana Bull Trout Conservation Strategy* (USDA-USFWS, 2013). The strategy for was been created in response to ongoing bull trout population declines occurring on and near National Forests in Western Montana, despite efforts to improve habitat quality. The strategy provides a standard process to update bull trout population and habitat status, a structured and consistent assessment of fish habitat conditions including stressors on populations, and prioritized needs by core area on National Forest Lands to give line officers the best available information prior to making decisions on bull trout restoration opportunities.

Flathead Lake Core Area Discussion

The Flathead Lake watershed is one of the largest, most complex, and best-documented bull trout core areas in the upper Columbia River watershed, encompassing 125,000-acre Flathead Lake (the largest freshwater lake in the United States west of the Mississippi River) and a large portion of northwest Montana extending into British Columbia, Canada. The Flathead Lake Core Area includes all of Flathead Lake and the North Fork of the Flathead River, Middle Fork of the Flathead River, and South Fork Flathead River (up to Hungry Horse Dam) and all tributaries within these described areas. The South Fork above Hungry Horse Dam forms the separate Hungry Horse Core Area. The Whitefish and Stillwater River systems are separate core areas and are currently insignificant contributors of bull trout to the Flathead Lake Core Area, due in part to low current population densities of fish that are restricted primarily to their headwaters, although they may have been more important historically. The Swan River is a separate core area from the outlet of Swan Lake upstream (Swan Lake Core Area) and also was apparently historically isolated due to the warm thermal regime of the lower Swan River. The conservation strategy only addresses bull trout populations on the Flathead National Forest and does not include populations within Canada and Glacier National Park.

The South Fork of the Flathead (upstream of Hungry Horse Dam) was a naturally important contributor to Flathead Lake. Zubik and Fraley (1987) estimated that potential habitat for about 2,100 spawning adult bull trout (and 65,287 migratory juvenile cutthroat trout) was lost annually to Flathead Lake in the South Fork of the Flathead (38 percent of the drainage basin) with the closure of Hungry Horse Dam in 195 3. Based on comparative population levels of spawning bull trout in the North Fork and Middle Fork, the loss statement (Zubik & Fraley, 1987) estimated that between 4,844 and 6,966 adult bull trout would have spawned in the Flathead River forks in the early 1980s without the dam.

Some biologists believe current bull trout densities in the Flathead Lake Core Area are approximately 10 percent of what they were historically, and other biologists believe current populations may be as much as 50 percent of what they were historically. The distribution of populations throughout the core area is

likely similar to historic patterns. Local populations are still relatively widespread in about 22 tributaries and occur in all historically occupied systems (occurrence is based largely on the presence of cold water). Life history expression is probably also similar to historic, as most populations are currently and were historically primarily adfluvial.

Bull trout populations in the Flathead Lake Core Area were likely first exposed to significant human-caused impacts in the late 1800s. Prior to this time, bull trout were fished for by native Salish and Pend d'Oreille peoples and maintained relatively robust and widespread populations throughout the Flathead Lake Core Area. Beginning in the late 1800s, however, European settlement in the area increased, which brought more fishing pressure and intensive land uses that directly affected bull trout and their habitats. Bull trout were commonly viewed as "trash fish" for decades and indiscriminately killed (until the 1950s, when tributaries were closed to fishing for bull trout—it is not clear whether these closures were due to observed population declines or were a proactive measure to protect vulnerable spawners). Logging by the private landowners in the Flathead Valley, soon followed by timber harvesting by the Forest Service in the early 1900s, was directly and indirectly responsible for extensive changes in habitat. These practices resulted in both direct mortality to bull trout inhabiting the river and also long-term simplification of habitat that negatively affected the productivity and carrying capacity of the system for decades. Construction of the transcontinental railroad caused significant impacts along the Middle Fork of the Flathead River, and road construction practices of the time paid little concern to important riparian habitat and access to spawning grounds. The mainstem Flathead River upstream of Flathead Lake was subjected to intensive snag removal and channel clearing to clear the way for steamboat traffic upstream from Flathead Lake.

Beginning around 1905, another long-term impact to the system arrived with the stocking of lake trout in Flathead Lake (lake whitefish were also planted around this time, but their impact on bull trout has been minimal, so far as is known). In 1910, other non-native fish were planted in the lake and throughout many tributaries. Yellow perch, brook trout, Yellowstone cutthroat trout, rainbow trout, and kokanee were all stocked in the system between 1910 and 1916. The effects of these species have not all been the same. As mentioned, lake trout likely had the largest long-term negative effect on bull trout through direct predation and competition for similar food resources in Flathead Lake. Brook trout have colonized much of the valley habitat (though less common in the Middle Fork and North Fork tributaries) and in so doing may have had effects on formerly productive bull trout populations. Kokanee, on the other hand, likely had a neutral or positive effect on bull trout populations by providing an abundant high-calorie food source in the lake and in the rivers where the larger fish migrated and spawned when they matured. It is thought that kokanee, an obligate planktivore, largely replaced formerly abundant native westslope cutthroat trout, but they may have bolstered bull trout populations by creating an unnaturally elevated prey base.

In the 1950s-1960s, another era of extensive logging in the three forks of the Flathead River headwaters of the core area began. This time, extensive road networks were constructed to access timber, which resulted in increased erosion and a proliferation of small-scale fish barriers at road/stream crossings throughout the watershed. These roads not only affected habitat but also facilitated increased fishing and harvest or poaching of spawning bull trout in many tributaries. These impacts occurred on both Flathead National Forest and state forest lands as well as Plum Creek Timber Company and other private lands throughout most of the Flathead Lake Core Area.

The 1964 flood was a record-breaking event that took out large portions of Highway 2 and the railroad along the Middle Fork of the Flathead River. Many streams were scoured to bedrock and large wood was flushed from the system, which simplified habitat. Streams may still be recovering from the effects of the flood.

On the fisheries front, Mysis shrimp were introduced into several Flathead Valley lakes in 1967, which ultimately spread to Flathead Lake (1981) and disrupted the food web interactions in the system. The establishment of Mysis was determined to be responsible for the collapse of a formerly strong population of kokanee salmon and fueled major increases in lake trout and lake whitefish populations (Spencer, McClelland, & Stanford, 1991). Predation, competition, or other forms of negative interaction with lake trout is widely believed to be the single factor most responsible for the currently depressed condition of bull trout in this core area (MFWP-CSKT, 2000). However, these complex interactions and the specific role of each in the Flathead Lake Core Area remain unsettled and are a source of major disagreement and ongoing concern.

Ongoing summary and discussion of recent (MFWP and CSKT) fish management program direction indicates that Flathead Lake anglers have harvested between 45,000 and 70,000 lake trout annually from 2008 through 2011 (roughly equal to the management goal of 60,000). Catch per unit effort and species composition of lake-wide gill net catch were similar in recent years, and indicators suggest the lake trout population remains stable (B. Hansen & Evarts, 2008) and bull trout and cutthroat trout populations remain stable but lower than pre-Mysis levels. Pike numbers, inhabiting primarily the mainstem Flathead River also appear relatively stable. Recent bioenergetics modeling (Muhlfeld, Bennett, Steinhorst, Marotz, & Boyer, 2008) indicated that northern pike consume nearly 3,500 bull trout annually in the core area and are likely contributing to the predator trap. Monitoring programs indicate that bull trout redd numbers were at or below secure levels prescribed my managers in the mid-1990s but exceeded secure levels since the late 1990s (Deleray & Hansen, 2002).

In the mid-1990s, with the threat of ESA listing impending, greater angling restrictions were instituted on bull trout harvest. There is currently no harvest of bull trout allowed in the Flathead Lake Core Area, but some incidental mortality is associated with the heavy angling pressure for lake trout in Flathead Lake and heavy angler use on the Flathead River system, and there is also some limited mortality associated with gillnetting in the lake.

At the current time, many of the past direct habitat impacts associated with logging and road construction have been reduced or eliminated, and therefore some potential stressors on the population no longer play as large a role as they did historically. In addition, much of the habitat where bull trout spawn and rear is protected by Wilderness, National Park, or National Wild and Scenic River corridors. Private land ownership in the three forks of the Flathead is limited. On National Forest lands where bull trout exist, there has been minimal development of new roads or timber sales and a strong emphasis on road decommissioning and application of BMPs, in large part due to grizzly bear security concerns. Potential for significant negative impacts due to sediment production and other wide-scale effects of recent large fires has been largely mediated by favorable precipitation and runoff patterns in the vulnerable post-fire periods. The full implementation of the selective withdrawal system at Hungry Horse Dam has restored more normative flow and temperature regimes to the mainstem Flathead River.

Though Hungry Horse Dam on the South Fork Flathead River removed a substantial portion (an estimated 38 percent) of the spawning and rearing habitat, the integrity and connectivity of the remaining habitat in the North and Middle Fork drainages of this core area is high. The Flathead Lake Core Area is a large core area, with some natural barriers in headwaters and occasional temporary barriers resulting from beaver dams or other natural activities. However, there are no known human-caused barriers on bull trout spawning and rearing streams, and bull trout from Flathead Lake have been documented to travel as far as 150 miles upstream to spawn in headwaters of the North Fork and Middle Fork.

Despite the recent improving trend in bull trout habitat, some concerns remain due to the potential for long-term increases in water temperatures, future effects of rain-on-snow precipitation patterns, and potential future land management in the headwaters. Recently, additional emphasis has been placed on

identifying and evaluating important bull trout habitat in the British Columbia headwaters of the Flathead, given threats of expanded coal, oil, and gas exploration and development and timber extraction.

An extensive redd count monitoring program was developed and implemented by MFWP beginning in 1980. Based on data collected from eight index tributary streams in the North Fork and Middle Fork of the Flathead River (collectively representing about 45 percent of the known spawning in the basin), bull trout index redd counts ranged from about 300-600 in the 1980s (averaging 392), then dropped drastically in the early 1990s to a range of 83-243 in the seven years prior to listing (averaging 137 between 1991 and 1997). From 1998 through 2012, index redd counts ranged from 130 to 251 redds, averaging 195. Some counts were considered minimum counts due to poor conditions during portions of the survey. Based on these counts, the recent trend appears relatively stable at a level roughly half of that in the 1980s.

Flathead River Basin-wide counts were made sporadically in 11 of the 30 survey years, representing "all 31 stream sections known to be used by Flathead Lake spawners" (T. Weaver, 2008, MFWP, pers. comm.). The Basin-wide total has ranged from lows of 236 (1997) and 291 (1992) to highs of 1,156 (1982) and 850 (1986). The Basin-wide count in 2012 was 500, approaching the average count of 578 for the 11 Basin-wide counts conducted since 1980.

Thus, there is considerable uncertainty regarding bull trout status and trends in the Flathead Lake Core Area, but recent Basin-wide counts would seem to indicate an adult bull trout population of at least 1,600 fish in this core area (3.2 adults per redd conversion factor), perhaps as high as nearly twice that (adding in non-spawning adults that remained behind in the lake or river).

Currently, the main threats to bull trout in the Flathead Lake Core Area are (1) introduced species/fisheries management, (2) Forest management practices and Forest roads, and (3) angling or harvest (legal or illegal). The USFWS convened a bull trout scientific review team in 2008 that agreed with 100 percent consensus that these three threats, in this order, currently represent the greatest threats to bull trout in the Flathead Lake Core Area. Given that threat (2) is currently being mitigated by BMPs and other actions and that active forest management activities are much reduced in scope, and also that the overall habitat trend is improving, they concluded that the non-native species threat (especially lake trout and Mysis but also northern pike and other warm-water fish) poses the greatest ongoing risk to bull trout in the Flathead Lake Core Area. The Forest Service will continue to play a leading role in facilitating appropriate habitat improvements for bull trout on Forest Service lands. Similarly, the Forest Service will continue to engage with partners, including the MFWP, USFWS, and the Confederated Salish and Kootenai Tribes, on native and non-native fish management issues in the core area, needs, and recovery planning.

Flathead Lake Core Area—Flathead National Forest

There are thirteen local populations within the core area on the Flathead National Forest, eight of which are index reaches. Ole, Park, and Nyack Creek are not included here because over 95 percent of the land base is in Glacier National Park. Frozen Lake is a simple core area. Cyclone Lake, Upper Stillwater Lake, Upper Whitefish Lake, and Whitefish Lake (also simple core areas) are not discussed in this conservation strategy because 90 percent or more of the land base is under state ownership. The index reaches are Trail Creek, Whale Creek, Coal Creek, Big Creek, Morrison Creek, Lodgepole Creek (tributary to Morrison Creek), Granite Creek, and Ole Creek. Although adfluvial bull trout do spawn in other tributaries, these eight streams support the larger adfluvial spawning runs, and redd numbers within them appear to represent about 45 percent of the total adfluvial spawning that occurs in the Basin.

Flathead Lake Core Area Summary

Table 39 summarizes relevant information from each of the 6th field HUC local populations. This summary provides an overall assessment of the importance of restoration activities for the entire Flathead Lake Core Area within the borders of the Flathead National Forest. It does not include necessary restoration activities in watersheds where the Forest has no ownership that may be critical for overall restoration of the bull trout population in the core area. All of the local bull trout populations are also part of the Conservation Watershed Network. The intent is to identify habitat networks of existing strongholds with robust populations and high quality habitat that will support expansion and recolonization to adjacent watersheds. These areas should conserve key processes likely to influence the persistence of populations or metapopulations.

Table 39. Summary of important local population attributes and conservation recommendations for the Flathead Lake Core Area.

Local Population	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Trail Creek	Upper Trail Creek	Low	Low	Conserve
	Lower Trail Creek	High	Low	Conserve
Whale Creek	Upper Whale Cr	Low	Low	Conserve
	Shorty Creek	High	Low	Conserve
	Lower Whale Creek	High	Low	Conserve
Red Meadow Creek	Red Meadow Creek	Low	Low	Conserve
Coal Creek	Upper Coal Creek	Low	Low	Conserve
	South Fork Upper Coal Creek	High	Low	Conserve
Big Creek	Hallowat Creek	High	Moderate	Active
	Upper Big Creek	High	Moderate	Active
	Lower Big Creek	Moderate	Low	Active
Strawberry Creek	Strawberry Creek	High	Low	Conserve
Bowl Creek	Bowl Creek	High	Low	Conserve
Clack Creek	Clack Creek	High	Low	Conserve
Schafer Creek	Schafer Creek	High	Low	Conserve
	Dolly Varden Creek	High	Low	Conserve
Morrison Creek	Morrison Creek	High	Low	Conserve
Granite Creek	Granite Creek	High	Low	Conserve
Long Creek	Long Creek	High	Low	Conserve
Bear Creek	Bear Creek	High	Low	Conserve
Frozen Lake*	Frozen Creek	High	Low	Passive

[a] **Active restoration** is management intervention systematically focused on improving a degraded habitat condition or dysfunctional watershed processes such that the improved habitat can be maintained via restored processes and removal of impairments; **passive restoration** is a restoration process more typified by simply reducing or eliminating the sources of degradation that may allow recovery over time. For instance, INFISH standards and guidelines are intended to reduce new or ongoing management pressures to riparian areas that can degrade or maintain degraded riparian and stream conditions; **conservation** is a strategy intended to maintain one or more existing local populations, habitats, and processes that, compared to other areas in the Core, are functioning well enough to provide a foundation from which other populations can anchor to and reconnect with as active improvements occur in other Core Area locations.

Hungry Horse Core Area Discussion

The Hungry Horse Core Area includes all of Hungry Horse Reservoir and the South Fork Flathead River and all tributaries upstream of the dam. Hungry Horse Dam, completed in 1954, isolates the South Fork Flathead River drainage from its former connectivity with Flathead Lake, cutting off about 38 percent of the spawning and rearing habitat for the Flathead Lake core area (Zubik & Fraley, 1987). The Hungry Horse Core Area bull trout population originated from adfluvial Flathead Lake stocks that were trapped upstream of Hungry Horse Dam. There is no evidence of resident fish occurrence in this core area.

In 1998, the status and trend of bull trout in the Hungry Horse Core Area was considered "strong" and "stable" based on information available at the time of listing (USFWS, 1998a). This was the only Montana core area accorded that combination of attributes and is in sharp contrast to most core areas in western Montana, where current bull trout densities are typically well below historic levels. Since then, the population has continued to remain stable and even increase, suggesting that the status and trend calls were accurate. The distribution of bull trout populations throughout the core area is probably similar to historic patterns, as is life form expression (dominated by adfluvial adults). This is a large core area with some natural barriers in headwaters and occasional temporary barriers resulting from beaver dams or other natural activities. There are no known human-caused barriers on bull trout spawning and rearing streams. In recent years, the reservoir has been held at more stable levels (as opposed to drawdowns of up to 200 feet in the early 1990s), further improving connectivity with reservoir tributaries and the upstream watershed. Hungry Horse Dam (564 feet high) is a complete barrier to all upstream and most downstream movement of bull trout. Entrainment of bull trout through the dam probably occurs at low levels but has not been an issue, likely due to the depth and configuration of penstock withdrawal. The South Fork upstream of Hungry Horse Dam is a de facto native fish refugium, and the barrier the dam presents to upstream movement of non-native species (e.g., rainbow trout and lake trout) is currently considered an asset to bull trout recovery.

Hungry Horse Reservoir and the South Fork of the Flathead is the largest bull trout habitat in northwest Montana with a predominantly native fish species assemblage. MFWP has recognized the importance of this and is implementing measures to systematically remove non-native salmonids in the limited headwater lake basins where they occur (as a result of historical stocking programs with rainbow trout and Yellowstone cutthroat trout). The entire upper watershed is within the Bob Marshall Wilderness.

Historic bull trout redd counts are not available. The number, size, and age composition of bull trout that were trapped upstream of the dam at closure in 1954 are unknown. It is likely that numbers were lowest immediately following the construction of the dam and filling of the reservoir and then quickly rebounded with the new habitat and food resources afforded by the reservoir. The population likely expanded for a period of several years through the 1960s. However, heavy angling, logging on non-wilderness lands surrounding the reservoir, and extreme reservoir drawdowns are surmised to have caused the bull trout population to decline during the 1970s and 1980s. In 1993, due to pending Endangered Species Act action, angling for bull trout was restricted. This facilitated a long-term increase in the population that has sustained itself despite limited angling opportunity and the harvest that was reinitiated beginning in 2004.

Current bull trout densities in the Hungry Horse Core Area appear to be relatively stable or increasing at about 2,500 to 3,000 adults, based on MFWP redd count data from 1993 to present. Because the Hungry Horse Core Area was formed by a reservoir that inundated a portion of the previous migratory corridor for fish from Flathead Lake, there was no established previous record of natural carrying capacity for this portion of the system in isolation. Rather, this core area incorporated about 38 percent of the spawning and rearing habitat for the Flathead Lake Core Area (Zubik & Fraley, 1987). The loss statement for the Hungry Horse Dam mitigation program concluded that the dam construction eliminated between 1,840 and 2,089 adult bull trout from the Flathead Lake population (Zubik & Fraley, 1987). Based on that

analysis, we can conclude that the adult bull trout population occupying this core area (estimated at 2,500-3,000 fish) is similar in size to the natural carrying capacity of the area when it was still attached to Flathead Lake. However, it must be noted that although Hungry Horse Reservoir is a large, deep, cold body of water that provides generally excellent foraging, migrating, and overwintering habitat for subadult and adult bull trout, it is not nearly as productive as the natural habitat of Flathead Lake. As a consequence, adult adfluvial bull trout in Hungry Horse Reservoir are typically not as large as the Flathead Lake fish and their condition factors are not as high.

In contrast to many core areas in western Montana, habitat in the Hungry Horse Core Area is large, connected, and secure. In addition, the population has the added benefit of having a large reservoir rearing area, providing habitat that is relatively buffered from environmental extremes and supports adequate natural food resources for a large bull trout population. A 1985 analysis of 125 stomachs of bull trout from Hungry Horse Reservoir found that native fish made up 99.7 percent of the diet, by weight (May et al., 1988), dominated numerically by northern pikeminnow (39 percent), mountain whitefish (28 percent), suckers (26 percent), and westslope cutthroat trout (7 percent). There are few current threats to bull trout in the core area. Currently, the greatest threats are angling (legal or illegal) and reservoir operations, in that order (USFWS, 2008).

The recreational bull trout fishery on Hungry Horse Reservoir has continued since 2004 and is being closely monitored (Hensler & Benson, 2007; Rosenthal, 2009, 2010; Rosenthal & Hensler, 2008). Angler catch and harvest (in parentheses) of bull trout from Hungry Horse Reservoir has been estimated as follows: 2004-05 catch = 355 (48); 2005-06 catch = 2,154 (58); 2006-07 catch = 623 (56); 2007-08 catch = 533 (57); 2008-09 catch = 621 (74); 2009-10 catch = 832 (97). In addition, anglers participating in the catch-and-release fishery authorized in the upper end of the reservoir and in the South Fork Flathead River into the Bob Marshall Wilderness were estimated to have caught 173 bull trout in 2004, 531 bull trout in 2005, 380 bull trout in 2006, roughly 320 bull trout in 2007, 405 bull trout in 2008, and 370 bull trout in 2009. In total, nearly 13,000 angler days of recreation in the combined reservoir and river fisheries has occurred over the 6-year period, and nearly 7,300 bull trout have been caught, of which 390 (roughly 5 percent) were harvested. The fishery is closely monitored and is not assumed to be a high threat because of the ability to adjust regulations quickly if needed.

Operations of the Federal Columbia River Power System in the past have led to extreme variability in the pool of Hungry Horse Reservoir, at times being drawn down over 200 feet from full. Although drawdowns of that magnitude have been eliminated in recent years, the State of Montana continues to express concern over the effect of water level fluctuation on native fish and recreation. Despite these variable pools, bull trout populations have not shown any measurable negative response.

In 2003 a series of major fires burned large portions of the bull trout habitat in the South Fork of the Flathead River drainage. In recent years, logging activities have been minimal with the exception of some post-fire salvage. Rain-on-snow events heavily impacted westside reservoir tributaries in 2003 and again in 2006, with large debris flows and several culvert and bridge blowouts. Despite this, or perhaps related to these flushing flows, bull trout spawning numbers in several of these streams (e.g., Wounded Buck and Wheeler Creeks) increased through the period 2006-2008.

There are eight bull trout spawning index reaches in the Hungry Horse Core Area. Collectively, these eight reaches represent up to 85 percent of the total Basin-wide spawning of bull trout. Bull trout redd numbers in the eight index reaches throughout the Hungry Horse Core Area from 1993 through 2015 can be found in appendix F of this BA. The data show that the four index streams in the wilderness support approximately 70 percent of the bull trout spawning in the Hungry Horse Core Area.

Hungry Horse Core Area—Flathead National Forest

There are ten local populations within this core area on the Flathead National Forest. These are:

1. Danaher Creek
2. Youngs Creek
3. Gordon Creek
4. White River
5. Little Salmon Creek
6. Bunker Creek
7. Spotted Bear River
8. Sullivan Creek
9. Wheeler Creek
10. Wounded Buck

Two simple core areas are also discussed below: Big Salmon and Doctor Lake.

All ten local populations in the core area support adfluvial bull trout spawning; there are no known resident populations. A similar pattern, in terms of importance, may have existed historically between these streams and today as they provide the largest amount of high quality groundwater-influenced spawning and rearing habitat due to their relative size and quality.

Hungry Horse Core Area Summary

Table 40 summarizes relevant information from each of the 6th field HUC local populations. This summary provides an overall assessment of the estimated cost, timeframe, and importance of restoration activities for the entire Hungry Horse Core Area within the borders of the Flathead National Forest. It does not include necessary restoration activities in watersheds where the Forest has no ownership that may be critical for overall restoration of the bull trout population in the core area.

Table 40. Summary of important local population attributes and conservation recommendations for the Hungry Horse Core Area.

Local Population	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Danaher Creek	Lower Danaher Creek	High	Low	Conserve
	Upper Danaher Creek	High	Low	Conserve
	Basin Creek	High	Low	Conserve
	Rapid Creek	High	Low	
Youngs Creek	Lower Youngs Creek	High	Low	Conserve
	Upper Youngs Creek	High	Low	Conserve
	Babcock Creek	High	Low	Conserve
Gordon Creek	Lower Gordon Creek	High	Low	Conserve

Local Population	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Little Salmon Creek	Little Salmon Creek	High	Low	Conserve
Bunker Creek	Lower Bunker Creek	High	Low	Passive
	Upper Bunker Creek	High	Low	Passive
	Gorge Creek	High	Low	Conserve
Spotted Bear River	Lower Spotted Bear River	High	Low	Passive
	Dean Creek	High	Low	Conserve
	Middle Spotted Bear River	High	Low	Conserve
	Wall Creek	High	Low	Conserve
	Spotted Bear River Headwaters	High	Low	Conserve
Sullivan Creek	Sullivan Creek	High	Moderate	
Wheeler Creek	Wheeler Creek	High	Moderate	
Wounded Buck Creek	Wounded Buck Creek	High	Low	
Doctor Lake	Upper Gordon Creek –	High	Low	
Big Salmon Lake	Big Salmon Lake	High	Low	

[a] **Active restoration** is management intervention systematically focused on improving a degraded habitat condition or dysfunctional watershed processes such that the improved habitat can be maintained via restored processes and removal of impairments; **passive restoration** is a restoration process more typified by simply reducing or eliminating the sources of degradation that may allow recovery over time. For instance, INFISH standards and guidelines are intended to reduce new or ongoing management pressures to riparian areas that can degrade or maintain degraded riparian and stream conditions; **conservation** is a strategy intended to maintain one or more existing local populations, habitats, and processes that, compared to other areas in the Core, are functioning well enough to provide a foundation from which other populations can anchor to and reconnect with as active improvements occur in other Core Area locations.

Swan Lake Core Area Discussion

The Swan Lake Core Area includes all of Swan Lake and the Swan River and all tributaries upstream. The Swan system is an important component of the overall Flathead River aquatic ecosystem. However, warm water temperatures in the lower Swan River (below Swan Lake) have most likely always limited the degree of bull trout movement between Flathead Lake and the Swan system. This observation is supported by genetic evidence. The Swan Lake Core Area has therefore likely always functioned primarily as a separate core area from the Flathead.

Swan Lake is recognized as a bull trout stronghold. USFS and USFWS biologists believe that current bull trout densities in the Swan Lake Core Area are roughly half of what they were historically. This is in contrast to most core areas in western Montana, where densities are much less than their historic level. The distribution of populations throughout the core area is likely similar to historic patterns as well, with populations still relatively widespread where suitably sized streams exist. Life form expression (dominated by adfluvial adults) is probably also similar, as no major barriers exist. Bigfork Dam is the only large barrier, and its impact on bull trout movement is probably minimal due to natural water temperature issues described above. There is a barrier near the mouth of Cooney Creek, but the degree of impact this may have on bull trout is not clear.

Bull trout populations in the Swan Lake Core Area were likely first exposed to significant human-caused impacts in the late 1800s. Prior to this time, bull trout were harvested by native Salish and Pend d'Oreille peoples for thousands of years and maintained relatively robust and widespread populations throughout the Swan Lake Core Area. Beginning in the late 1800s, however, European settlement in the area increased, which brought more fishing pressure and intensive land uses that directly affected bull trout and their habitats. Logging by the Kalispell and Flathead Company and the Forest Service in the early 1900s was directly and indirectly responsible for much of the change in habitat as large drainages important for adfluvial bull trout were roaded and harvested.

Beginning in 1910, another major change to the watershed began to take place as non-native fish were planted in the lake and throughout many tributaries. Yellow perch, brook trout, Yellowstone cutthroat trout, rainbow trout, and kokanee were all stocked in the system between 1910 and 1936. The effects of these species have not been uniform. Brook trout had perhaps the biggest long-term negative effect on bull trout, bringing threats of both competition and hybridization that continue to this day. In several major bull trout spawning tributaries over half the *Salvelinus* biomass is composed of brook trout and bull trout X brook trout hybrids. Kokanee, on the other hand, likely had a positive effect on bull trout populations by providing an abundant high-quality food source in the lake where the larger fish matured. Although kokanee may have largely replaced the native westslope cutthroat trout, this effect may have bolstered the bull trout population by creating an unnaturally elevated prey base. In the period from approximately 1930 to 1960, bull trout populations were more carefully managed with increased angling protection and were observed to have increased in the Swan Lake Core Area.

In the 1950s-1960s, however, another era of extensive logging in the core area began. This time, roads were constructed to access the timber, which resulted in increased erosion and a proliferation of small-scale fish barriers at road and stream crossings throughout the watershed. These roads not only affected habitat but also facilitated increased fishing and excessive harvest or poaching of spawning bull trout in many tributaries. These impacts occurred on both Forest Service and Plum Creek Timber Company lands throughout most of the Swan Lake Core Area.

On the fisheries front, the same time period saw the introduction of Mysis shrimp in 1967 and the introduction of northern pike in approximately 1970 into Swan Lake. Mysis actually had a beneficial effect on bull trout populations because they supplemented the food chain, but pike had the opposite effect by becoming not only a predator to juvenile bull trout but also a potential competitor for available food resources. Bull trout and northern pike have been somewhat more compatible in Swan Lake than some other systems through the past four decades, likely due in large part to the partitioning of available habitat and limited pike recruitment combined with robust productivity of bull trout in the system. The combined impacts of non-native species, angling/poaching, and land management activities appear to have caused a marked decline in the bull trout population from about 1950 to the mid-1990s.

In the mid-1990s, with the threat of Endangered Species Act listing impending, greater angling restrictions were instituted on bull trout harvest. Angler harvest was gradually restricted over time, and now no harvest of bull trout is permitted upstream of Swan Lake. Perhaps most significantly, the four most important spawning streams (Lion, Goat, Squeezer, and Elk) allow no recreational fishing at all, thus eliminating any incidental mortality. This action, along with cumulative effects of improved habitat practices, helped generate a noticeable increase in the Swan Lake Core Area bull trout population for the next decade or more. Until very recently, the Swan Lake population was considered strong enough to permit a limited recreational fishery on the lake itself. It is now a catch-and-release fishery.

The last several years, however, have seen a reversal in redd counts, suggesting that the population is again declining, and there may be several reasons for this decline. The recent increase in lake trout in Swan Lake is most likely partially responsible for the decrease in bull trout, as they are both top-level

predators competing for the same resources and predation on bull trout by lake trout does occur to some degree. In addition, the intense effort at lake trout removal in 2007-2012 (over 30,000 lake trout gillnetted and removed) resulted in a by-catch of approximately 1,500 bull trout and the projected mortality of nearly half these fish. The inherently high variability in bull trout populations may also be expressing itself. In any case, bull trout in the Swan Lake Core Area, although not currently represented at the levels they were historically, are still stronger than most core areas and likely represent a population that will remain strong if the lake trout threat can be successfully mitigated.

Many of the past direct habitat impacts associated with logging and road construction have been reduced or eliminated, and therefore some stressors on the population no longer play as large a role as they did historically. Most spawning streams have relatively good habitat conditions. Recent inventory and monitoring work has found that many streams are within a standard deviation of unmanaged, reference streams. Beginning in the 1990s and continuing into the early 2000s many historic, undersized culverts were replaced and best management practices on road surfaces greatly reduced the legacy impact of roads. Streamside buffers appear to adequately protect fish habitat during ongoing timber harvest. Recent federal acquisition of Plum Creek lands through the Montana Legacy Project and other improvements through programs such as the Montana Department of Natural Resources and Conservation's *Habitat Conservation Plan* should continue to contribute to this positive habitat trend.

Bull trout redds in many of the index reaches throughout the Swan Lake Core Area are relatively stable over the time period prior to lake trout establishment in Swan Lake, but overall redd numbers are down recently due to the significant declines in Elk and Lion Creeks. These two streams produce a large portion of the overall redds in the basin and therefore influence cumulative counts.

Currently, the main factors limiting bull trout populations in the Swan Lake Core Area are probably the lake trout and other non-native fish communities throughout the system (mainly northern pike in the lake and brook trout in tributaries), combined with the legacy of past land management actions that resulted in impacts to stream habitat. Other impacts, such as fishing mortality and poaching, also remain a concern.

Although none of these impacts is easy to address, it is important that we begin to address them while there are still relatively healthy bull trout populations to work with in the Swan Lake Core Area. It is likely that the impacts from any one of these sources cannot be eliminated entirely, but persistent improvement in each will contribute synergistically to a stronger population over the long term, which will move the bull trout closer to delisting and ultimately to recovery.

For example, it is unlikely that non-native fish can be completely eliminated from the watershed. However, the Forest service should continue to coordinate with MFWP on management that reduces the numbers and distribution of non-native trout if it would benefit bull trout recovery in the watershed. Similarly, with the recent large-scale change in land ownership associated with the Montana Legacy Project, there will be opportunities to manage tributary watersheds more for the long-term productivity and resilience of aquatic ecosystems rather than strictly for timber production. The transportation system could also be addressed more comprehensively due to these changes.

Swan Lake Core Area: Flathead National Forest

There are nine local populations within this core area on the Flathead National Forest. They are as follows:

1. Elk Creek
2. Cold Creek

3. Jim Creek
4. Piper Creek
5. Lion Creek
6. Goat Creek
7. Woodward Creek
8. Soup Creek
9. Lost Creek

Although adfluvial bull trout do spawn in other tributaries, these tributary streams support the majority of fluvial spawning, and redd numbers within them likely represent over 90 percent of the total adfluvial spawning that occurs in the basin. There are two disjunct populations (Holland and Lindbergh Lakes) that are considered separate core areas and are also monitored on an annual basis. Unfortunately, both Holland and Lindbergh Lake have been recently invaded by lake trout. So far as is known, limited interchange of bull trout occurs amongst the three Swan core areas. Discussions of these two simple core areas are also included in this chapter.

Of the nine local populations in the core area, Lion Creek, Goat/Squeezer Creeks, and Elk Creek currently support the majority of adfluvial bull trout spawning. A similar pattern, in terms of importance, may have existed historically between these streams as they provide the largest amount of high quality groundwater-influenced spawning and rearing habitat due to their relative size and quality.

Swan Lake Core Area Summary

Table 41 summarizes relevant information from each of the 6th field HUC local populations. This summary provides an overall assessment of the estimated cost, timeframe, and importance of restoration activities for the entire Swan Lake Core Area within the borders of the Flathead National Forest. It does not include necessary restoration activities in watersheds where the Forest has no ownership that may be critical for overall restoration of the bull trout population in the core area.

Table 41. Summary of important local population attributes and conservation recommendations for the Swan Lake Core Area.

Local Population	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Elk Creek	Elk Creek	High	Low	Conserve
Cold Creek	Cold Creek	Low	Moderate	Active
Jim Creek	Jim Creek	High	Low	Active
Piper Creek	Piper Creek	Moderate	Low	Conserve
Lion Creek	Lion Creek	High	Low	Conserve
Goat Creek	Goat Creek	High	Low	Conserve
Woodward Creek	Woodward Creek	High	Low-Moderate	Passive
Soup Creek	Soup Creek	Low	Moderate	Conserve
Lost Creek	Lost Creek	Moderate	Low	Conserve
Lindbergh Lake	Headwaters Swan River	High	Low	Active

Local Population	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Holland Lake	Holland Creek	Moderate	Moderate	Passive

[a] **Active restoration** is management intervention systematically focused on improving a degraded habitat condition or dysfunctional watershed processes such that the improved habitat can be maintained via restored processes and removal of impairments; **passive restoration** is a restoration process more typified by simply reducing or eliminating the sources of degradation that may allow recovery over time. For instance, INFISH standards and guidelines are intended to reduce new or ongoing management pressures to riparian areas that can degrade or maintain degraded riparian and stream conditions; **conservation** is a strategy intended to maintain one or more existing local populations, habitats, and processes that, compared to other areas in the Core, are functioning well enough to provide a foundation from which other populations can anchor to and reconnect with as active improvements occur in other Core Area locations.

INFISH Standards and Guidelines

The Inland Native Fish Strategy (INFISH) (USDA, 1995c), which is the current aquatic conservation strategy for the Forest, was designed to provide protection for native fish. Although it allowed for restoration, INFISH primarily provided direction for protection and passive restoration measures. With the INFISH amendment, the 1986 forest plan direction reduced the risk to watersheds, soils, and riparian and aquatic resources from new and ongoing activities primarily with standards and guidelines that influenced management within Riparian Habitat Conservation Areas (USDA, 1995c, pp. 1-2). For some resources, standards and guidelines in the 1986 forest plan contained general direction for repairing past damage, although INFISH direction was lacking for other resources such as timber harvest. During implementation of the 1986 forest plan as amended, the intensity and risks associated with new and ongoing land management activities have been greatly reduced compared to the decades prior to the 1986 plan.

INFISH has been implemented considerably longer than its intended 18 months. The strategy has been documented to be effective in protecting aquatic resources through ongoing PACFISH/INFISH biological opinion (PIBO) effectiveness monitoring (M. P. Meredith et al., 2011); however, the one component identified as lacking in INFISH is active restoration. The absence of a clearly stated aquatic restoration goal in the existing plan was one of the many items identified as needing to be changed in the plan revision process, so the revised forest plan includes direction for restoration.

The revised forest plan adds an active restoration component through desired conditions, objectives, guidelines, and standards that would supplement the retained passive components of INFISH. The revised forest plan would also help move projects and activities towards the desired conditions and improve aquatic habitats. Table 42 provides a conceptual crosswalk between INFISH and the revised plan.

Table 42. Crosswalk of Plan Components under INFISH to ARCS

1995 INFISH Component	Comparable INFISH component/strategy In 2017 Flathead Plan	Differences between 1995 INFISH and 2017 Flathead Plan	Rationale for Changes
Riparian goals	Component: Instead uses a required plan component Desired Conditions	More description listed in plan revision for desired conditions, focused on ecological conditions that sustain riparian and aquatic habitat	Goals are optional components in 2012 Rule that according to rule are "other than desired conditions, usually related to process or interaction with the public."
Riparian management objectives (RMOs)	Not carried forward as written in 1995 as BASI no longer supports a site by site approach without placing in context with conditions and drivers beyond the stream reach.	Flathead draft plan relies on Desired conditions, which focus on retaining process function, in combination with PIBO monitoring data and	BASI since 1995 has moved away from the expectation that numerical values found in high value habitat should occur everywhere at the same time: also, objectives in 2012

1995 INFISH Component	Comparable INFISH component/strategy In 2017 Flathead Plan	Differences between 1995 INFISH and 2017 Flathead Plan	Rationale for Changes
		analysis, which compares populations of managed conditions against populations of unmanaged conditions	planning rule require a completion date, which would be difficult to predict for riparian instream conditions.
Riparian habitat conservation areas (RHCAs)	Component carried forward with Name change Riparian Management Zone, to be consistent with Planning Rule	Some adjustments to widths for wetlands (Increase), otherwise draft plan components do require minimum widths same as 1995 Infish.	Changes made between proposed action and DEIS to clarify intent and insure necessary protection continues under new plan.
Standards and guidelines (for activities in or affecting RHCAs)	Component carried forward with few exceptions; now distinguish between standard and guide	No longer just Standard and Guide, split into either Standard or a Guide. Also Some text changes in individual standards and guidelines	Concept was retained for S &G's but language was sometimes changed to ensure a standard or guideline was achievable, and/or to clarify intent. Split also aligns with 2012 Planning Rule.
Priority watersheds	Component-other required content Carried forward in 2 way: 1. priority watersheds as other plan content identified for WCF as required by 2012 rule; and objective for storm-proofing objective development of a Conservation Watershed Network (similar to 1990 priority list contained in Amendment #3).	2 watersheds under this revision will be identified as priorities for restoration activities on Forest to be compatible with 2012 rule. Objective for Conservation Watershed Network prioritizes the most important watersheds to treat for stormproofing during the span of the new plan	WCF recognizes the agency moving towards attaining desired outcomes from project, versus the standard outputs typically associated with target accomplishment.
Watershed analysis	Not carried forward as described in 1995 INFISH. Instead, Multi-Scale Analysis is included as a strategy in appendix C of the revised forest plan, consistent with ICEBMP 2014 Framework	Multi-scale analysis strategy provides guidance on integration commensurate with issues being addressed.	Watershed analysis as originally practiced became cumbersome and struggled to integrate resources. Existing data and analysis tools much greater than 1995, multi scale sharpens focus on the need to integrate information commensurate with issues
Watershed restoration	Component Carried forward in 2 way: 1. priority watersheds as other plan content identified for WCF as required by 2012 rule; and objective for storm-proofing objective development of a Conservation Watershed Network (similar to 1990 priority list contained in Amendment #3).	Often WCF identified priorities will focus on immediate watersheds needing focused attention. While they may not be the highest priorities for fish, the Conservation Watershed Network Objective does identify the most important watersheds for fish conservation.	WCF recognizes the agency moving towards attaining desired outcomes from project, versus the standard outputs typically associated with target accomplishment. Watersheds Prioritized for stormproofing under Conservation Watershed Network objective are priorities for stormproofing to help watersheds be more resilient to climate change.
Monitoring	Other Plan material- ultimately, BLM and USDA Forest Service adopted PIBO monitoring Strategy	PIBO monitoring Strategy carried forward and strengthened development of data analysis tools.	

Refer to appendix D for plan components related to bull trout.

Effects of the Proposed Action

General effects at the forestwide scale

Healthy riparian areas stabilize stream channels, provide storage for sediment, serve as nutrient sinks for surrounding watersheds, improve the quality of the water leaving the watershed (DeBano & Schmidt, 1989; Platt, 1991), reduce the energy associated with high flow events, and therefore provide the best conditions for bull trout and their habitats. Riparian areas are dynamic and are susceptible to effects from management activities but are resilient and can recover quickly when managed correctly (DeBano & Schmidt, 1989); riparian areas are also resistant to those effects if in a healthy condition.

Nearly all activities allowed within the different management area categories in the revised forest plan have the potential to indirectly affect bull trout and their habitats in a beneficial or negative manner. Land management activities that disturb the soil surface or require added use of already disturbed features such as road prisms have the greatest potential and risk of adverse effects. Activities that have the greatest potential to disturb soils and indirectly affect bull trout and designated critical habitat include vegetation management, fuels management, livestock grazing, roads, and recreation. Because the cause-and-effect relationships from land management activities are typically indirect, it is difficult to predict exactly what would happen to bull trout habitat and populations as a result of implementing the proposed action, especially with the protective measures outlined above under plan components.

The proposed forestwide objectives, standards, and guidelines described previously would protect bull trout and their habitats when implementing land management activities. Watershed, soil, riparian, and aquatic habitat conditions under the proposed action, in general, are expected to improve as a reflection of the current trend in reductions of timber harvest activities and associated ground disturbance as well as proposed conservation and habitat protection direction in the revised forest plan. For example, forestwide directions are designed to improve overall watershed condition (FW-OBJ-WTR-01 thru 04); protect soil conditions and soil quality; and restore riparian and aquatic habitats (FW-STD-SOIL-01 through 04, and FW-STD-RMZ-01 thru 06). Additionally, FW-DC-P&C-15 emphasizes cooperation and coordination to help recover bull trout.

Impacts to bull trout and critical habitat will be analyzed and consulted on individually during project-level implementation site-specific management activities such as travel management proposals, timber sales, and recreational site improvements.

General effects of typical management activities

Vegetation management

Managing vegetation on forest lands can impair water quality by routing runoff and sediment onto bottomland stream areas. Over the last planning period under the 1986 plan forest as amended by INFISH, the Forest addressed these impacts by regulating the extent of upland timber harvest, applied best management practices to limit stream connection from impervious surfaces, and minimized entries into riparian habitat conservation areas to provide protection from upslope activities and filter runoff. These best management practices were instituted in the 1980s to control non-point source pollution (Binkley & Brown, 1993), and the riparian habitat conservation areas were established by the 1995 INFISH amendment. According to results from the State of Montana audits of BMPs, the Forest Service BMPs were effective 96 percent of the time (Ziesak, 2015).

Forest management disturbs uplands through removal of tree canopy and the yarding of the material to a central processing facility. Site preparation historically reduced groundcover by broadcast burning remaining vegetation to bare soil for planting and to clear remaining fuels. The practice in the 1980s produced higher-severity fire because the purposeful clearing of this vegetation also removed protective groundcover. The Flathead National Forest has largely moved away from this practice, instead using either mechanical piling/burning or prescribed fire as primary methods for reducing hazardous fuels. A change in contemporary timber practices to whole tree yarding has further reduced remaining vegetation while preserving protective groundcover covering at least 85 percent of the area, based on soil monitoring data (Milner, 2015).

Studies have documented increased sediment erosion associated with timber harvest, but the primary agent is sediment from roads (Bilby, Sullivan, & Duncan, 1989; Luce & Black, 1999; Sugden & Woods, 2007). Management controls non-point delivery of sediment within harvest areas through the use of water and soil conservation practices and best management practices (USDA, 2012b), focused on stabilization of log skidding and landing networks where erosion is most probable. Otherwise, forests generally have very low erosion rates, with chronic erosion after disturbance lasting typically 1 to 3 years (Elliot, Hall, & Scheele, 2000). After timber harvest and site preparation, regrowth of vegetation covers the soil surface with plant litter, soils armor, and potential erosion hazard becomes low (Elliot et al., 2000).

Where prescribed fire is applied and blackens the area, runoff can increase from reduced infiltration. Blackened soil areas can accelerate runoff due to soil sealing from ash that lowers the infiltration capacity of soils (Doerr et al., 2006; Larsen et al., 2009). These conditions vary spatially and decrease over the first year as products of burning in the soil degrade (Doerr et al., 2006; Wondzell & King, 2003). Natural forest conditions have hydrophobic conditions that resist infiltration due to the drying of soils and the waxes in plant litter, but the main difference is that burned areas lack surface roughness to dissipate rain splash energy and interrupt runoff. Other factors that increase runoff from harvest and burn areas are steep slopes, low groundcover, and long slope lengths (Elliot, 2013). Runoff transports loose soil particles and deposits sediment down the slope proportional to runoff energy. One reason sedimentation decreases over time is that the sediment supply decreases after bare surfaces armor, lacking a ready sediment supply. Over the past planning period, management has mitigated prescribed fire by not lighting fire within stream buffer areas and burning during cool and moist conditions, which results in low- and moderate-severity fire.

The loss of forest canopy on harvest sites changes the water balance; studies in the Pacific Northwest have documented cases where excess water from harvest areas influence the peak and timing of stream flows (Keppeler & Ziemer, 1990; Moore & Wondzell, 2005; Stednick, 1996). In reviews, these cases depended largely on the extent of harvest and the climatic regime (Grant, Lewis, Swanson, Cissel, & McDonnell, 2008). The effect diminishes in time as vegetation re-establishes. Peak flow increases were raised as a concern due to their potential to alter stream morphology and degrade water quality. The altering of streamflow can also influence stream temperature (Swanston, 1991), although the principle factor in affecting stream temperature is changes to riparian cover that shades streams (Beschta, Bilby, Brown, Holtby, & Hofstra, 1987; Gomi, Moore, & Dhakal, 2006; J. S. Macdonald, Beaudry, MacIsaac, & Herunter, 2003).

Watershed yield studies have specifically targeted timber harvest activities that would generate a response and might not necessarily mimic current forest practices. Beschta et al. (2000) found a weak relationship between forest harvest and increased peak flows and reported “mixed messages” about the relationship between forest harvest and peak flow responses. Numerous studies documented the effects of forest canopy removal on peak flows in the Pacific Northwest (Beschta et al., 2000; Hubbart, Link, Gravelle, & Elliot, 2007; J. A. Jones & Grant, 1996; Kuras, Alila, & Weiler, 2012; Thomas & Megahan, 1998; Tonina

et al., 2008), but, surprisingly, very few demonstrated a direct link between water yield/peak flow changes and measured channel impacts in forested environments. In the latest review of studies in the Pacific Northwest, Grant et al. (2008) suggested that if degradation were to occur, channels most sensitive to peak flow changes are low gradient with gravel bed and sand bed substrates.

Forest Service analysis techniques rely on relationships between canopy cover area and generalized recovery trends to evaluate risks associated with harvest. One of these approaches uses equivalent clearcut acres (ECA) to equilibrate area harvested to runoff potential (Ager & Clifton, 2005) to evaluate potential effects on streams. However, establishing a direct relationship between ECA metrics and channel conditions is difficult. Schnackenberg and MacDonald (1998) found no correlation between ECA and stream channel characteristics in forested catchments in Colorado. MacDonald and Hoffman (1995) studied the relationship between WATSED-predicted water yield/peak flow increases and channel characteristics on the Kootenai National Forest. WATSED similarly equilibrates the area harvested to potential sediment. None of the channel types (pool riffle or colluvial step-pool) showed any increase in bankfull width or width/depth ratio with more intensive management. In addition, there was no apparent correlation between the amount of timber harvest and the magnitude of peak flows, and climatic differences are the dominant control on the size of peak flows in the study area (L. H. MacDonald & Hoffman, 1995). These studies highlight the difficulty in associating size of harvest to effects at the reference scale of a watershed.

The concern over changes to peak flow from timber harvest was raised when timber was harvested on a larger scale than current. The Forest no longer harvests timber at the rate seen in the 1970s. Average annual harvest rates were 11,000 acres in the 1980s compared to roughly 2,000 acres currently. In addition, many of the classic watershed studies could not disentangle the effects from roads, where at least 2 percent of the study areas had roads and skidding networks (Grant et al., 2008). Forest management has somewhat alleviated these effects by establishing streamside zones (riparian habitat conservation areas with INFISH), reducing road construction, and implementing BMPs. Plan components limit further road construction within the primary conservation area for grizzly bears and within the conservation watershed network that applies to 87 watersheds out of a total of 220 watersheds.

Under implementation of the proposed action, most vegetation management activities are anticipated to occur in management areas 6b and 6c (general forest). Vegetation management activities are allowed in management areas 3a (special areas), 4a (research natural areas), 4b (experimental forests), 5a, 5b, and 5c (backcountry), 6a, 6b, and 6c (general forest), and 7 (focused recreation areas), although only management areas 6b, 6c, and 7 are suitable for scheduled timber production. The revised forest plan would continue to limit timber harvest in RMZs through riparian standards and guidelines, since the primary objective of such management would either be for the direct benefit of riparian and stream (inner RMZs) or not retard riparian and stream condition (outer portion of the RMZs).

Sedimentation resulting from vegetation management activities can affect aquatic habitats for bull trout. Revised forest plan direction is intended to protect bull trout and bull trout designated critical habitat from possible detrimental effects due to timber harvest. Desired conditions for soils include maintaining soil productivity and hydrologic function as well as minimizing effects and recovering areas that have incurred detrimental disturbance (FW-DC-SOIL-01, 02, 03). The desired conditions, standards, and guidelines for soils will benefit bull trout by reducing negative effects resulting from sediment delivery to designated critical habitat. The plan components that provide direction for decommissioning temporary roads (FW-STD-SOIL 3 and 4) will provide improved conditions since temporary roads were not addressed under INFISH.

Restoring soil productivity on previously impacted areas is a forestwide objective (FW-OBJ-SOIL-01), and existing sedimentation issues would therefore continue to improve under the revised forest plan.

Project-level design criteria contain direction to protect soils during vegetation treatment such as timber harvest and prescribed fire (FW-GDL-SOIL-01, 02, 03, 04), and soil productivity would be maintained or improved under the revised forest plan. FW-GDL-RMZ-13 minimizes effects to RMZs by limiting ground-based logging equipment, skid trails, landings, and roads. As restoration activities trend vegetation towards desired conditions and road segments are improved to reduce likelihood of culvert failures (FW-GDL-CWN-01), watershed health is expected to improve. FW-DC-WTR-04 and 06 emphasize the protection of water quality and habitat during all management activities, and improved water quality will ultimately benefit bull trout.

With regards to vegetation management within RMZs, inner and outer zones are being established. For fish-bearing and perennial streams, the inner zone is 150' and 50' for intermittent streams. FW-STD-RMZ-06 applies to the inner RMZ, and vegetation management shall only occur to restore or enhance aquatic and riparian resources. In other words, entry into the inner zone will be limited, and this is due to the critical role the inner zone provides for shade, large woody debris recruitment, bank stability, and sediment control. It is the intent of this standard to provide for riparian and aquatic processes and functions and protect them.

The outer zone for fish-bearing streams is 300' and 150' for perennial streams (essentially perennial streams' outer and inner zone are the same as riparian functions, and processes function the same regardless of fish presence). The outer zone for intermittent streams is 100'. Guideline FW-GDL-RMZ-15 is designed to allow management within the outer zone with a priority of avoiding ground disturbance so as to not create sediment and ultimate transport to streams. In addition, additional guidelines (FW-GDL-RMZ 08-11) restrict clearcutting in the outer RMZ and require 350' cover distance, which will limit management activities within the outer RMZ. Lastly, FW-GDL-RMZ-13 prohibits road and landing construction in an RMZ unless needed to cross a stream.

Fuels Management

Fire effects vary according to fire intensity, severity, and frequency, which are the primary factors that define fire regimes. Wildfires can affect water chemistry, water quantity, and stream channel structure through changes in transpiration, infiltration, groundwater recharge, erosion and mass wasting, riparian shading, and the recruitment and delivery of coarse debris (Benda & Dunne, 1997; Gresswell, 1999; Moody & Martin, 2001a, 2001b; Wondzell, 2001). Potential post-wildfire risks from floods, landslides, and debris flows to human life, property, and/or municipal supply watersheds are an increasing concern across the western United States (Moody & Martin, 2001a).

Climatic events following wildfire can trigger surface erosion or mass failures (landslides), which in turn can deposit sediment that alters stream channel structure and function. Severe wildfire can result in large expanses of blackened area that has high potential for generating runoff and delivering sediment to streams when intense rainstorms occur. When wildfire burns through a riparian area, the outcome may leave the riparian area with no shade, which increases water temperatures. This effect may be offset by cooler groundwater from adjoining slopes.

Long-term fire suppression causes forest successional processes to continue, which can increase evapotranspiration and interception, potentially resulting in less water available for wetlands. In many cases, lack of fire can lead to the encroachment of woody species (primarily shrubs) into peatland habitats, which could lead to competitive exclusion of herbaceous species. Suppression of natural fire regimes causes fuel loads to accumulate. When wildfire does occur, the intensity and severity are often higher than they would be with more natural levels of fuels. This can result in higher rates of fuel consumption and availability of ash and nutrients that can be delivered to aquatic environments. Suppression of natural fire regimes results in forests that have more leaf area. This results in higher

evapotranspiration and interception levels, which leaves decreased amounts of water available for surface and subsurface flow. Lower levels of stream flow can affect aquatic species because of warmer water temperatures and changes in water chemistry. In addition, fire suppression can allow fuels to accumulate above natural levels, which can cause wildfires to burn more severely. This process can change infiltration characteristics of the soil and change hydrologic characteristics. Fire suppression activities, such as retardant use and drafting water from streams, can also affect bull trout.

Use of wildland fire and prescribed fire for multiple objectives can affect flow regimes by reducing evapotranspiration, interception, and snow accumulation patterns and by increasing soil moisture and surface runoff. Prescribed fire can also reduce the evapotranspiration demands and make more water available for wetlands. Over the long term, greater than 2 to 3 years, prescribed fire is expected to improve riparian condition, if applied to meet site-specific riparian management objectives. Fire along streambanks and shorelines can result in variable amount and distribution of ground exposure. Moderate- to light-severity fires generally have little influence on riparian vegetation and ground litter removal, and subsequent surface erosion. Severe fires may remove virtually all riparian vegetation and groundcover and result in soil erosion and sedimentation to nearby water bodies and loss of important transitional habitats for aquatic-dependent species such as bull trout.

Wildfire suppression tactics can affect watershed resources through the building of firelines and large fuel breaks and use of fire retardant, which cause soil disturbance and remove vegetation. Ground disturbance from wildfire suppression, in addition to the baring of ground caused by wildfire, can cause a net decrease in effective groundcover so that it no longer resists rainfall runoff. These activities can route sediment to streams from compacted machine paths and linear features, which channels runoff. Post fire rehabilitation attempts to mitigate these effects across the fire area. The action alternatives would mitigate these effects by limiting fire suppression activities away from the most sensitive areas, the RMZs. The preferred alternatives carries forward forest plan components to locate fire camps away from riparian areas where risk of sedimentation and degradation to water quality is highest (FW-GDL-RMZ 3). The preferred alternative would have stronger language to avoid degrading water quality from suppression activities by minimizing suppression activities in RMZs (FW-GDL-RMZ 5), with specific direction to avoid fuel storage in RMZs that could drain runoff into streams (FW-GDL-RMZ 4).

Impacts to RMZs and habitat may still occur in certain circumstances when there are no other suitable locations for incident bases, camps, helibases, staging areas, etc. Delivery of chemical retardant, foam, and other additives near or on surface waters may occur when there is imminent threat to human safety and structures or when a fire may escape, causing more degradation to RMZs than would be caused by the addition of chemical, foam, or additive delivery to surface waters in RMZs. Conversely, where management treatments are used to reduce wildfire hazard, positive long-term effects may be realized.

Other fire suppression effects to water quality occur from fire retardant drops. Large quantities of retardant can kill fish, and indirectly fire retardant can kill stream invertebrates and cause eutrophication of downstream reaches (Spence, Lomnicky, Hughes, & Novitzki, 1996). The preferred alternative would improve direction for fire retardant drops. Rather than relying solely on resource advisors to avoid risks, areas of high risk would be mapped to improve the communication of where aerial operations need to avoid dropping fire retardant (FW-GDL-RMZ 2). Avoidance areas have been mapped in response to the *Biological Opinion on Effects to Listed Species from U.S. Forest Service Aerial Application of Fire Retardants on National Forest System Lands* (USFWS, 2011a). Potential meltwater stonefly habitat, defined as areas in proximity to ice masses, have been mapped and have been added to the retardant avoidance maps.

Effects of wildfire on stream runoff, sedimentation, and nutrients are largely beyond the scope of forest planning because it is not possible to predict when and where wildfires will burn. However, monitoring of

these effects has shown mostly temporary, transient effects of wildfire on water quality. Monitoring by MFWP of percent fines in the North Fork in Trail, Whale, Coal and Big Creeks following the Moose Fire (2001) and the Robert Wedge Fire (2003) showed only small increases in sediment in the year following each fire, with a return to base levels within several years.

Roads

Road networks have been shown to have detrimental effects on water and aquatic resources in forested landscapes. Road systems can change a natural hydrologic regime by altering natural flow patterns and increasing sediment delivery to streams. Roads have been shown to destabilize side-casted material and hillsides, expand the lengths of gullies and stream channels, increase sediment delivery, and alter streamflow and channel adjustments (Furniss, Roelofs, & Yee, 1991).

Natural drainage patterns are affected long-term by the mere presence of roads. Roads intercept subsurface drainage in cutslopes, capture rainfall on hardened road surfaces, and route excess runoff into the stream channel system. These impacts increase as the road system becomes more connected, in terms of hydrology, to the natural channel network. Where a dense road network is well connected to the stream network, it can be an "extension" of the actual stream network and alter streamflow regimes. These alterations can increase the delivery of water to the mouth of a watershed during snow melts and storm events, which can increase peak flows in streams and water levels in ponds, lakes, and wetlands.

Sediment from the road system can be delivered to streams by direct erosion of cut and fill slopes associated with stream crossings or by surface runoff from roads and ditches that carries sediment-laden water directly or indirectly to streams (R. Al-Chokhachy et al., 2016; Robert Al-Chokhachy, Roper, & Archer, 2010). In general, roads lacking surface rock, those with steep grades and steep sideslopes, and those that cross streams or are in proximity to streams are the greatest contributors of sediment from surface erosion. In steep terrain, roads can increase the rate of hill slope failures and soil mass wasting. Excessive fine sediment loading can lead to changes in channel morphology and water temperature because of pool filling, widening of the channel, and making the channel shallower, which can result in water temperature increases as a result of having a shortened water column that takes less solar energy to heat. Such changes in channel morphology are typically found at road-stream crossing locations and in response to mass failures associated with road runoff. Sometimes roads capture flow out of the channel and result in the stream rerouting down the road, which typically results in road failure and more sediment delivery to streams.

Vehicular traffic also contributes to sediment delivery from roads, particularly if ruts develop in the road and if traffic is heavy during the shoulder seasons when the ground is more saturated. Log haul during timber sales is typically done on the same road system for weeks or months at a time, and thus the quantity and repeated nature of this traffic make it a systematic, recognizable source of sediment on forest roads (R. Al-Chokhachy et al., 2016; Cissel, Black, Nelson, & Luce, 2014).

The location and design of valley bottom roads also create long-term effects on water resources. Poorly placed roads can encroach on stream channel and floodplain areas. Many older roads were constructed very close to stream channel areas, often in the floodplain. Often, streams were straightened to accommodate road placement. Roads can affect stream channels directly if they are located on active floodplains or directly adjacent to stream channels. For example, a road located adjacent to a stream can be a chronic source of sediment. If the road changes the morphological characteristics of the stream, this can set forth a chain reaction of channel adjustments that can result in accelerated bed and streambank erosion, which produces excessive sediment (R. Al-Chokhachy et al., 2016).

Not all sediment production from roadways reaches the aquatic system. Many of the aforementioned effects of roads can be mitigated by design changes that disperse rather than concentrate road runoff. Properly designed and maintained road treatments can decrease runoff and sediment loading to streams. Good design provides stable cut and fill slopes and adequate drainage that allows water to filter through vegetated strips or sediment traps before entering the stream channel. The effectiveness of these vegetative strips generally increases with increased width and lower hillslope gradient, but the effects of chronic road problems may still impact streams even when streams are protected by wide and intact vegetative strips (Trombulak & Frissell, 2000). Other design elements used to mitigate road interception and runoff are the addition of gravel surfacing and seasonal road closures. Road treatments can upgrade or remove problem culverts to allow sediment and wood to move downstream instead of accumulating upstream of roads and leading to culvert blockage and failure. However, temporary, short-term, and long-term sediment and turbidity increases can occur from project implementation as well as from post-project stabilization.

Turbidity and sediment increases result from the construction of roads, road grading, ditch cleaning, culvert replacement, road ripping or decompaction, and the installation of waterbars due to the heavy equipment excavation that these activities require. Minor amounts of fine sediment would be delivered to streams during implementation of road treatment activities and during the first substantial runoff event. Subsequent runoff events would contribute less sediment production over time but are expected to last up to one year later or until vegetation is established on bare-soil areas adjacent to streams. Design criteria and best management practices are used to minimize the amount of fine sediment entering stream channels while work is in progress and after the work is completed, including promoting vegetation establishment through seeding.

Roads that are at high risk of failure and have the potential to cause extensive resource damage are candidates for relocation or decommission. Preferred locations for roads are away from stream channels, riparian areas, steep slopes, high-erosion-hazard areas, and areas of high mass movement. Realignment of roads so they traverse riparian areas and streams at perpendicular angles rather than parallel angles would improve the quality of riparian and aquatic habitats in presently impacted stream reaches by reducing chronic sediment sources. If relocation is not possible, seasonal restrictions could limit road damage and subsequent sedimentation.

The potential risk of detrimental effects exists as long as the road is retained. The continued use and existence of roadway segments poses a risk of erosion, slope failure, and sediment delivery to receiving waters. Road decommissioning reduces the long-term risk of sediment delivery to streams from roads and roadside ditches through reducing culvert failures and landslides, eliminating vehicular traffic, improving infiltration of water into the ground through decompaction of road surfaces, and reducing overland and ditch flow into streams. Although some sediment is expected to be delivered to streams during culvert removal and decommissioning processes, the amount of sediment delivered to streams is expected to be significantly less than would occur if the roads were left under current maintenance. Cook and Dresser (2007) found that stream crossings that were restored through decommissioning delivered only 3 to 5 percent of the amount of fill material that was originally located at each crossing.

Removal or closure of roads adjacent to streams can have short- and long-term positive effects on soil hydrologic function, soil productivity, and stream water temperature. Trees and other riparian vegetation can recolonize a ripped roadbed and help provide shade. How much water or stream temperature improves depends on the existing stream shade that blocks solar radiation and water temperature, the stream's size, and how much riparian road is removed or closed.

Under the existing 1986 forest plan as amended by INFISH, activities have helped to improve soil and aquatic resource conditions through changes in road and travel management. Forest roads that are

maintained on an annual basis are typically those roads that have the most administrative and visitor use. Roads that have been closed or receive limited visitor use have revegetated to some degree or have been decommissioned. During the last several years, many roads that are graded have had new surfacing, such as gravel or oil, to reduce the rate of road deterioration and subsequent erosion from road surfaces. Several roads have been moved out of riparian areas or decommissioned, and culverts were installed or removed at stream crossings that were contributing sediment directly to the aquatic ecosystem or impeding passage of aquatic organisms. Although there have been improvements to the overall road network from the decommissioning and restoration of stream crossings, some crossings will continue to affect bull trout migration into historical habitats due to improperly designed structures from past management. Maintenance, closure, and decommissioning of roads, as well as restoration efforts at crossings, are expected to continue at similar or slightly increased levels compared to recent levels.

Existing roads will be routinely improved, upgraded, or decommissioned as determined by project-level planning efforts; new road construction will be limited due to grizzly bear standards which set the baseline at the 2011 level; and road decommissioning activities will offset the overall environmental effects of new road construction.

The revised forest plan does not include any objectives specifically for road construction as it relates to soil and aquatic resource protection or restoration; however, the plan does include an objective for 30 to 60 miles of road decommissioning or the placing or roads into intermittent storage as an annual average over a 5-year period (FW-OBJ-IFS- 01). These efforts are most likely to occur in management area 6, where active restoration opportunities present themselves through the implementation of site-specific projects. With the application of revised forest plan direction, overall watershed conditions would improve with the reduction in road densities. Current management activities to improve water quality and aquatic habitats have included a reduction in the number of stream crossings or rehabilitation of their condition. This emphasis on improving or removing stream crossings for the benefit of bull trout and native fish would continue with implementation of the revised forest plan (FW-STD-IFS-7, FW-GDL-IFS- 3-11, 14, and 15. FW-OBJ-WTR-02 and 03 help to remove or mitigate risk factors associated with roads and to improve watersheds and water quality.

There are several guidelines (FW-GDL-4, 5, 6, and 11) that address roads that may be behind gates or berms and that they should be treated to assure that they are hydrologically disconnected from the stream network and in a stable condition. The Forest has developed a monitoring plan in cooperation with USFWS that rolled previous terms and conditions from project Biological Opinions into the plan. The monitoring plan develops a rotating panel to survey and correct problems that may be identified.

Bull trout would benefit by the direction for the conservation watershed network, which has a desired condition to provide for cold water refugia in the face of climate change (FW-DC-CWN-1), and the objectives (FW-OBJ-CWN-01 and 02) will proactively stormproof open roads to reduce the risk of culvert failures that might occur with increasing fall rain events, as well as not allowing a net increase of road network in these watersheds.

Proposed forestwide direction would lead toward further improvement regarding the effects of roads on bull trout and designated critical habitat.

Livestock Grazing

Livestock grazing near streams can result in changes in channel morphology (Belsky & Gelbard, 2000; Platt, 1991). Livestock trailing and general soil displacement along stream bank areas can result in collapse of undercut bank areas and an overall increase in bank angle, loss of bank cover, and stream widening along the entire stream reach. Over long periods of time, grazing can lead to an entire channel

becoming downcut to the point that gully erosion is initiated and a new channel is formed at the bottom of the gully. This type and extent of downcutting results in an entire channel type change. Livestock trampling streambanks can increase ground exposure, surface erosion, and sedimentation. Concentrated livestock waste can cause eutrophication of lakes and ponds. Livestock grazing directly in wetlands or immediately adjacent to them can cause soil compaction, hummocking, and loss of vegetation, ultimately inhibiting subsurface water flow.

Removal of riparian vegetation through livestock management can influence the amount of solar radiation and water temperature regimes. These changes can ultimately lead to shifts in dissolved oxygen and pH. In addition, removal of riparian vegetation can increase nitrate levels, which can increase the biological production in water. Loss of riparian vegetation can influence the amount of solar radiation reaching a water body and increase water temperatures. Greater temperature fluctuations (diurnal and seasonal) can also occur when riparian vegetation is removed or decreased. Livestock grazing has the potential to cause increased sediment delivery through trampling of stream banks and removal of riparian vegetation.

Although livestock grazing is a minor component of management on the Forest, there may be localized effects of current and past management activities. Livestock numbers have decreased since the 1986 forest plan, as amended. Currently, there is one allotment in Piper Creek that has five cow-calf pairs that would be considered to be within a watershed that supports bull trout. The Holland Lake allotment is near the confluence with Swan River, and the outlet of Holland Lake is considered too warm to support bull trout.

Forestwide standards and guidelines would protect and minimize the effects of grazing on aquatic resources. Three guidelines specific to grazing (FW-GDL-GR-03, 04, and 05) would help to reduce impacts on water quality. These guidelines would reduce bank trampling and minimize livestock operations within RMZs. Reducing the length and timing of the grazing season in RMZs allows for more growth of grasses and forbs that capture overland flow, prevent rills from forming, and prevent erosion from delivering sediment to water bodies, thereby lowering turbidity and fine sediment deposition in the waterbody. It would also reduce potential bacteria such as *E. coli*, which has been shown to affect nutrients.

Watershed conservation practices and updated grazing standards and guidelines designed to protect water quality and riparian areas would be included in allotment-management plans as they are revised and updated.

Recreation

General effects from recreational use, construction, and maintenance to watershed resources can include undesirable changes to (1) upland and riparian soil and vegetation conditions, causing increased erosion and runoff, decreased soil-hydrologic function, loss of vegetative cover and wood recruitment, and reduced water quality; (2) stream morphology, water quality, streamflow, and substrate; and (3) water quality from spills of fuel, oil, cleaning materials or human waste associated with equipment, and the pumping of toilets.

Nonmotorized and motorized watercraft use can “disturb” or “stress” adult and juvenile fish. Typical activities associated with nonmotorized use include floating, wading, and swimming in areas where fish are holding, rearing, or spawning. Studies conducted on the Rogue River have shown that juvenile salmon and steelhead that were passed by nonmotorized watercraft exhibited both behavioral and physiological signs of stress (Satterthwaite, 1995). The energy expended by juvenile salmonids reacting to passing watercraft may result in a reduction in energy available for growth and development. A decrease in

available energy stores may also reduce their effectiveness in competing for food, defending territories, or spawning.

Streambank trampling, camping along the stream's edge, heavy fishing, and off-road vehicle use usually result in the loss of vegetation within riparian areas. Loss of vegetation from shorelines, wetlands, or steep slopes can cause erosion and pollution problems (Burden & Randerson, 1972; Quigley & Arbelbide, 1997).

Trail maintenance can affect large wood recruitment and function that influences stream channel morphology and aquatic habitat. Bucking out fallen trees can reduce the tree's length and sever the bole from its root wad. Smaller tree lengths are not likely to contribute as much to stream channel stability and are more likely to be washed out during high stream flow events. Smaller instream wood will also delay the recovery of channel features needed to maintain habitat for aquatic species, including overhead cover and low-velocity refugia during high-flow events.

Recreational impacts may include rutting, erosion, and loss of groundcover from user trails, trampling of vegetation, vegetation removal, and soil compaction of streamside and upland sites. Rutting may increase surface erosion associated with heavily used hiking or horse trails and off-road vehicles. High-use campsites may cause root damage in trees, resulting in reduced vigor and mortality.

In general, people who recreate in national forests participate in activities such as driving, hiking, horseback riding, hiking, and camping in the vicinity of lakes and streams. Protection of water quality, quantity and riparian habitat near these recreationally important water bodies is achieved through the implementation of watershed conservation practices.

Recreational activities can degrade aquatic, riparian, and wetland environments. Because many existing trails and developed and dispersed recreation sites on the forest are located adjacent to wetlands and riparian areas or, in some cases, within the flood-prone areas of streams, these sites have been subjected to the following impacts: damage to and displacement of riparian vegetation; soil compaction and soil erosion; increased rates of overland flow; sedimentation; and pathogenic contamination of potable and non-potable waters. Often, the aforementioned impacts tend to be localized, but in areas that experience substantial recreational use, the cumulative impacts to aquatic and riparian ecosystems can be both observable and measurable.

Recreational use will almost certainly increase in the coming decades. Projected increases in recreational use are commensurate with all alternatives. Watershed conservation practices implemented to protect aquatic and riparian resources notwithstanding, impacts to these resources will likely increase given increased use because stream and lake environments will continue to disproportionately attract forest users.

Most dispersed and developed sites are located within riparian areas; the ground is often hardened and ground vegetation may be removed, but areas have not been identified where excessive sediment from these sites is a concern. Dispersed sites typically do not have toilet facilities, and concentrations of human waste have been found at some locations. Impacts are isolated, and no monitoring has been performed to identify impacts to water-quality parameters. Trees have been felled for safety reasons in campgrounds and will continue to be felled for safety reasons. Under current direction, these trees would be removed or chopped up for use as firewood and would not contribute to instream bank stability, thermal regulation, or fish habitat needs. Once again, this impact is limited to developed recreation site. Generally, PIBO monitoring does not show that large wood is limited in forest streams.

A guideline to mitigate the effects from recreation facilities located within RMZs, FW-GDL-REC-06, would ensure new facilities or infrastructure are located to minimize impacts on water and riparian resources. Appendix C of the forest plan includes strategies to address impacts from existing recreation facilities located in RMZs, including impacts on water quality in fish-bearing waters.

However, it is assumed that minor, localized impacts to riparian vegetation, woody debris, and water quality would still occur where recreation use and activities are allowed. Existing recreational facilities and actions within or affecting RMZs may need to be modified, discontinued, or relocated if they are identified as not fully meeting functional aquatic/riparian conditions and processes or improving conditions and processes. Modifying or relocating facilities may cause temporary affects to streams and riparian areas. Where facilities cannot be located outside of RMZs, effects would be minimized to the greatest extent possible but not completely eliminated.

Current management and future trends in recreation management are likely to include continued efforts to relocate trails and dispersed and developed recreational sites away from streams and riparian areas in order to meet the intent to protect and improve water quality and aquatic habitats.

Mining

Locatable minerals

Locatable or hard rock minerals include deposits of gold, silver, copper, etc. There were approximately 63 patented and unpatented mining claims on the Forest, according to the Montana Bureau of Mines and Geology. A 2002 Montana Bureau of Mines and Geology report found that the Big Four Mine on the Swan Lake Ranger District near West Fork Dayton Creek was the only site identified on the Flathead National Forest that had potential impacts on Forest-administered land. Water-quality samples collected in 2000 upstream and downstream of the site indicated no adverse impacts. That mine is no longer active, and the only active mining claim located within the planning area is the Mary Dee II lode claim, which is located on the Hungry Horse Ranger District. None of these mines is within bull trout habitat.

There are no existing mining operations on the Forest. Recreational mining, such as suction dredging, may occur, although the Forest has not received requests for special-use permits for recreational mining. Suction dredging is regulated by federal and state mining laws and regulations. Montana Department of Environmental Quality has closed many of the Forest's bull trout and cutthroat streams to suction dredging, and therefore impacts from mining will not be seen in those streams. Large increases in mining activity are not anticipated for the future but cannot be ruled out. The 1872 Mining Law limits Forest Service authority over mining activities but allows the setting of terms and conditions to minimize impacts to NFS lands. The preferred alternative in the revised forest plan would require remedial action and protection of soil and water resources if permits are approved.

Leasable minerals (oil and gas)

The Flathead River Basin contains federally owned subsurface mineral estate under NFS lands that the federal government has leased for oil and gas development. When legislation was initially proposed in 2010, there were 115 oil and gas leases in the North Fork watershed that the BLM had issued between 1982 and 1985. The leases, which cover over 238,000 acres, are inactive and under suspension as part of the 1985 court case Conner v. Burford. At the request of Senators Max Baucus and John Tester of Montana, leaseholders have voluntarily relinquished 76 leases, totalling almost 182,000 acres. The BLM has not offered any other leases in the Flathead National Forest since the Conner v. Burford litigation suspended the existing leases in 1985.

The North Fork Watershed Protection Act of 2013 (H.R. 2259) withdrew federal lands (430,000 acres) within the North Fork and Middle Fork of the Flathead watershed from all forms of location, entry, and patent under mining laws and from disposition under all laws related to mineral or geothermal leasing. H.R. 2259 does not affect valid existing rights, including the 39 leases in the North Fork watershed that are suspended under the Conner v. Burford litigation.

Salable minerals

Salable minerals include common varieties of sand, stone, gravel, and decorative rocks. The Forest Service salable mineral material policy (Forest Service Manual 2850) states that disposal of mineral material will occur only when the authorized officer determines that the disposal is not detrimental to the public interest and the benefits to be derived from proposed disposal will exceed the total cost and impacts of resource disturbance. The Forest uses materials such as gravel, riprap, and crushed aggregate for maintenance and new construction of roads, recreation sites and repair of damage caused by fire, floods, and landslides. These materials come from Forest Service pits and quarries. The type, volume, and source location of in-service mineral material varies year by year and according to need. Free-use permits can be issued to any state, federal, or territorial agency, unit, or subdivision. As an example, the Glacier View Ranger District has issued crushed stone to Flathead County for maintenance and improvement of the North Fork Road. Free-use permits can also be issued to the general public. An individual may obtain a free-use permit to collect rock, as long as it is not for commercial use, sale, or barter. Only hand tools can be used to collect the rock; no digging is permitted, and only the collection of loose rock is authorized. Usually about 75 permits are issued each year.

There are no active mineral leases on the Forest and no effect on watersheds, fish, or riparian areas. Generally, gravel pits are situated away from riparian areas and tend not to affect watersheds or riparian areas. There would be no effects on fish, watersheds, or riparian areas from any of the alternatives from free-use permits to the general public.

Effects to Bull Trout and Designated Critical Habitat

The *Recovery Plan for the Coterminous United States Population of Bull Trout* (USFWS, 2015c) identified the bull trout core area as the closest approximation of a biologically functioning unit for bull trout. By definition, a core area includes a combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout) and a core population that constitutes the basic unit on which to gauge recovery. A core population is a group of one or more local populations that exist within core habitat.

Core areas require both habitat and bull trout to function, and the number and characteristics of local populations inhabiting a core area provide a relative indication of the core area's likelihood to persist (USFWS, 2015c). A core area is a system of watersheds within a larger basin. Each watershed is the habitat for a local population that interacts with other local populations throughout the larger basin. Local populations within a core area have the potential to interact because of connected aquatic habitat. A local population is defined as a group of bull trout that spawn within a particular stream or portion of a stream system. A local population is considered the smallest group of fish that is known to represent an interacting reproductive unit. In most areas, a local population is represented by a single headwater tributary or complex of headwater tributaries where spawning occurs. Gene flow may occur between local populations (i.e., those within a core population), but is assumed to be infrequent compared with that among individuals within a local population. The Flathead National Forest supports 38 local populations and three core areas with bull trout.

Flathead Lake Core Area

The majority of the Flathead Lake Core Area on the Forest is allocated to management areas 1a and 1b (62 percent) and management area 6 (19 percent) (table 43). NFS lands designated management area 6 across this core area will be foreseeably affected by scheduled timber harvest, recreation, prescribed fire, and access management that may result in sedimentation, substrate embeddedness, and other direct or indirect effects from project-level activities. An additional 16 percent of the activity area in this core area is allocated to management area 5 (table 43). A wide range of uses are allowed in management area 5; however, management area 5 lands would generally be relatively large areas without roads, providing a variety of motorized and nonmotorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would mostly be temporary. Management area 1a is a wilderness designation, and management area 1b is recommended wilderness and has the greatest restriction on all uses. Management area 2 is a wild and scenic river designation that also limits Forest activities. The allocation of 80 percent of this core area to management areas 1, 2, and 5 would limit the likelihood of adverse effects on bull trout and bull trout critical habitat in these areas.

In Big, Coal, and Red Meadow Creeks, the majority of acres are allocated to management areas 5 and 6. As described above, the risk of adverse effects on bull trout would be reduced with a management area 5 allocation but may occur in association with recreational trail improvements and access. The next highest allocation is management area 6b in these watersheds where moderate intensity timber harvest and general forest activities would occur. Effects would be greater than in management area 5 primarily due to road management activities, but effects on bull trout that could result from Forest management activities would be minimized through implementation of RMZ standards and guidelines as well as standards to hold roads within the primary conservation area for grizzly bears to the 2011 baseline. Restoration such as stormproofing roads in these watersheds may result in additional short-term adverse effects related to sedimentation or in-stream activities. These short-term effects would be partially offset by long-term improvements in habitat conditions.

Frozen Lake and Trail and Whale Creeks have the majority of their acres in management area 1b, with recommended wilderness in the headwaters that would be beneficial to bull trout as potential sediment-producing activities would be below bull trout spawning. Management areas 6a and 6b are designated lower within the watersheds and primarily below bull trout spawning, which reduces the likelihood of sediment generated from management activities to affect bull trout spawning and embryonic survival.

Trail and Whale Creeks are prioritized for upgraded culverts and reducing road-related effects as part of the conservation watershed network and as such may have short-term effects that will result in long-term benefits by stormproofing these watersheds in the face of climate change. Trail and Whale Creeks would also receive additional protection due to being recommended as wild and scenic rivers, which provides additional protections within a ¼-mile corridor.

Bear, Morrison, and Granite Creeks are in a mix of management areas 5, 6a, 6b, and 1b and currently designated wilderness. The largest allocation is in management areas 1a and 1b, with a range of 43-94 percent, and management area 6 is 24 percent in both Bear and Granite Creeks. Soils in this area are erosive when compared to other areas on the Forest and, unlike other bull trout watersheds in the Middle Fork Flathead, the headwaters are outside of wilderness. Plan components to implement BMPs and avoid areas with mass failure potential will minimize sediment in the headwaters. Morrison and Granite Creeks both have middle reaches inside wilderness, which provides a high degree of protection. Bear Creek parallels Highway 2 and the BNSF railroad, and coordination with the Montana Department of Transportation and BNSF will continue to ensure that maintenance operations are consulted on with the Forest through special-use permits that would have requirements to reduce sediment into Bear Creek.

The other bull trout watersheds within the Middle Fork of the Flathead River in the Flathead Lake Core Area are within wilderness and receive a high degree of protection. Potential impacts to bull trout can still occur from outfitter and guide operations, and the Forest has terms and conditions from previous consultations to provide measures in special-use permits to reduce impacts to bull trout.

Critical habitat has been designated in Trail, Whale, Red Meadow, Coal, Big, Bear, Morrison, and Granite Creeks as well as in the mainstem North Fork and Middle Fork Flathead Rivers. Limited adverse effects may occur at the project level, particularly associated with restoration activities such as culvert removals, upgrades, and other road-related work. Effects from other management activities would be limited through application of revised forest plan direction and other measures (e.g., retained decisions, BMPs, Forest Service Handbook and Manual direction, other legal and regulatory requirements) as described previously. There should be incremental corresponding improvements in the indicator of sediment over the long term of the plan, with short-term effects from road and culvert work that affects PCEs 2, 3, and 6. Over the life of the plan, minor improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7 through natural processes. Substantial changes in PCEs 6, 8, and 9 are not expected in the Flathead Lake Core Area.

Table 43. Flathead Lake Core Area (FLCA)—acres and percentages of bull trout-occupied drainages in the action area by management area (MA).

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the FLCA
Trail Creek	32,693 (77)	4,443 (11)	0	0	84 (< 1)	4,977 (12)	0	42,197
Whale Creek	24,142 (63)	4,247 (11)	0	0	1,168 (3)	8,659 (23)	0	38,216
Red Meadow Creek	2,716 (15)	18 (< 1)	0	0	5,076 (28)	10,556 (57)	0	18,366
Coal Creek	0	0	0	0	24,592 (61)	15,785 (39)	0	40,626
Big Creek	0	0	0	0	19,666 (38)	29,578 (57)	2,807 (4)	52,051
Bear Creek	12,253 (52)	47 (< 1)	0	0	5,467 (23)	5,735 (24)	0	23,455
Granite Creek	7,918 (43)	44 (< 1)	0	0	5,978 (33)	4,399 (24)	0	18,295
Morrison Creek	30,235 (94)	75 (< 1)	0	0	465 (1)	1,522 (5)	0	32,297
Strawberry Creek	17,303 (100)	0	0	0	0	0)	0	17,303
Bowl Creek	18,428 (100)							18,428
Clack Creek	37,595 (100)							37,595
Schafer Creek	16,136 (100)							16,136

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the FLCA
Dolly Varden Creek	16,465 (100)							16,465
Long Creek	14,078 (100)							14,078
Basin	11,720 (100)							11,720
Trail (Middle Fork)	12,495 (100)							12,495
Frozen Lake	5,922 (69)				2,654 (31)			8,576
Total acres (%) in core area	260,099 (62)	8,874 (2)	0	0	65,150 (16)	81,211 (19)	0	418,299

Table 44. Flathead Lake Core Area (FLCA)—acres and percentages of bull trout-occupied drainages in the Stillwater and Whitefish drainages by management area (MA).

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5 a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the FLCA
Upper Stillwater Lake	0	0	0	0	1759 (100)	0	0	1759
Upper Whitefish Lake	0	0	0	0	3866 (79)	1054 (21)	0	4920
Whitefish Lake	0	0	0	0	541 (14)	3278 (86)	0	3819

Hungry Horse Reservoir Core Area

The majority (67 percent) of the Hungry Horse Reservoir Core Area is allocated to existing wilderness, management area 1a (table 45). National Forest lands designated management area 6 (15 percent), mainly along Hungry Horse Reservoir tributaries across this core area, will be foreseeably affected by scheduled timber harvest, recreation, prescribed fire, and access management that may result in sedimentation, substrate embeddedness, and other direct or indirect effects from project-level activities. The largest percentage of management area 6 in bull trout watersheds occurs in Wheeler (44 percent), Wounded Buck (34 percent), Sullivan (24 percent), Quintonkon (48 percent), Bunker (9 percent) and Spotted Bear River (7 percent). As described above, the risk of adverse effects on bull trout may be the greatest in this allocation, but may occur in association with recreational trail improvements and moderate intensity timber harvest and general forest activities would occur. Effects in management area 6 would be greater than management area 5 primarily due to road management activities however, effects on bull trout that could result from forest management activities would be minimized through implementation of RMZ

standards and guidelines. Restoration in these watersheds may result in additional short-term adverse effects related to sedimentation or in-stream activities. These short-term effects would be partially offset by long-term improvements in habitat conditions. Additionally, there are no grazing allotments that encompass bull trout occupied streams.

MA6a and 6b are designated lower within the watersheds and primarily below bull trout spawning which reduces the likelihood of sediment generated from management activities to affect bull trout spawning and embryonic survival. Headwaters tend to be protected by management allocation areas that will have less forest management.

An additional 10 percent of the activity area in this core area is allocated to management area 5 (Table 45). A wide range of uses are allowed in management area 5; however, management area 5 lands would generally be relatively large areas, without roads, providing a variety of motorized and nonmotorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would be restricted due to grizzly bear conservation and frozen at the 2011 baseline level. Management area 1 is a wilderness designation and has the greatest restriction on all uses. The allocation of 77 percent of this core area to management areas 1 and 5 would limit the likelihood of adverse effects on bull trout in these areas.

Even though the majority of bull trout spawning occurs within the Bob Marshall Wilderness, there are known outfitter camps along bull trout spawning reaches particularly along Big Salmon, Little Salmon and Youngs Creeks, where disturbance may and does occur from stream crossings and outfitter camp activity such as getting water that may temporarily move bull trout off redds. Few adverse effects other than trail and outfitter use are anticipated for the wilderness local populations because they are allocated to management area 1 where few allowable uses would occur.

Wounded Buck and Sullivan Creek are identified as the highest priorities for stormproofing within the Conservation Watershed Conservation Network which would result in an overall reduction of potential culvert failure but would result in short term increases in sediment as culverts are removed or upgraded.

Spotted Bear River would receive additional protection due to being recommended as a Wild and Scenic River which provide additional protections within a ¼ mile corridor.

Critical habitat has been designated for each of the local populations (Danaher, Youngs, Gordon, White River, Little Salmon, Big Salmon, Bunker, Sullivan, Quintonkon, Wheeler, and Wounded Buck) as well as the mainstem South Fork Flathead River and Spotted Bear River. Doctor Lake and Big Salmon Lake are also designated. Limited adverse effects may occur at the project level, particularly associated with restoration activities such as culvert removals, upgrades and other road related work. Effects from other management activities would be limited through application of Revised Plan direction and other measures (e.g., retained decisions, BMPs, handbook and manual direction, other legal and regulatory requirements) as described previously. There should be incremental corresponding improvements for the indicator of sediment over the long term of the plan with short term effects from the road and culvert work which affects PCEs 2, 3, and 6. Over the life of the plan, minor improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7 through natural processes. Substantial changes in PCEs 6, 8, and 9 are not expected in the Hungry Horse Reservoir core area.

Table 45. Hungry Horse Reservoir Core Area—acres and percentages of bull trout-occupied drainages in the action area by management area (MA).

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the HHRCA
Danaher Creek	72,053 (100)	0	0	0	0	0	0	72,053
Youngs Creek	77,732 (100)	0	0	0	0	0	0	77,732
Gordon Creek[1]	42,315 (100)	0	0	0	0	0	0	42,315
White River	56,718 (100)	0	0	0	0	0	0	56,718
Little Salmon Creek	36,485 (100)	0	0	0	0	0	0	36,485
Big Salmon Creek[2]	49,741 (100)	0	0	0	0	0	0	49,741
Bunker Creek	20,235 (62)	15	0	0	9,754 (30)	2,841 (9)	0	32,830
Sullivan Creek	0	0	0	0	23,412 (76)	7,502 (24)	0	30,914
Quintonkon Creek	0	0	0	0	9,274 (51)	8,498 (48)	187 (1)	17,959
Wheeler Creek	1,014 (6)	0	0	0	8,965 (49)	8,021 (44)	113 (< 1)	18,113
Wounded Buck Creek	1,198 (11)	0	0	0	4,990 (44)	4,933 (34)	142 (1)	11,263
Spotted Bear River	93,047 (81)	5,273 (5)	0	0	7,912 (7)	8,194 (7)	0	114,426
Total acres (%) in core area	450,538 (67)	52,886 (8)	0	0	64,307 (10)	104,296 (15)	442 (< 1)	672,027

[1] also covers Doctor Lake

[2] also covers Big Salmon Lake

Swan Lake Core Area

The majority of the Swan Lake Core Area is allocated to management areas 1a and 1b (48 percent) and general forest management areas 6b and 6c (34 percent) (table 46). NFS lands designated management area 6 (34 percent) across this core area will be foreseeably affected by scheduled timber harvest, recreation, prescribed fire, and access management that may result in sedimentation, substrate embeddedness, and other direct or indirect effects from project-level activities. The largest percentage of management area 6 in bull trout watersheds occurs in Goat/Squeezer (26 percent), Piper (49 percent), Cold (54 percent), and Jim Creeks (63 percent). As described above, the risk of adverse effects on bull trout would be reduced in this allocation but may occur in association with recreational trail improvements, and moderate-intensity timber harvest and general forest activities would occur. Effects in management area 6 would be greater than in management area 5, primarily due to road management activities, but effects on bull trout that could result from forest management activities would be minimized through implementation of RMZ standards and guidelines. Restoration in these watersheds

may result in additional short-term adverse effects related to sedimentation or in-stream activities. These short-term effects would be partially offset by long-term improvements in habitat conditions. Additionally, there is one grazing allotment in Piper Creek that has five cow-calf pairs and an allotment below bull trout habitat at the outlet of Holland Lake. Thus, very little effects on bull trout occur from grazing in the Swan Lake Core Area.

An additional 14 percent of the activity area in this core area is allocated to management area 5 (table 46). Lost Creek has the largest allocation of management area 5 at 76 percent, followed by Soup Creek at 56 percent. A wide range of uses are allowed in management area 5; however, management area 5 lands would generally be relatively large areas without roads, providing a variety of motorized and nonmotorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would be restricted due to grizzly bear conservation and would be frozen at the 2011 baseline level. Management area 1 is a wilderness designation and has the greatest restriction on all uses. The allocation of 62 percent of the Swan Lake Core Area to management areas 1 and 5 would limit the likelihood of adverse effects on bull trout in these areas. The combined allocation of management areas 1a, 1b, and 5 in the Swan Lake Core Area is the lowest on the Forest. Former Plum Creek lands primarily in the valley floor were largely allocated to management area 6c, which would have the greatest potential for possible affects due to increased forest management.

Streams that drain from the west along the Mission Mountains—Elk, Jim, Cold and Piper—have their headwaters protected within the Mission Mountain Wilderness, whereas Lion Creek's headwaters are protected within recommended wilderness management area1b. Potential impacts from management activities would be less in these bull trout streams due to the headwater protection, but impacts to Goat, Squeezer, Soup, and Woodward Creeks might be greater due to a higher percentage in general forest management areas 6b and 6c. Lost Creek has a large percentage of lands allocated to management area 5 (76 percent), which allows some timber harvest but is not scheduled. In addition, road construction would be largely limited within bull trout watersheds because they are in the primary conservation area for grizzly bears.

Goat and Lion Creeks are identified as the highest priorities for stormproofing within the watershed conservation network, which would result in an overall reduction of potential culvert failure but would result in short-term increases in sediment as culverts are removed or upgraded.

Elk Creek, Lion Creek, and the headwaters of the Swan River above Lindbergh Lake would receive additional protection due to being recommended as wild and scenic rivers, which provides additional protections within a ¼-mile corridor.

Critical habitat has been designated for each of the local populations as well as the mainstem Swan River. Limited adverse effects may occur at the project level, particularly associated with restoration activities such as culvert removals, upgrades, and other road-related work. Effects from other management activities would be limited through application of the revised forest plan direction and other measures (e.g., retained decisions, BMPs, Forest Service Handbook and Manual direction, other legal and regulatory requirements), as described previously. There should be incremental corresponding improvements in the indicator of sediment over the long term of the plan, with short-term effects from road and culvert work that affects PCEs 2, 3, and 6. Over the life of the plan, minor improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7 through natural processes. Substantial changes in PCEs 6, 8, and 9 are not expected in the Swan Lake Core Area.

Table 46. Swan Lake Core Area (SLCA)—acres and percentages of bull trout-occupied drainages in the action area by management area (MA).

Population / drainage name (HUC)	MA1 acres (percent)	MA2 acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5 acres (percent)	MA6 acres (percent)	MA7 acres (percent)	Total acres of drainage in the SLCA
Elk Creek	12,645 (78)	2,447 (15)	0	0	421 (3)	774 (5)	0	16,287
Cold Creek	9,179 (44)	3 (< 1)	0	0	394 (2)	11,110 (54)	0	20,683
Jim Creek	3,884 (33)	0	0	0	483 (4)	7,271 (63)	0	11,638
Piper Creek	4,998 (45)	0	0	0	622 (6)	5,394 (49)	0	11,014
Lion Creek	11,283 (55)	3,314 (16)	0	0	770 (4)	5,111 (25)	0	20,478
Goat Creek	9,036 (68)	0	0	0	927 (7)	3,416 (26)	0	13,379
Woodward Creek	0	0	33 (1)	0	888 (23)	3,011 (77)	0	3,932
Soup Creek	0	0	0	0	1,363 (56)	1,050 (44)	0	2,413
Lost Creek	47 (< 1)	55 (< 1)	0	0	11,956 (76)	3,582 (23)	0	15,640
Lindbergh Lake	17,385 (71)	837 (3)	4 (< 1)	0	1,821 (7)	4,533 (18)	0	24,580
Holland Lake	4,383 (36)	0	0	0	1,028 (8)	6,253 (51)	590 (5)	12,254
Total acres (%) in core area	72,840 (48)	6,656 (4)	0	0	20,673 (14)	51,505 (34)	0	151,674

Bull Trout Critical Habitat

The USFWS published a final critical habitat designation for the coterminous United States population of bull trout on October 18, 2010 (USFWS, 2010); the rule became effective on November 17, 2010. Designated bull trout critical habitat is of two primary use types, (1) spawning and rearing and (2) foraging, migration, and overwintering, and it includes both reservoirs/lakes and stream/shoreline miles.

The conservation role of bull trout critical habitat is to support viable core area populations. The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. Critical habitat units (CHUs) generally encompass one or more core areas and may include foraging, migrating, and overwintering areas outside of core areas that are important to the survival and recovery of bull trout.

The primary function of individual CHUs is to maintain and support core areas that (1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (B. Rieman & McIntyre, 1993); (2) provide for persistence of strong local populations, in part by providing habitat conditions that encourage movement of migratory fish (MBTSG, 1998; B. Rieman & McIntyre, 1993); (3) are large enough to incorporate genetic and phenotypic diversity but small enough to ensure connectivity between populations (Hard, 1995; Healy &

Prince, 1995; MBTSG, 1998; B. Rieman & McIntyre, 1993); and (4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (Hard, 1995; MBTSG, 1998; B. Rieman & McIntyre, 1993; B. E. Rieman & Allendorf, 2001).

Critical habitat includes the stream channels within the designated stream reaches and has a lateral extent as defined by the bankfull elevation on one bank to the bankfull elevation on the opposite bank. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series.

Activities that cause adverse effects to critical habitat are evaluated to determine if they are likely to "destroy or adversely modify" critical habitat by no longer serving the intended conservation role for the species or retaining those PCEs that relate to the ability of the area to at least periodically support the species.

Critical Habitat in the Flathead Lake Core Area

A total of 283 miles of streams/rivers and 126,474 acres of lakes—Flathead (122,318 acres), Cyclone (141), Frozen (22), Upper Stillwater (593), Upper Whitefish (80), and Whitefish (3,320)—are included in the designation of critical habitat for the Flathead Lake Core Area on NFS lands.

The operation of Hungry Horse Reservoir and downstream temperature/flow influence may affect PCEs 4, 5, 7, and 8.

PCE 9 is degraded because of the influence of lake trout within Flathead Lake. Brook trout abundance within this core area is absent to low, but interaction between bull trout and brook trout is greatest in Bear Creek.

Critical Habitat in the Hungry Horse Reservoir Core Area

A total of 223 miles of streams and 28,710 acres of reservoirs/lakes—Hungry Horse Reservoir (23,602 acres), Big Salmon Lake (973), and Doctor Lake (53)—are included in critical habitat for the Hungry Horse Reservoir Core Area. Forest management has relatively little influence in the reservoir. This core area exhibits perhaps the strongest record of an increasing/stable trend across the entire U.S. range of bull trout due to the majority of populations within the Bob Marshall Wilderness. Consequently, the PCEs in this core area appear to be functioning appropriately for the most part, with perhaps the exception of local populations outside the wilderness and the management of reservoir levels. Risk to the function of the PCEs appears minimal.

The large surface area of the reservoir allows for greater solar insolation and raises, water temperatures in the reservoir, although the impact on fish, if any, is unclear (PCE 5). The dam and its regulation based on energy production needs disrupt the natural hydrograph governing the timing and quantity of runoff (PCE 7) downstream of Hungry Horse Dam and subsequently Flathead River. The Hungry Horse Reservoir Core Area is most likely the only core area in Montana that does not have any local populations influenced by non-native species, and thus PCE is very strong.

Critical Habitat in the Swan Lake Core Area

A total of 90 miles of stream/river and 4,506 acres of lakes—Swan (3,275 acres), Holland (414), Lindbergh (817)—are included in the critical habitat for the Swan Lake Core Area. The greatest threat to critical habitat in this core area is non-native lake trout in Swan Lake, affecting PCE 9. Forestry practices have also had extensive impacts to this core area on lands formerly owned by Plum Creek, affecting PCEs 3, 4, 6, and 8.

Effects to Critical Habitat

The revised forest plan provides direction under which future management decisions are made. Because it is a programmatic decision that authorizes no specific action, no direct effects on critical habitat would occur from the proposed action. Any direct effects would occur later, during individual project implementation when site-specific decisions are made. All project-level activities would undergo their own environmental analyses and section 7 consultation. An analysis of the anticipated effect of management activities on the primary constituent elements (PCEs) for bull trout is given below, followed by the expected impacts on each core area.

Effects from Forest Management Activities

Vegetation management may have temporary impacts on PCE 1 (permanent water with low levels of contaminants) and PCE 4 (appropriate substrates) when harvest activities generate increases in sediment. Revised forest plan standards and guidelines would minimize many effects of vegetation management by providing a buffer where management is prohibited and riparian vegetation develops under natural processes. Thus, vegetation management is not expected to impact PCE 2 (appropriate water temperatures), PCE 3 (complex stream channels), and PCE 8 (abundant food base). PCEs 5 (natural hydrograph), 6 (subsurface water connectivity), 7 (migratory corridors), and 9 (non-native species) are not affected.

Fuel management through the use of prescribed fire and hand thinning is expected to have little direct effect on bull trout PCEs. Fuel management may reduce the potential for severe and intense wildfires. High-intensity fire can change infiltration characteristics of the soil and change hydrologic characteristics in watersheds when they occur over large areas, resulting in increased erosion. Wildfire suppression has the potential to affect PCE 1 by application of fire retardant, although current standards require avoidance of waterways, and the revised forest plan continues these protections. The requirement for the use of minimum impact suppression techniques in riparian areas ensures protection of critical habitat during wildfire suppression. In general, fuel and fire management activities may indirectly affect the potential to impact hydrologic characteristics on the watershed scale (PCE 5). Changes in the revised forest plan that emphasize fuel treatments to reduce the risk of stand-replacing fires should result in benefits to PCE 5 by reducing the risk of wildfires that may open stand canopies.

Access management and recreation affect bull trout critical habitat primarily through the delivery of sediment (PCE 4) and through stream crossings that may block fish passage (PCE 7). Where existing roads are in close proximity to streams and riparian vegetation is reduced, ongoing impacts to PCEs 2, 3, and 8 may occur. Where road fill impinges directly on the stream or where soils become compacted in wetland and riparian areas from dispersed camping, effects to PCE 6 may occur. Forestwide desired conditions, objectives, standards, and guidelines in the revised forest plan that emphasize road decommissioning, regular road maintenance, removal of barriers at stream crossings, and motor vehicle use designations designed to move OHV use away from riparian areas will reduce but not eliminate these impacts.

Livestock grazing may affect bull trout critical habitat due to trampling or trailing along streambanks and grazing or trampling of riparian vegetation. These impacts may reduce the function of PCEs 1-4 and 8 by increasing bank instability, creating erosion, increasing sediment (PCEs 1 and 4) and, with heavy use, channelization and an increase in the width-depth ratio (Belsky et al. 1999) (PCE 2,3, and 8). Reduction of riparian vegetation through consumption or physical impacts from trampling affects the function of PCE 2 and 8 by removing overhanging vegetation, which provides shade to reduce temperatures and nutrients and habitat to support an abundant food base. Grazing occurs primarily along roads and in transitory range where previous timber harvest has created an open understory with herbaceous

vegetation, so direct impacts to streams are less likely. Avoidance of timber harvest in riparian areas was instituted with the 1995 INFISH forest plan amendment and continues with revised direction, thus allowing for increased canopy cover along streams. Piper Creek is the only designated critical habitat with an active grazing allotment, and it has 5 cow-calf pairs.

Watershed improvement activities would be expected to result in a temporary impact to PCEs 1 and 4 with the potential for long-term benefit to PCEs 1 through 8, depending on the specifics of the project. As with all project-level decisions, separate consultation looking at design and site-specific impacts would occur prior to any project implementation.

Cumulative Effects

The cumulative effects area for bull trout is the Flathead Basin which includes the Whitefish, Stillwater, Swan, and Flathead rivers as well as Flathead Lake. Flathead Lake and its fishery influences cumulative effects upon bull trout due competition and predation by lake trout. Cumulative effects under the Endangered Species Act include state, tribal, local, or private actions that are reasonably certain to occur in the action area. Past actions have been included in the environmental baseline. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in the cumulative effects analysis in this biological assessment.

Non-federal land management policies are likely to continue affecting riparian and aquatic resources. The cumulative effects in the Flathead River Basin are difficult to analyze, considering the broad geographic landscape covered, the uncertainties associated with government and private actions, and ongoing changes to the region's economy. Whether those effects will increase or decrease in the future is a matter of speculation; however, based on the growth trends and current uses identified in this section, cumulative effects are likely to increase.

State-owned school trust lands managed by the Montana Department of Natural Resources in the Stillwater, Coal, and Swan State Forests will continue to support a variety of uses from livestock grazing to mining, timber harvest, and recreational fishing and hunting. Montana law requires that school trust lands be managed to maximize income for the school trust. Management impacts may be greater on these lands than on other state or federal lands but may not result in loss of fish populations.

Numerous smaller private landowners within the boundaries of the Flathead National Forest implement activities such as timber harvest, road building and maintenance, livestock grazing, water diversion, residential development, and agriculture. Future private activities will continue and, presumably, increase. As population density rises, demand for residential and commercial development is also likely to grow. Such increased use and demand would increase the importance of quality habitat on NFS lands as strongholds for bull trout persistence and recovery.

For the most part, the stream systems originate on-Forest in protected headwaters, eventually flow downstream onto lands owned or administered by entities other than the Forest Service, and ultimately flow into Flathead Lake. Many fish populations, whether they move off-Forest as part of their life cycle or remain entirely within a localized area, require the interconnectivity of these streams to survive as a population. For almost all species, genetic interchange between subpopulations is necessary to maintain healthy fish stocks. The more wide-ranging the species, the more critical interconnectivity may be in order for the fish to access important habitat components. Thus, activities off-Forest that disrupt fish migration corridors can have significant impacts to fish populations upstream.

A host of activities that have the potential to riparian and aquatic resources occur on private lands within the Flathead River Basin. These include water diversion, irrigation, livestock grazing, farming of varied

cash crops, timber harvest, water-based hunting, outfitted and non-outfitted angling, establishment of subdivisions, housing and commercial development, building and stocking of private fish ponds, chemical treatment of noxious weeds, flood control and stream channel manipulation, and hydropower management.

Harvesting and poaching by anglers has been identified as one reason for bull trout decline (USFWS, 2002). Recreational fishing will likely increase as the general residential population in western Montana increases. In addition, misidentification of bull trout has been a concern because of the similarity of appearance with brook trout. Although the harvest of bull trout is illegal, incidental catch does occur. The fate of released bull trout is unknown, but some level of hooking mortality is likely due to the associated stress and handling.

The potential for introduction of disease and aquatic nuisance species exists on all lands within the cumulative effects analysis area. The extent of influence exerted by disease or exotic species is often determined by an area's suitability. If conditions are favorable enough to promote and perpetuate them, then effects are determined by the fishery's susceptibility to influence. The effects of these introductions could range from extreme to negligible, based upon the species. Quagga or zebra mussels introduced into Flathead Lake could have a devastating effect upon the entire ecosystem.

MFWP is the responsible agency for managing fish populations. Regulations will most likely continue to allow the angling and harvest of fish, with variations on fishing limits and times when angling can occur and some gear restrictions. Flathead Lake and Swan Lake are critical to maintaining bull trout and westslope cutthroat trout populations in tributaries within the North and Middle Forks of the Flathead River and Swan River. Fish populations within the lakes are interconnected to upstream ecosystems. How non-native fish, i.e., lake trout, are managed within these lakes will largely determine the viability of migratory bull trout and westslope cutthroat trout populations (USFWS, 2015b).

The most complex cumulative effects relate to the restoration of bull trout and westslope cutthroat trout within the project area. The complexity of these life histories exposes them to many factors affecting their abundance and viability. Cumulative effects to native fish include (1) predation, hybridization, and competition with non-native fish; (2) destruction or degradation of spawning and rearing habitat from logging, grazing, road construction/maintenance, and urban development on private and other non-federal lands; (3) degraded water quality as a result of polluted runoff from urban and rural areas; and (4) migration barriers that result from roads on private or other non-federal lands.

Bull trout determination of effects and rationale

The proposed action may affect and is likely to adversely affect bull trout and bull trout critical habitat.

Rationale for Determination

Populations of bull trout will be maintained in their existing status and are likely to increase as stream and riparian conditions are improved, based on the restoration activities and protective measures that are provided. Stochastic events such as disease, climatic changes, natural disturbances, or increases in non-native species such as lake trout will continue to have population effects beyond the control of the Forest.

The proposed federal action represents a programmatic decision that would change management area designation and, therefore, would have no direct effects on bull trout or their habitats. Any direct or indirect effects would occur later, during project level implementation, when site-specific decisions are made based on revised forest plan direction and direct, indirect, and cumulative effects of proposed actions are evaluated. The revised forest plan provides the direction under which future management decisions are made. All project-level activities will undergo separate site-specific environmental analyses,

and section 7 consultation will occur when effects to threatened or endangered species or their habitats are anticipated.

There are likely to be improvements to bull trout and bull trout designated critical habitat from the implementation of revised forest plan direction and natural ecological successional processes, but the environmental baseline for the activity area is not likely to change as the plan does not make any on-the-ground decisions and any changes to the environmental baseline would result from natural processes. Conversely, the Forest does not anticipate a downward trend in the environmental baseline for populations in these core areas as a result of land management activities because of the limited amount of allowable uses that could negatively affect the species as well as the protective measures and direction in the revised forest plan.

Implementation of the revised forest plan would provide for an overall net benefit to bull trout and bull trout designated critical habitat. Although there would be no direct effects to individual bull trout or designated critical habitat resulting from the proposed action itself, indirect effects of the proposed action resulting from project-level activities have the potential for take and may affect individuals, critical habitat, or both. Activities that are allowable under the revised forest plan that occur in RMZs or within the stream channel environment may have short-term adverse effects and are likely to adversely affect bull trout and bull trout designated critical habitat.

Meltwater stonefly

The meltwater Lednian stonefly is a small, dark-colored species that inhabits extremely cold glacier-fed streams, primarily at high elevations in Glacier National Park. Little else is known about its habits or ecology except that the adults hatch by mid-summer (July-August) and are presumably mating during this time. The meltwater stonefly was found on the Flathead National Forest in the headwaters of Tunnel Creek below Grant Glacier in 2010 and above Sunburst Lake in 2015. This species could possibly be found in other glacier meltwater areas, although this habitat type is rare on the Forest.

The larvae are found in small alpine, mountain streams (Newell & Minshall, 1976), but only those closely linked to glacial runoff (Treanor, Giersch, Kappenman, Muhlfeld, & Webb, 2013). Ecologically, this species is a cold-water stenotherm that is unable to tolerate warm water temperatures (greater than 10 °C) and is generally collected within a few hundred meters of the base of glaciers or snow melt-derived streams.

The greatest concern related to this species is climate change, which will continue to shrink glaciers that the species is dependent on for survival. Estimates are that all glaciers will be gone from Glacier National Park by 2030, essentially the life of this plan. The Forest does not conduct activities in this species habitat, and thus the proposed action will have no effect on the meltwater stonefly.

Plant Species

Spalding's Catchfly

Spalding's catchfly (*Silene spaldingii*) is a perennial herb in the pink family (Caryophyllaceae). It was listed as threatened under the Endangered Species Act by the USFWS on November 9, 2001 (FR 66(196): 51598-51606) (USFWS, 2001a). Although the USFWS intends to identify critical habitat for this species, critical habitat designation was precluded at the time of listing due to a lack of funding. The recovery plan for Spalding's catchfly (USFWS, 2007c) outlines the recovery strategy, recovery goals, objectives, and delisting criteria. A five-year review was conducted by USFWS (2009b). No change in listing was recommended due to lack of changes in the species status.

Affected Environment

Habitat

Spalding's catchfly habitat is primarily dry grasslands and grassland inclusions typically dominated by rough fescue (*Festuca campestris*) or Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and other bunchgrasses. There may be scattered ponderosa pine trees, forming an open canopy. Plant communities dominated by these grass species are exceedingly rare on the Forest. A few patches of suitable habitat exist along the North Fork of the Flathead River floodplain from the Canadian border to Polebridge, in the Swan Valley, and in larger open fescue bunchgrass prairies in the South Fork of the Flathead and Danaher Creek Drainages within the Bob Marshall Wilderness. However, these areas have been surveyed extensively in the past, and Spalding's catchfly was not found. There may be suitable grasslands in the Hog Heaven Range west of Flathead Lake and on the south slopes near Ashley Lake, as well. None of these areas are specifically mapped; even so, they would comprise less than 1 percent of the land base of the Forest.

Occurrence

Spalding's catchfly is a Palouse Prairie endemic that is currently known from 107 populations across its range in Montana, Idaho, Oregon, Washington, and British Columbia. The populations are often small and isolated. Sixty-four occurrences are known from Montana, all in grassland plant communities located in the northwestern portion of the state. The numbers of individuals at most of these occurrences are very low. No populations are known from the Forest, although four occurrences are within three, 10 and 15 air miles from the Forest.

Threats

This species has suffered considerable habitat loss and fragmentation due to agricultural and urban development, grazing, herbicide treatment, and exotic weed invasion (Lichthardt, 1997; Schassberger, 1988). Disturbances such as grazing or fire may be important to the long-term persistence of this species in northwest Montana as a result of reduced competition with the large, litter-producing native bunchgrasses, primarily rough fescue, with which it co-occurs (Lesica, 1997a). Invasion by exotic species threatens nearly all populations. The threat of herbicide drift is a factor affecting Idaho populations, although this is not a threat in Montana as the few known Montana occurrences are geographically removed from agricultural treatments.

Trends

Populations of Spalding's catchfly have been extirpated in some portions of its range and are stable in others, depending on the particular threats to each population (USFWS, 2007c). Due to the nature of the

species' life history, population numbers vary from year to year. Many plants go dormant, depending on climatic conditions (Lesica, 1997a; Lesica & Crone, 2007). Some years exhibit tens of thousands of plants, and other years only a few hundred plants are observed (USFWS, 2007c).

Environmental Consequences

Because there are no known occurrences of Spalding's catchfly on the Forest, the following discussion only evaluates how the proposal could potentially impact habitat that may be suitable for the plant.

Programmatic Effects of the Flathead National Forest Plan Revision

Forest plan components comply with the requirements of the Endangered Species Act of 1973. All federally recognized threatened, endangered, and candidate species would continue to be managed and protected across the Forest in accordance with Forest Service policy, recommended protection measures in recovery plans (if available), and all applicable state and federal laws. Project-level analysis will evaluate site-specific impacts to these species, and consultation with the USFWS will take place for all projects potentially affecting threatened and endangered species. Additional design features or mitigation measures at the project level may be developed if it is determined that they are needed.

Although there are no known populations of Spalding's catchfly on the Forest, the dry grassland habitats where this species might occur would have a low likelihood of notable impact from human activities. Timber harvest would not occur within this type; recreational use, such as hiking, may occur but has low likelihood of impact to the integrity of the plant community. Risk of invasive plant species poses the greatest threat to integrity of the dry grassland communities. Plan components that emphasize protection of high-priority areas (including native grasslands) and treatments that focus on these areas provide protection to these rare plant communities that serve as potential habitat for Spalding's catchfly (refer to FW-DC-NNIP-01, FW-OBJ-NNIP-01).

Determination of Effects and Rationale

Given the protection provided to potential habitat for Spalding's catchfly and the conservation measures that include evaluation of potential site-specific impacts during project planning, the programmatic revised forest plan would have no effect on potential habitat for Spalding's catchfly. Because the proposed action would have no effect to Spalding's catchfly, there would not be any cumulative impacts.

Water Howellia

Water howellia (*Howellia aquatilis*) is a vascular plant species in the family Campanulaceae. The USFWS drafted a recovery plan for the species (Shelly & Gamon, 1996), but it has not been finalized. Therefore, there are no recovery goals officially identified for the species. A conservation strategy for water howellia on the Forest was completed (USDA, 1996), incorporating strategies from the draft recovery plan and providing management direction to guide the conservation of the species. This strategy was incorporated into the current forest plan (amendment 20) and will be carried forward into the revised plan.

The Service completed a year review on water howellia (USFWS, 2013f). Existing federal regulatory mechanisms have protected water howellia habitat from adverse human-caused impacts. Due to these actions and continuing existing conservation practices, water howellia is recommended for delisting (USFWS, 2013f).

Affected Environment

Habitat

Water howellia is an aquatic plant restricted to small pothole ponds or oxbows long since isolated from the flowing surface waters of the adjacent river. These wetland habitats are generally shallow (approximately 20-40 inches deep during the early summer months). All of the howellia occurrences in the Swan Valley are in glacially formed ponds or retired river oxbows, usually surrounded in part by deciduous trees and a diverse matrix of coniferous forests (Lesica, 1990).

Occurrence

Currently, there are 220 known populations of water howellia in the Swan River Valley (MNHP-MTFWP, 2016). Of these, 191 (87 percent) occur wholly (183) or partially (8) on Flathead National Forest lands. These 220 populations represent 73 percent of the known 302 global occurrences.

General surveys for water howellia in the Swan Valley have been conducted since 1987 and have continued to the present. The Flathead National Forest, with the cooperation of Montana Natural Heritage Program and the Nature Conservancy, has surveyed the majority of identifiable potential water howellia ponds in the Swan Valley. Many ponds that contain suitable habitat but are unoccupied by water howellia have been found in the Swan River Valley. Some initially identified suitable but unoccupied ponds have been later found to contain water howellia. Other identified suitable unoccupied ponds could harbor water howellia at some point in the future.

Threats

The Natural Heritage Program Network has ranked this species as G3, meaning that it is at a moderate risk of extinction due to its restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors (NatureServe, 2015). The Montana Natural Heritage Program has ranked the species as S3, which means potentially at risk in the state because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas. Water howellia is currently listed as threatened by the Service.

Water howellia habitat has been subject to various management activities, including road construction, logging, and grazing (Shelly, 1988; USDA, 1997). These activities could alter hydrological conditions by the removal of vegetation or impacts on soils adjacent to occupied ponds. Resulting increased pond evaporation, changes in interception and transpiration of water by plants, and alteration of water flow in soils may influence water levels in ponds. This may be detrimental or beneficial to water howellia depending on the site-specific situation and annual variations in precipitation and temperature, since sufficient drying of ponds is required in the fall for water howellia seed germination to take place (Lesica, 1990).

The non-native variety of reed canarygrass (*Phalaris arundinacea*) has threatened some populations across its range but not affected other populations (Lesica, 1997b; USFWS, 2013f). One howellia site in Montana, the Swan River Oxbow (a Nature Conservancy preserve) does have documented encroachment of reed canarygrass that is likely an introduced cultivar from the adjacent national wildlife refuge, and impacts to that site have been documented by Lesica (1997b). The small isolated populations of reed canarygrass that occur in many of the howellia ponds in the Swan Valley may be native (Merigliano & Lesica, 1998), and a 10-year monitoring study (USDA, 2010a) did not show much expansion of reed canarygrass in these ponds.

Additional human-caused threats to water howellia include potential drift from chemical spraying of invasive species near ponds. The effects of chemical controls conducted by state and private lands near

water howellia ponds are unknown. The effects of herbicides at or near water howellia ponds on the Forest were analyzed in the *Flathead National Forest Noxious and Invasive Weed Control Environmental Assessment and Decision Notice* (USDA, 2001b). No chemical controls have been conducted at or near howellia ponds on the Forest. Surveys for at-risk plant species are required before conducting chemical control of invasive weeds on the Forest.

Natural disturbances that may affect water howellia include climate change, aquatic vegetation succession, and wildland fire. Changing climate patterns may affect the seasonal fluctuations in pond water levels that influence water howellia populations. Successive years of either dry, hot growing seasons or very wet, cool growing seasons could affect the annual filling and drying regime that is important to the persistence of the populations. Vegetation succession in ponds could lead to extirpation of a population, e.g., if the plant community in a pond shifts to a sedge meadow or eventually to forest. Wildland fire could have beneficial and detrimental effects to water howellia, depending on the situation. A hot fire late in the season could burn over seeds that are in shallow soil. Fire's removal of trees and other vegetation surrounding ponds could have hydrological effects that alter water levels, with site-specific effects similar to the discussion on logging above.

Trends

In 1998, a 10-year monitoring plan was initiated by the Forest to detect changes in water howellia distribution and abundance and was completed in 2007 (USDA, 2010a). This study assisted in evaluating whether current management prescriptions for water howellia were sufficient for continued viability of the Swan Valley metapopulation. Approximately 65 occupied ponds were monitored annually over the 10-year period. Although population levels were reduced in 2 of the 10 years due to yearly variations in precipitation and temperature, the species is adapted to such fluctuations, and overall the monitored populations in both disturbed and undisturbed settings were stable throughout the study (Shelly, Mantas, Pipp, & Hahn, 2016). Additional survey work has increased the total number of documented populations in the Swan Valley, including the discovery of occurrences of water howellia in previously unoccupied yet suitable ponds. Population levels of water howellia are primarily influenced by annual fluctuations in precipitation and pond drying, with reduced population sizes often occurring during years following cooler, wetter summers. This is because the latter conditions inhibit fall seed germination (Lesica, 1990, 1992).

The Service concluded their 5-year review of water howellia in 2013 (USFWS, 2013f). Their conclusion was that the threats identified at the time of listing have been mitigated through regulatory mechanisms such as the conservation strategy and the incorporation of project design features that remove or minimize disturbance to populations, such as the 300-foot minimum management buffer around ponds for project-level decisions. Other regulatory direction, such as buffers that limit ground-disturbing activities around wetlands not occupied by water howellia, have also contributed to the conservation of water howellia habitat. Reed canary grass threatening ponds has been successfully treated in some states (USFWS, 2013f) and does not seem to be invading other habitat as previously thought (USDA, 2010a). Grazing has been removed from water howellia habitat, as well.

In addition to management changes to water howellia habitat, there have been almost 200 additional populations documented range-wide since the time of listing, including sites previously believed to be extirpated in Oregon and California. Because of all of these factors, the Service is recommending delisting water howellia while maintaining current conservation measures (USFWS, 2013f).

Environmental Consequences

Programmatic Effects of the Flathead National Forest Plan Revision

Forest plan components comply with the requirements of the Endangered Species Act of 1973. All federally recognized threatened, endangered, and candidate species would continue to be managed and protected across the Forest in accordance with Forest Service policy, recommended protection measures in the recovery plans (if available), and all applicable state and federal laws. Project-level analysis would evaluate site-specific impacts to these species, and consultation with the USFWS would take place for all projects potentially affecting threatened and endangered species. Additional design features or mitigation measures at the project level might be developed if it is determined that they are needed.

The Condon Creek Botanical Special Area is recognized for its importance in protecting known populations of water howellia, and this special designation is retainedwith management area 3B designation (special areas). Forest plan components provide protection for the wetland habitat as well as the adjacent upland forested habitat within the Condon Creek Botanical Special Area (refer to MA3b-Special Area-DC-01, 02, 03, and 04). Components emphasize retaining the natural condition of these areas, supporting sustainable and healthy populations of water howellia, and providing educational and research opportunities as appropriate.

The conservation strategy for water howellia (USDA, 1997) would be retained, and represents the primary guidance for maintenance of suitable habitat for the species. The strategy requires a 300-foot minimum management buffer around all ponds that provide habitat for water howellia, including both occupied and suitable but unoccupied ponds (FW-DC-PLANT-02; FW-GDL-PLANT-01, 02). A 300 foot riparian management zone is also established around howellia ponds in plan direction (FW-STD-RMZ-01). Forest plan components that address desired conditions and limitations on management activities within all riparian management zones (RMZs) would also apply to ponds providing water howellia habitat, wherever the RMZ direction is more restrictive than the conservation strategy direction. These components address maintaining desired vegetation composition, structural diversity, patterns, and ecological processes within RMZs, appropriate to the natural disturbance regimes of the area (FW-DC-RMZ-01 through 06). Standards and guidelines limit vegetation management or other activities (such as timber harvest or gravel extraction), and the use of herbicides, pesticides and other toxic chemicals within RMZs (FW-STD-RMZ-02 through 05; FW-GDL-RMZ-01, 04, 06, 08 through 15). Limits on activities within RMZs associated with fire management, such as aerial application of chemical retardant, locations of fire-suppression facilities, and refueling stations, are also incorporated into revised forest plan direction (FW-GDL-RMZ-02, 03 and 05; FW-GDL-PLANT-03). Direction related to protection of riparian management zones and associated aquatic resources for management activities associated with grazing, recreation, roads, and other infrastructure is provided in the revised forest plan as well. Refer to appendix D for the list of all plan components.

Consequences to water howellia from forest plan components associated with other resource programs or management activities

Effects from access (motorized and nonmotorized) and recreation use

Water howellia could potentially be affected by recreation activities that could cause ground disturbance, such as hiking/trampling, biking, dispersed camping, and off-road vehicle use, particularly during periods when pond water levels are low and the habitat is more vulnerable to disturbance. Roads and trails for recreational use can contribute to the spread of noxious weeds.

Effects from vegetation management and fire

Under the natural disturbance regimes of the Forest, large, stand-replacing wildfires have occurred in the past and are likely to continue to occur across portions of the landscape in the future. Although plant species in the northern Rockies have evolved in this fire-dominated ecosystem, there might be cases where severe and extensive stand-replacing wildfire events could alter hydrological conditions relative to water levels in water howellia ponds.

Vegetation management treatments can have impacts to plants and plant habitat through canopy removal and soil disturbance. Vegetation treatment may require road building or maintenance. Roads increase access and provide an avenue for invasive plant species. The revised forest plan incorporates the conservation strategy for howellia and has plan components associated with vegetation management that protect habitat and contribute to conservation of the species, as described earlier in this section.

Effects from non-native invasive plants and control treatments

Introduced, invasive plant species can displace native plants through competition. Impacts may also result from treatments that include herbicide spraying and mechanical ground disturbance to control noxious weeds once they gain a foothold. Competition from invasive non-native species and noxious weeds can result in the loss of habitat, loss of pollinators, and lowered viability of rare plant species viability. Roads, trails, livestock, and canopy reduction can provide ideal pathways for the introduction of exotic and non-native species. Indirectly, herbicide spraying can affect populations of native pollinators by contaminating nesting materials and pollen resources, further decreasing the viability and reproductive success of rare species. The revised forest plan incorporates direction that guides the treatment of invasive species based on the forestwide analysis and decision for noxious weeds that was incorporated into the existing and revised forest plan direction. Under this direction, treatments would be designed to avoid or minimize impacts to plant species at risk in order to support their persistence over the long term. Special areas and riparian areas (particularly those associated with water howellia ponds) would be recognized as high-priority areas for the management and treatment of invasive species (FW-DC-NNIP-01 and FW-OBJ-NNIP-01). An integrated management approach to weed control would be applied (FW-DC-NNIP-04).

Determination of Effects and Rationale

The proposed action may affect, but is not likely to adversely affect, water howellia. The conservation strategy for water howellia (USDA, 1997) will be retained in the revised forest plan, and includes direction to maintain both occupied and suitable but unoccupied pond habitats for the species. In addition, the standards and guidelines for riparian management zones also apply to the pond habitats of the species. All of these plan components are designed to protect water howellia and improve its habitat on the Flathead National Forest. Although all project-level activities will undergo separate site-specific environmental analyses, and Section 7 consultation will occur where effects to water howellia or its habitat are possible, incorporation of these forest plan protective measures during project implementation is expected to result in insignificant or discountable effects to the species and its habitat. Although cumulative effects of past management activities in the Swan Valley have affected water howellia and its habitat, the forest plan measures provide for protection and improvement of occupied and suitable but unoccupied habitat. Stochastic events such as climate change and natural disturbances will continue to have population effects beyond the control of forest management.

Appendix A: Record of Consultation with U.S. Fish and Wildlife Service

Date	Consultation
June 3, 2016	NOI published in Federal Register for revised Flathead National Forest plan alternatives and DEIS; alternatives and DEIS for amendment of Kootenai, Helena, Lewis and Clark, and Lolo Forest Plans to incorporate habitat management direction for the NCDE grizzly bear population.
June 20, 2016	Meeting with wildlife biologists Reed Kuennen and Nancy Warren; fisheries biologist Pat Van Eimeren; silviculturist Heidi Trechsel; USFWS consultation biologists Ben Conard, Katrina Dixon, and Kevin Aceituno; and planning team leader Joe Krueger and staff officer Rob Carlin to discuss consultation strategy, timelines, roles, and responsibilities.
July-August, 2016	USFS and USFWS sign consultation agreement
September 23, 2016	USFS sends draft BAs to USFWS including: • A broad description of the action to be consulted on, • A description of the specific area that may be affected by the action, • The current status and habitat use of listed species in the action area, and identification of designated critical habitat within the action area, • Discussion of the methods and scientific information used, • Environmental baseline for each threatened or endangered species and critical habitat.
November 30, 2016	USFWS and USFS meet to discuss draft BAs; sections on grizzly bear and development of a preferred alternative
December 8, 2016	USFWS and USFS meet to discuss draft BAs; sections on lynx, bull trout, critical habitats, Howellia, proposed and candidate species
January 10, 2017	USFS and USFWs discuss aquatic plan components; Pat Van Eimeren, Joe Krueger, and Kevin Aceituno.
January 25, 2017	USFWS and USFS meet to discuss proposed actions and their effects; sections on grizzly bear, lynx, critical habitats, proposed and candidate species. Ben Conard, Katrina Dixon, Jennifer Fortin-Norris, Wayne Kasworm, Nancy Warren, Reed Kuennen, Pat Van Eimeren Joe Krueger. USFS lets USFWS they will be submitting draft BAs in mid-February due to need for USFS RO review.
February 21, 2017	USFS submits draft BAs, version 2, to USFWS.
March 6, 2017	Phone call to discuss updates to timeline for formal consultation; Ben Conard, Kevin Aceituno, Joe Krueger, Reed Kuennen, Nancy Warren, Pat Van Eimeren. USFS agrees to submit BAs to USFWS by mid-March, 2017. USFWS agrees to discuss draft T & C's, conservation measures, and reporting requirements, related to grizzly bear during April, 2017. Due to litigation, regional level priorities, and additional complexity of the Flathead's BA, USFWS expresses their concern that they may need 90 days (until mid-June) to complete consultation on Flathead BA.
March 13, 2017	Forest Service submits the Biological Assessment for Threatened, Endangered, and Proposed Species: Forest Plan Amendments incorporating management direction for the NCDE grizzly bear population into the Helena, Lewis and Clark, Kootenai, and Lolo Forest Plans.
March 17, 2017	Forest Service submits the Biological Assessment for Threatened, Endangered, and Proposed Species: Revised Land and Resource Management Plan for the Flathead National Forest.
August 29 and September 8, 2017	USFWS meets with USFS to discuss draft biological opinions.

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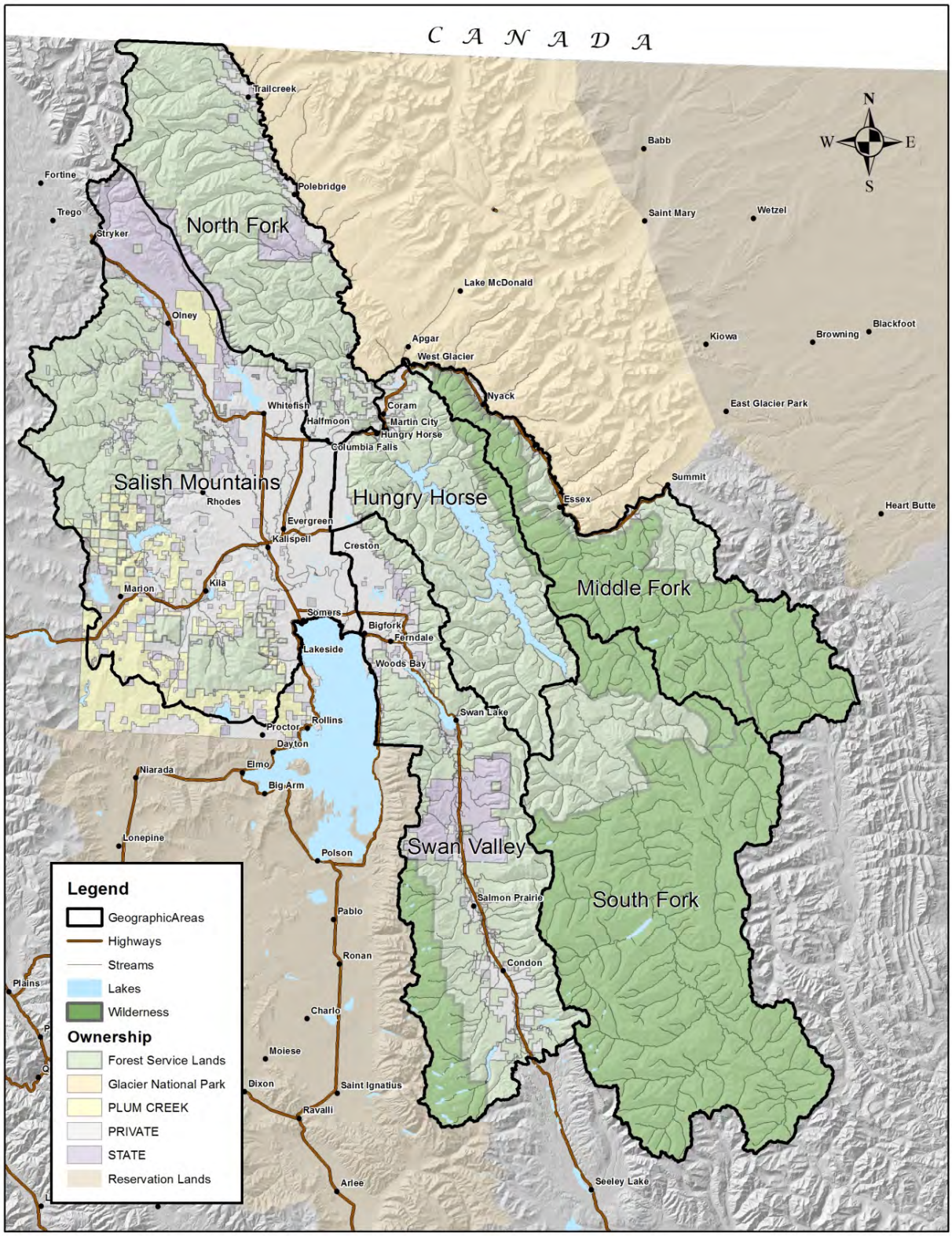


Figure B-1. Flathead National Forest geographic area (GA) boundaries and land ownership.

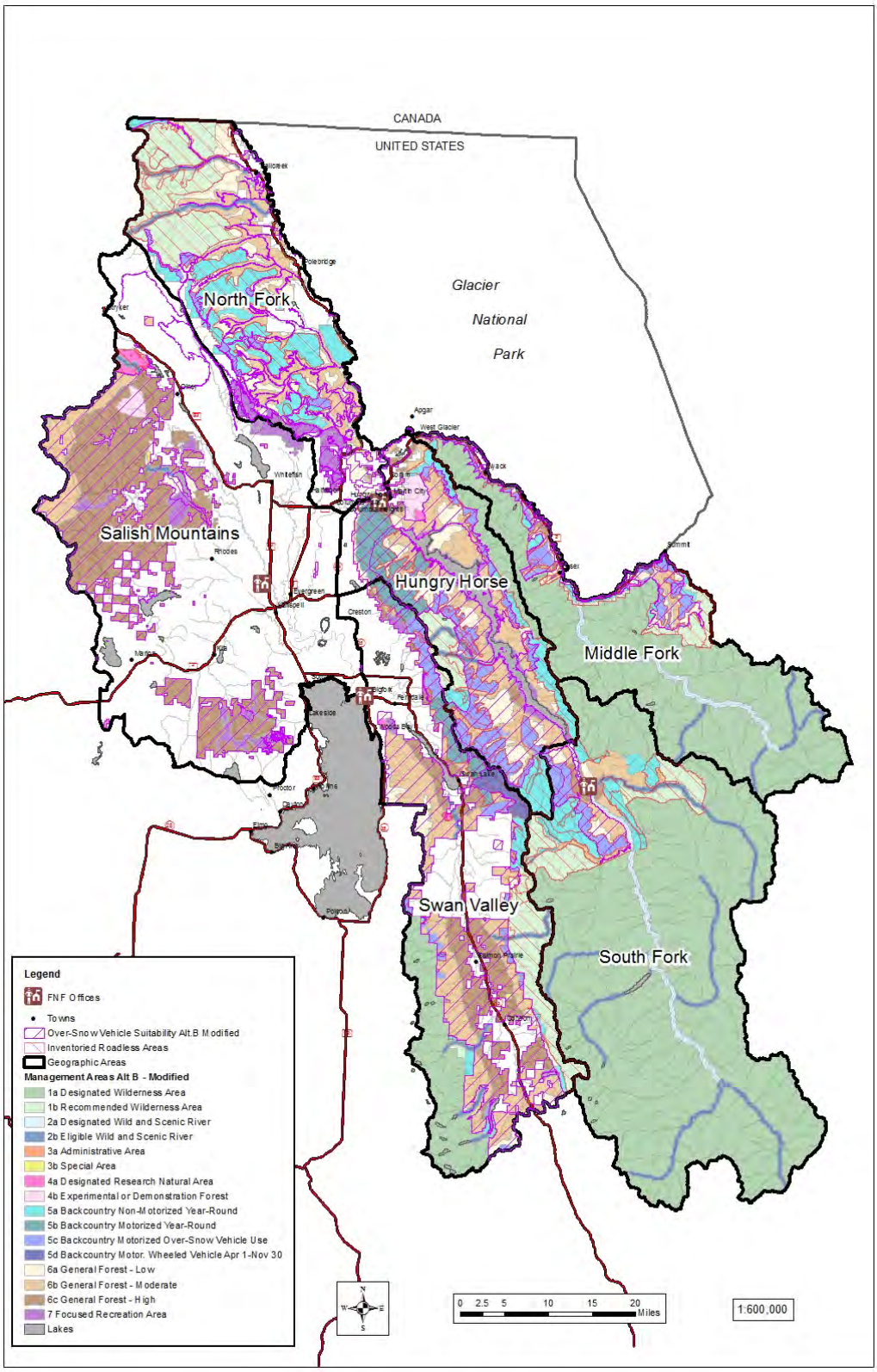


Figure B-2. Proposed action (alternative B modified) management areas.

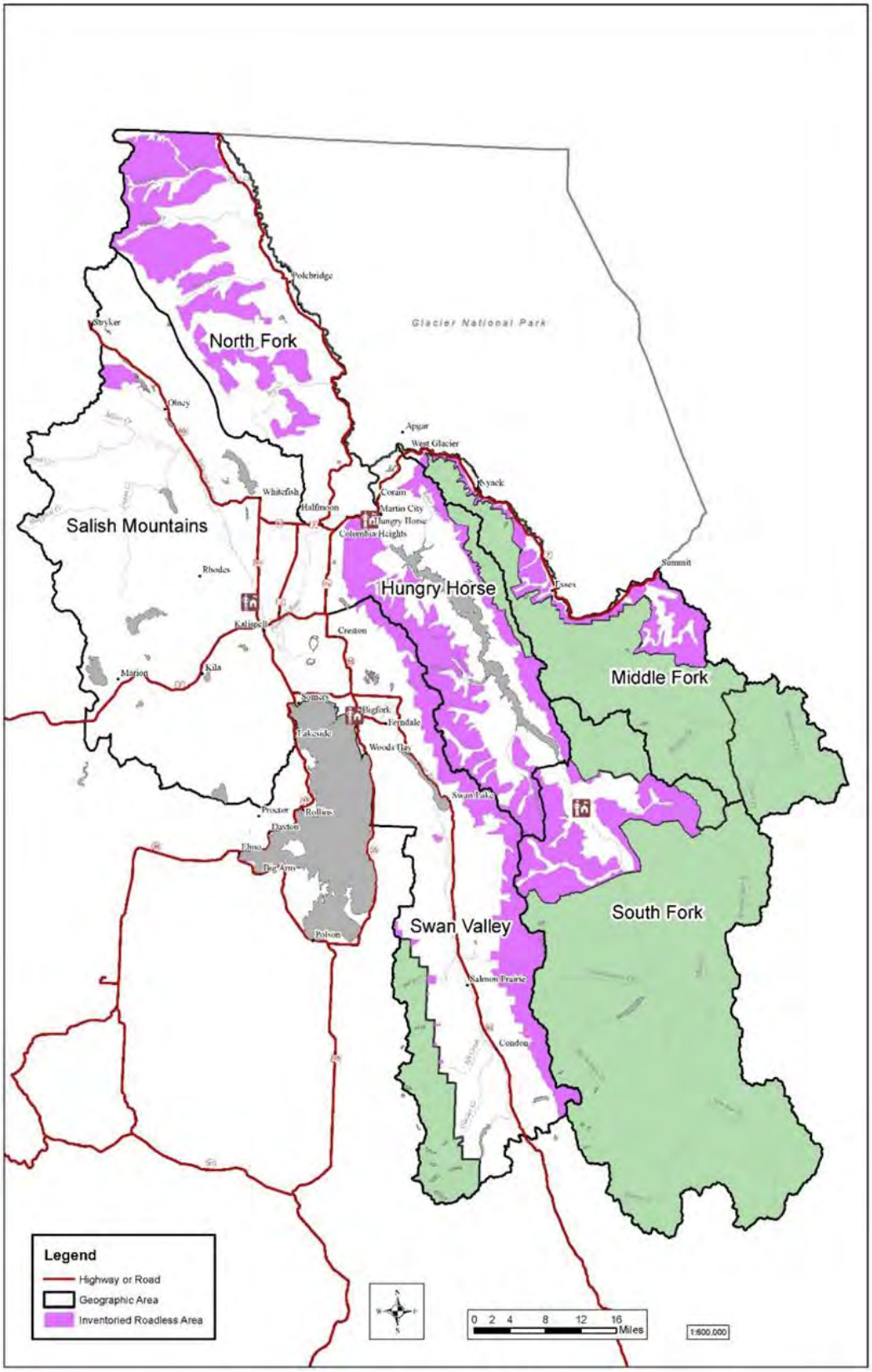


Figure B-3. Inventoried roadless areas on the Flathead National Forest.

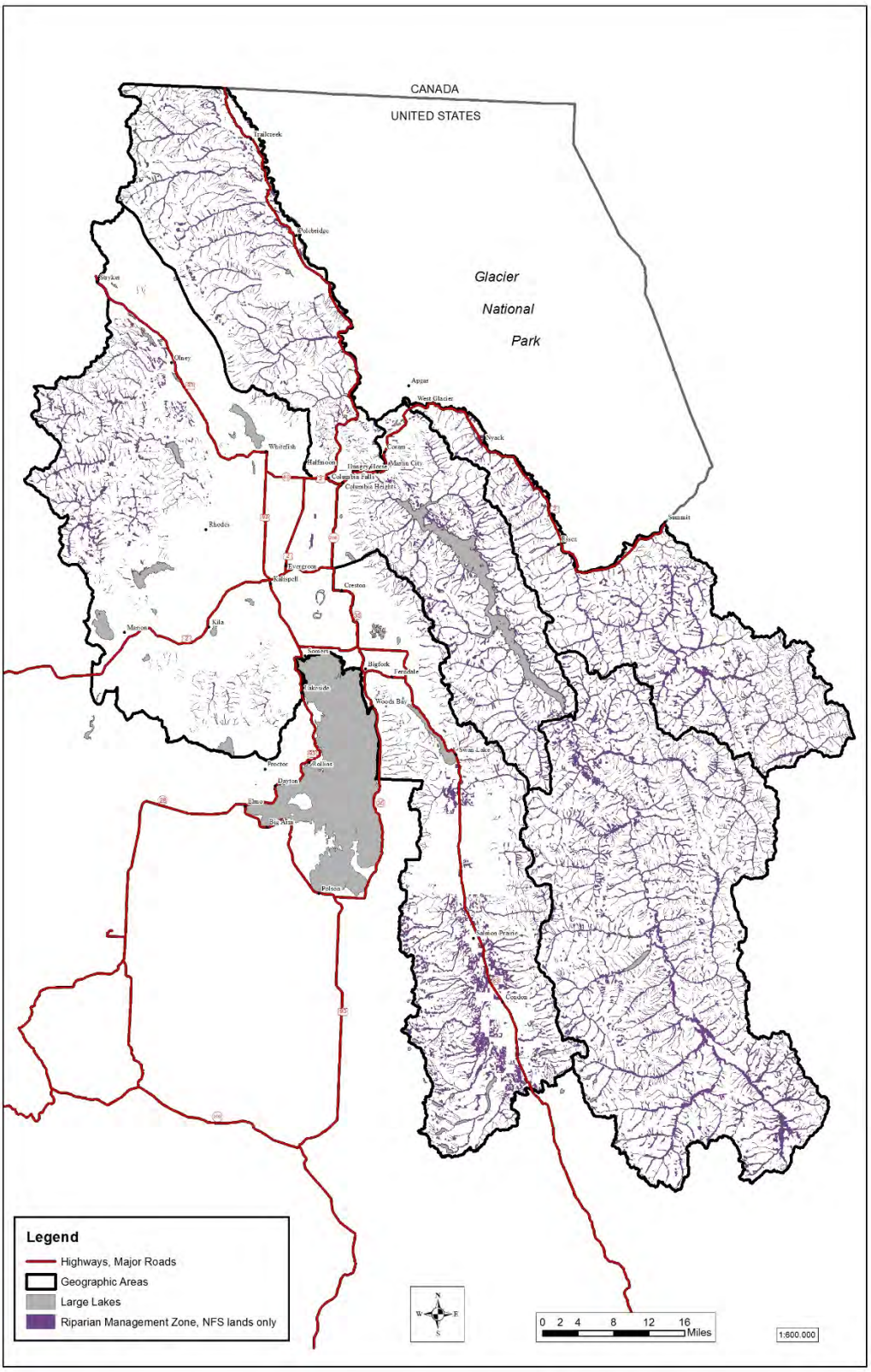


Figure B-4. Riparian management zones on NFS lands.

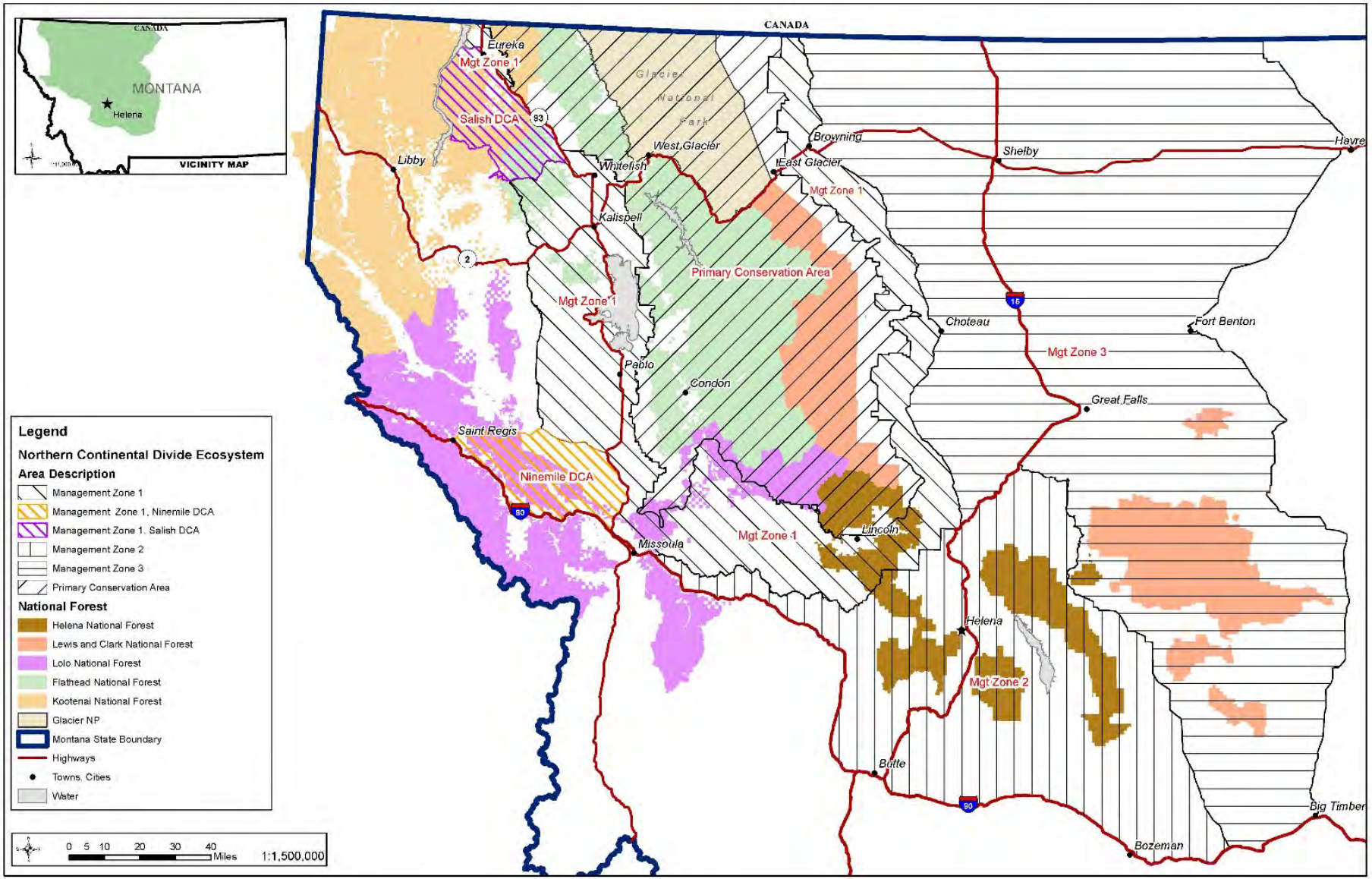


Figure B-5. NCDE grizzly bear management zones.

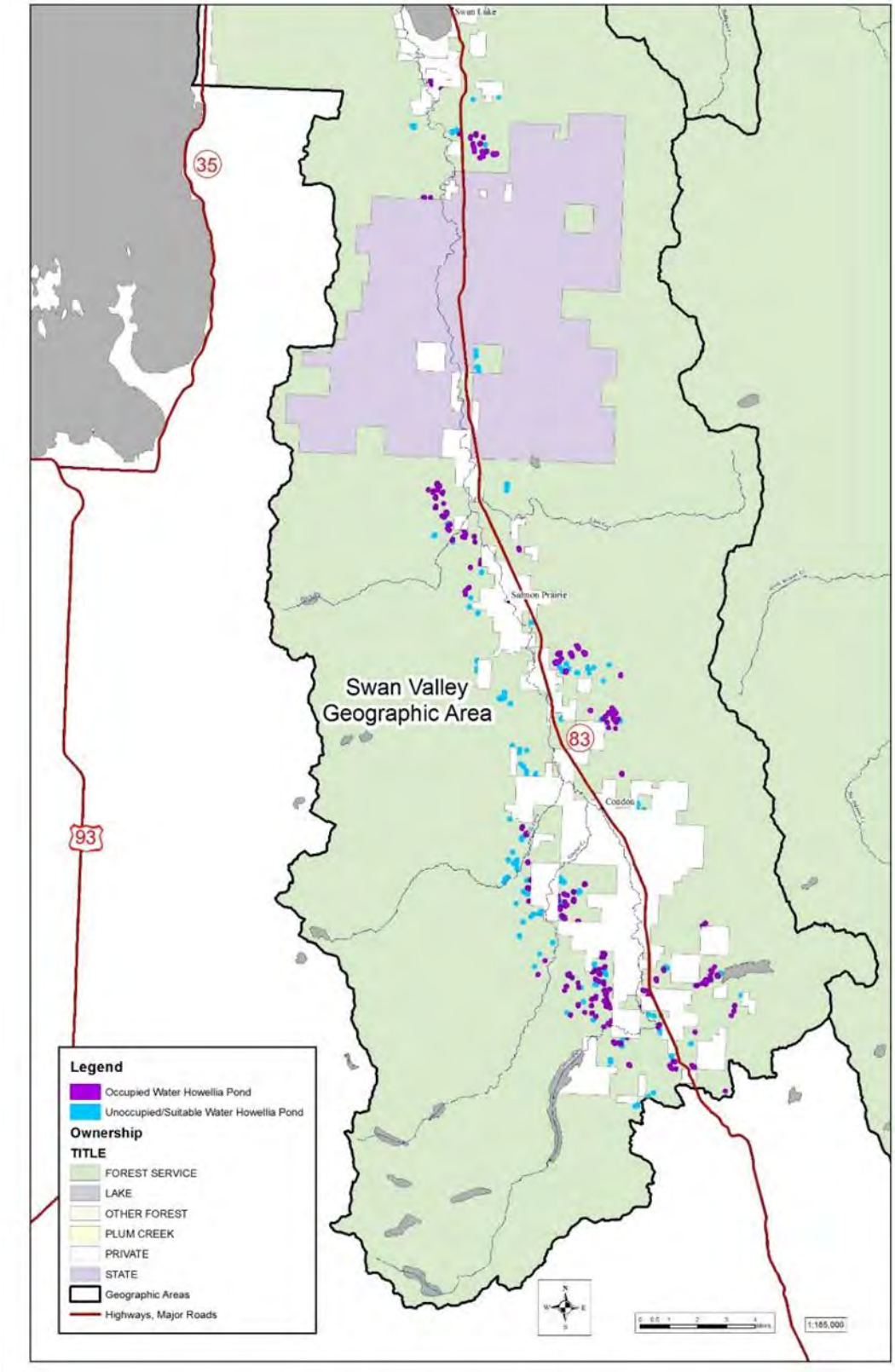


Figure B-6. *Howellia aquatilis* sites in Category 4 riparian management zones of the Swan Valley.

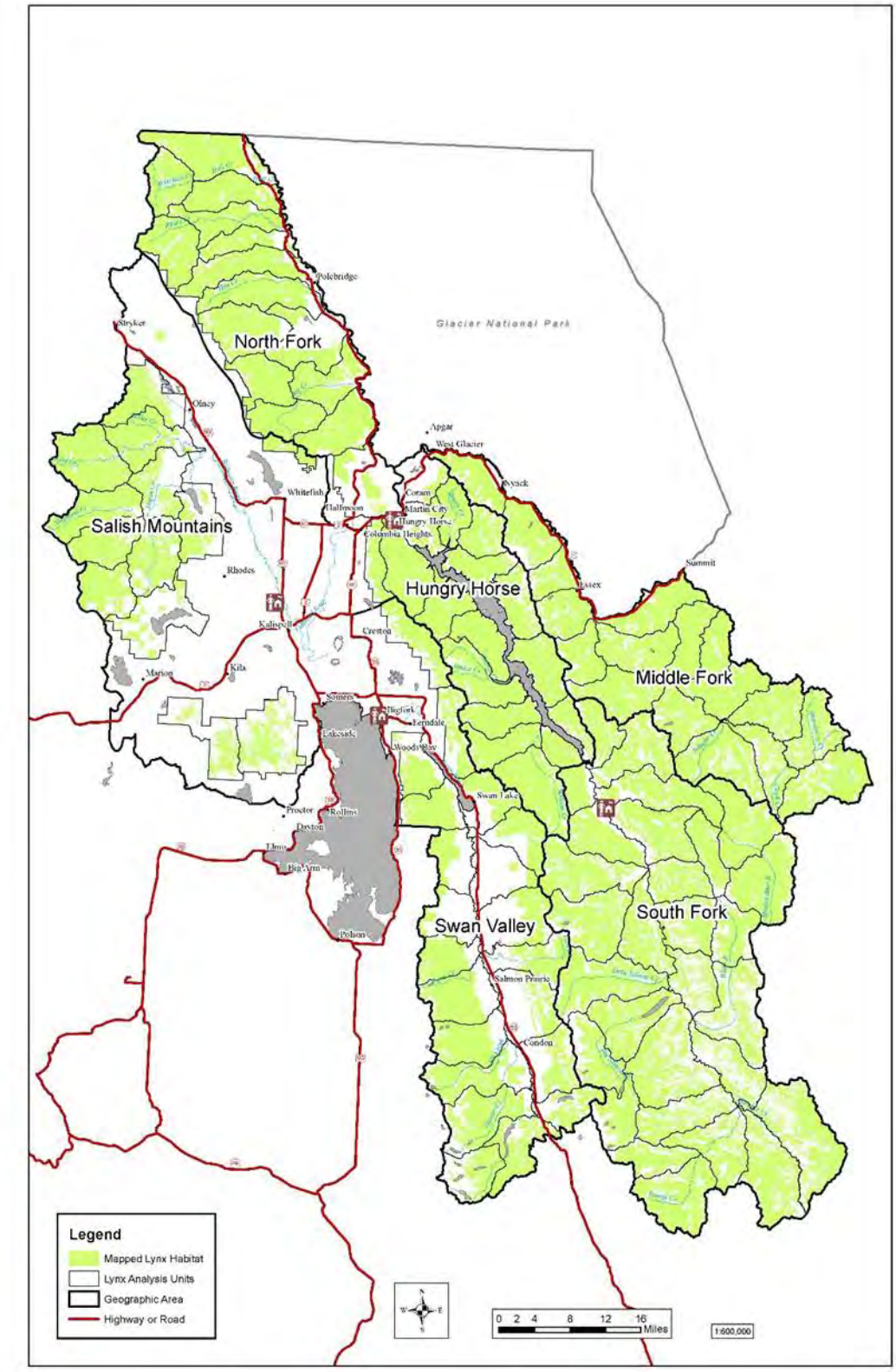


Figure B-7. Lynx analysis units on the Flathead National Forest.

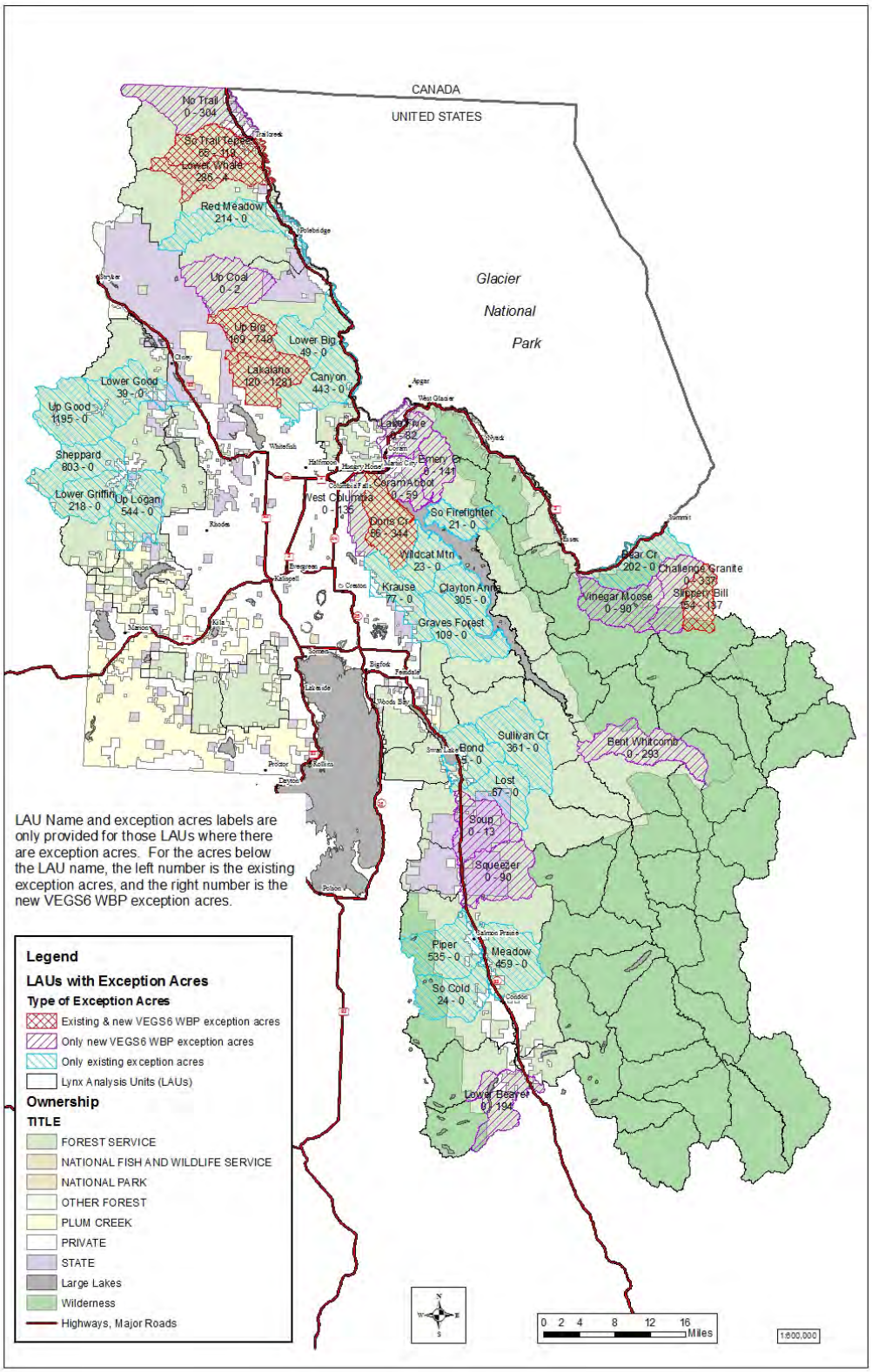


Figure B-8. Lynx analysis units with exception acres; alternative B modified.

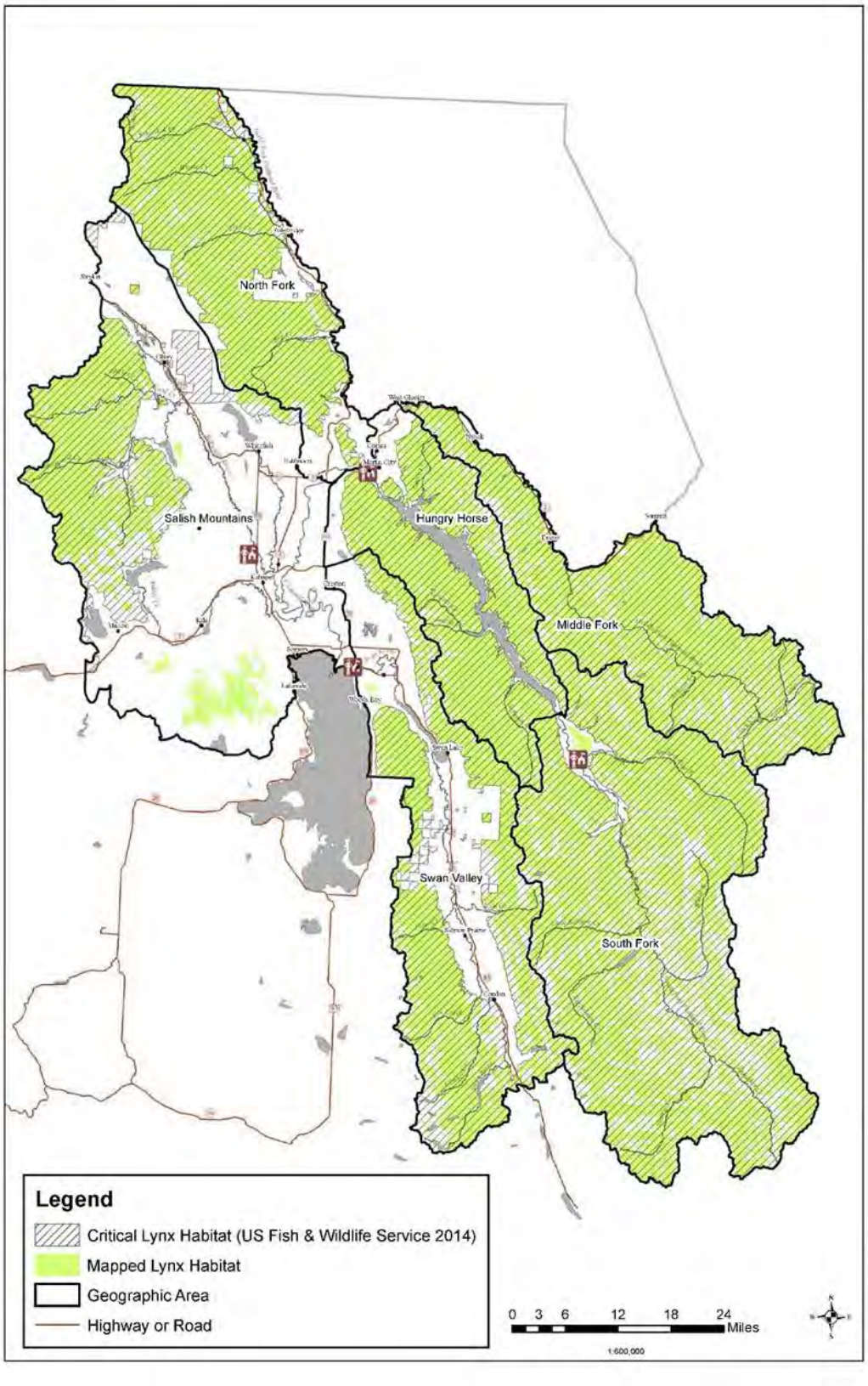


Figure B-9. Critical lynx habitat and modeled potential lynx habitat on the Flathead National Forest.

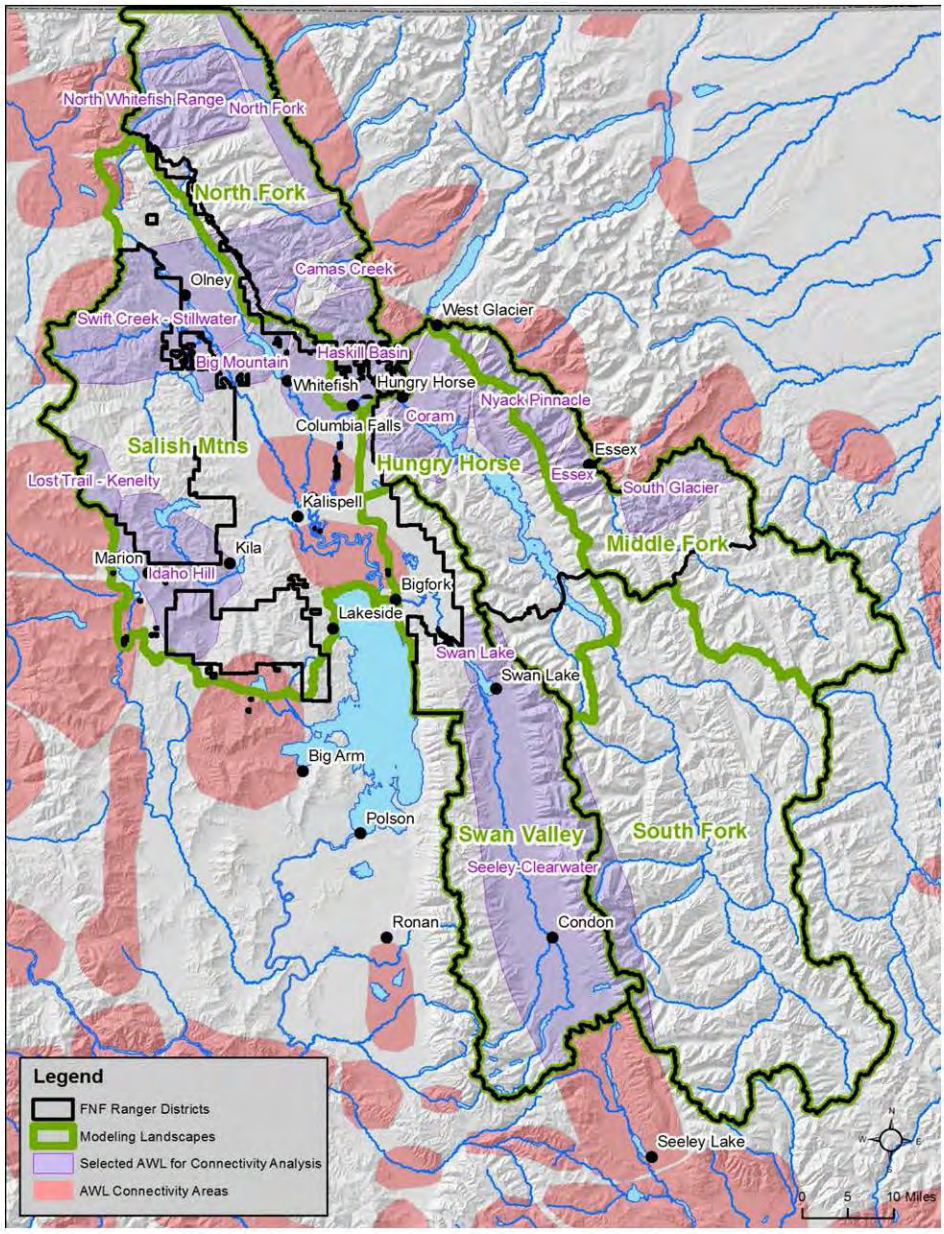
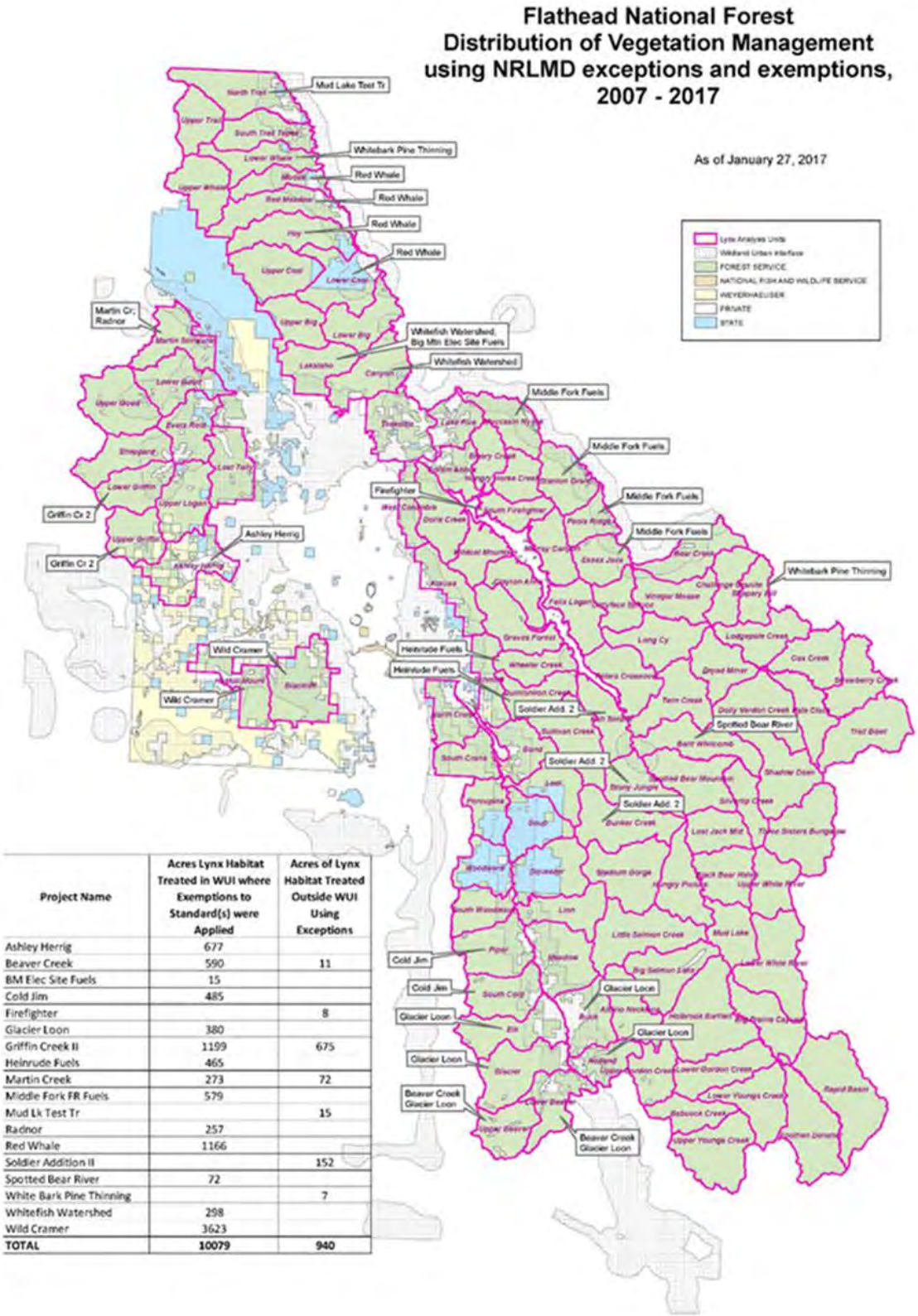


Figure B-10. Selected polygons for connectivity analysis (Source: American Wildlands obtained from databasin.org)



Project Name	Acres Lynx Habitat Treated in WUI where Exemptions to Standard(s) were Applied	Acres of Lynx Habitat Treated Outside WUI Using Exceptions
Ashley Herrig	677	
Beaver Creek	590	11
BM Elec Site Fuels	15	
Cold Jim	485	
Firefighter		8
Glacier Loon	380	
Griffin Creek II	1199	675
Heinrude Fuels	465	
Martin Creek	273	72
Middle Fork FR Fuels	579	
Mud Lk Test Tr		15
Radnor	257	
Red Whale	1166	
Soldier Addition II		152
Spotted Bear River	72	
White Bark Pine Thinning		7
Whitefish Watershed	298	
Wild Cramer	3623	
TOTAL	**10079**	**940**

Figure B-11. NRLMD exceptions and exemptions; Flathead National Forest 2007 to 2017.

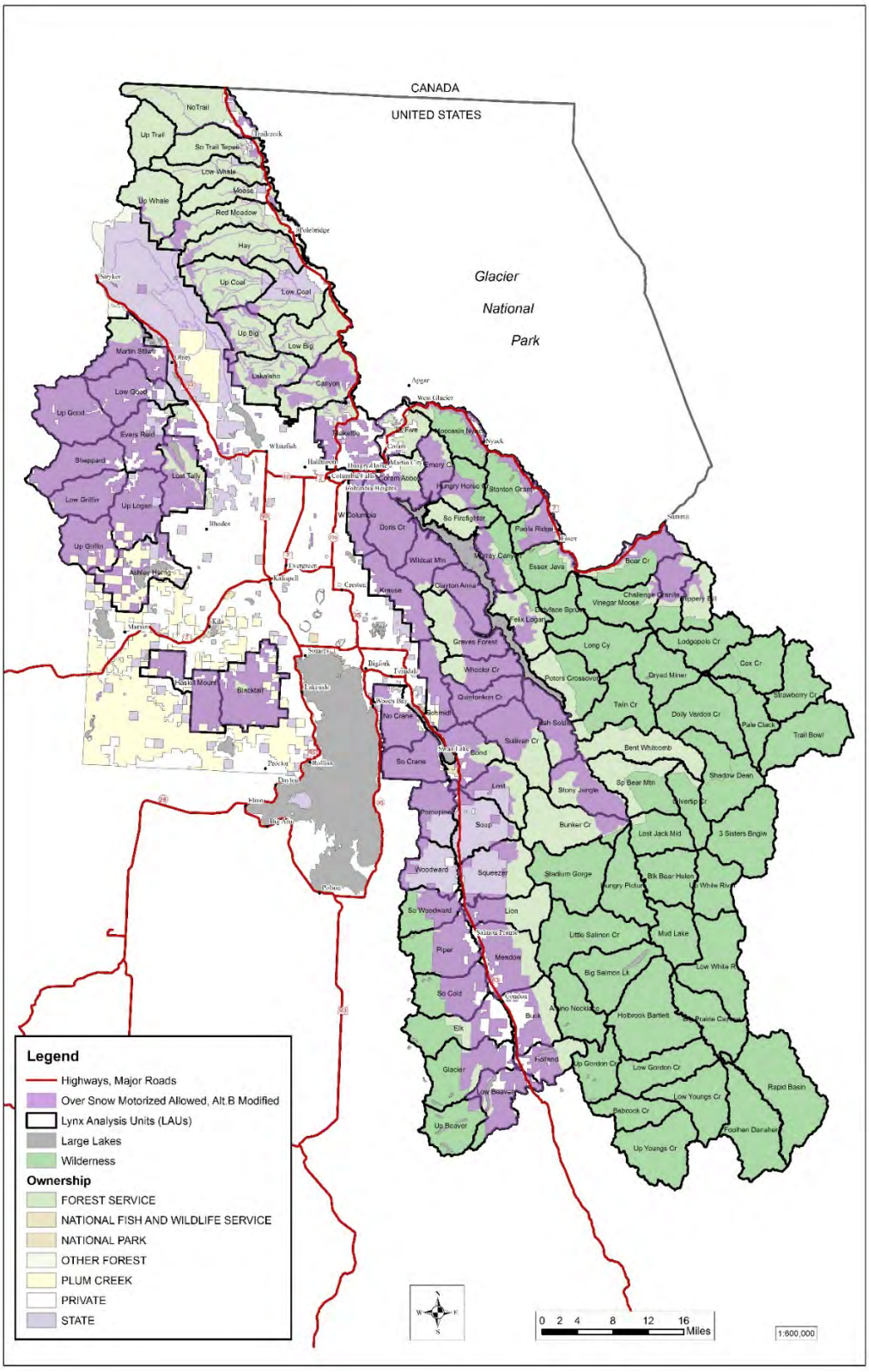


Figure B-12. Lynx analysis units and suitability for motorized over-snow vehicle use; alternative B modified.

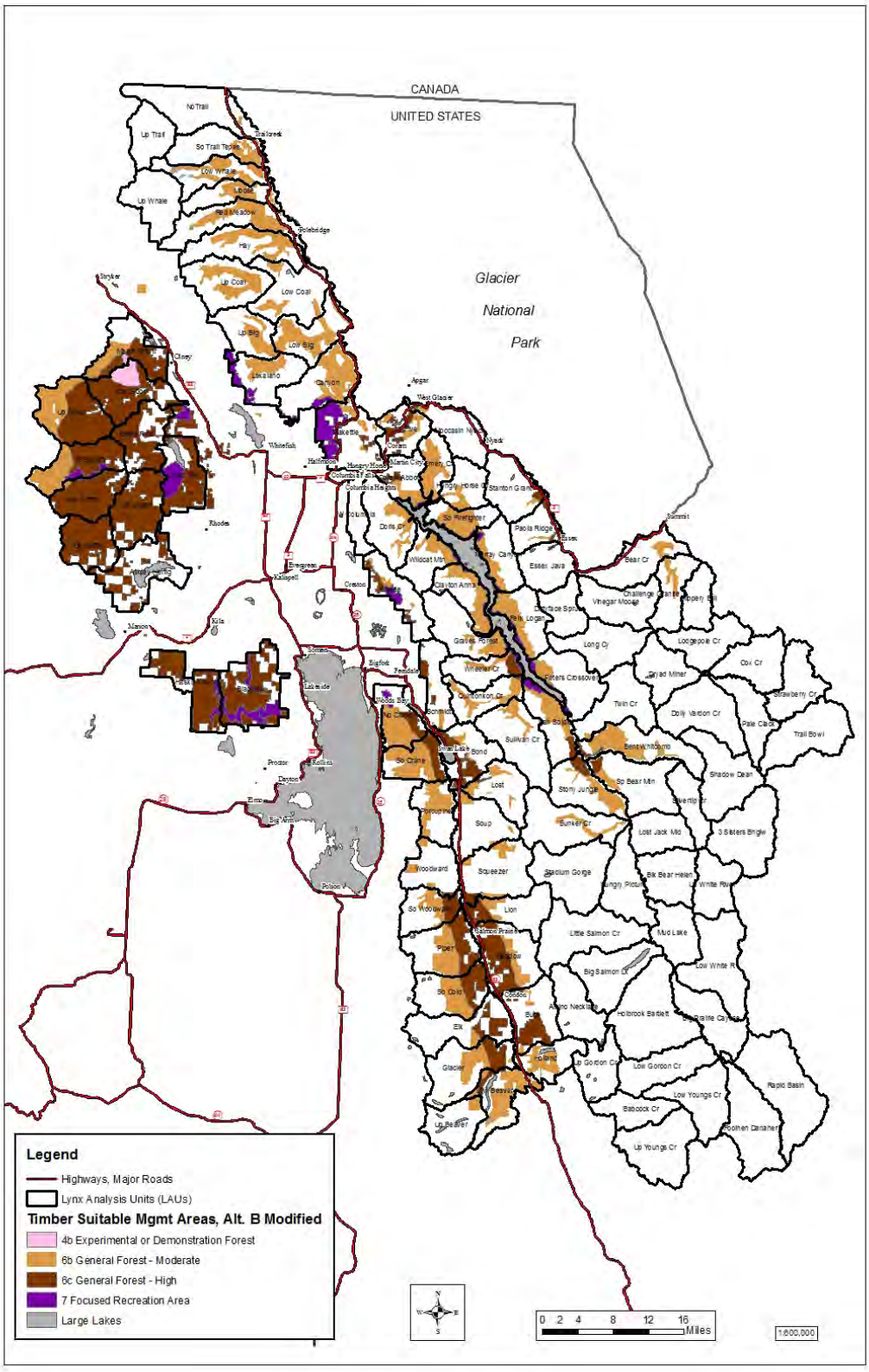


Figure B-13. Lynx analysis units and lands suitable for timber production; alternative B modified.

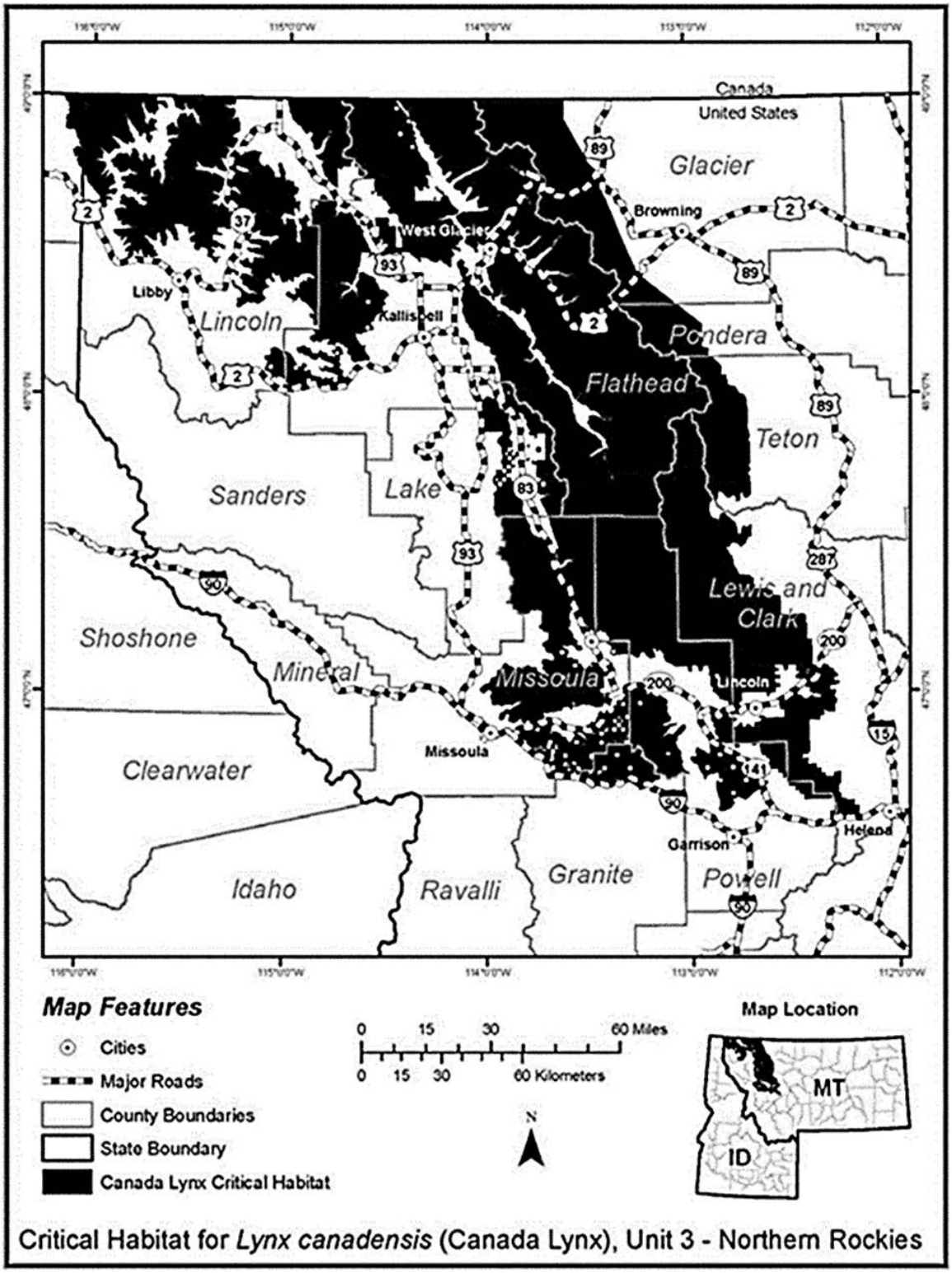


Figure B-14. Canada lynx critical Habitat Unit 3 (Source: Federal Register Vol. 79, No. 177, Friday, September 12, 2014).

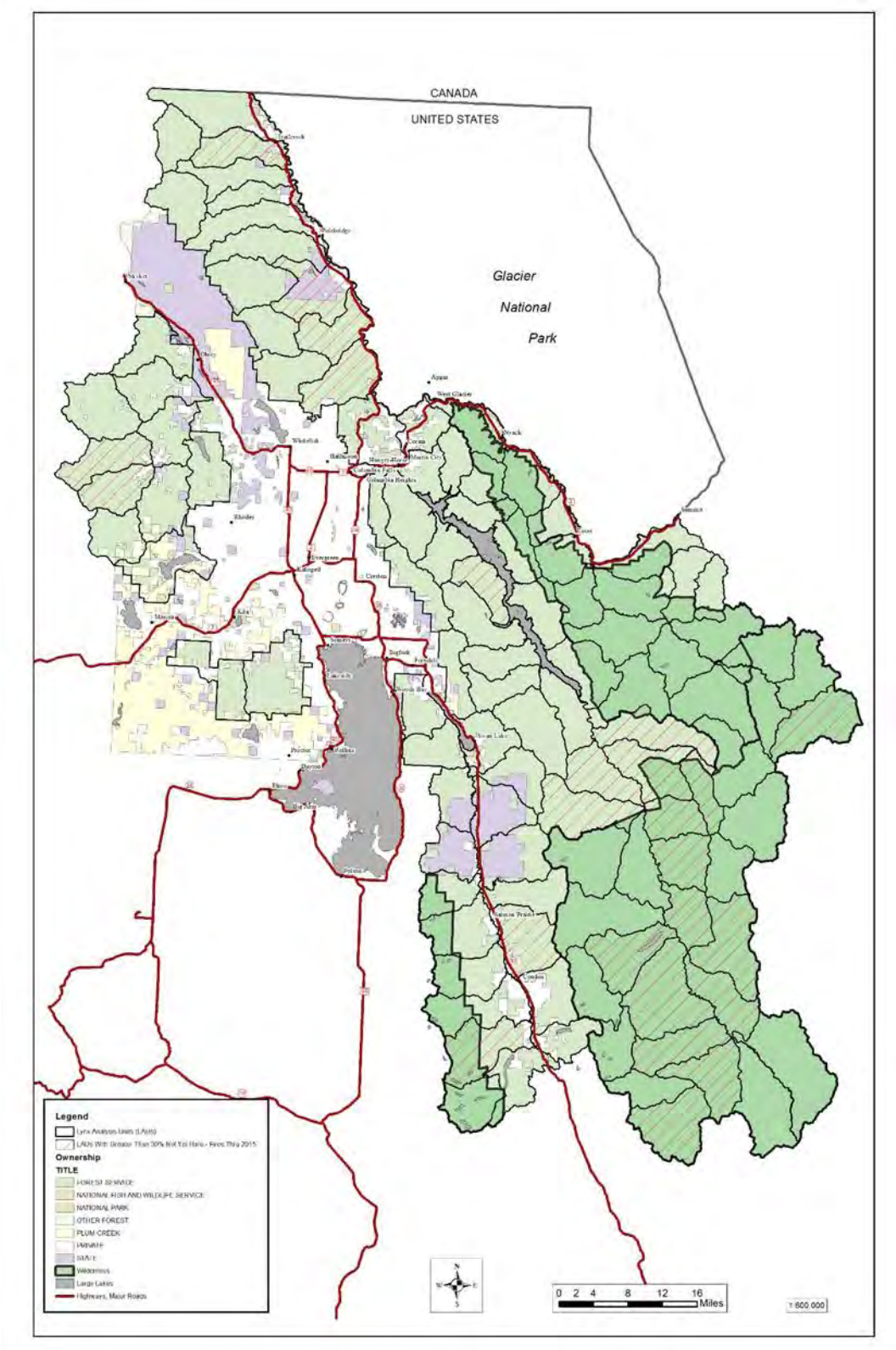


Figure B-15. Lynx analysis units that may have more than 30% of lynx habitat that is not yet hare habitat due to wildfires as of 2015.

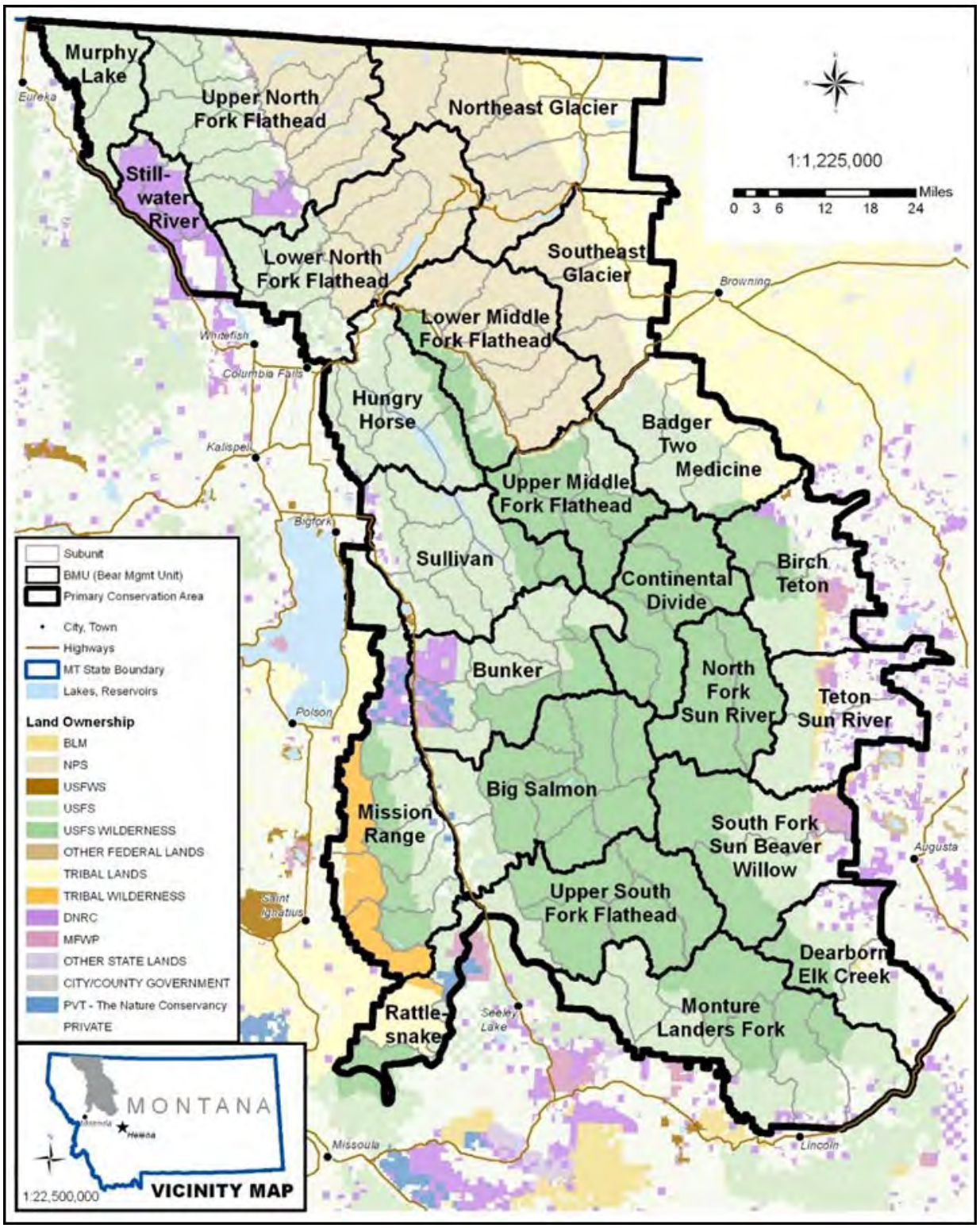


Figure B-16. Bear management units (BMUs) and subunits in the NCDE primary conservation area.

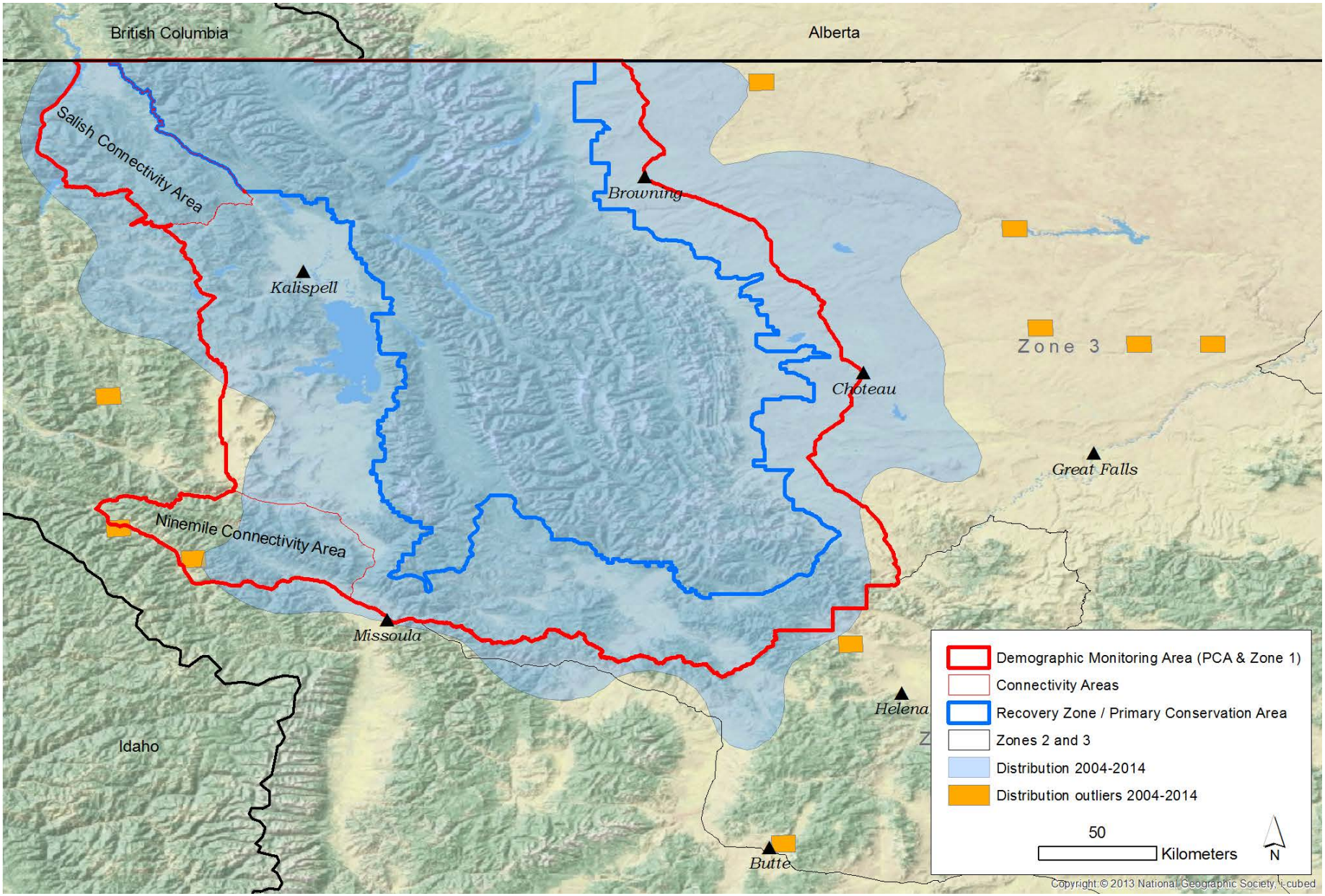


Figure B-17. Distribution of grizzly bears (2004 to 2014) in the NCDE (Source: Costello et al. 2016).

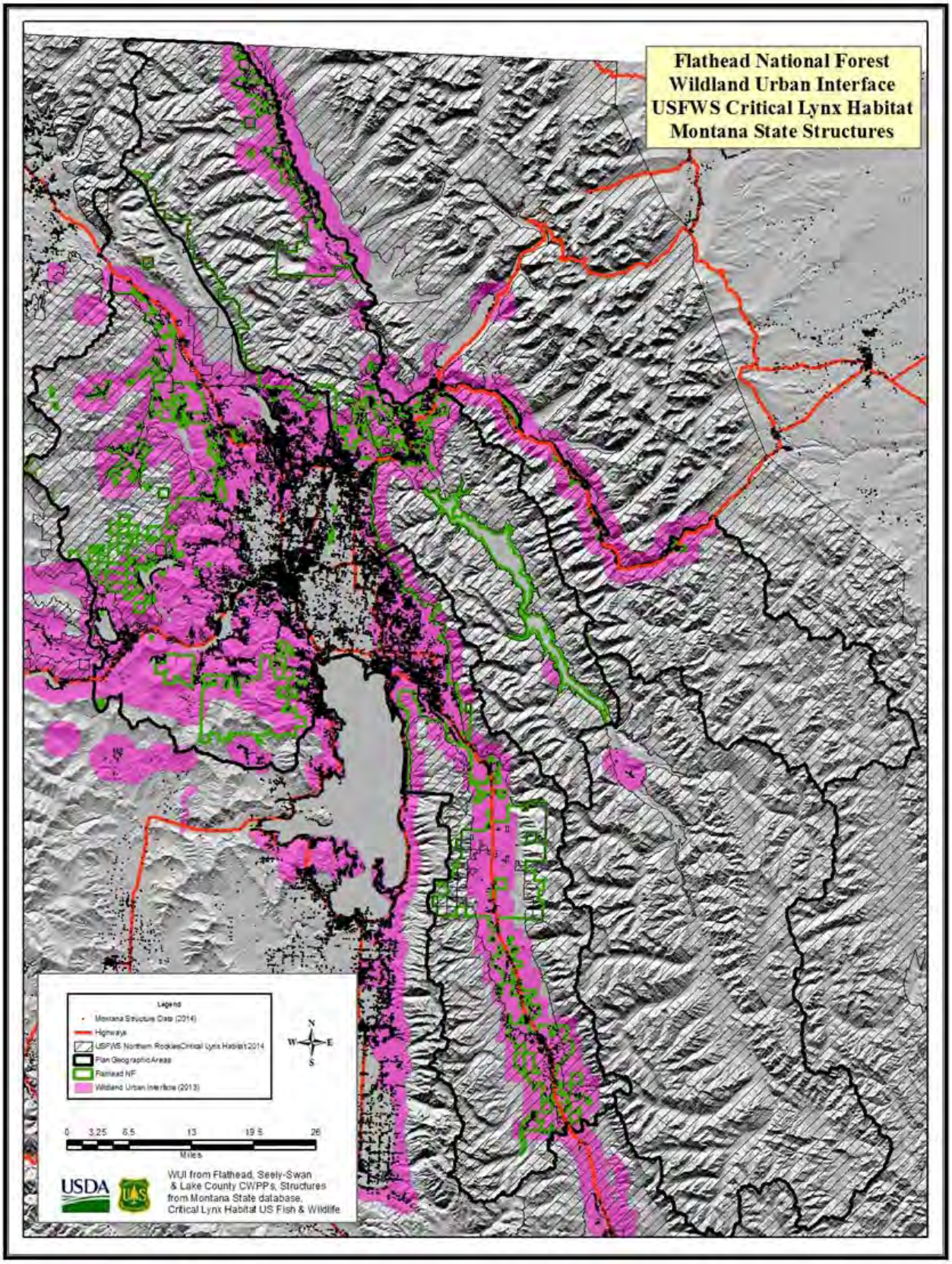


Figure B-18. Canada Lynx critical habitat and the wildland-urban interface.

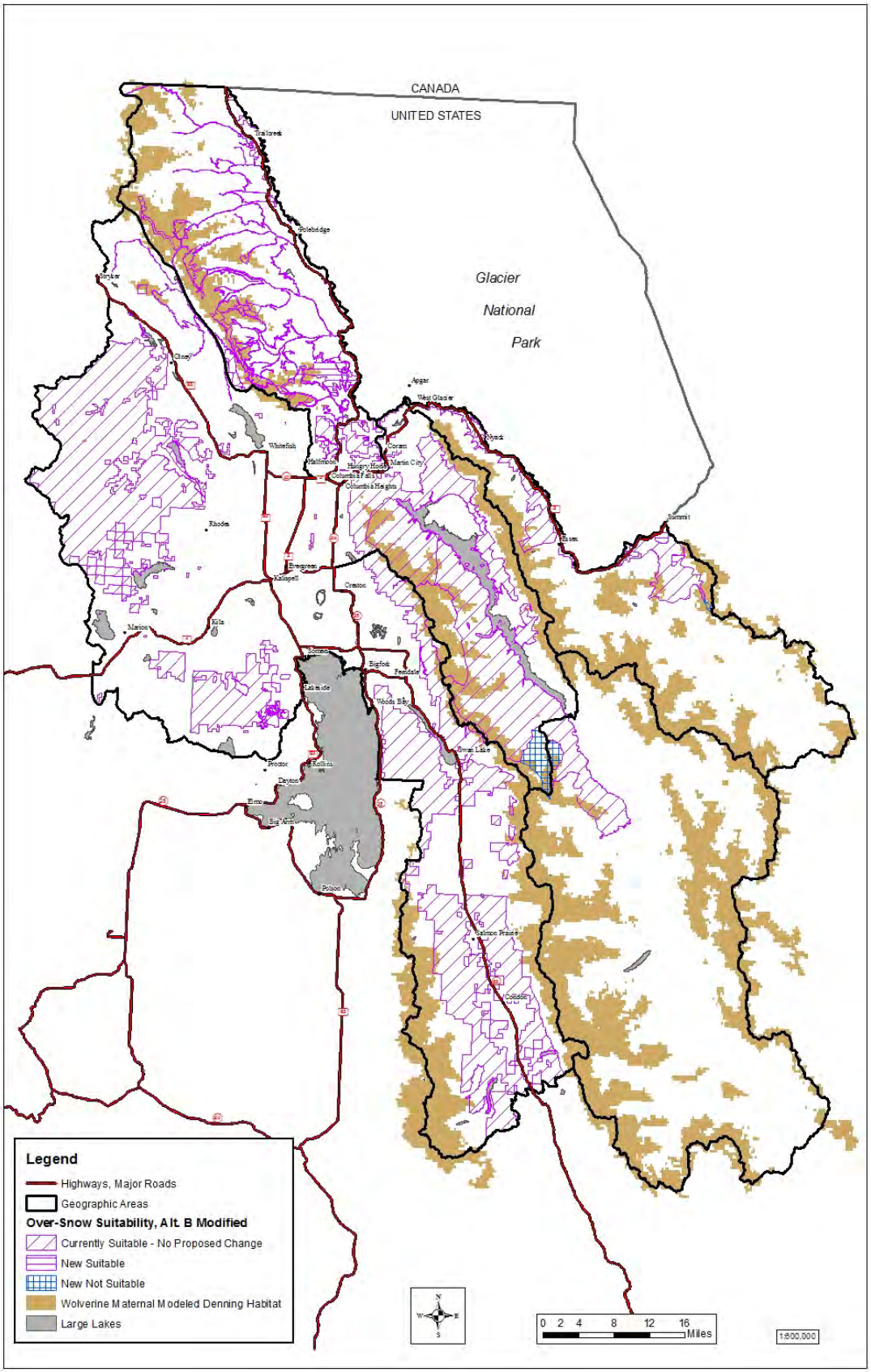


Figure B-19. Modeled wolverine maternal denning habitat (based on Copeland et al. 2010) and suitability for motorized over-snow vehicle use.

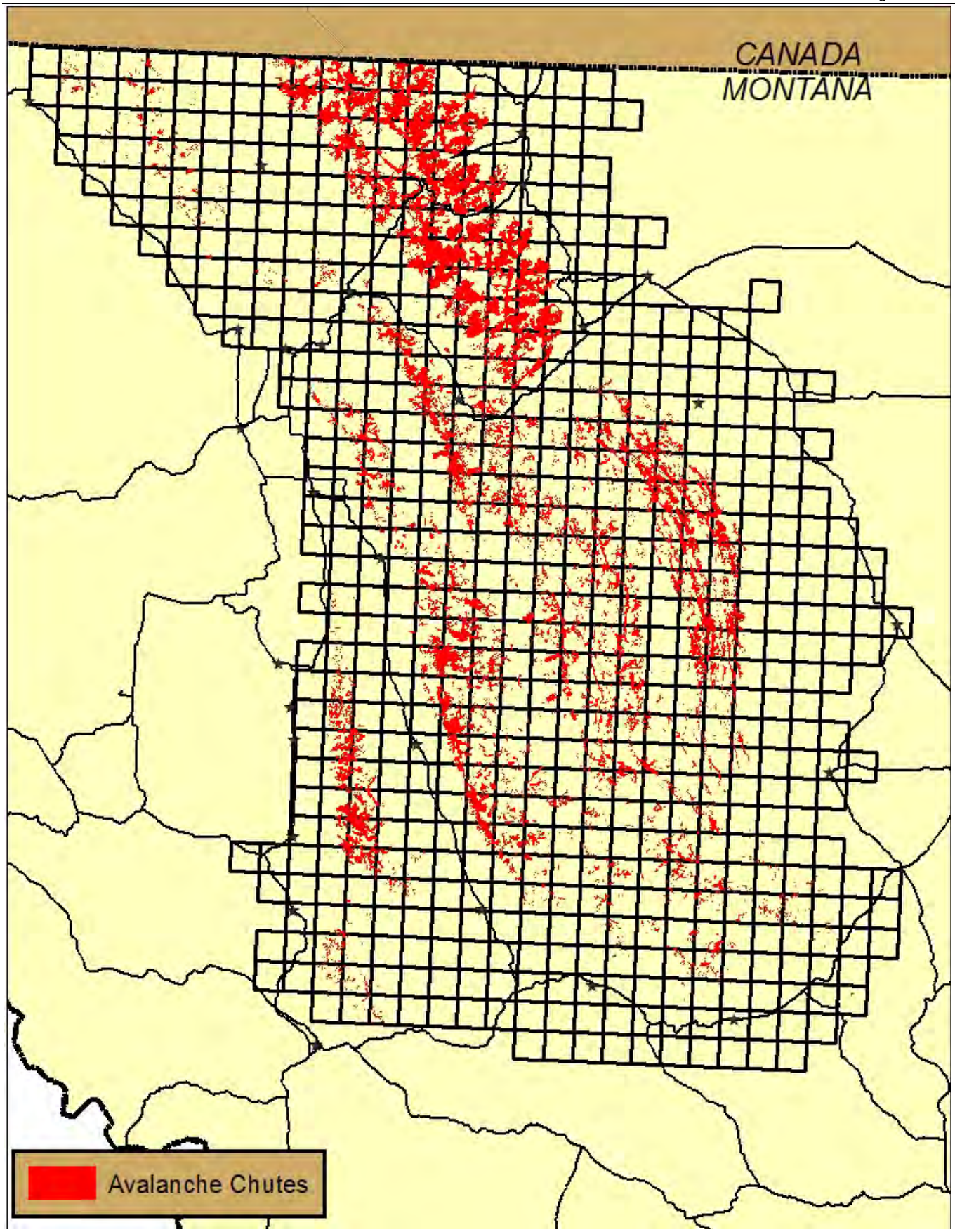


Figure B-20. Avalanche chute distribution in the NCDE (Source: T. Graves 2016).

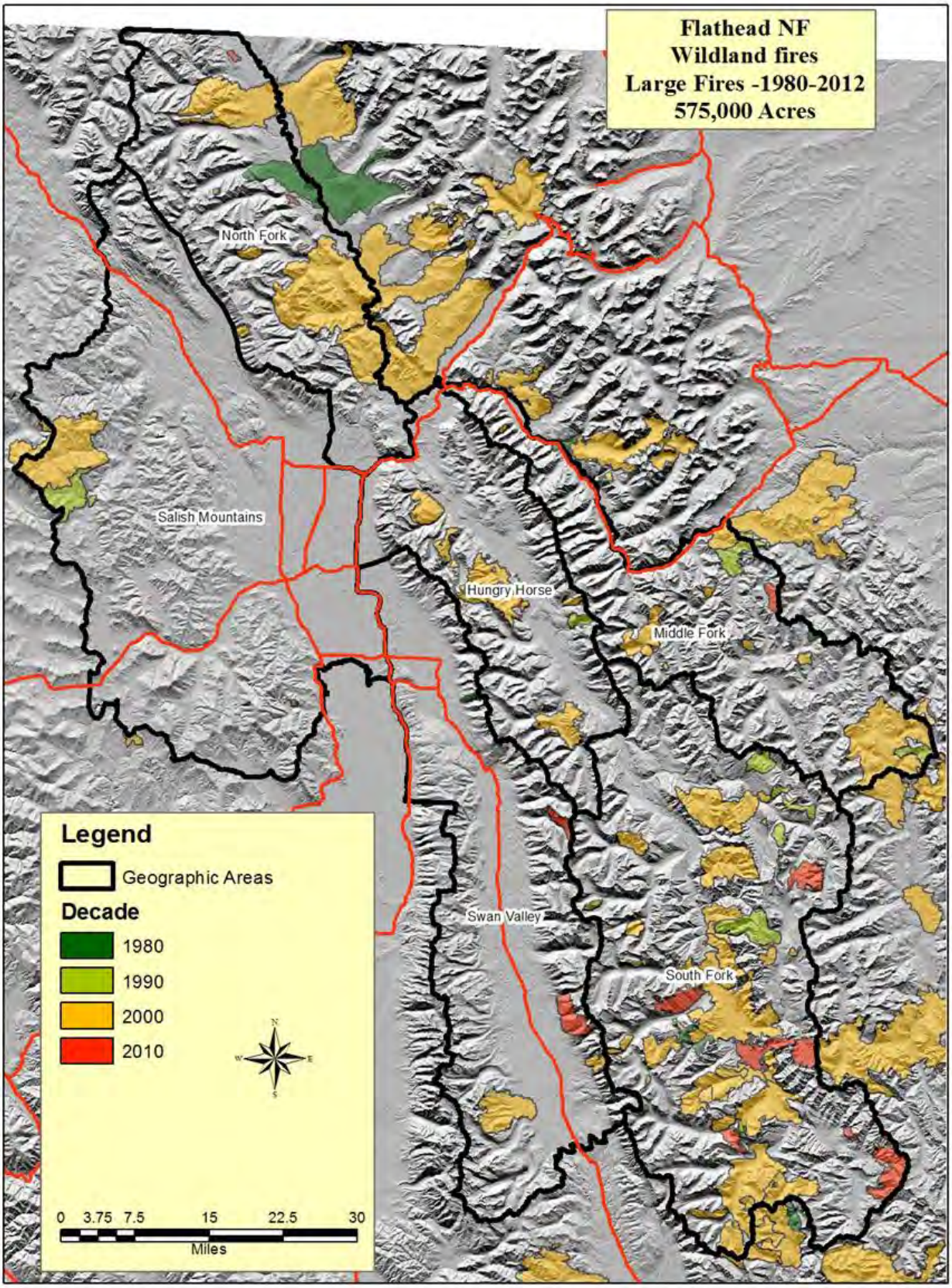


Figure B-21. Wildfire areas in, and adjacent to, the Flathead National Forest.

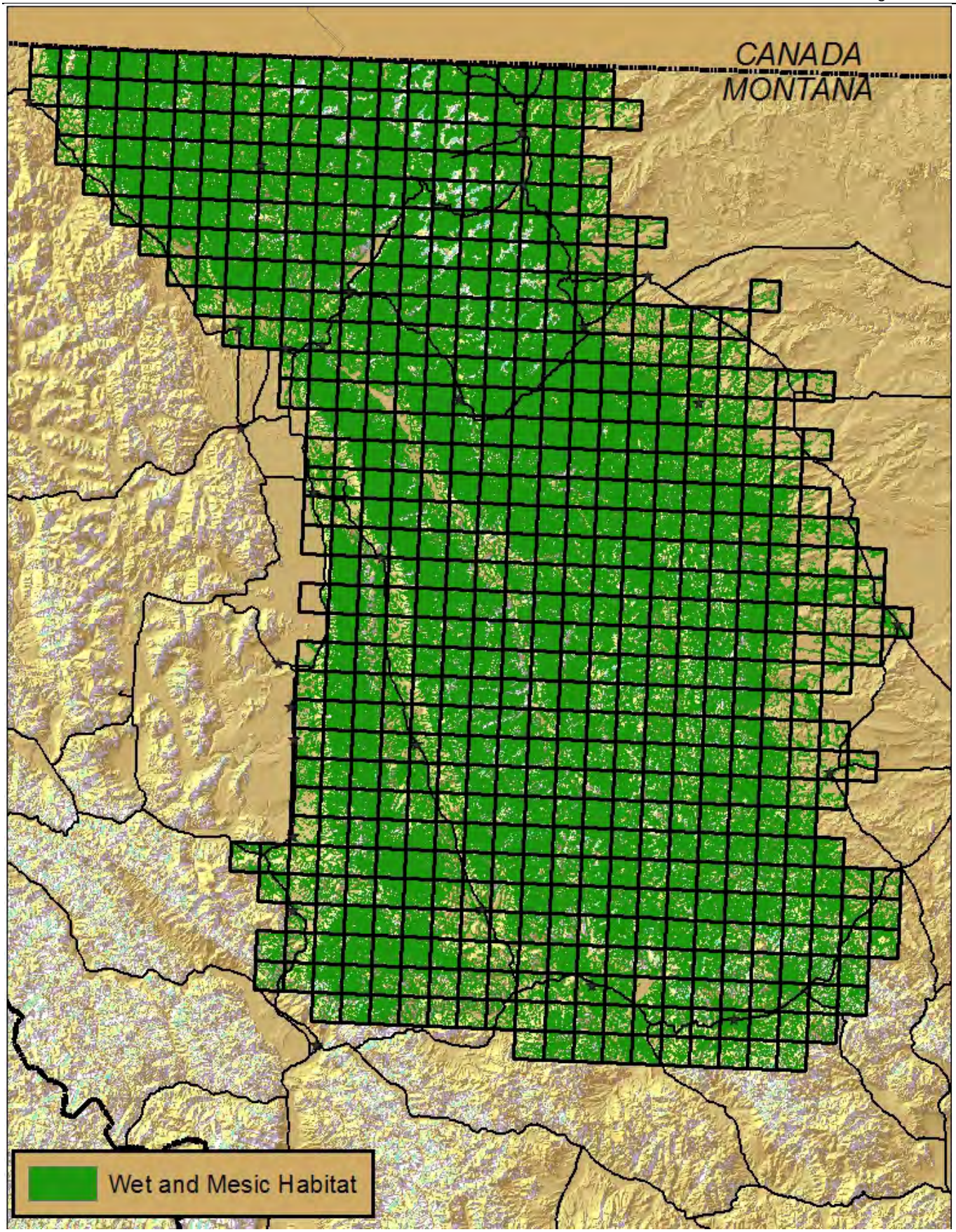


Figure B-22. Wet and mesic habitat in the Northern Continental Divide Ecosystem (Source: T. Graves 2016).

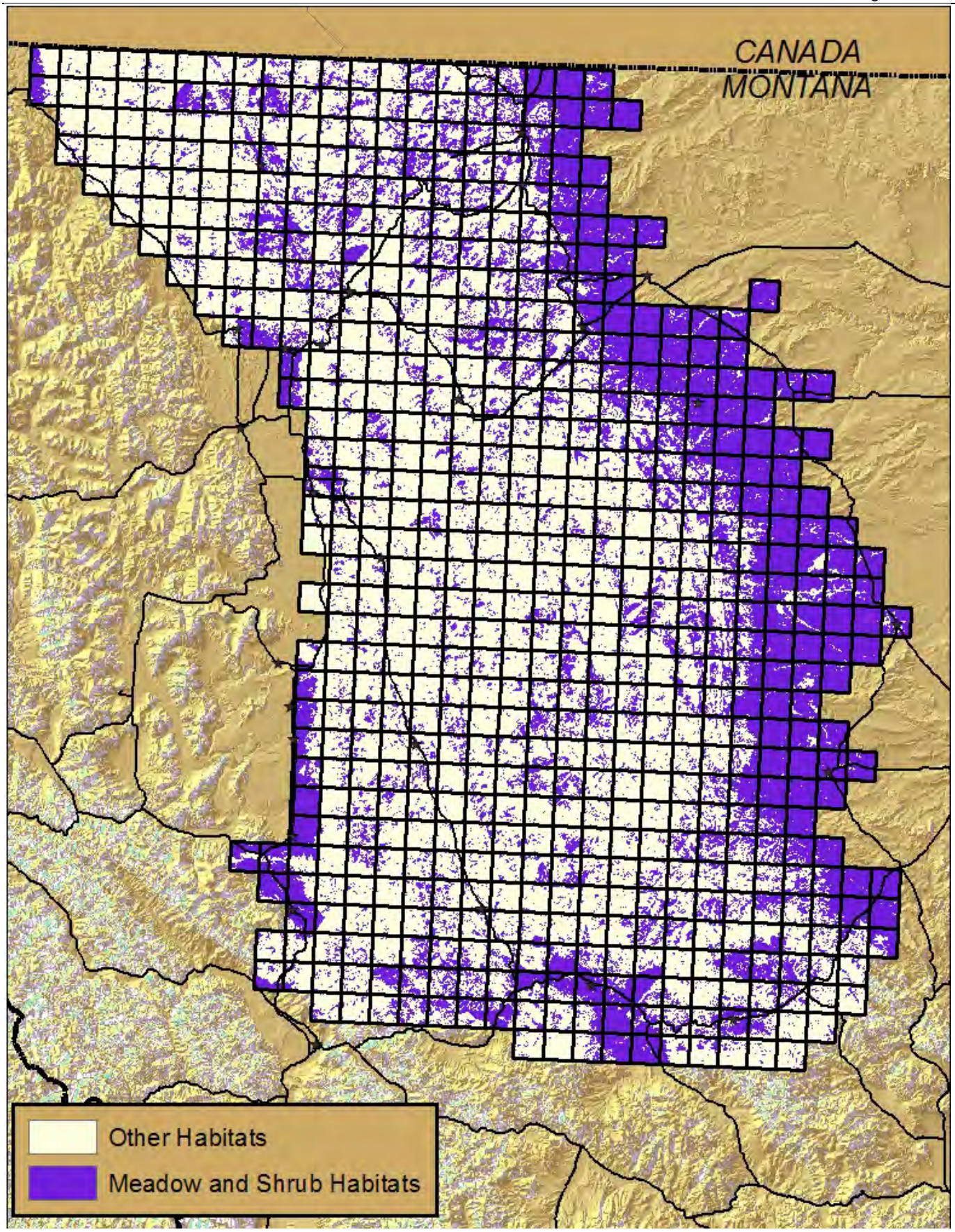


Figure B-23. Meadow and shrub habitat in the Northern Continental Divide Ecosystem (Source: T. Graves 2016).

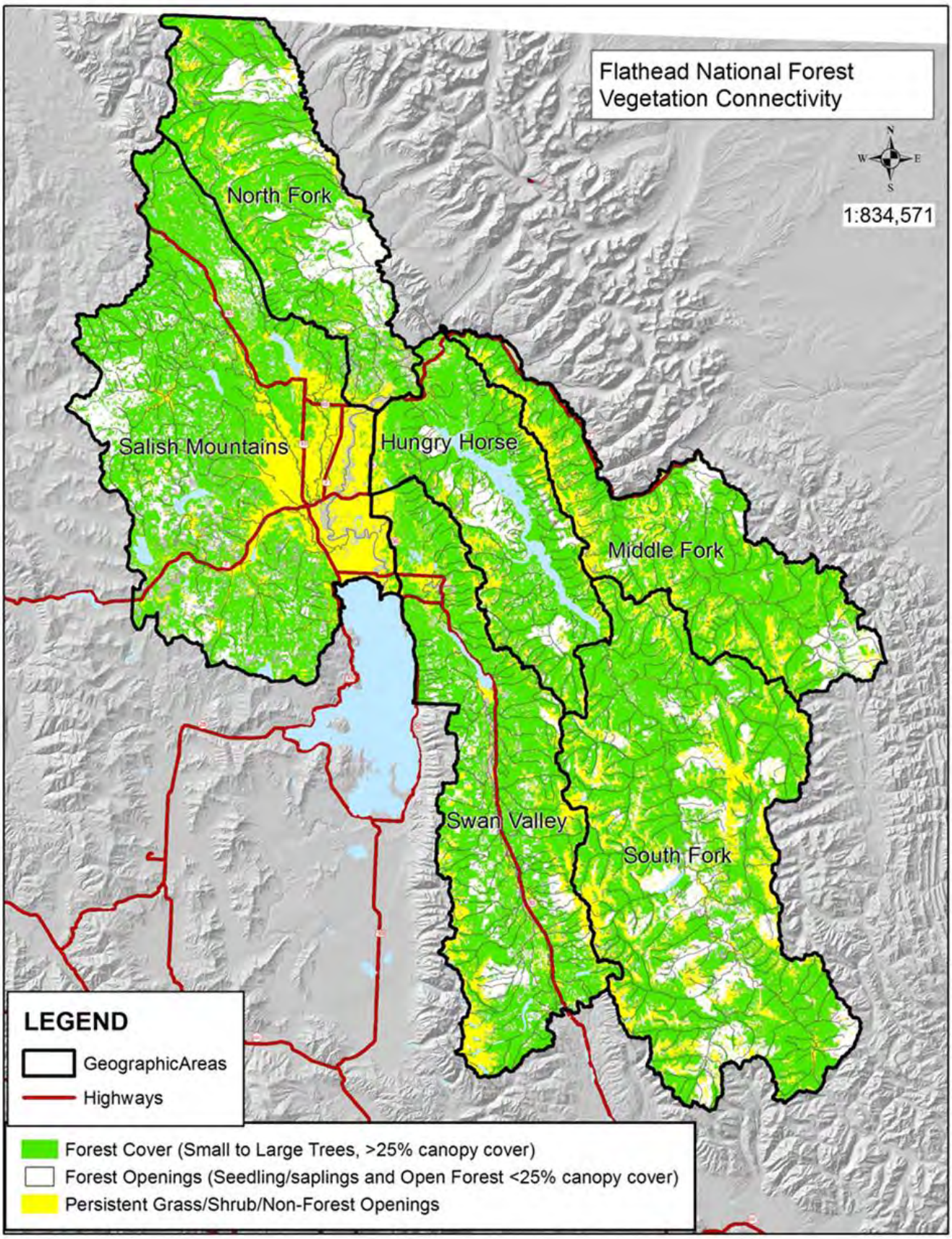


Figure B-24. Connectivity of vegetation in Flathead National Forest geographic areas; all land ownerships.

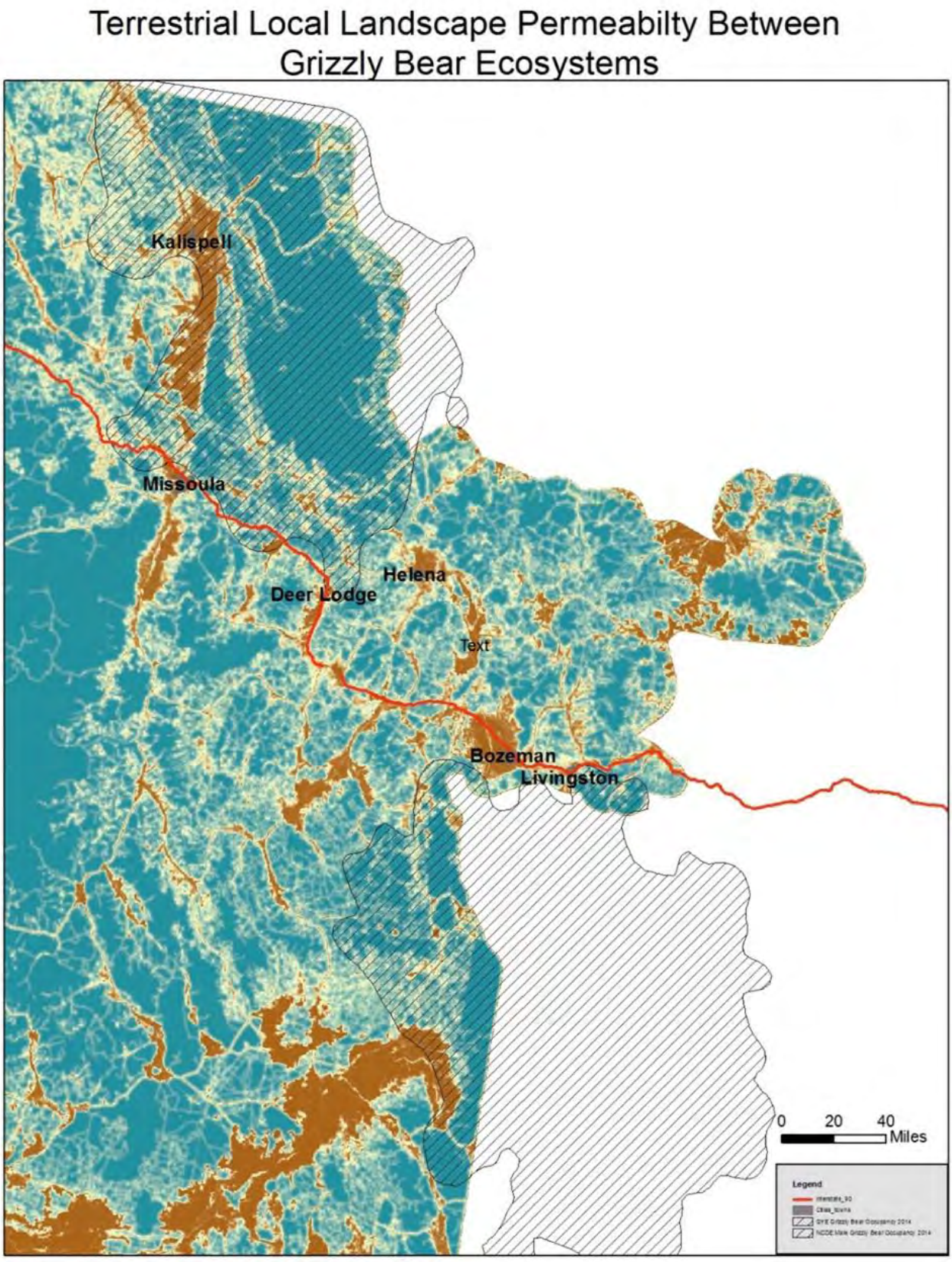


Figure B-25. Terrestrial landscape permeability between areas occupied by the grizzly bear: Northern Continental Divide and Greater Yellowstone Ecosystems (Source: R. Mace; http://nature.org resilienceNW obtained from databasin.org 2016).

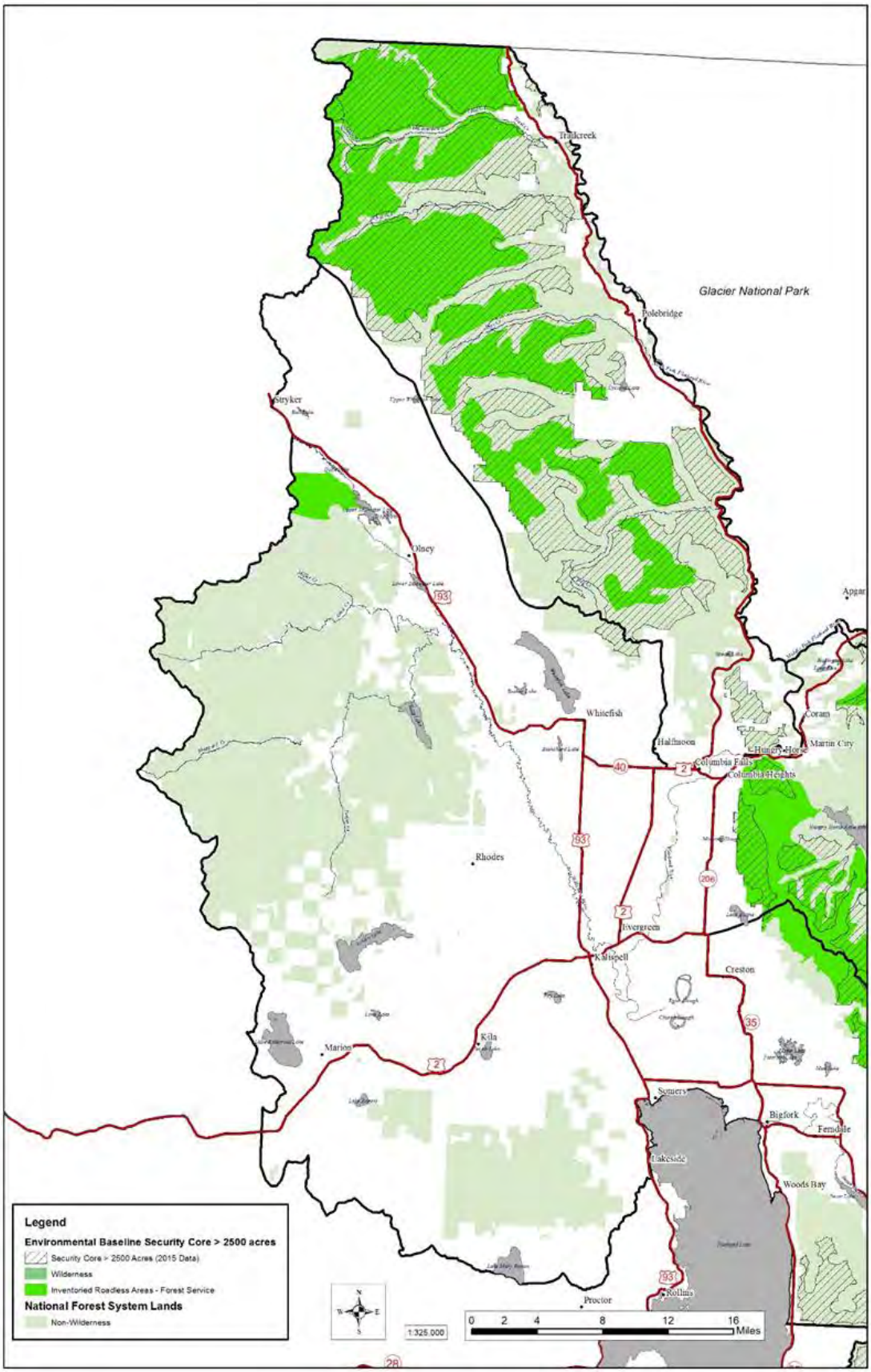


Figure B-26. Security core, wilderness, and inventoried roadless areas; Flathead National Forest north half.

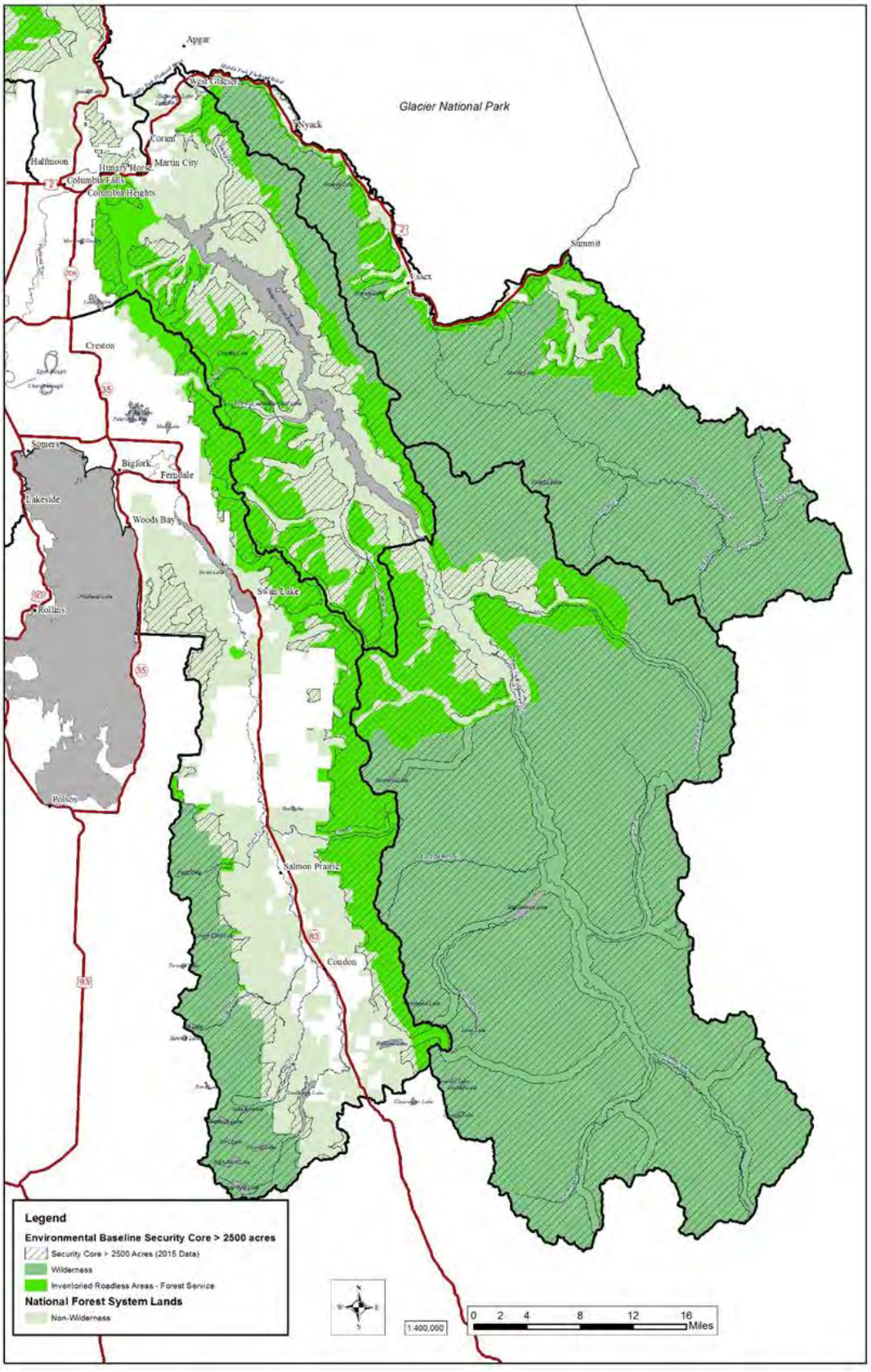


Figure B-27. Security core, wilderness, and inventoried roadless areas; Flathead National Forest south half.

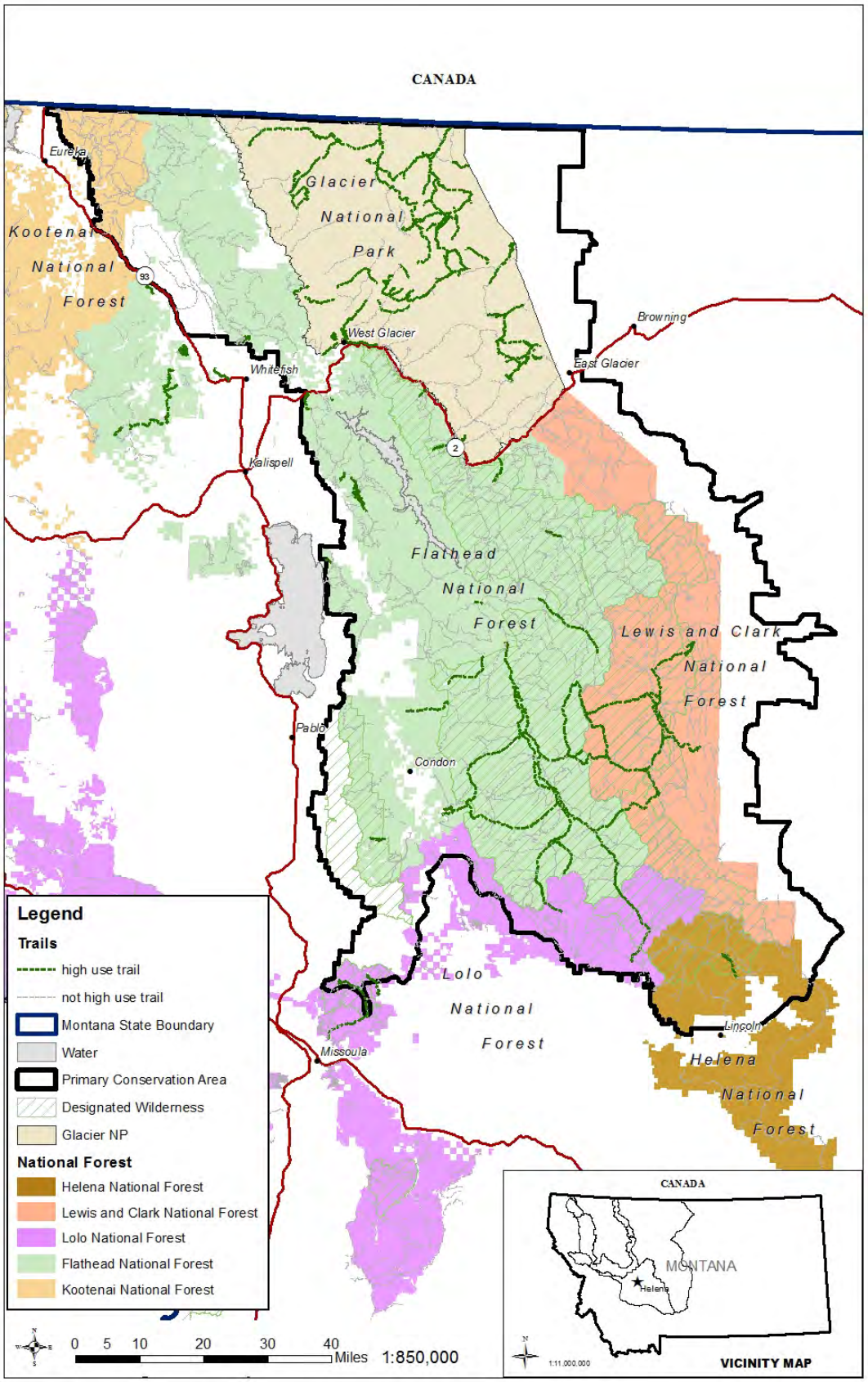


Figure B-28. High use trails in the NCDE.

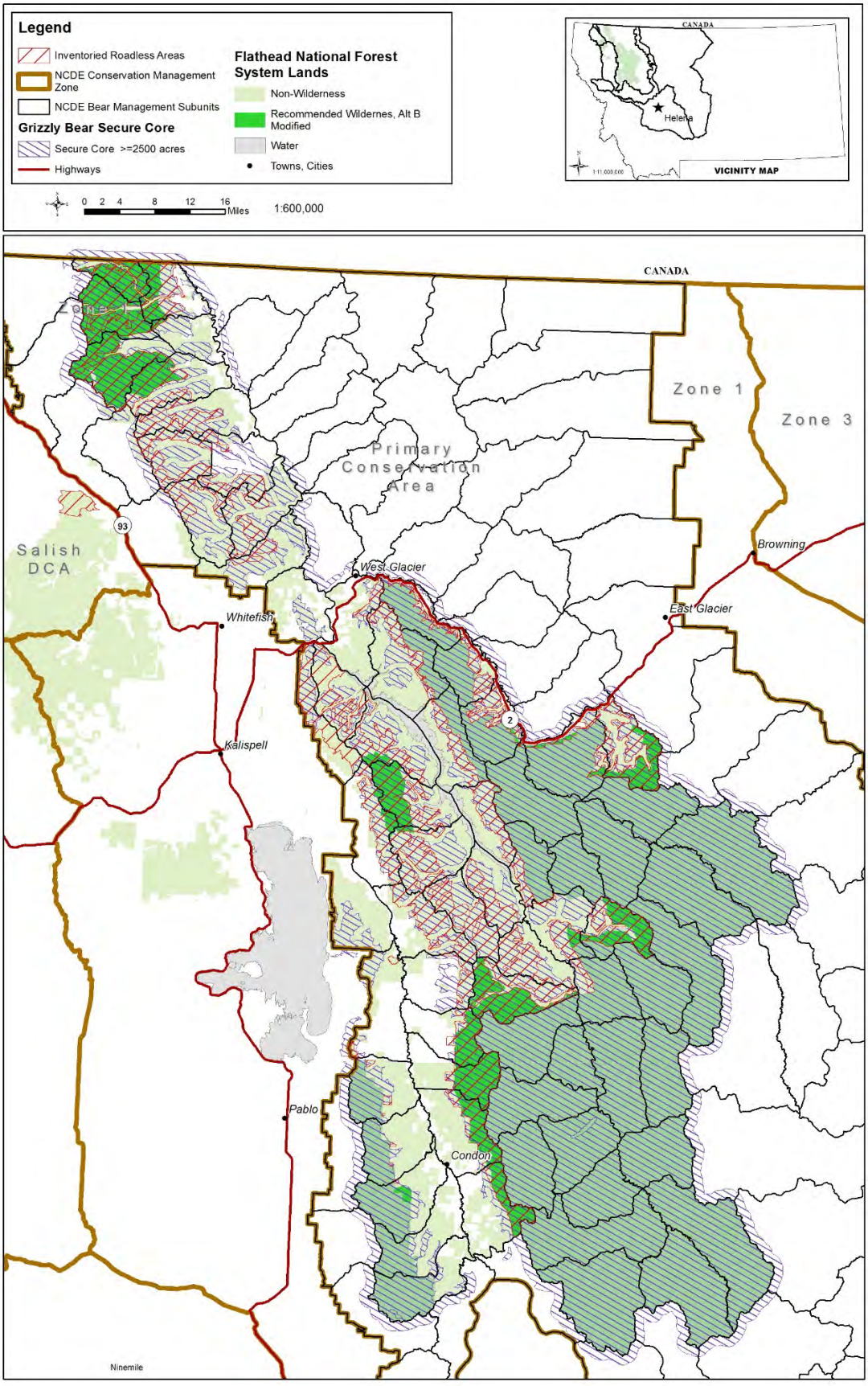


Figure B-29. Secure core with wilderness, recommended wilderness, and inventoried roadless areas; alternative B modified.

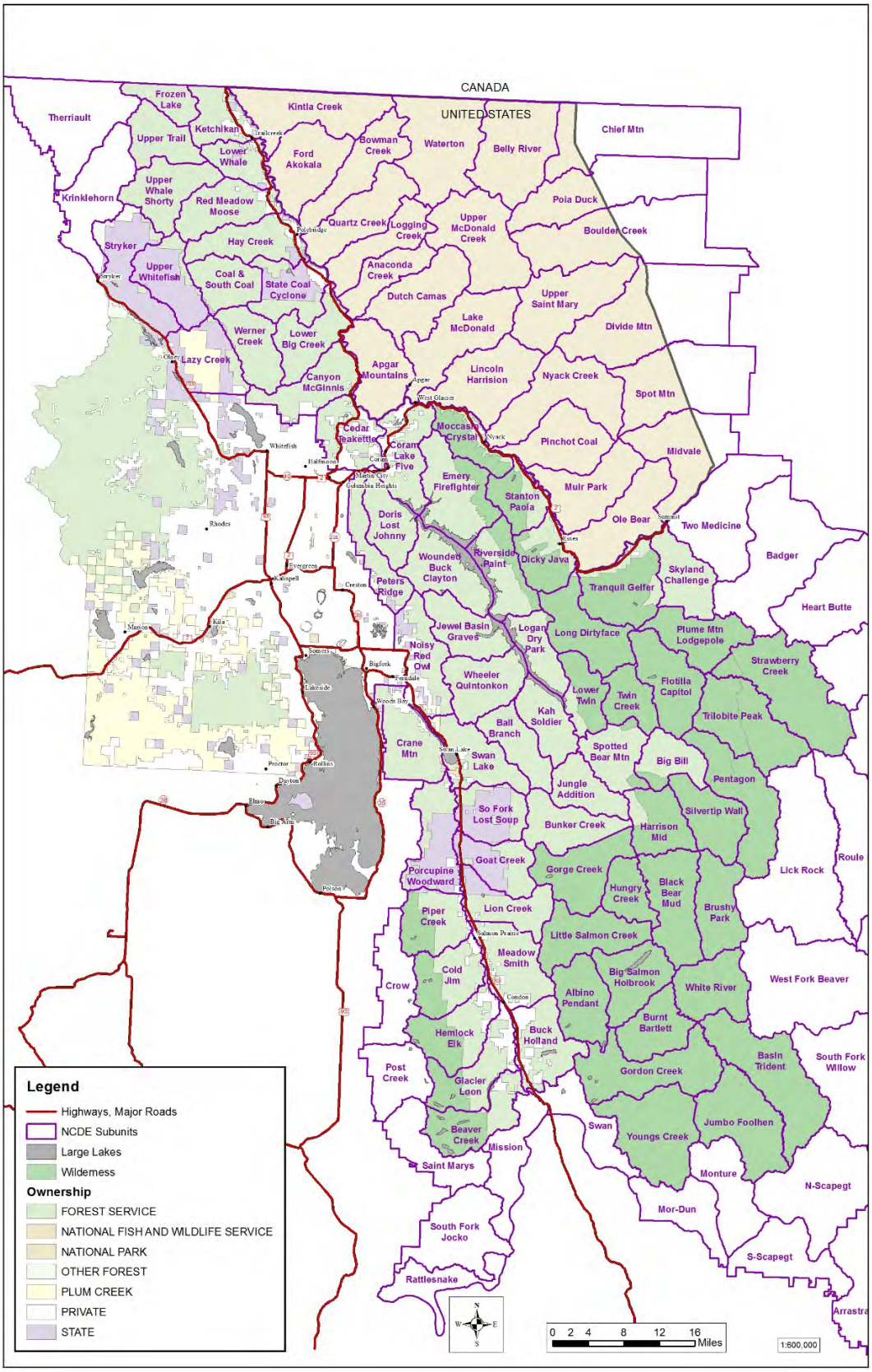


Figure B-30. Northern Continental Divide Ecosystem bear management unit (BMU) subunits.

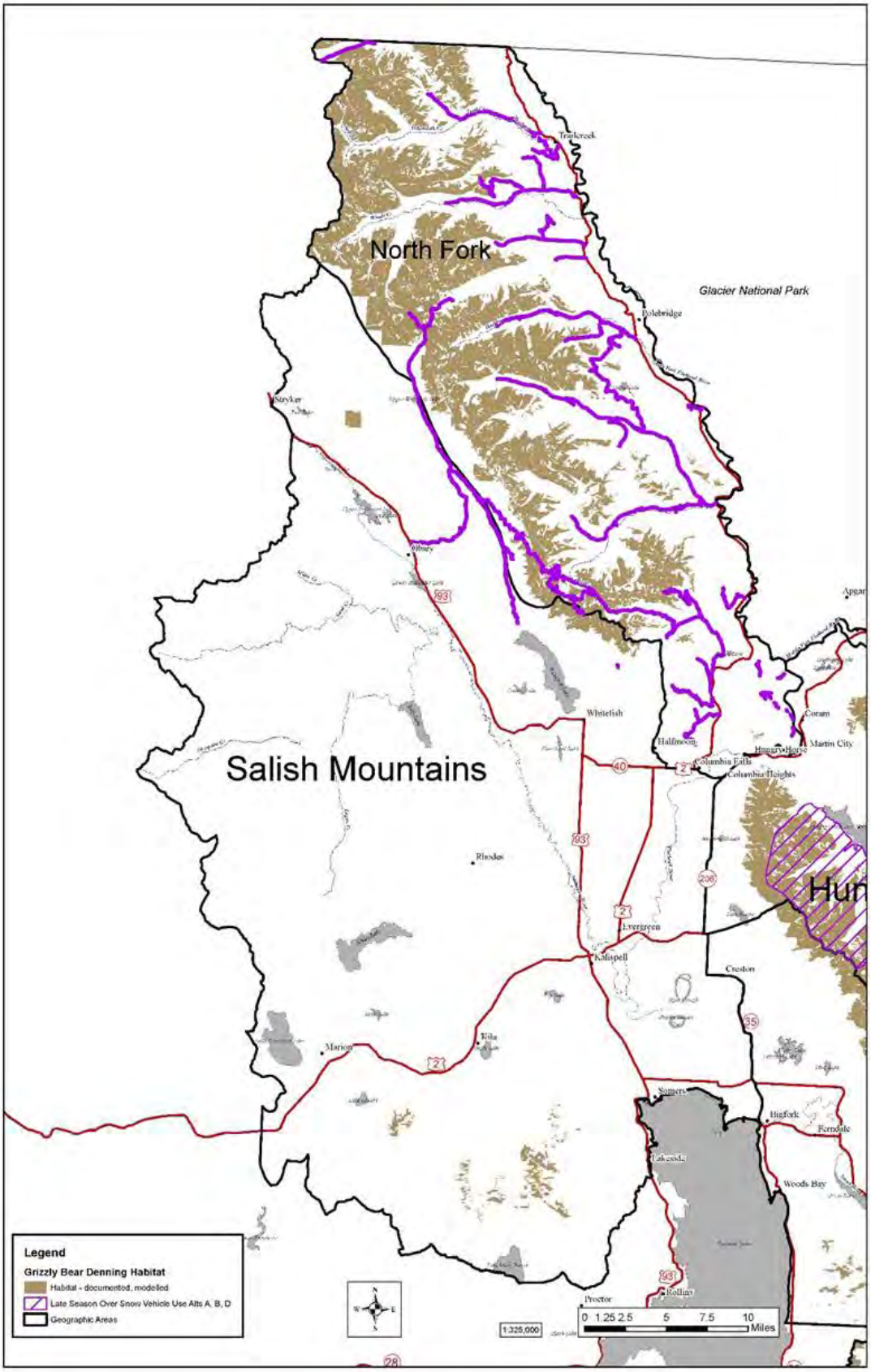


Figure B-31. Modeled grizzly bear denning habitat; designated late-season over-snow routes—north half.

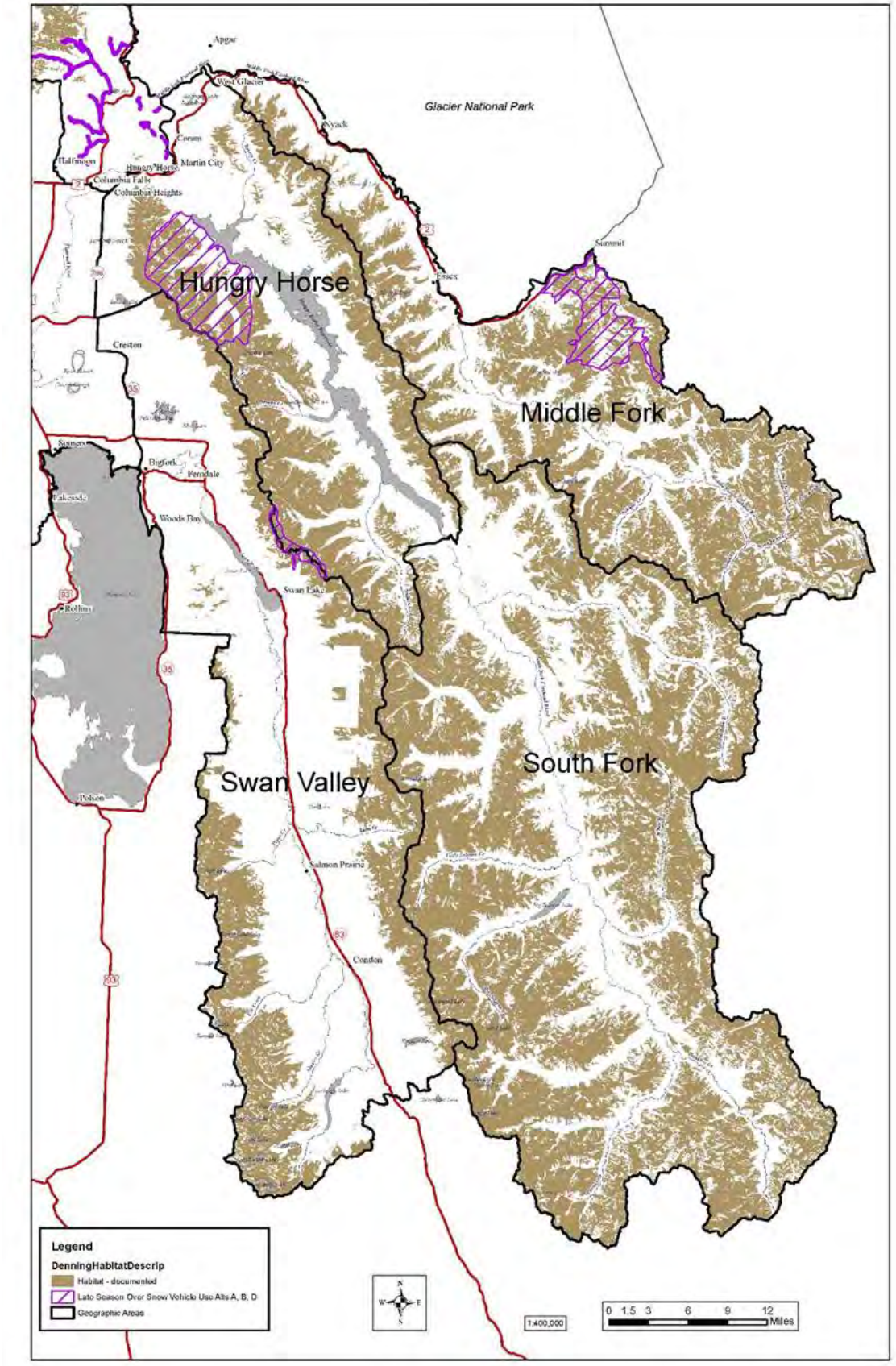


Figure B-32. Modeled grizzly bear denning habitat; designated late-season over-snow areas—south half.

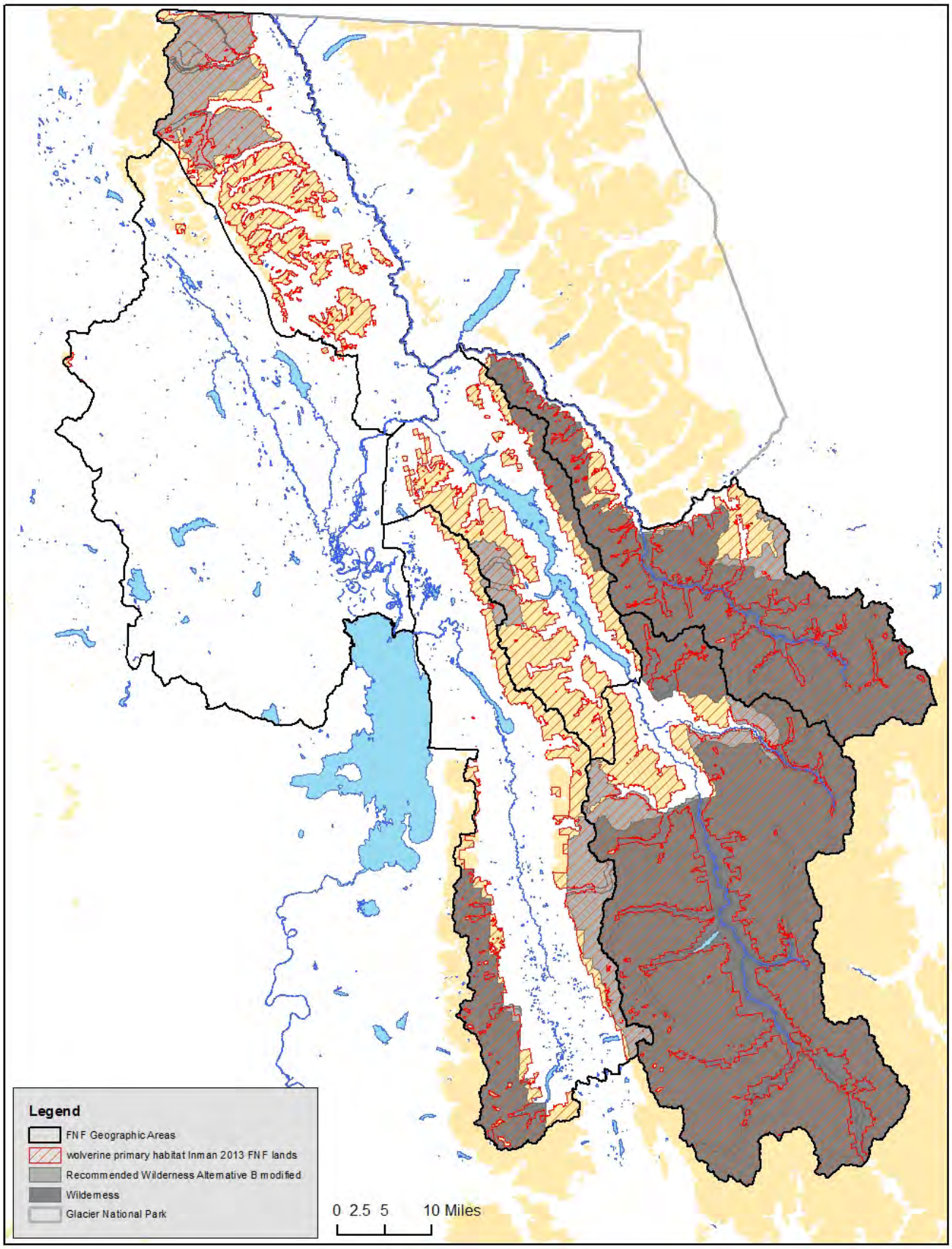


Figure B-33. Wolverine primary habitat (based on Inman et al. 2013; obtained from databasin.org), recommended wilderness, and wilderness.

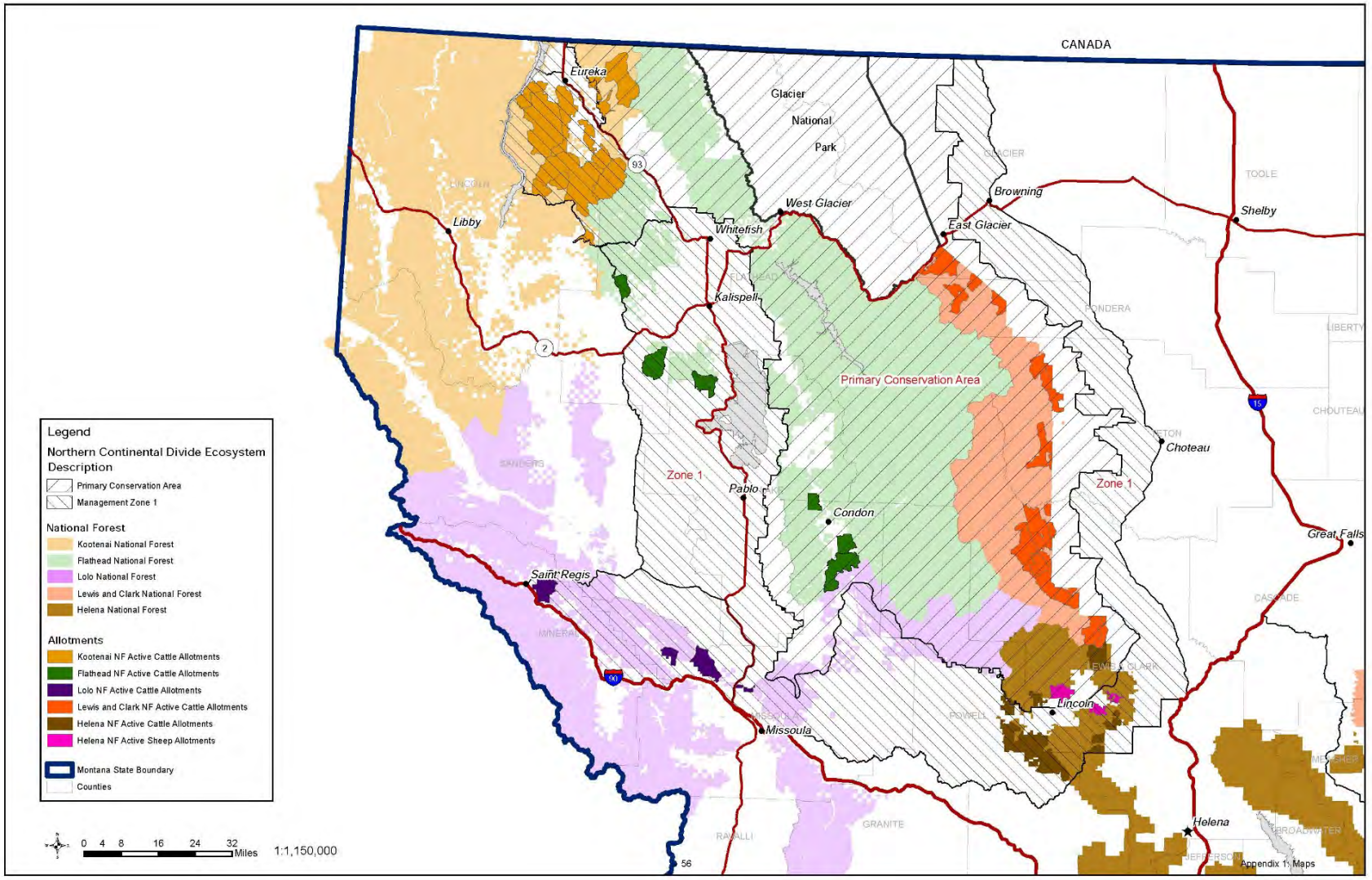


Figure B-34. Grazing allotments on the Northern Continental Divide Ecosystem.

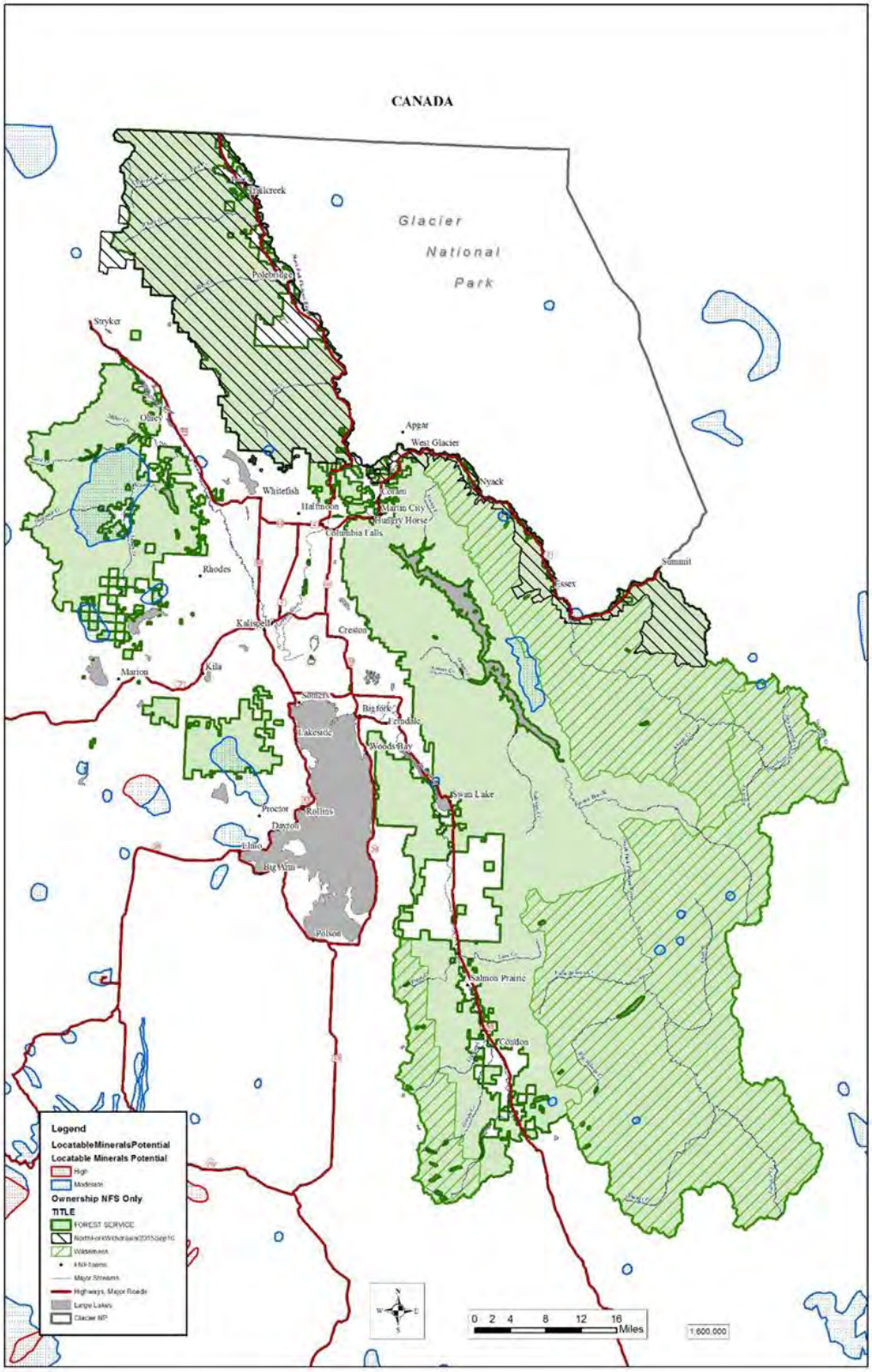


Figure B-35. Potential locatable minerals on the Flathead National Forest.

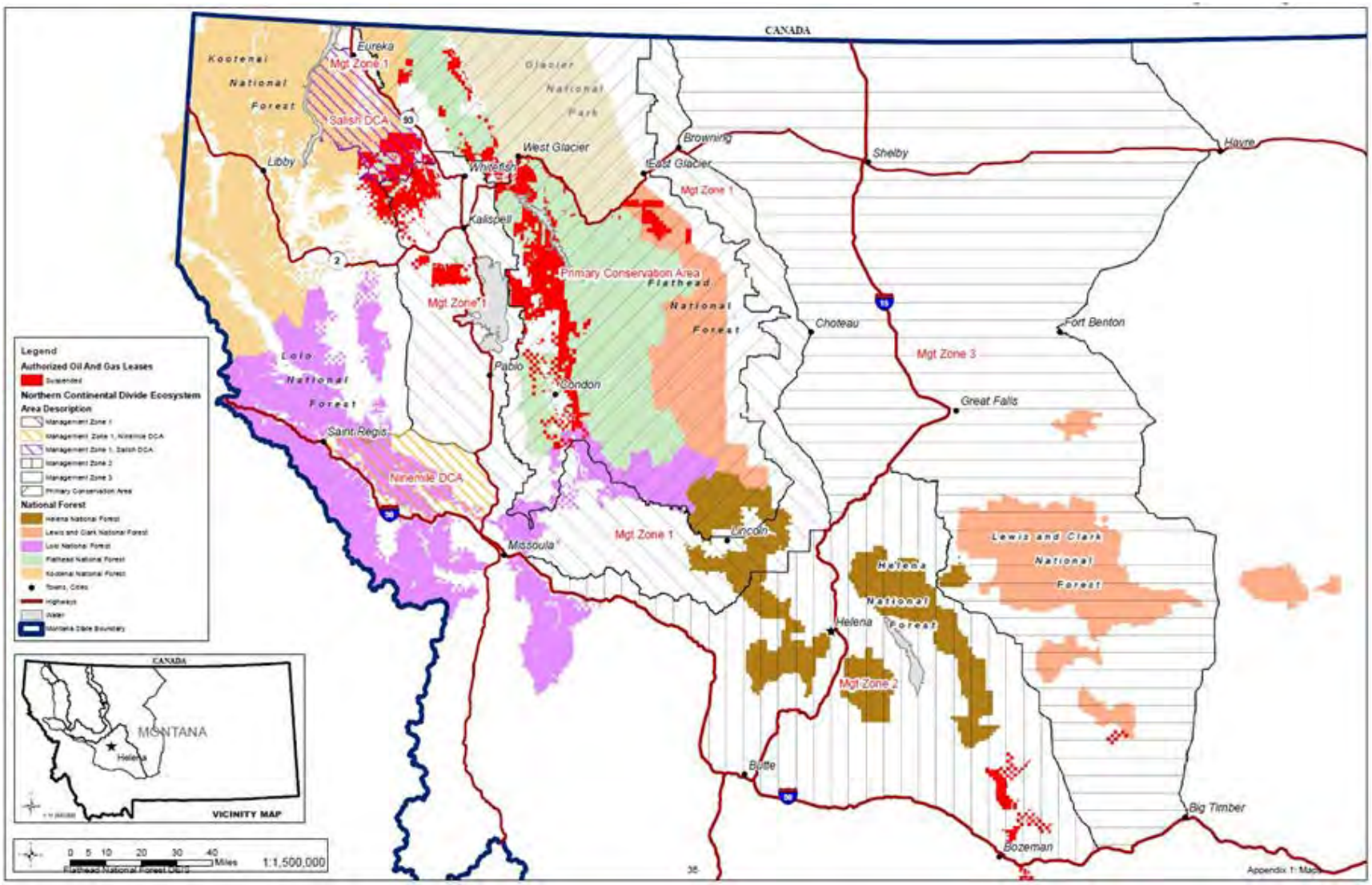


Figure B-36. Suspended oil and gas leases in the Northern Continental Divide Ecosystem.

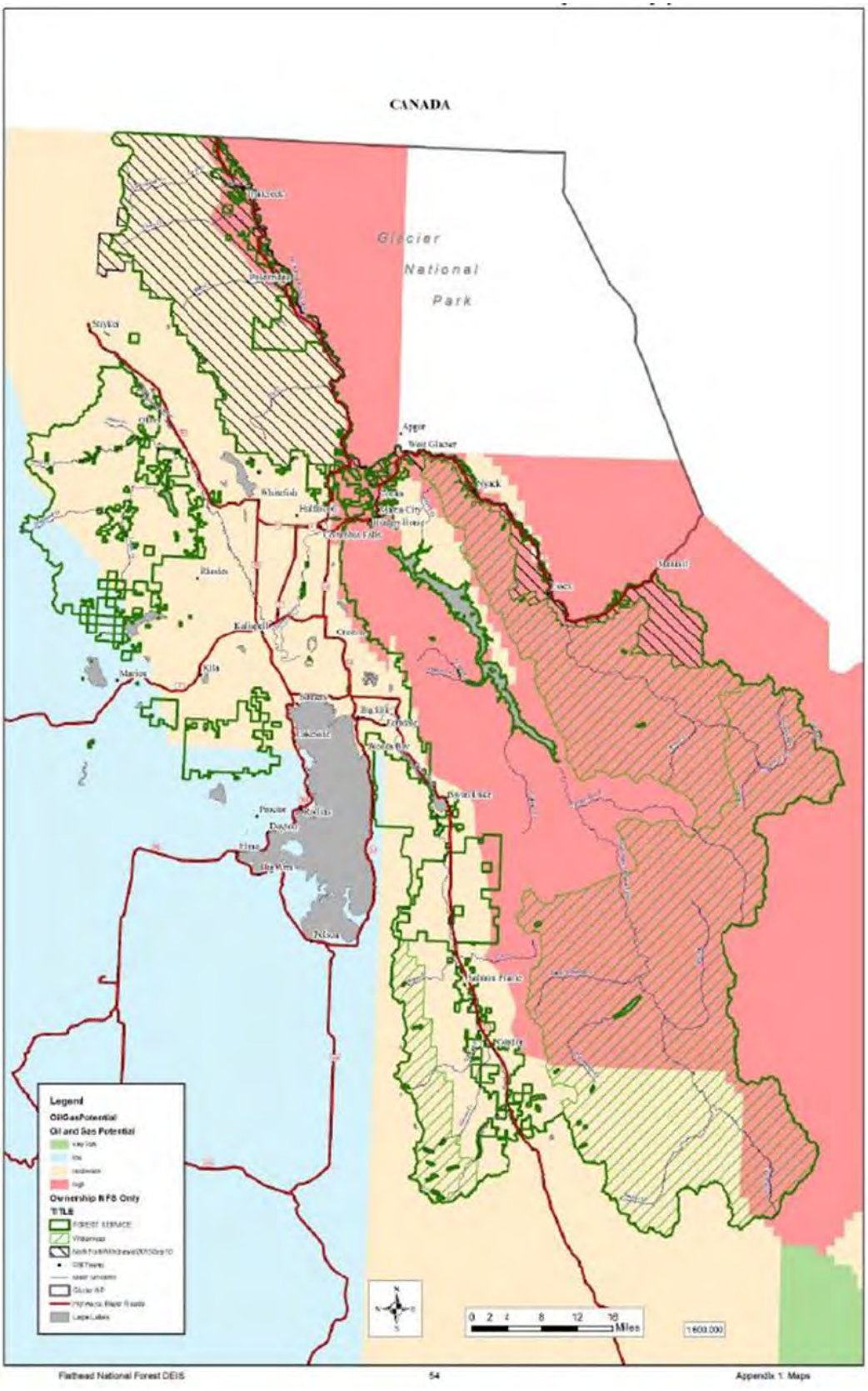


Figure B-37. Oil and gas potential and withdrawal areas on the Flathead National Forest.

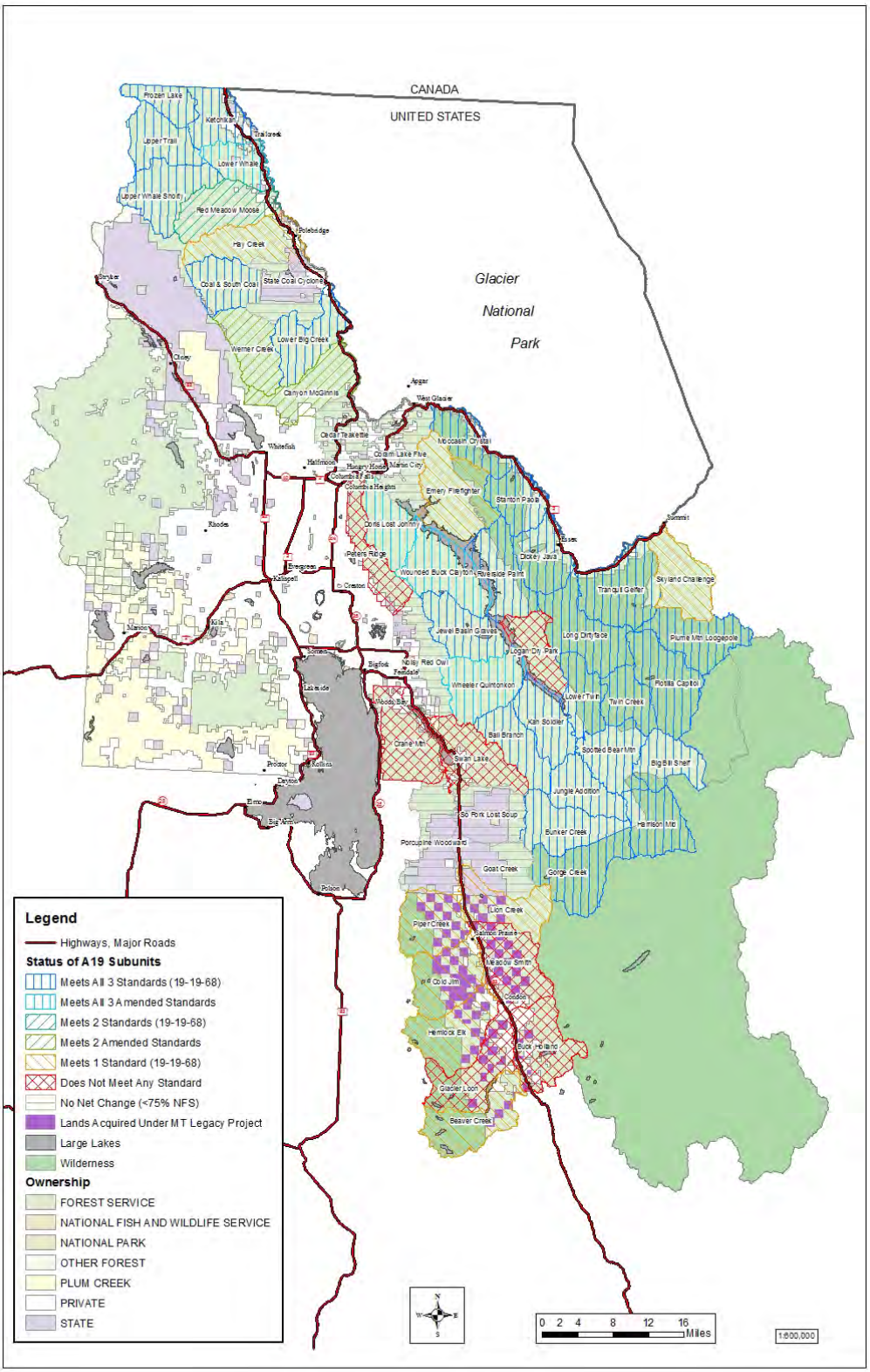


Figure B-38. Status of amendment 19 subunits.

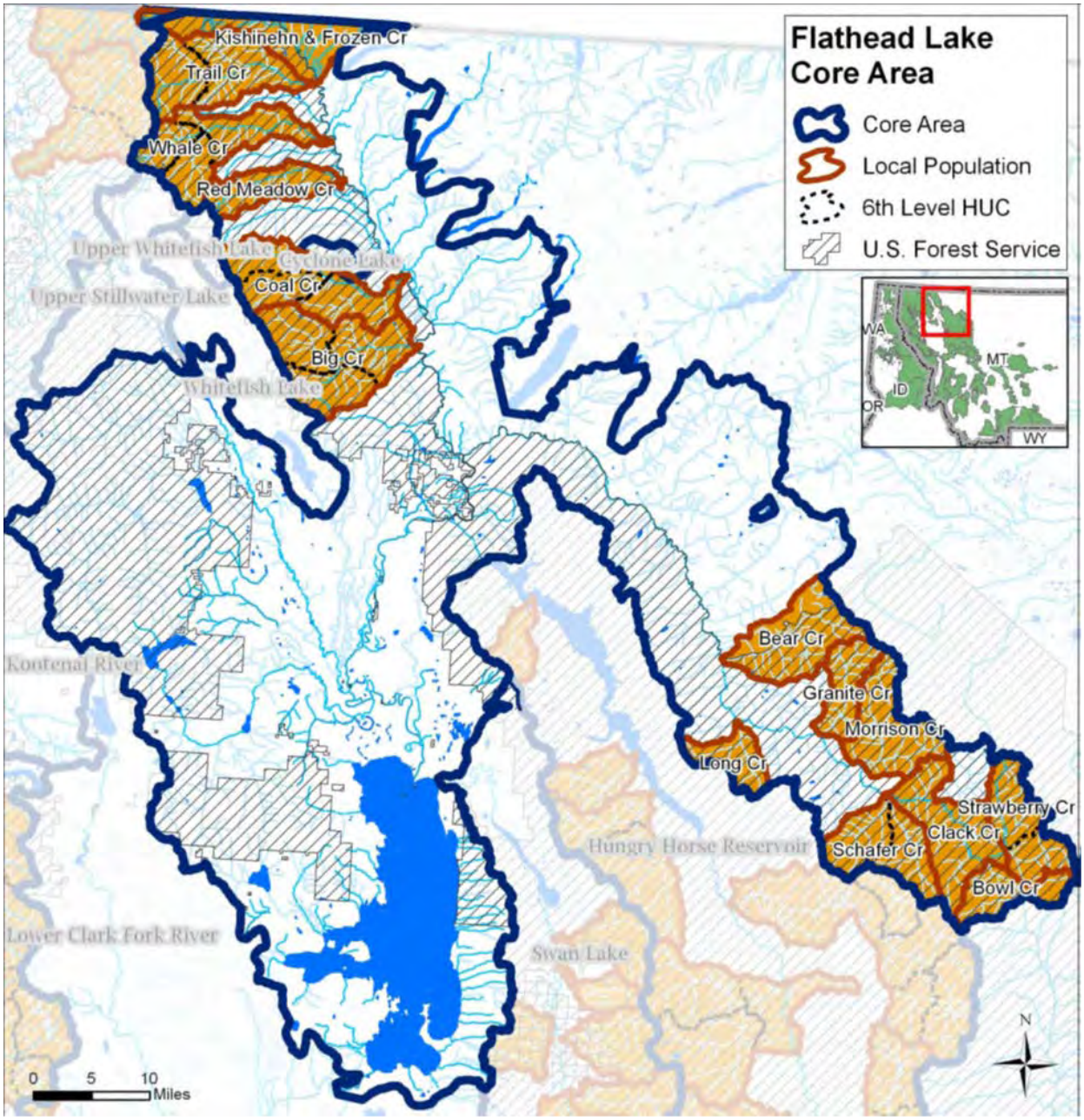


Figure B-39. Flathead Lake core area (including North and Middle Forks).

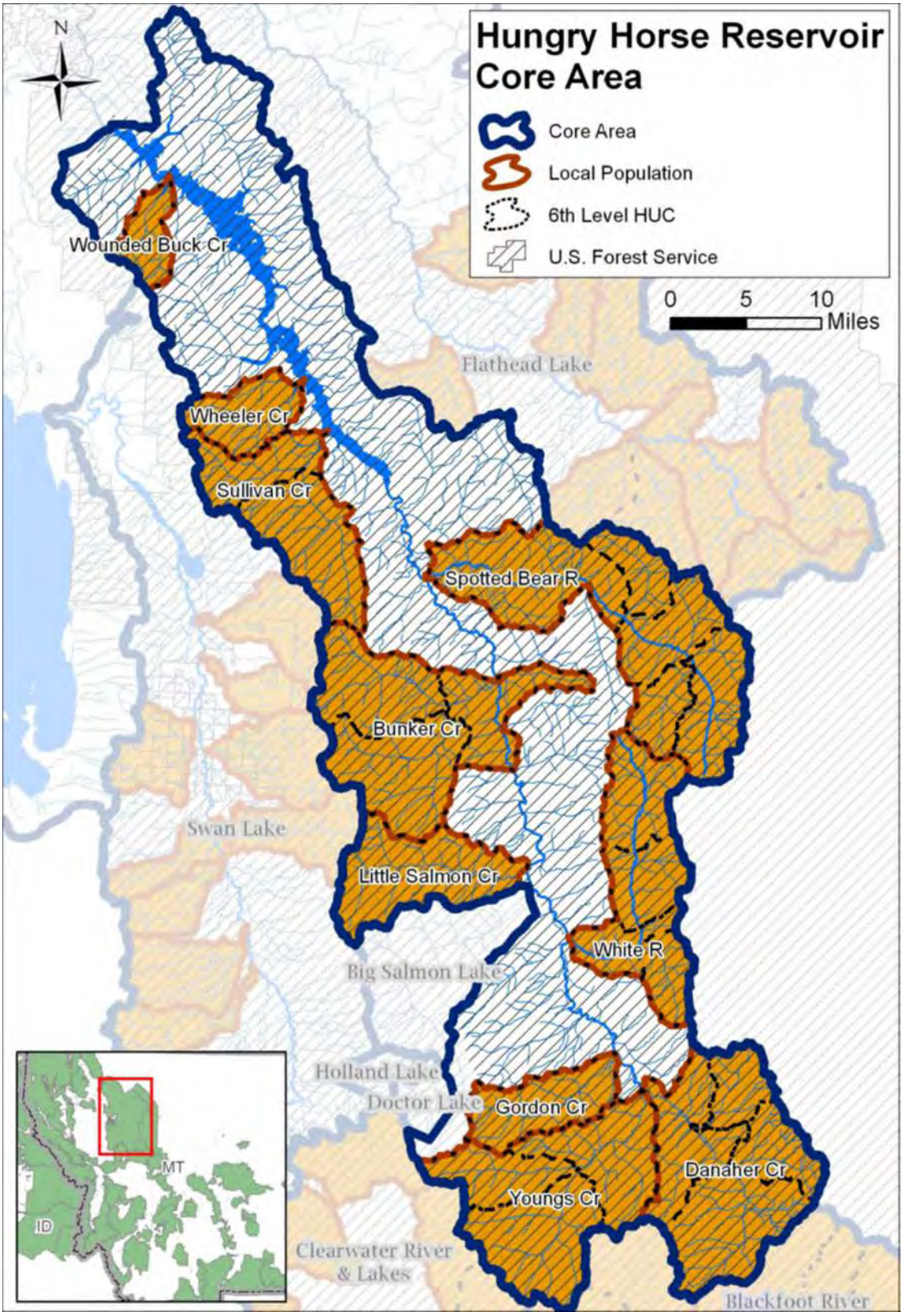


Figure B-40.Hungry Horse and surrounding core areas.

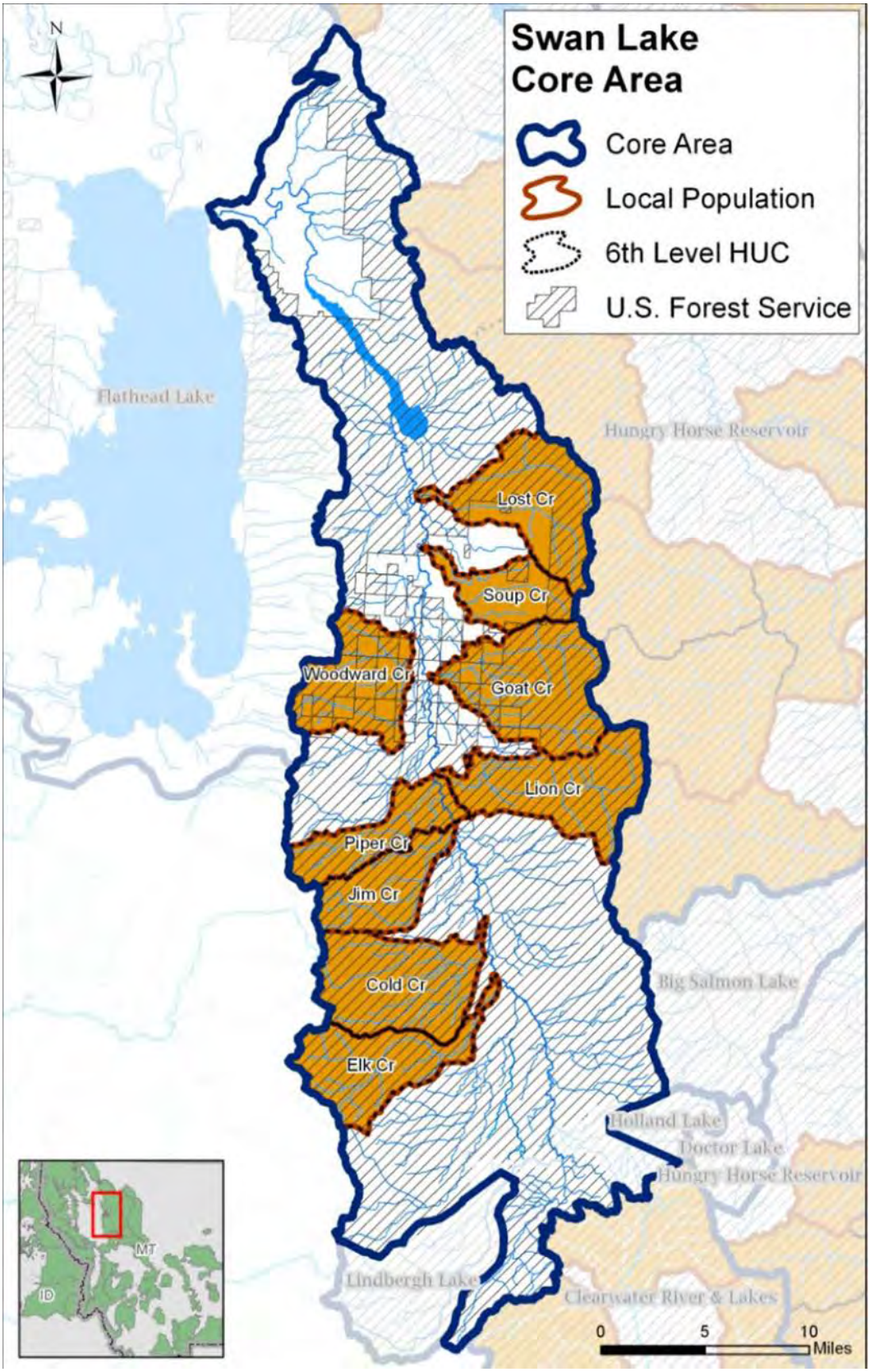


Figure B-41. Swan Lake and surrounding core areas.

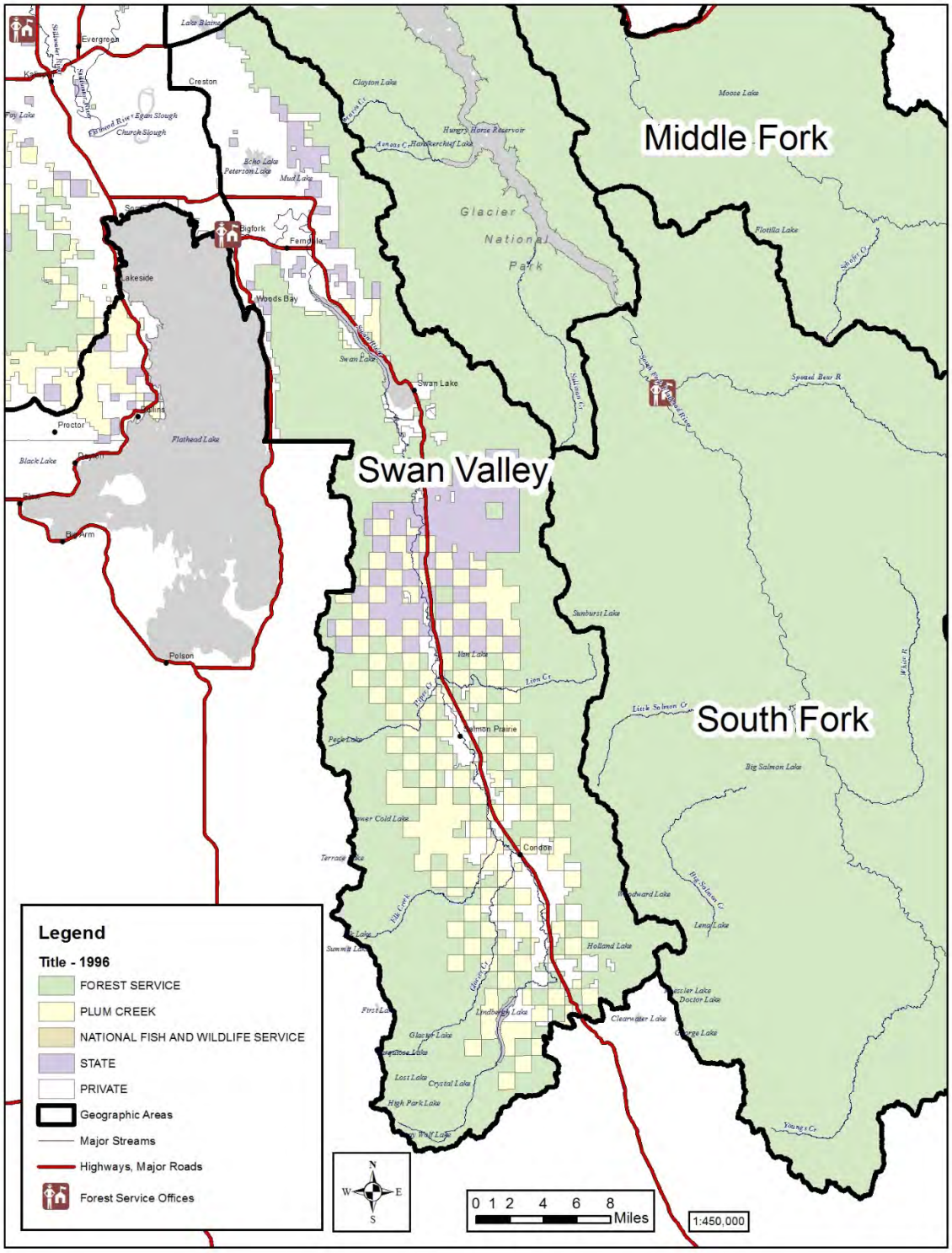


Figure B-42. Swan Valley ownership prior to Legacy Land acquisition.

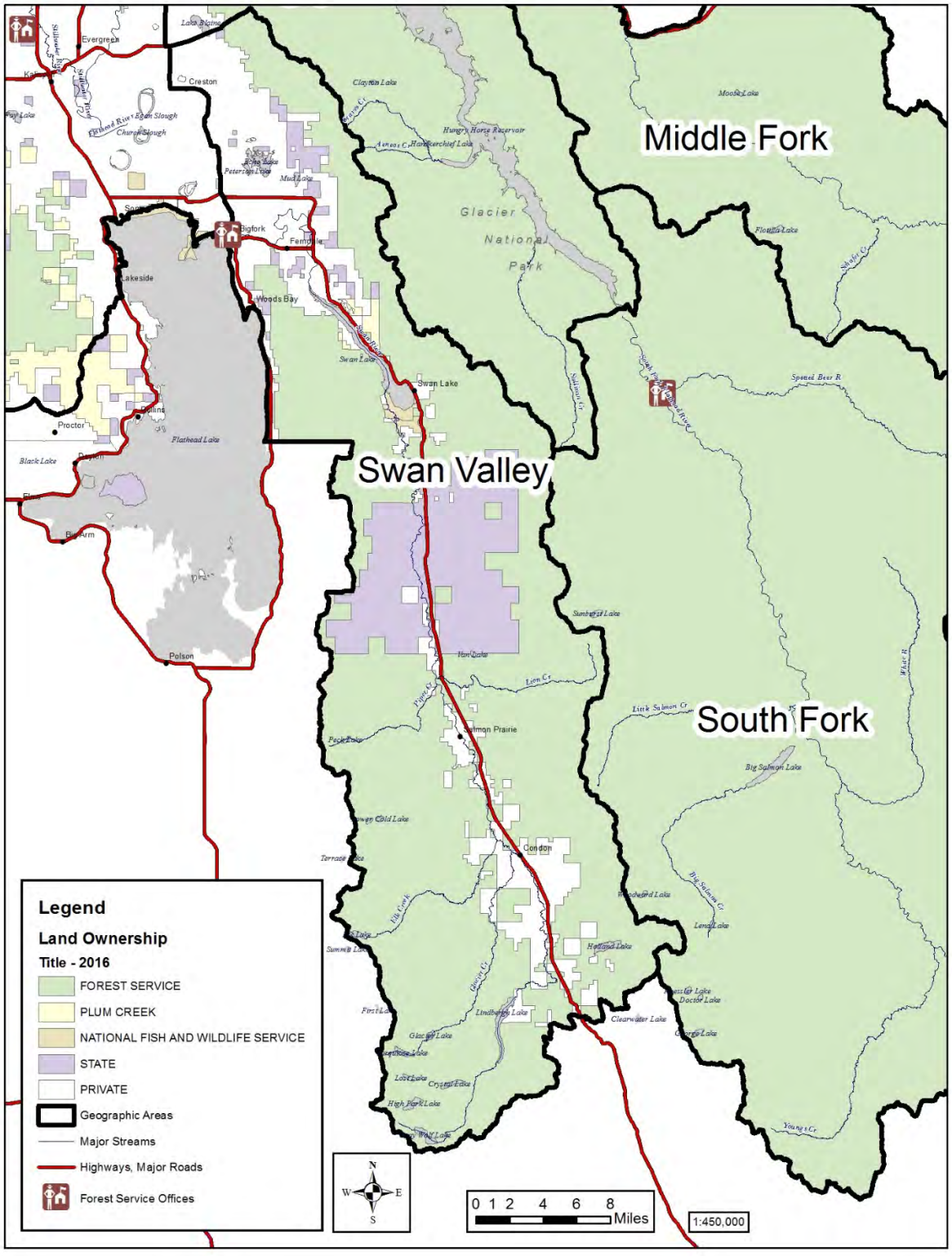


Figure B-43. Swan Valley ownership following Legacy Land acquisition and other acquisitions.

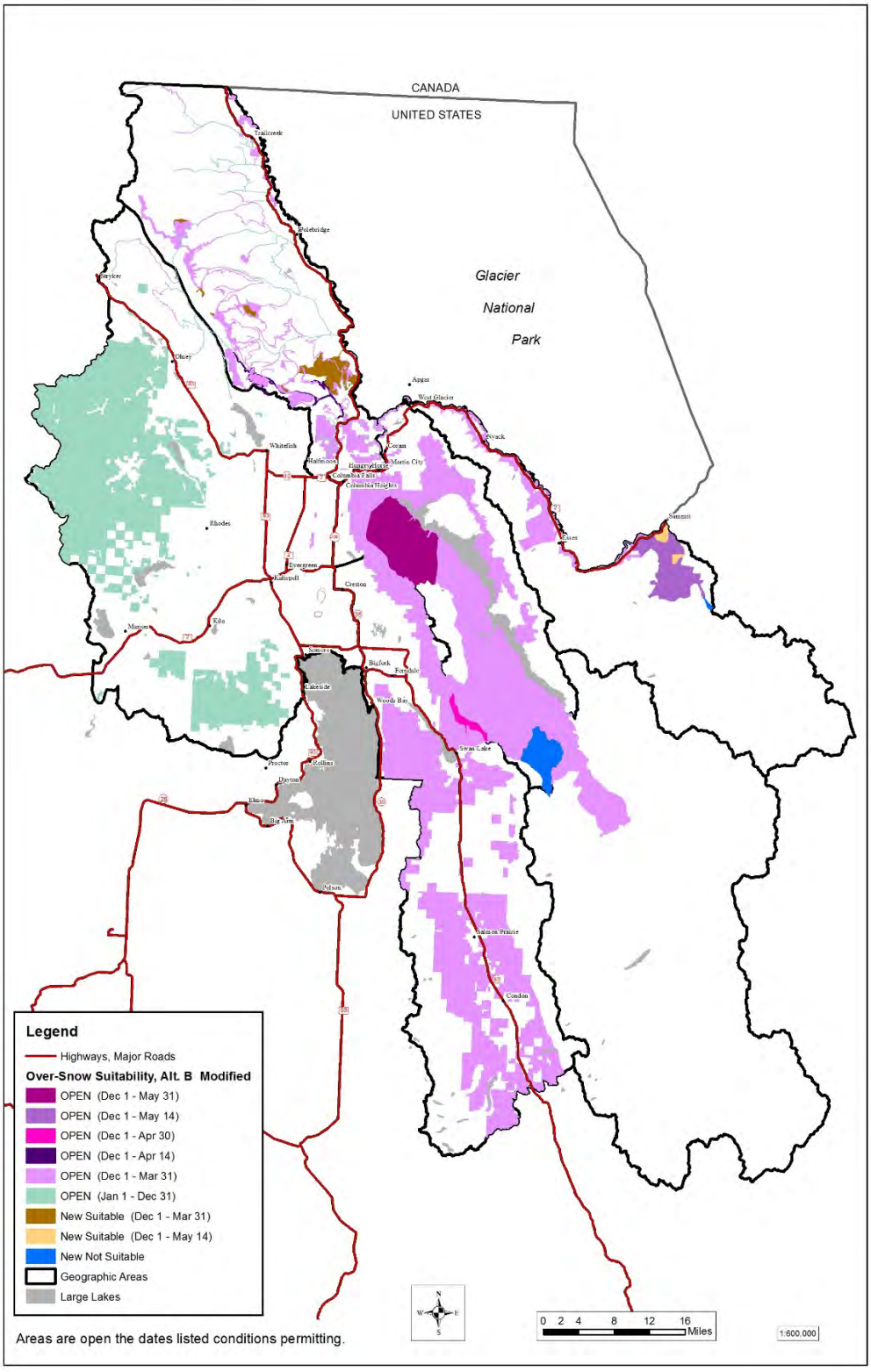


Figure B-44. Suitability for motorized over-snow vehicle use by season; alternative B modified.

Appendix C: Updates to Lynx Modelling

Canada Lynx Habitat Modelling for the Flathead National Forest Land and Resource Management Plan Revision Process Paper prepared by Reed Kuennen, wildlife biologist, Flathead National Forest, February, 2014.

Introduction

This document describes the process used to update modelling and mapping of lynx habitat for the Flathead National Forest plan revision. Lynx habitat on the Flathead National Forest (FNF) was modelled and mapped in 2000 when the Canada lynx (*Lynx canadensis*) was listed as a threatened species. New scientific information was incorporated into the 2014 Flathead National Forest model of lynx habitat, published in the Assessment of the Flathead National Forest (USFS 2014), in the Proposed Action—Revised Forest Plan Flathead National Forest (USFS 2015), and in the DEIS for the revised forest plan (USFS 2016), with subsequent public comment. Modeling and mapping is consistent with the definition of lynx habitat and is verified at the project level.

In 2007, there were 18 national forest plans amended to incorporate the Northern Rockies Lynx Amendment (NRLA), which is also known as the Northern Rockies Lynx Management Direction (NRLMD)(USDA FS 2007). The NLRMD standards and guidelines apply to lynx habitat on each national forest, including the Flathead National Forest. In 2009, lynx critical habitat was initially designated by the U. S. Fish and Wildlife Service (USFWS)(USDI FWS 2009) and was subsequently updated in 2014 (USDI FWS 2014).

The Flathead National Forest is part of lynx critical habitat Unit 3, Northern Rocky Mountains Region. The USFWS designated critical habitat for the Canada lynx based on assessment of areas: (1) determined to be occupied at the time of listing; (2) that contained the physical and biological features in the appropriate spatial arrangement and quantity, essential for the conservation of the species (called the primary constituent element, or PCE); and (3) that may require special management considerations or protection.

The following information and direction was used to update the 2000 lynx habitat geographical information system (GIS) map layer for the revised Flathead National Forest Land and Resource Management Plan (revised forest forest):

- Information and direction contained in the Canada Lynx Conservation Assessment and Strategy (LCAS)(Ruediger et al. 2000, Interagency Lynx Biology Team 2013)
- Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx; Final Rule; February 25, 2009 (USDI FWS 2009)
- Revised Designation of Critical Habitat for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Revised Distinct Population Segment Boundary; Proposed Rule; FR Doc. 2013-23189 09/26/2013 (USDI FWS 2013); and also Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx and Revised Distinct Population Segment Boundary; Final Rule; Federal Register / Vol. 79, No. 177 / Friday, September 12, 2014 / Rules and Regulations (USDI FWS 2014)
- NRLMD (USDA FS 2007)

- Research published by Dr. John Squires for northwest Montana (Squires et al. 2006, 2008, 2010, 2013) and lynx telemetry locations within the Flathead National Forest provided by Dr. John Squires.
- Potential vegetation types (PVTs) for the Flathead National Forest (USDA FS 2004).
- VMAP classification for the Flathead National Forest (2012 Classification, Berglund et al. 2009)

The information cited is the best available scientific information concerning lynx populations, distribution, habitat use, and prey species on the Flathead National Forest. Although this information has greatly improved current understanding for modelling of lynx habitat, improved information is expected to be developed as research results become available.

Lynx habitat on the Forest will be modelled and mapped in two phases. Phase I entails identifying the combination of biophysical attributes that comprise potential boreal forest lynx habitat on the Flathead National Forest. At any given point in time, some of this habitat is in a suitable condition and some is in a temporarily unsuitable condition. Phase II will entail further characterizing the vegetative condition of modelled lynx habitat to estimate the proportion of habitat that is suitable for foraging by lynx, based upon studies in process. For example, Dr. Squires and others are working on development of a lynx habitat model using new technologies to assess the vegetation condition, and considering reproductive female home ranges, within the distribution of Canada lynx in western Montana.

Lynx Analysis Units

The LCAS (Ruediger et al. 2000, Interagency Lynx Biology Team 2013) indicated that lynx analysis units (LAUs) should be developed and used to determine habitat conditions and assess management effects to lynx. This process resulted in the mapping of 109 LAUs across the Forest.

The LCAS outlined a number of criteria and related information that should be considered in the identification of LAUs and in mapping areas of habitat. The following LCAS criteria and variables were considered when LAUs on the Forest were determined:

1. Development of LAUs need not be a new type of analysis unit. Previously delineated and accepted units such as 6th field Hydrologic Unit Codes (HUCs) or other ecological units are acceptable as LAUs.
2. LAUs could likely encompass both suitable lynx habitat (e.g., denning and foraging habitat) and unsuitable areas (e.g., lakes, low elevation ponderosa pine forest, and alpine tundra).
3. Conservation measures including NLRMD standards and guidelines apply to mapped lynx habitat within LAUs.
4. LAUs should be at least the size of the area used by an individual lynx.
5. LAU boundaries would not be adjusted for individual projects, but will remain constant.
6. The size of LAUs should generally be 25-50 mi^2 in contiguous habitat and likely larger in less contiguous or poor quality habitat.

LAU boundaries on the Flathead National Forest have not been adjusted, but have remained constant since their original determination.

Phase I: Modelling and Mapping Boreal Forest Lynx Habitat

Based on current knowledge of the life history, biology, and ecology of lynx, certain elements are thought to be important to the conservation of the species. Elements of lynx habitat and how they were used to update lynx habitat on the Forest are summarized in the following sections. The lynx habitat model is based on biophysical conditions that have the potential to produce lynx habitat in a suitable condition. At any point in time, some areas will be suitable and some will not (see glossary in NRLMD ROD and LCAS (Lynx Biology Team 2013)).

A. Boreal Forest Landscapes and Deep Fluffy Snow

Snow is a defining habitat variable for lynx. Lynx have large feet that are adapted for habitats with deep, fluffy snow, which gives them a competitive advantage. In areas which lack deep fluffy snow, there is greater habitat use by bobcats, mountain lions and coyotes (USDA FS 1999, pp.89-95; USDI FWS 2009 pg. 8616), an increase in competition for prey, and an increase in potential predation on lynx. Because snow is biologically important to lynx (Ruediger et al. 2000, Interagency Lynx Biology Team 2013) it was included as PCE1b of lynx critical habitat (see Table C-1). For mapping lynx habitat on the Flathead National Forest, elevation was used as a factor for indicating presence of deep fluffy snow.

Table C-1. Canada lynx critical habitat PCE[1]

Boreal forest landscapes supporting a mosaic of differing successional forest stages containing:	
a.	Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistory stands with conifer boughs touching the snow surface.
b.	Winter snow conditions that are generally deep and fluffy for extended periods of time.
c.	Sites for denning that have abundant coarse woody debris, such as downed trees and root wads.
d.	Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

1. Excerpted from the Federal Register, Vol. 74, No. 36, February 25, 2009 [50 CFR Part 17]; Federal Register / Vol. 79, No. 177 / Friday, September 12, 2014 / Rules and Regulations (USFWS 2014)

In the Northern Rocky Mountains, Canada lynx select home ranges at mid-elevations of about 4,100 to 7,700 feet (ft). Looking at seasonal habitat use, Squires found that lynx used mid-to high-elevation forests during winter and slightly higher elevations during summer (Squires et al. 2010).

Flathead National Forest modelling of habitat that provides deep fluffy snow:

In modelling, the Flathead National Forest used an elevation of 4100 ft. as the lower limit of lynx habitat, based upon published research by Squires, unless: 1) we had lynx radiotelemetry data providing evidence of lynx use at lower elevations, or 2) data providing evidence of greater than average snow depths for a particular portion of a watershed. Flathead National Forest staff examined snow depth data from weather reporting stations and Natural Resource Conservation Service (NRCS) snow courses through 2013, where available (see Phase I: Lynx Habitat GIS Processing subsection at the end of this documents for details).

B. Boreal Forest Landscapes and Seasonal Habitat Use by Canada lynx

Lynx studies in the Northern Rockies have reported an association with moderate elevations, deep fluffy snow, relatively gentle topography, spruce and subalpine fir forests, a dense understory, and multistory forests containing a variety of tree size classes. In the western United States, lynx selected for mature multistory stands dominated by Engelmann spruce and subalpine fir in winter (Koehler et al. 2008 In USDI FWS 2009, Squires et al. 2010). In Squires' Montana study area; he observed that winter is the

most constraining season for lynx in terms of resource availability and use (Squires et al. 2010). High hare abundance occurred in stands of large diameter [greater than or equal to 11 inches diameter at breast height (dbh)] trees where limbs reached the snow at the surface level and smaller trees contributed to dense horizontal cover, resulting in lynx successfully capturing prey (Squires et al. 2010 pg. 1656). In northwest Montana, the proportion of size classes of trees in forests used by lynx were 5 percent saplings (2.5–8 cm or 1–3 in. dbh), 19 percent pole (8–18 cm or 3–7 in. dbh), 42 percent mature (18–28 cm or 7–11 in. dbh), and 29 percent large (>28 cm or >11 in dbh)(Squires et al. 2010 pg. 1654). Lynx generally avoided dry forest types with high proportions of Douglas-fir, grass in the understory, or snags. Regenerating stands composed of small-diameter saplings in recent clear-cuts, as well as other forest openings, were generally avoided during winter. When lynx did cross openings they remained near the forest edge, with an average crossing distance of 384 ft. from the forest edge (range 131–1,243 ft) (Squires et al. 2010). These key habitat parameters for snowshoe hare and winter lynx feeding habitat were also described as PCE1a for lynx critical habitat (see Table 1).

Contrary to habitat use by lynx in winter, Squires and others (2010) found forest stands in Montana with mature and large diameter trees were used less often during summer. Lynx broadened their selection to include younger regenerating stands composed of Engelmann spruce and subalpine fir with abundant small diameter and pole-sized trees, abundant total shrubs, and high horizontal cover (Squires et al. 2010). As in winter, lynx generally avoided dry forest types with high proportions of Douglas-fir, grass in the understory, or snags (Squires et al. 2010 pg. 1655). Elevations used by lynx were slightly higher (i.e., 136 ± 24 m [446 ± 79 ft]) in summer than during the winter but still occurred in the montane zone between the alpine and dry forest types (Squires et al. 2010).

As stated in the critical habitat final rule (USDI FWS 2009, pg. 8617), “Because of the patchiness and temporal nature of high-quality snowshoe hare habitat, lynx populations require large boreal forest landscapes to ensure that sufficient high quality snowshoe hare habitat is available and to ensure that lynx may move freely among patches of suitable habitat and among subpopulations of lynx.” Lynx habitat within the boreal forest landscape is typically patchy because the boreal forest contains stands of differing ages and conditions, some of which are suitable as lynx foraging or denning habitat (or will become suitable in the future due to forest succession) and some of which serve as travel routes for lynx moving between foraging and denning habitat (McKelvey et al. 2000, pp. 427–434; Hoving et al. 2004 In USDI FWS 2009, pp. 290–292).

Within the elevation range used by Canada lynx, the Flathead National Forest used potential vegetation types (USDA FS 2004) and VMAP existing vegetation classes (Berglund et al. 2009, USDA FS 2011) to model areas of boreal forest lynx habitat able to grow subalpine fir and spruce trees (see Phase I: Modeling Lynx Habitat GIS Processing subsection” at the end of this document for details). On the Flathead National Forest, there are also areas within the elevation range used by lynx that are not boreal forests able to grow subalpine fir and spruce.

Lynx Denning Habitat

Denning habitat is the environment lynx use in the late winter and early spring when giving birth and rearing kittens (until kittens are mobile). At a landscape level, dens were generally located in concave or drainage-like topographies and often on northeast aspects. Squires found that denning habitat is generally abundant across the coniferous forest landscape; especially in riparian habitats and in areas where insect, disease or fire kills patches of trees. Squires found that lynx located their dens in a variety of habitats. Multi- storied stands of spruce-fir forests with high horizontal cover and abundant coarse woody debris provide denning habitat (Squires et al. 2006, 2008, 2010). Squires found that eighty percent of dens were located in mature forest stands and 13 percent in mid-seral, regenerating stands. Young stands that were either naturally sparse or mechanically thinned were seldom used for denning, however, lynx denned

along the edges of regenerating forests where trees had blown down into piles of woody debris. Denning habitat should be located within daily travel distance of an adult female lynx (i.e., typical travel distance is 3-6 mi). Squires stated that, given the large home ranges and low den site fidelity of lynx, den sites are not likely to be limiting (Squires et al. 2008). As a result, denning habitat is not modelled as part of the Forest Plan revision process.

Lynx Matrix Habitat

In mountainous areas, the boreal forests that lynx use are characterized by scattered moist forest types with high hare densities in a matrix of other habitats (e.g., hardwoods, dry forest, non-forest) with low hare densities. In these areas, lynx incorporate the matrix habitat (non-boreal forest habitat elements) into their home ranges and use it for traveling between patches of boreal forest that support high hare densities where most foraging occurs (USDI FWS 2009 pg. 8616). LAUs contain a mix of lynx habitat as well as the matrix as defined in the 2009 rule designating lynx critical habitat. Since the matrix provides limited snowshoe hare resources or other life requisites for lynx, no conservation measures were developed that specifically address management of matrix, except as related to maintaining connectivity Interagency Lynx Biology Team 2013).

Lynx Foraging Habitat

At the present time, the Flathead National Forest is not modelling the dense understory conditions providing hare and lynx foraging habitat at the Forest level, because we do not currently have data that allows us to discern these conditions across the entire Flathead National Forest. Foraging habitat is determined through inventories at the project level.

Areas Excluded from Lynx Critical Habitat

Within critical habitat mapped by the USFWS, and also within lynx habitat modeled by the Forest, certain areas are excluded. According to the Critical Habitat Final Rule (USDI FWS 2009 pg. 8641)(Federal Register /Vol. 79, No. 177 / Friday, September 12, 2014 /Rules and Regulations pg. 54823): “Given the scale of the critical habitat units, it was not feasible to completely avoid inclusion of water bodies, including lakes, reservoirs and rivers; grasslands, or human-made structures such as buildings, paved and gravel roadbeds, parking lots, and other structures that lack the primary constituent element (PCE) for the lynx. These areas, including any developed areas and the land on which such structures are located, that exist inside critical habitat boundaries, are excluded by text and are not designated critical habitat.”

Updating Modelled Lynx Habitat

The initial process completed in 2000 relied upon existing forestwide data layers. In 2000, the Flathead National Forest stated that lynx habitat for the Flathead National Forest would be updated as new scientific information becomes available. Modelled lynx habitat will continue to be classified, verified, refined, and updated during project-level analysis. If new scientific information becomes available it will be assessed to determine whether changes in modelling of lynx habitat may be needed.

Flathead National Forest Lynx Habitat Assessment: Sensitivity Analysis

In the process of updating lynx habitat modelling on the Forest for the forest plan revision assessment, Squires’ 2010-2013 lynx locations (determined by radio telemetry) in the North Fork, Middle Fork and South Fork Flathead River drainages were examined. The ArcGIS “select by location” feature was used to examine data for potential vegetation types (PVTs, or groupings of habitat types) and Flathead National Forest 2012 VMAP polygons that overlapped with lynx telemetry locations. The 2012 VMAP classification, corrected for fires and recent harvest (called transitional forest) is the best available wall-

to-wall data layer available for analysis of current vegetation conditions. Data included satellite telemetry locations of 3 female and 5 male lynx. Lynx locations were recorded every half hour, resulting a total of 13,417 telemetry location points.

Analysis of Lynx Locations

Elevation: Squires' lynx telemetry data specific to the Flathead National Forest showed that lynx were located at a minimum elevation of about 3700 feet in the Middle Fork Flathead River watershed, 3800 feet in the North Fork Flathead River watershed (north of Polebridge) and 4000 feet in the South Fork Flathead River watershed, and at a maximum elevation of 7100 ft.

Potential Vegetation Types: In the North Fork Flathead River watershed, 95 percent of lynx locations occurred in polygons with the Abla1, 2, 3 and 4 PVTs. In the South and Middle Fork Flathead River watersheds, 94 percent of lynx locations occurred in polygons with these PVTs. If the Picea, Laly, Pial, and Tsme2 PVTs are added to the Abla PVTs, it accounts for 96 percent of lynx locations in all three watersheds. Other VMAP polygons, accounting for about 3 percent of lynx locations, included the following forested PVTs: Abgr3, Thpl 1 and 2. About 1 percent of lynx locations were documented in other PVTs, including Psme 1, 2 and non-forested.

VMAP Dominance Types: While PVTs are based on the potential of a site to produce a certain vegetation type, VMAP dominance types describe the existing vegetation at a point in time. VMAP polygons with lynx locations included a large number of tree dominance type classes as well as transitional forest (fire and harvest areas), shrub, and herb. Tree dominance types included MX- Abla (mixed subalpine fir), MX-Pien (mixed Engelmann spruce), MX-Pico (mixed lodgepole pine), MX-Psme (mixed Douglas-fir), MX- Laoc (mixed western larch) and Poptr (quaking aspen)(using the VMAP Dom40 classification). On the Flathead National Forest, subalpine fir and spruce often occur in mixed species stands. A stand is coded as a subalpine fir or spruce dominance type if a tree species makes up at least 40% of the tree species in a polygon. Most lynx locations were in mixed (MX) forest stands. In the North Fork, 31 percent of lynx locations occurred in subalpine fir or spruce dominance types and in the South and Middle Forks, 27 percent of lynx locations were found in these types. There were a few lynx locations in polygons classified as sparse vegetation, including polygons classified as "road."

Size Class: Winter lynx locations were assessed to see if there was an association with VMAP size class. Fourteen percent (929 of 6505) of Squires' lynx locations occurred within the class "avg. tree dbh greater than or equal to 15 inches d.b.h." If all tree classes greater than or equal to 10 inches avg. dbh were included, it accounted for 51 percent (3294 of 6505) of Squires' lynx telemetry locations (Feb-May15, South Fork and Middle Fork). If all tree classes greater than or equal to 5 inches avg. dbh are included it accounts for 77 percent (5032 of 6505) of Squires' tracked lynx locations (Feb-May15, South Fork and Middle Fork).

Canopy Cover: Winter lynx locations were assessed to see if there was an association with VMAP canopy cover. Fifty percent (3167 of 6505) of Squires' lynx telemetry locations occurred within tree canopy classes with 60 percent, or more, tree canopy cover. All tree canopy cover classes greater than or equal to 40 percent accounted for eighty-five percent (5515 of 6505) of Squires' locations. All tree canopy cover glasses greater than or equal to25 percent accounted for 91 percent (5918 of 6505) of Squires' lynx locations. Ninety three percent (6053 of 6505) of Squires' radioed lynx locations occurred within all VMAP tree canopy cover classes with greater than 10 percent canopy cover.

Past Harvest and Fires: All of the Flathead National Forest past harvest polygons that contained lynx telemetry locations were examined in this analysis. One male and one female lynx in the North Fork Flathead River watershed used 24-57 year old regeneration harvest units and 14-24 year old

sanitation/salvage harvest units. For the female lynx, 59 percent of the locations were found in past harvest units while for the male lynx, 65 percent of the locations were located in past harvest units. Many of the past harvest units were thinned prior to 1999, before the lynx was listed as a threatened species. Both of these lynx also used patches in the 2003 Wedge Canyon fire area during the summer. Patches used by lynx were either unburned or were in areas that had regenerated rapidly after the fire. The male lynx also made extensive use of the 1988 Red Bench fire area.

In the South Fork, 32 percent of lynx locations for three male lynx were in past regeneration harvest units from 14-55 years old. These lynx did not use the 8-year old Ball Creek fire area except along the edge and in a few unburned patches. In the Middle Fork, the two male lynx using National Forest lands had 15 percent of their locations in past regeneration harvest units from 23-56 years old, as well as post-fire sanitation/salvage units from 20-22 years old. These lynx were using burn edges as well as tree patches and stringers as small as 15 acres within the 8000-acre Challenge fire area (that burned 25 years ago) and also within the 46,000-acre Skyland fire area (that burned 15 years ago).

Edge Buffering: Lynx use of openings was also examined. Ninety-four percent of the lynx locations were found within 384 feet of the edge of polygons with trees greater than or equal to 5 inches dbh. Many of Squires' lynx telemetry locations on the Flathead National Forest that were in the herb and shrub VMAP dominance classes were located along the edge of forested polygons. Ninety-seven percent (6280 of 6505) of lynx locations were found within 121 feet of the forest edge.

Analysis of Summer Lynx Locations

The number of lynx telemetry locations on the Flathead National Forest was more limited for the summer time period than winter, with only 1956 total locations in the Middle Fork Flathead River watershed. In summer, 30 percent (113 of 379) of locations were found in herb, shrub, and sparse vegetation polygons compared to 6 percent in winter within the herb and shrub classes, consistent with Squires published findings (Squires et al. 2010). Ninety-two percent (1790 of 1956) of summer lynx locations were found within 384 feet of a forest edge which is 6 percent lower than that observed during winter.

GIS Process

Kathy Ake, GIS Specialist

Phase I: Lynx Habitat Map Updates Flathead National Forest

GIS process by Kathy Ake, GIS Specialist, Flathead National Forest

Elevation

Low elevations lacking deep, fluffy snow were not included as lynx habitat. Based upon Squires' research (2010, 2013) areas above about 4,100 ft. are considered lynx habitat unless: 1) the FNF had telemetry data indicating lynx are using lower elevations for a particular drainage/portion of a drainage or 2) there is data indicating greater than average snow depths for a drainage/portion of a drainage (based upon local snow depth data from weather reporting stations and NRCS snow courses) (see Table C-2 and Figure C-1). Where we lacked data, we were conservative.

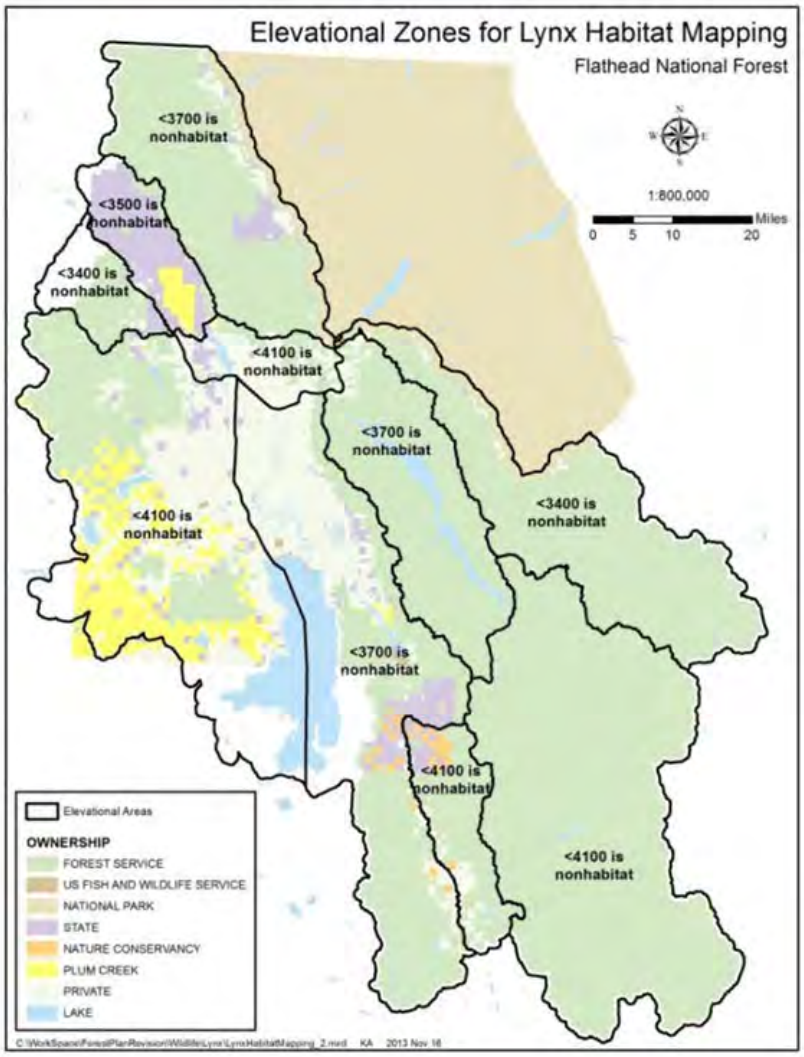


Figure C-1. Elevations for lynx habitat modeling on the Flathead National Forest

Table C-2. Areas above threshold elevations that are considered habitat for lynx based upon deep, fluffy snow

Area Description	Habitat Elevation Threshold (feet)
North Fork Flathead River, north of Canyon Creek drainage	3,700
North Fork Flathead River, south of Canyon Creek drainage	4,100
Middle Fork Flathead River	3,400
South Fork Flathead River, HH Reservoir drainage	3,700
South Fork Flathead River, south of HH Reservoir drainage	4,100
Swan River (Swan Valley), except as described below	3,700
Swan Valley east side from Goat Creek south to divide	4,100
Salish Mountains, south of Good Creek	4,100
Good Creek drainage (in the Olney, MT area)	3,400
Stillwater River, east of Hwy 93	3,500

Non-Forest

Non-forest areas were excluded as lynx habitat. The VMAP base-level layer (2012 classification, Barber et al. 2011, Berglund et al. 2009) was used to delineate non-forest vegetation classes, but was first updated for recent harvest and fires. To delineate recent harvest and fires, the USFS FACTS database and USFS fire databases were used to determine if a non-forest VMAP polygon was the result of recent fire or harvest. If so, it was coded as "transitional forest." Then the VMAP classes representing "sparse vegetation" (including permanent rock and other areas with <10 percent canopy cover) as well as herbaceous vegetation were not coded as lynx habitat. VMAP codes are 3100 for HERB; 7000 for SPVEG; and 8900 for TR-FOR (transitional forest).

QUERY: ("LIFEFORM" = 3100 OR "LIFEFORM" = 7000) AND "DOM_GRP_6040" <> 8900

Water

Water was excluded as lynx habitat. Lakes, ponds, and reservoirs greater than and equal to 5 acres in size were not coded as lynx habitat. National Hydrologic Data (NHD) datasets were used to select for water bodies greater than 5 acres in size. Codes are 390 for Lake/Pond and 436 for Reservoir. (Note: NHD "Ice Mass" polygons are all within the non-forest VMAP polygons and "Swamp/Marsh" polygons may be within the herbaceous or shrub VMAP polygons).

QUERY: ("FTYPE" = 390 OR "FTYPE" = 436) AND "GIS acres" >= 5.00

Potential Vegetation Type (PVT)

VMAP categories for "forest" and "transitional forest" within the elevation range used by Canada lynx were assessed for FNF lynx habitat. Forest, shrub and transitional forest VMAP polygons were coded as lynx habitat if:

1) the associated PVT has the capability of producing boreal spruce/subalpine fir forest, or 2) the pattern of vegetation on the forest is such that a PVT capable of producing snowshoe hares (such as grand fir PVT) is in close juxtaposition to a PVT capable of producing spruce/subalpine fir forest. Because lynx do not use warm dry habitats (Squires 2010) those PVT groups were not coded as lynx habitat (USFS R1 modeled PVT layer, USDA FS 2004). There is some uncertainty regarding lynx use of the *Pinus albicaulus* and *Larix lyalli* habitat types, but these habitat types make up only about 4% of the modelled lynx habitat on the Forest. Table C-3 provides a crosswalk between the PVT code and lynx habitat.

Table C-3. Crosswalk between PVT code and lynx habitat.

PVT Code	Characteristic	Lynx Habitat Code
abgr1	warm, dry	HABITAT
abgr2	warm, dry	HABITAT
abgr3	warm, moist	HABITAT
abla1	cool, wet	HABITAT
abla2	cool, moist	HABITAT
abla3	cool, moderately dry	HABITAT
abla4	Cold	HABITAT
laly	Cold	HABITAT
pial	Cold	HABITAT
picea	cool moist	HABITAT
pico	cool, moderately dry	HABITAT
pifl	Cold	HABITAT
pipo	warm, dry	NOT HABITAT

PVT Code	Characteristic	Lynx Habitat Code
poptre	Hardwood	HABITAT
psme1	warm, dry	NOT HABITAT
psme2	warm, dry	NOT HABITAT
psme3	warm, dry	NOT HABITAT
thpl1	cool, wet	HABITAT
thpl2	warm, moist	HABITAT
tshe	cool, moist	HABITAT
tsme1	cool, moist	HABITAT
tsme2	cool, moist	HABITAT

Combining Input Layers

After combining the four input feature classes (elevation, non-forest, water, and PVT group) and clipping the data to the Flathead NF Plan Revision geographic area boundaries (plus an additional 1 mile), the field <LynxHabitatPhaseI_description> was created.

Values are 'HABITAT' or NOT HABITAT (<reason>)' based upon the attributes of the input layers, within the elevation range used by lynx.

PVTs were available for more than 95 percent of the area mapped, but where the input feature classes did not have PVT information, the FNF VMAP classification (2012) updated with transitional forest for recent fires and timber harvest) was used, as shown in Table 4. VMAP is a classification of existing vegetation dominance types and not potential vegetation types (PVT). On the FNF, Douglas- fir (PSME) and western larch (LAOC) may occur as dominant seral species in boreal forest PVTs. As a result, the PSME and LAOC dominance types from VMAP were coded as habitat, to be conservative. If PVTs were not available, VMAP provided the best available information.

Table C-4. VMAP classes classified as potential lynx habitat on the Flathead National Forest

VMAP Class	Lynx Habitat Description
3300 – SHRUB	HABITAT
5000 – WATER	NOT HABITAT
8010 – PIPO	NOT HABITAT
8020 – PSME	HABITAT
8023 – PSME-IMIX	HABITAT
8024 – PSME-TMIX	HABITAT
8040 – LAOC	HABITAT
8043 – LAOC-IMIX	HABITAT
8044 – LAOC-TMIX	HABITAT
8050 – PICO	HABITAT
8053 – PICO-IMIX	HABITAT
8060 – ABLA	HABITAT
8064 – ABLA-TMIX	HABITAT
8070 – PIEN	HABITAT
8073 – PIEN-IMIX	HABITAT
8074 – PIEN-TMIX	HABITAT
8090 – THPL	HABITAT
8123 – PIAL-IMIX	HABITAT
8130 – LALY	HABITAT
8160 – POPUL	HABITAT
8400 – IMIX	HABITAT

VMAP Class	Lynx Habitat Description
8600 – HMIX	HABITAT
8900 – TR-FOR	HABITAT

As a final step, the DISSOLVE ArcTool was applied to decrease the number of polygons. Polygons less than 1.0 acre in size were merged into the adjacent polygon sharing the longest border.

Appendix C References

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Appendix D: Key plan components

The following selection of management direction are excerpts from the revised forest plan of key information related to listed species.

Bull Trout

Desired conditions: A desired condition is a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be described in terms that are specific enough to allow progress toward their achievement to be determined, but do not include completion dates (36 CFR 219.7(e)(1)(i)).

Desired conditions describe the aspirations or visions of what the plan area (or portions thereof) should look like in the future and drive the development of the other plan components. Desired conditions essentially set forth the desired landscape of the future and the other plan components give guidance on how to get there. Desired conditions should be developed with the context of the plan area's distinctive roles and contributions within the broader landscape in mind (sec. 22.32 of this Handbook). A plan's set of desired conditions must be internally consistent so they are feasible and attainable, and they must be written clearly so that they can be understood by the public as well as the Agency. The set of desired conditions must reflect the capability of the plan area and the fiscal capability of the Agency. The set of desired conditions for plan revision must cover ALL the requirements for a plan set out at 36 CFR 219.8 through 219.11—to provide for sustainable ecosystems with ecological integrity, in the context of multiple-use management. The set of desired conditions should integrate the ecological, economic, social, and cultural desired conditions. The format function of desired conditions is addressed in this section. Sections 23 through 24.44 of this Handbook set forth guidance for the resource requirements for plan components.

Desired conditions, as key plan components, are fundamental to determining monitoring strategies and requirements. Desired conditions should define the geographic scale, where applicable, used to measure change associated with them. Responsible Officials should include sufficiently detailed descriptions of desired conditions so they are useful to determine the purpose and need for many projects such as restoration projects and activities. Other plan content may identify, if applicable, how desired conditions may differ from existing conditions.

Implementation of the revised Plan is driven in large part by the Desired Conditions which were developed to move the affected forest resources toward environmental stability and diversity.

The intent of these desired conditions is to create a proactive commitment to the recovery of bull trout within the Flathead National Forest. These desired conditions make the commitment to implement the Bull Trout Recovery Plan. The forest determined making bull trout recovery a focus was the most effective way to benefit bull trout and minimize adverse effects due to ongoing management.

The Western Montana Bull Trout Conservation Strategy (2012) will be used to inform baseline data needs and management direction as it relates to bull trout and designated critical habitat on the Flathead National Forest. The conservation strategy was developed by the Western Montana Level 1 Team to provide direction for affected forests to implement bull trout recovery actions. The strategy is a component of the final recovery plan and as such fits with the revised plan's stated desired condition for bull trout and designated critical habitat.

Desired Conditions

Bull Trout Specific Desired Condition

FW-DC-P&C-16 The bull trout population trends towards recovery through cooperation and coordination with USFWS, tribes, State agencies, other Federal agencies, and interested groups. Recovery is supported through the Bull Trout Conservation Strategy and the Bull Trout Recovery Plan.

Additional desired conditions determined to benefit bull trout and designated critical habitat are listed below.

The following desired conditions apply at the larger (e.g., watershed) scale (10 or 12 digit hydrologic unit scale), not at particular sites, e.g., stream reaches. The national hydrologic unit is the basis for defining the specific scales at which the watershed desired conditions apply. The three watershed scales most relevant to the implementation of the forest plan are subbasin (8-digit hydrologic unit), watershed (10-digit hydrologic unit), and subwatershed (12-digit hydrologic unit). Individual project assessments often use data collected at finer scales, such as the subwatershed, drainage, valley segment, site, or stream reach scale.

01 NFS lands provide the distribution, diversity, and complexity of watershed- and landscape-scale features, including natural disturbance regimes and the aquatic and riparian ecosystems, to which species, populations, and communities are uniquely adapted. Watersheds and associated aquatic ecosystems retain their inherent resilience and are able to respond and adjust to disturbances without long-term adverse changes to their physical or biological integrity.

02 Spatial connectivity exists within or between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, groundwater, wetlands, upslope areas, headwater tributaries, and intact habitat refugia. These network connections provide chemically and physically unobstructed routes to areas critical for fulfilling the requirements of aquatic, riparian-associated, and many upland species of plants and animals.

03 Habitat and ecological conditions support self-sustaining populations of native aquatic and riparian-associated plant and animal species.

04 Instream habitat conditions for managed watersheds move in concert with or towards those in reference watersheds. Aquatic habitats are diverse, with channel characteristics and water quality reflective of the climate, geology, and natural vegetation of the area. Stream habitat features across the Forest, such as large woody material, percent pools, residual pool depth, median particle size, and percent fines, are within reference ranges as defined by agency monitoring.

05 Aquatic systems and riparian habitats possess physical integrity, including physical integrity of shorelines, banks, and bottom configurations, within their natural range of variation.

06 Water quality, including groundwater, meets or exceeds applicable state water quality standards, fully supports designated beneficial uses, and meets the ecological needs of native aquatic and riparian-associated plant and animal species. The Forest has no documented lands or areas that are delivering water, sediment, nutrients, and/or chemical pollutants that would result in conditions that violate the State of Montana's water quality standards (e.g., TMDLs) or are permanently above natural or background levels.

07 The sediment regime within waterbodies is within the natural range of variation. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

08 In-stream flows are sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows are retained. Streamflow regimes maintain riparian ecosystems and natural channel and floodplain dimensions. Stream channels transport sediment and woody material over time while maintaining reference dimensions (e.g., bankfull width, depth, entrenchment ratio, slope, and sinuosity).

09 The timing, variability, and duration of floodplain inundation is within the natural range of variation. Floodplains are accessible to water flow and sediment deposits. Over-bank floods allow floodplain development and the propagation of flood-associated riparian plant and animal species.

10 Groundwater-dependent ecosystems, including peatlands, bogs, fens, wetlands, seeps, springs, riparian areas, groundwater-fed streams and lakes, and groundwater aquifers, persist in size and seasonal and annual timing and exhibit water table elevations within the natural range of variation. Surface and groundwater flows are connected, provide late-season stream flows and cold water temperatures, and sustain the function of surface and subsurface aquatic ecosystems.

11 Upland areas surrounding wetlands that have the most direct influence on wetland characteristics, as well as stream segments that flow directly into wetlands, sustain the characteristics and diversity of those wetlands. Non-forested areas in and surrounding wetlands are composed of plant and animal communities that support and contribute to wetland ecological and habitat diversity.

12 Habitats and native assemblages of aquatic and riparian-associated plants and animals are free of persistent non-native species such as zebra mussels, New Zealand mud snails, quagga mussels, Eurasian milfoil, and brown trout. Non-native species (e.g., non-native bullfrogs, Chytrid fungus, yellow flag iris, or reed canary grass) are not expanding into waterbodies.

13 Peatlands, including fens, have the necessary soil, hydrologic, water chemistry, and vegetative conditions to provide for continued fen development and resilience to changes in climate and other stressors. Peatlands support unique plant and animal species that are characteristic of historical conditions. Trees exist on drier hummocks within and on the edge of peatlands but do not retard development.

14 Beavers play an important ecological role benefiting groundwater, surface water, stream aquatic habitat complexity, and adaptation to changing climate conditions.

15 Watersheds provide high-quality water for downstream communities dependent upon them.

16 Educational and informational programs are provided to enhance understanding of wetlands, stream ecosystems, and watersheds.

17 The Forest cooperates with Federal, tribal, State, and local governments to identify and secure instream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.

Desired Conditions – Conservation Watershed Network (FW-DC-CWN)

01 The conservation watershed network has high-quality habitat and functionally intact ecosystems that are contributing to and enhancing the conservation and recovery of specific threatened or

endangered fish species or aquatic species of conservation concern[3] and providing high water quality and quantity. The watersheds contribute to the conservation and recovery of native fish and other aquatic species and help make habitat conditions more resilient to climate change.

Desired Conditions – Riparian Management Zone (FW-DC-RMZ)

01 Riparian management zones reflect a natural composition of native flora and fauna and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes and processes affecting the area. In addition to natural processes, vegetation management activities contribute to vegetation conditions that are resilient. The species composition and structural diversity of native plant communities in riparian management zones, including wetlands, provide summer and winter thermal regulation, nutrient filtering and appropriate rates of surface erosion, bank erosion, and channel migration.

02 Riparian management zones provide key conditions, including slope stability and associated vegetative root strength, wood delivery to streams and streambanks, input of leaf and organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality, operating consistently with local disturbance regimes.

03 Riparian management zones in forested settings have more diverse vegetation structure relative to areas outside the riparian management zone. This includes a higher density of large downed wood, snags, and decadent live trees and higher amounts of litter and duff to support terrestrial riparian-associated plants and animals that feed, nest, den, or roost near water. Downed wood greater than 9 inches in diameter is available, consisting of intact pieces of a variety of species, sizes, and stages of decay, including cull tree tops and cull logs.

04 Riparian management zones have more diverse vegetation composition relative to areas outside the riparian management zone. This includes riparian-associated grasses, forbs, shrubs (e.g., willows); deciduous trees (e.g., cottonwoods, birch, aspen), and conifer trees to support terrestrial animals that feed, nest, den, or roost near water.

05 A mosaic vegetation pattern, including forest patches of different shapes, successional stages, and tree densities, occurs within riparian management zones. Early successional forest openings are typically irregularly shaped, with variable tree densities or patches of larger trees along their boundaries that reduce the risk of windthrow and reduce edge effects for wildlife.

06 Cover conditions in riparian management zones contribute to habitat connectivity for a variety of wildlife species (e.g., Canada lynx, grizzly bear, marten, fisher).

Desired conditions – Soils (FW-DC-SOIL)

01 Soil function and long-term productivity is conserved.

[3] Species of conservation concern are identified by the Regional Forester; more information is available at http://bit.ly/NorthernRegion-SCC.

Objectives

An objective is a concise, measurable, and time-specific statement of a desired rate of progress toward a desired condition or conditions. Objectives should be based on reasonably foreseeable budgets (36 CFR 219.9(e)(1)(ii)).

A project or activity is consistent with the objectives of the Plan if it contributes to or does not prevent the attainment of any other applicable objectives. The project documentation should identify any applicable objective(s) to which the project contributes. If there are no applicable objectives, project documentation should state that fact. It should be noted that although desired conditions can be represented by an unconstrained budgets, objectives under the proposed action are based upon current

Objectives - Watersheds (FW-OBJ-WTR)

01 Complete all essential work identified within the Class 2 priority watersheds as identified under the watershed condition framework (see appendix E).

02 Enhance or restore 25 to 50 miles of stream habitat to maintain or restore structure, composition, and function of habitat for fisheries and aquatic species other than fish. Activities include, but are not limited to, berm removal, large woody debris placement, road decommissioning or stormproofing, riparian planting, and channel reconstruction.

03 Reconnect 10 to 20 miles of habitat in streams disconnected by roads or culverts where aquatic and riparian-associated species' migratory needs are limiting distribution of those species.

04 Improve watershed conditions on 4,000 to 8,000 acres, with an emphasis on priority watersheds under the watershed condition framework and the conservation watershed network.

Objectives – Conservation Watershed Networks (FW-OBJ-CWN)

01 The conservation watershed network is the highest priority for restoration actions for native fish and other aquatic species. The stormproofing of 15 to 30 percent of the roads in the conservation watershed network is prioritized, as funding allows, to benefit aquatic species (e.g., bull trout). See appendix C for specific strategies for treatment options and for prioritization, such as of roads paralleling streams vs. ridgetop roads.

02 Over the life of the plan, stormproofing the transportation system (e.g., upsizing culverts, reducing sediment on roads, realigning stream-constraining road segments, etc.) will be accomplished as opportunities are identified on the following prioritized subwatersheds: Sullivan Creek, Wounded Buck Creek, Trail Creek in the North Fork, Whale Creek (includes Upper Whale, Lower Whale, and Shorty Creeks), Granite Creek, Bear Creek, Goat Creek, and Lion Creek.

Objectives – Riparian Management Zone (FW-OBJ-RMZ)

01 Improve 300 to 1,000 acres of riparian habitat.

Objectives - Infrastructure (FW-OBJ-IFS)

01 Decommission or place into intermittent stored service 30 to 60 miles of roads.[4] Priorities are roads causing resource damage in priority watersheds and/or roads located within desired nonmotorized recreation opportunity spectrum settings and/or roads within bull trout watersheds.

Forest Plan Standards

Standards: A standard is a mandatory constraint on project and activity decision making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1) (iii)).

There are several ways to constraint projects and activities: standards, guidelines, and other sources of constraints. A standard differs from a guideline in that a standard is a strict constraint, allowing no variation, whereas a guideline allows variation if the result would be equally effective. Examples of other sources of constraints on the design of projects and activities include congressional direction, regulations, timber sale contract clauses, and special use authorization standard clauses.

Standards are used when the requirement is absolute such as to ensure projects will not prevent achievement of a desired condition, or to ensure compliance with laws such as the timber requirements of sections 6(g)(3)(E) and (F) of the NFMA to protect aesthetics, fish, recreation, soil, watershed, and wildlife (16 U.S.C. 1604(g)(3)(E) and (F)), or to protect threatened or endangered species under the Endangered Species Act of 1973 as amended (16 U.S.C. 1531-1544). Standards can be used to limit disturbances from projects and activities to animal dens, perennial streams, and wildlife habitat. Standards can also be used to protect resources by restricting authorization of specific uses in appropriate circumstances. Such uses might include firewood gathering, grazing, motor vehicle use, road construction, timber harvest, removal of sand and gravel, sanitary waste facilities, storage of fuel, and surface occupancy in riparian areas.

Standards – Watersheds (FW-STD-WTR)

01 New stream diversions and associated ditches shall have screens placed on them to prevent capture of fish and other aquatic organisms.

02 Project-specific best management practices (including both Federal and State of Montana practices) shall be incorporated into project plans as a principle mechanism for controlling non-point pollution sources in order to meet soil and watershed desired conditions and to protect beneficial uses.

03 Portable pump set-ups shall include containment provisions for fuel spills, and fuel containers shall have appropriate containment provisions.

Standards – Riparian Management Zone (FW-STD-RMZ)

01 The entire width of the riparian management zones shall be delineated as follows.

Category 1 Fish-bearing streams: Riparian management zones consist of the stream and the area on both sides of the stream extending from the edges of the active channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to a distance equal to the height of two site-

[4] USDA. (2014). Travel analysis report for Flathead National Forest. Kalispell, MT: USDA Forest Service, Flathead National Forest. Planning record exhibit # 00413.

potential trees,[5] or 300 feet slope distance (600 feet total, which includes both sides of the stream channel), whichever is greatest.

Category 2 Permanently flowing non-fish-bearing streams: Riparian management zones consist of the stream and the area on both sides of the stream extending from the edges of the active channel to the top of the inner gorge, or to the outer edges of the riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, which includes both sides of the stream channel), whichever is greatest.

Category 3 Seasonally flowing or intermittent streams and lands identified as potentially unstable or landslide prone: This category includes features with high variability in size and site-specific characteristics. At a minimum, the riparian management zone must include (1) the intermittent stream channel and the area to the top of the inner gorge; (2) the intermittent stream channel or wetland and the area to the outer edges of the riparian vegetation; (3) the area from the edges of the stream channel, wetland, or landslide-prone terrain to a distance equal to the height of one site-potential tree or 100 feet slope distance (200 feet total, which includes both sides of the stream channel), whichever is greatest; or (4) the extent of unstable and potentially unstable areas (including earthflows).

Category 4a Ponds, lakes, reservoirs, and wetlands greater than 0.5 acre and all sizes of howellia ponds and fens/peatlands: Riparian management zones consist of the body of water or wetland and the area to the outer edges of the riparian vegetation; or to the extent of the seasonally saturated soil; or to the distance of the height of one site-potential tree; or 300 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond, or lake—whichever is greatest. For management direction related to water howellia, refer to the following plan components: FW-DC-PLANT-01 and 02, FW-GDL-PLANT-01, 02, and 03, FW-DC-NNIP-01, MA3b-Special Area-DC-04, and GA-SV-DC-01 and 02.

Category 4b Ponds, lakes, reservoirs, and wetlands less than 0.5 acre (except howellia ponds and fens/peatlands; see category 4a): Riparian management zones consist of the body of water or wetland and the area to the outer edges of the riparian vegetation; or to the extent of the seasonally saturated soil; or to the distance of the height of one site-potential tree; or 100 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond, or lake—whichever is greatest.

The riparian management zone is divided into two areas called the inner and outer riparian management zones. Management direction may differ in these two zones. If an already established road is located within the riparian management zone, a site-specific determination shall be made as to the width of the inner riparian management zone. The width defined in the descriptions below can be made larger to protect sensitive resources.

The *inner* riparian management zones are defined as follows:

- For category 1 and 2 streams, the width of the inner riparian management zone shall be a minimum of 150 feet on each side of the stream.

[5] The height of a site-potential tree is the expected average maximum height a tree in the dominant crown class (upper forest canopy layer) would achieve, given the site productivity.

- For category 3 streams where side slopes are greater than 35 percent, the width of the inner riparian management zone shall be a minimum of 100 feet on each side of the stream or to the top of the inner gorge slope break, whichever is greater.
- For category 3 streams where side slopes are less than 35 percent, the inner riparian management zone shall be a minimum of 50 feet on each side of the stream.
- For category 4a and 4b ponds, lakes, reservoirs, and wetlands, the width of the inner riparian management zone shall be a minimum of 50 feet except for peatlands, fens, and bogs, where the minimum width is 300 feet.

The following standards apply to the entire riparian management zones for all categories:

02 Vegetation management activities within riparian management zones must be consistent with State law (e.g., Montana Streamside Management Zone Law).

03 Storage and refueling sites within riparian management zones must be approved by a Forest aquatics specialist or resource advisor and have an approved spill containment plan.

04 Herbicides, pesticides, and other chemicals shall not be applied within riparian management zones. Exceptions may be made if chemical use is necessary to maintain, protect, or enhance aquatic and riparian resources or to restore native plant or animal communities.

The following standard applies to the entire riparian management zone for peatlands, fens, and bogs within category 4a:

05 Ground-disturbing vegetation treatments in the riparian management zones for peatlands, fens, and bogs shall only occur in order to restore or enhance aquatic and riparian-associated resources.

The following standard applies to the inner riparian management zone for all categories except peatlands, fens, and bogs within category 4a:

06 Vegetation management shall only occur in the *inner* riparian management zone in order to restore or enhance aquatic and riparian-associated resources. Exceptions may occur as long as aquatic and riparian-associated resources are maintained. Exceptions shall be limited to (1) non-mechanical treatments such as prescribed fire, sapling thinning, or hand fuel reduction treatments; (2) mechanical fuel reduction treatments in the wildland-urban interface within 300 feet of private property boundaries; or (3) treatments that address human safety hazards (e.g., hazard trees) adjacent to infrastructure or within administrative or developed recreation sites.

Standards – Soil (FW-STD-SOIL)

01 Vegetation management activities do not create detrimental soil conditions on more than 15 percent of an activity area. In activity areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current condition and proposed activity must not exceed 15 percent following project implementation and restoration. In areas where more than 15 percent detrimental soil conditions exist from prior activities, the effects from project implementation and restoration must address currently impaired soil functions to improve the long-term soil condition.

02 Project-specific best management practices and design features shall be incorporated into land management activities as a principle mechanism for protecting soil resources.

03 Soil function shall be restored on temporary roads (and decommissioned road prisms used as temporary roads) when management activities that use these roads are completed. Restoration

treatments shall be based on site characteristics and methods that have been demonstrated to measurably improve soil productivity.

04 When decommissioning existing roads, soil function shall be restored. Restoration treatments shall be based on site characteristics and methods that have been demonstrated to measurably improve soil productivity.

Standards - Infrastructure (FW-STD-IFS)

05 During dust abatement applications on roads, chemicals shall not be applied directly to watercourses, waterbodies (e.g., ponds, lakes), or wetlands.

06 For new road construction and reconstruction of existing road segments within or adjacent to riparian management zones, side-casting of fill material shall not occur.

07 To maintain free-flowing streams, new, replacement, and reconstructed stream crossing sites (culverts, bridges, and other stream crossings) shall accommodate at least the 100-year flow, including associated bedload and debris.

Standards – Grazing (FW-STD-GR)

08 New livestock handling and/or management facilities must be located outside of riparian management zones. New areas for livestock trailing, bedding, watering, salting, loading, and other handling or management efforts shall be limited to those areas and times that would not adversely affect listed animal and plant species or animal and plant species of conservation concern.

Forest Plan Guidelines

Guidelines: A guideline is a constraint on project and activity decision making that allows for departure from its terms, so long as the purpose of the guideline is met (§ 219.15(d)(3)). Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iv)).

Guidelines serve the same purpose as standards but they differ from standards in that they provide flexibility in defining compliance, while standards are absolute constraints.

Guidelines – Watershed (FW-GDL-WTR)

01 In order to restore watersheds, sediment-producing activities in watersheds with approved TMDLs should be designed to comply with the Montana Department of Environmental Quality's TMDL implementation plan.

02 To maintain stream channel stability and aquatic habitat, large woody debris should not be cut and/or removed from stream channels unless it threatens critical infrastructure or human safety, such as mid-channel bridge piers, or poses long-term risks to bull trout passage.

03 When drafting water from streams, pumps should be screened to prevent capture of fish and aquatic organisms. During the spawning season for native fish, pumping sites should be located away from spawning gravels.

04 When beaver dams are threatening infrastructure or impairing bull trout spawning, preferred techniques that sustain beavers (e.g., using pipes to reduce water levels, notching dams to restore fish passage) should be used.

05 To protect spawning fish, eggs, and embryos, in-stream management activities that may disturb native salmonids or that have the potential to directly deliver sediment to their habitats should be limited to times outside of spawning and incubation seasons for those species, as displayed in table 1.

Table 5. Operational restrictions to protect spawning fish and fry emergence while operating within the high water mark

Species	Location	Inoperable activity period
Westslope cutthroat trout	Known spawning streams	May 1 through July 15
Bull trout	Known spawning streams	September 1 through March 15

06 Information on preventive measures related to aquatic invasive species should be provided at water-based recreation sites such as boat ramps to help prevent the introduction of non-native species.

07 To prevent the introduction of non-native species, equipment that comes in contact with a waterbody should be inspected and cleaned of aquatic invasive species prior to use in a waterbody or when moving between watersheds, including drafting equipment, water tenders, and helicopter buckets.

08 When aquatic invasive species (e.g., zebra mussels, quagga mussels, Eurasian milfoil, reed canary grass) are detected, they should be controlled in cooperation with appropriate agencies.

09 New management activities shall be consistent with applicable state source water protection requirements and goals. Short-term effects[6] from activities may be acceptable when those activities support long-term benefits[7] to aquatic resources.

Guideline – Conservation Watershed Networks (FW-GDL-CWN)

01 To reduce sedimentation, for subwatersheds included in the conservation watershed network, net increases in stream crossings and road lengths should be avoided in riparian management zones unless the net increase improves ecological function in aquatic ecosystems. The net increase is measured from the beginning to the end of each project.

Guidelines – Riparian Management Zone (FW-GDL-RMZ)

The following guidelines apply to entire riparian management zones for all categories:

01 Downed trees (e.g., windthrow) should be left on-site inside of riparian management zones to meet large wood desired conditions, where it is safe and practical to do so.

02 Aerial application of chemical retardant, foam, or other fire chemicals and petroleum should not occur in mapped aerial retardant avoidance areas (see glossary) in order to protect terrestrial and aquatic resources associated with riparian management zones.

[6] Effects that occur during, or immediately following, implementation of activity.

[7] Benefits that occur following completion of the activity.

03 Temporary fire facilities (e.g., incident bases, camps, staging areas, helispots, and retardant batch plants) for incident activities should not be located in riparian management zones in order to protect terrestrial and aquatic resources associated with riparian management zones.

04 To protect the integrity of aquatic and riparian ecosystems, refueling, equipment maintenance, and storage of fuels or other toxicants should not occur in riparian management zones.

05 When conducting wildland fire operations within riparian management zones, minimum impact suppression tactics should be used to protect terrestrial and aquatic resources associated with riparian management zones.

06 Sand and gravel mining and extraction at new sites should not occur within riparian management zones to protect terrestrial and aquatic resources associated with riparian management zones. Exceptions may occur for trail work.

07 At developed recreation sites and administrative sites, trees within the riparian management zone that are determined to be a hazard should be felled to provide for public safety, in consultation with a Forest aquatics specialist. If felled, downed trees should be left on-site as needed to meet large wood desired conditions, where it is safe and practical to do so.

08 If tree harvest activities occur within riparian management zones, live reserve trees should be retained (if present) to protect water quality and contribute to forest live tree structural diversity (and future dead standing and downed wood) for aquatic- and riparian-dependent species (e.g., the clearcut harvest method should not be used). Because site and forest conditions vary considerably, the sizes, species, density, and pattern of reserve trees would be determined at the project level.

09 If new openings are created in riparian management zones through even-aged regeneration harvest (see glossary) or fuel reduction activities, each created opening's distance to cover (see glossary) should not exceed 350 feet to provide wildlife habitat structural diversity, connectivity, and cover.

10 If harvest activities occur within riparian management zones, all snags greater than or equal to 12 inches d.b.h. should be retained within the harvest area to contribute towards more diverse forest structure and desired habitat conditions by providing higher snag and downed wood densities (once the snags fall) as compared to areas outside riparian management zones. Exceptions to this guideline and development of an alternative snag prescription may be considered where there are issues of human health and safety (i.e., developed recreation sites, sites adjacent to landings) or where a decreased amount of wildland fuels is desired to protect communities and community assets (i.e., within the wildland-urban interface). Due to the high density and variability in snags and landscape conditions created by wildfire, exceptions and alternative prescriptions may also be considered in areas burned by stand-replacing fire based on a site-specific analysis.

11 To reduce the risk of sediment input and to protect the integrity of aquatic and riparian ecosystems, new roads (including temporary roads) and new landings should not be constructed in category 1, 2 or 3 riparian management zones, except where it is necessary for a road to cross a stream. Exceptions may be considered where site-specific analysis and implementation of mitigation measures are determined appropriate by a Forest aquatics specialist to protect aquatic and riparian resources.

The following guidelines apply to the entire riparian management zone for category 1, 2, and 3 streams and for fens/peatlands:

12 Vegetation management activities should be designed to include one or more of the following measures to avoid ground disturbance that may deliver sediment and reduce the risk of alteration of hydrologic processes:

- no ground-based logging equipment except during suitable winter logging periods;
- full suspension yarding;
- falling and yarding methods that promote retention of understory vegetation and other groundcover

13 If prescribed fire activities occur, ignition should take place outside the riparian management zone and fire should be allowed to naturally spread into the riparian management zones. The intent is to allow fire to enter and cross the zone at predominantly low to moderate intensity and create vegetation conditions consistent with natural fire regimes.

The following guidelines apply only to the inner riparian management zone for categories 4a and 4b (except fens/peatlands):

14 To reduce the risk of sediment input and to protect the integrity of aquatic and riparian ecosystems, new landings and new roads (including temporary roads) should not be constructed. Exceptions for temporary roads and landings may be considered only where site-specific analysis and implementation of mitigation measures are determined to be appropriate by a Forest aquatics specialist to protect aquatic and riparian resources.

15 If vegetation treatments occur in the inner riparian management zones, they should be designed to include one or more of the following measures to avoid ground disturbance that may deliver sediment to wetlands and to reduce the risk of alteration of hydrologic processes:

- no ground-based logging equipment unless occurring during suitable winter logging periods;
- full suspension yarding;
- falling and yarding methods that promote retention of understory vegetation and other groundcover

Guidelines – Soils (FW-GDL-SOIL)

01 Ground-based equipment for vegetation management should only operate on slopes less than 40 percent to protect soil quality. Exceptions will be considered only with site-specific analysis where soil, slope, and equipment are determined appropriate to maintain soil functions.

02 To maintain soil quality and stability, ground-disturbing management activities should not occur on landslide-prone areas.

03 Project activities should provide sufficient effective ground cover with a post-implementation target of 85 percent to provide nutrients and reduce soil erosion.

04 To maintain organic matter for soil function, vegetation management activities should conserve coarse woody debris at levels described in FW-DC-TE&V-17 and FW-GDL-TE&V-08 in the Vegetation and Terrestrial Ecosystems section. Management activities should either retain forest floor at half the current thickness or no less than 1 centimeter thick on average across activity areas.

Guidelines – Infrastructure (FW-GDL-IFS)

03 Roads, skid trails, temporary roads, and trails should have water drainage systems that possess minimal hydrological connectivity to waterbodies (except at designated stream crossings) to maintain the hydrologic integrity of watersheds and protect them from the delivery of water, sediment, and pollutants.

04 To reduce the risk to aquatic resources when decommissioning roads, making roads impassable, or storing roads, roads should be left in a hydrologically stable condition. For example, drainage off roads should be routed away from resources and landslide prone areas and towards stable areas of the forest floor to provide filtering and infiltration.

05 Prior to placing physical barriers such as berms on travel routes (e.g., roads, skid trails, temporary roads, or trails), the Forest should ensure that road drainage features are in place to protect aquatic and other resources.

06 To maintain and/or improve watershed ecosystem integrity and reduce road-related mass wasting and sediment delivery to watercourses, new and relocated roads, trails (including skid trails and temporary roads), and other linear features[8] should not be located on lands with high mass wasting potential.

07 To maintain free-flowing streams, new, replacement, and reconstructed stream crossing sites (culverts, bridges, and other stream crossings) should be designed to prevent diversion of stream flow out of the channel in the event the crossing is plugged or has a flow greater than the crossing was designed for.

08 When constructing or reconstructing trail and road fords, measures to harden the streambed, banks, and approaches for new trail and road fords should be included in the project design in order to maintain channel stability and reduce sediment delivery to watercourses.

09 To protect water quality, maintenance activities such as road blading and snowplowing on existing roads, should not side-cast into or adjacent to waterbodies. When plowing snow, breaks should be designed in the snow berms to direct water off the road.

10 When constructing or reconstructing roads, drainage should be routed away from potentially unstable channels, fills, and hillslopes to reduce sediment delivery into streams.

11 To provide safe and functioning airstrips, management and maintenance of airstrips should follow Federal Aviation Administration recommendations.

12 Within areas specifically identified as being important for wildlife connectivity across highways (see table 18), the Forest should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety.

Table 6. Key highway crossing areas for wildlife

Area	Route	Mile Marker
east of Essex[1]	U.S. 2	181-184
east of Essex[1]	U.S. 2	189-190

[8] Linear features include powerline rights-of-way and utility corridors.

Area	Route	Mile Marker
east of Columbia Falls[1]	U.S. 2	141-143
north of Columbia Falls[1]	Rt. 486	7-9
between Whitefish and Eureka[1]	U.S. 93	148
between Whitefish and Eureka[1]	U.S. 93	157-160
Swan Valley[2, 3, 4]	U.S. 83	31-36
Swan Valley[2, 3, 4]	U.S. 83	45-58

1. Based on R. Ament, P. McGowen, M. McClure, A. Rutherford, C. Ellis, & J. Grebenc (2014), *Highway mitigation for wildlife in northwest Montana*, Bozeman, MT: Sonoran Institute, Northern Rockies Office, retrieved from http://largelandscapes.org/media/publications/Highway-Mitigation-Wildlife-NW-Montana.pdf.

2. Based on M. P. Huijser, K. E. Gunson, & C. Abrams (2006), Animal-vehicle collisions and habitat connectivity along Montana Highway 83 in the Seeley-Swan Valley, Montana: A reconnaissance, Western Transportation Institute, retrieved from http://www.mdt.mt.gov/research/projects/env/seeley.shtml.

3. Based on P. L. Sandstrom (1996), *Identification of potential linkage zones for grizzly bears in the Swan-Clearwater valley using GIS* (MS thesis), University of Montana, Missoula, retrieved from http://scholarworks.umt.edu/etd/.

4. Based on J. L. Weaver (2014), *Conservation legacy on a flagship forest: Wildlife and wildlands on the Flathead National Forest, Montana*, Bozeman, MT: Wildlife Conservation Society, retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjI5LmQ19nKAhUK6mMKHeRNC38QFggcMAA&url=http%3A%2F%2Fwww.wcsnorthamerica.org%2FAdmin-Plus%2FDocustore%2FCommand%2FCore_Download%2FEntryId%2F28194.aspx&usg=AFQjCNFbCN6XJslT6iW_LSda_zKBLU1O8g&bvm=bv.113034660,d.cGc.

13 To maintain and protect natural hydrologic flow paths, the transportation infrastructure should not alter stream courses. For example, streams should have crossing structures and not be routed down ditches.

14 To provide and maintain native aquatic organisms in fish-bearing streams, construction, reconstruction, or replacement of stream crossings should provide and maintain passage for all life stages of native aquatic organisms unless barriers are created or maintained to prevent spread or invasion of non-native species in alignment with fish and wildlife management agencies.

15 When designing, constructing, or reconstructing system trails, information on how to avoid and respond to bear-human encounters should be posted at trailheads. In addition, site-specific trail design should include one or more methods to limit the risk of bear-human conflicts such as, but not limited to,

- locating trails outside of riparian management zones or avalanche chutes unless it is necessary to cross or to access an existing developed recreation site, and
- designing and/or maintaining trails to increase sight distance and/or to address speed of travel consistent with site-specific conditions for the managed use of the trail.

16 To protect fisheries resources and riparian-associated resource conditions and to maintain quality and quantity of water flows to, within, or between groundwater-dependent ecosystems, groundwater use developments (e.g., drinking water wells, wastewater facilities) should not:

- be developed in riparian management zones (unless no alternatives exist);
- measurably lower river flows, lake levels, or flows to wetlands or springs (e.g., change springs from perennial to intermittent or eliminate springs altogether); and/or
- discharge pollutants directly to groundwater.

Guidelines – Lands and Special Uses (FW-GDL-LSU)

01 Special use authorizations in the primary conservation area should have permit requirements to help reduce or limit the risk of grizzly bear-human conflicts.

02 To maintain or improve habitat conditions for fish, water, and other riparian associated species and resources, authorizations for new special-use permits should include requirements for best management practices and at the conclusion of the permit should restore in-stream and riparian conditions if necessary.

03 To protect riparian and aquatic habitat, new support facilities should be located outside of riparian management zones. Support facilities include any facilities or improvements (e.g., workshops, housing, switchyards, staging areas, transmission lines) not directly integral to the production of hydroelectric power or necessary for the implementation of prescribed protection, mitigation, or enhancement measures. At time of permit reissuance, the removal of such support facilities, where practical, should be considered.

Guidelines - Recreation (FW-GDL-REC)

02 To protect resources, new solid and sanitary waste facilities should be located outside of the inner riparian management zone.

06 To protect fishery resources and riparian-associated plant and animal species, new developed recreation sites should not be located within the inner riparian management zone, except when they are related to health and safety or water, such as boat ramps and fish platforms. Structures should be developed with a Forest aquatics specialist so that fisheries and riparian-associated plant and animal species are protected.

Guidelines - Grazing (FW-GDL-GR)

03 Livestock trailing, bedding, watering, salting, loading, and other handling activities should be avoided in riparian management zones.

04 To reduce bank trampling of perennial vegetation on or near the water's edge (i.e., the greenline):

- do not exceed 20 percent streambank alteration;
- do not exceed 40 percent utilization of mean annual vegetative production on woody vegetation; and
- maintain at least 4-6 inches or do not exceed 40 percent utilization of mean annual vegetative production on herbaceous vegetation.

Suitability

FW-SUIT-RMZ-01: Riparian management zones are not suitable for timber production. Timber harvesting for other multiple use purposes is allowable.

Aquatic Ecosystem Monitoring

Plan monitoring questions and indicators for aquatic ecosystems

Monitoring Question(s)	Plan Component(s)	Potential Indicator(s)
MON-WTR-01: What are the changed conditions of instream physical habitat parameters in managed vs. unmanaged sites?	**FW-DC-WTR-04**	**IND-WTR-** **01.** PIBO monitoring: positive trend in PIBO metrics such as bank angle, wood frequency, percent fines, residual pool depth, percent pools, and median substrate size (D50) **02**. Results of McNeil core samples of percent fines
MON-WTR-02: To what extent are forest management activities moving towards habitat objectives for native fish?	**FW-OBJ-CNW-01** **FW-OBJ-WTR-01 through 04**	**IND-WTR-** **03.** Number of fish passage barriers removed or created **04.** Number of roads decommissioned within the riparian management zone **05.** Number of culverts removed or upgraded **06.** Number of activities with stream miles of habitat improvements
MON-WTR-03: What activities have occurred in the riparian management zone?	**FW-STD-RMZ-03, 04** **FW-DC-RMZ-03**	**IND-WTR-** **07.** Treatment type and acres within riparian management zones **08.** Number of entries and road crossing inside riparian management zones
MON-WTR-04: What is the condition of water quality in waterbodies?	**FW-DC-WTR-06**	**IND-WTR-09**: Number of waterbodies listed on the Montana Department of Environmental Quality integrated report (305b/303d)
MON-WTR-05: What is the status of native fish populations?	**FW-DC-CNW-01**	**IND-WTR-** **10.** Number of redds (bull trout) **11.** Fish density—number/100 square meters **12.** Degree of spread of hybridization (MFWP data, redd counts)
MON-WTR-06: Do management activities contribute nutrients to Flathead Lake?	**FW-DC-WTR-17**	**IND-WTR-13**: Amount of phosphorus, nitrites, and nitrates that originate from NFS lands.
MON-WTR-07: What is the status of streambanks within grazing allotments?	**FW-GDL-05**	**IND-WTR-** **13.** Percent streambank alteration **14.** Percent utilization on woody vegetation **15.** Percent utilization on herbaceous vegetation

Culvert Monitoring Plan

The Culvert Monitoring Plan (July 2016) follows.

USDA
Forest Service

Northern
Region

Flathead
National
Forest

July 2016

Version 1.0

Culvert Monitoring Plan

Flathead National Forest



FS-107568

Background

In 1995, the Flathead National Forest amended the Forest Plan with specific road density standards to provide for grizzly bear security. This management direction was included in Forest Plan Amendment 19, which includes specific road density standards by grizzly bear management units on the Hungry Horse, Glacier View, and Spotted Bear Ranger Districts. As a result, all project-level decisions since 1995 had to incorporate the new A-19 road density standards to meet the new direction. The Tally Lake and parts of Swan Lake Ranger Districts were not affected by A-19 but still reduced road density for various resource management purposes. This resulted in numerous roads being decommissioned, closed, gated, or bermed. In the majority of cases, roads that were decommissioned (removed from the transportation system) involved removal of all stream culverts and water proofing of the road prisms. However, roads that remain on the system that are closed have had evolving and complex decisions which resulted in gated/bermed roads with have stream culverts in some cases, while others have had culverts removed. Because motorized access on these roads is limited (even for administrative use), regular inspection of culverts is a challenge. At the present time, approximately 702 miles of road have been closed, and 299 miles have been decommissioned in bull trout watersheds. These roads have been blocked by gates, berms, guard rails, boulders, or other structural barriers. Not all roads have been closed or decommissioned for grizzly bear security, but vast majority have.

At the present time, the Forest has seven Biological Opinions for bull trout that have specific terms and conditions that require some form of culvert inspection and/or monitoring. These opinions span a period of 14 years, with the first one being issued in 2002. Table 1 summarizes these opinions and associated Terms and Conditions that require culvert inspection and/or monitoring.

Stream crossing culverts on roads behind gates, berms, and other structures represents a risk to bull trout habitat. With access limited by motorized use, culverts may not be observed by Forest Service personnel on any kind of regular basis, whether it be through a formal monitoring program or just casual observation by employees. This monitoring plan is an attempt to address Terms and Conditions in all Biological Opinions to date, in a comprehensive and systematic way.

Biological Opinions and Associated Terms and Conditions

The following Biological Opinions for bull trout and their associated Terms and Conditions have been issued by the US Fish and Wildlife Service. The Terms and Conditions listed under each Opinion relate to culvert inspection and monitoring only. These opinions are both programmatic and project specific.

Table 1. Terms and Conditions contained in Biological Opinions that include culvert monitoring elements.

Biological Opinion	Terms and Conditions Related to Culvert Monitoring	Area of Applicability
Chilly James Restoration Project (January 2016)	The Forest shall provide the results of the annual monitoring conducted as described in Terms and Conditions above, by May 1 each year, for activities occurring in the preceding calendar year, or by an alternate date as agreed by the Service. These annual monitoring reports will follow the same format used in the Biological Opinion on the Effects to Bull Trout and Bull Trout Critical Habitat from the Implementation of Proposed Actions Associated with Road-related Activities that May Affect Bull Trout and Bull Trout Critical Habitat in Western Montana, Appendix B. Annual Report of Road-related Activities	Cold Creek Jim Creek

	(USFWS 2015). The annual monitoring report shall include a narrative on compliance of proposed actions identified in the BA, EA, and this BO and shall expressly describe whether the level of incidental take associated with these elements of the proposed project has been exceeded.	
Roads Programmatic (April 2015)	Appendix E in the Roads Programmatic Opinion includes specific design criteria for two types of closure levels. These design criteria must be followed to meet the first Term and Condition in the opinion (page 66). The specific monitoring requirements listed in Appendix E are shown below. These requirements apply to roads closed by gates, guardrails, concrete or earth barriers, or recontour at intersection. • Annually check pipes and ditches to assure they remain free from blockage • Annually inspect and maintain each stream-crossing structure left in place. If annual inspection and maintenance is not feasible, remove all stream crossing structures when the road is closed. • Annual inspect water-bars or cross ditches until stabilized or revegetated to assure they remain stable and free from blockage.	All bull trout habitat (Forest-wide) where the 2015 Roads Programmatic BO was applied.
Amendment 19 Revised Implementation (November 2010)	TC1. In order to minimize potential or unanticipated consequences from the delayed implementation of A-19, the Service requires the Forest to adopt the following measures, or respond in a letter to the Service within 60 days as to the reasons such reasonable and prudent measures were considered and are not feasible and provide an alternative plan for Service approval. The following terms and conditions are established to implement Reasonable and Prudent Measure #1. • By August 1, 2009, survey the culvert status on the 16.5 miles of roads in the four watersheds identified at risk due to delayed implementation of A-19. In Red Meadow Creek, this includes approximately 6 miles of road and 12 culverts. In Granite and Morrison Creeks, this includes approximately 6.5 miles of road and 14 culverts. In North Fork Lost Creek, this includes approximately 4 miles of road with 2 culverts and 2 bridges. Each culvert or bridge should be GPS located, examined, digitally photo-documented from both ends, and classified for risk of failure according to existing Forest standards (see e.g., Stevens and Kendall 2007). • For all culverts described in TC1(a), conduct and document timely maintenance; defined as removing debris and ingrown vegetation in and around entrance and exits. This maintenance shall occur prior to September 1, 2009, to reduce chances of failure during significant runoff events that may occur after bull trout spawning in 2009. • For any culverts documented in TC1(a) that have either failed or are in the imminent process of failing (e.g., partially or entirely plugged and/or with evidence of road fill undercutting or fill slope eroding), appropriate remedial actions to remove or replace the culvert, including channel restoration, will be implemented prior to bull trout spawning in 2009. There is an expectation that one or fewer culverts will be in this condition. However, if the number or location of such culverts exceeds one, the Forest should contact the Service within 72 hours and seek written approval of the Service in developing a plan to proceed, potentially including reinitiation of consultation because authorized levels of take in this BO may be exceeded. • For culverts considered at high risk to fail, but not actively in the process of failing as in TC1(c), a plan and schedule to either remove those culverts and restore the channel per INFISH BMPs, or to upgrade the culvert to a pipe sufficiently sized to minimize future risk rating, must be completed and submitted to the Service prior to December 31, 2009. Remedial actions or other measures agreed to during reconsultation must be approved by the Service prior to July 1, 2010.	Red Meadow Creek Coal Creek Hay Creek North Fork Lost Creek Skyland Creek Challenge Creek

	TC3 The Forest shall provide the results of culvert monitoring and maintenance conducted in summer 2009, to the Service by December 31, 2009, in report format including pre- and post-maintenance photo documentation of all pipes considered high risk. Results of monitoring conducted shall follow the reporting format described in Stevens and Kendall 2007, with the addition of GPS locations and photo-documentation described in TC1(a).	
Robert Wedge Post-Fire Project (November 2004)	• 14. The Forest will submit a proposal for monitoring culverts on bermed roads. The proposal must be approved by the Service prior to project implementation. The proposal should include rationale for the proposed monitoring method based on the results of previous monitoring efforts in the Moose and Spotted Beetle projects. A report of monitoring activities shall be submitted by the Forest fisheries biologist in a format agreed upon by the Forest and the Service by March 01 of each year for the previous year's activities. This report shall include, but is not limited to the location of the pipe, size, amount of fill, and current condition.	Whale Creek Trail Creek
West Side Reservoir Post-Fire Project (December 2004)	• 14. The Forest will submit a proposal for monitoring culverts on bermed roads. The proposal must be approved by the Service prior to project implementation in 2005. The proposal should include rationale for the proposed monitoring method based on the results of previous monitoring efforts in the Moose and Spotted Beetle projects. Culverts on bermed roads in bull trout priority watersheds will be considered a priority for monitoring. A report of monitoring activities shall be submitted by the Forest fisheries biologist in a format agreed upon by the Forest and the Service by March 01 of each year for the previous year's activities. This report shall include, but is not limited to the location of the pipe, size, amount of fill, and current condition.	Wounded Buck Sullivan Creek
Moose Post-Fire Project (November 2002)	• 3. The Forest shall ensure that roads closed year-long by gates or berms have properly functioning culverts and effective surface drainage to minimize surface erosion. The Forest shall implement monitoring of culverts on these roads according to monitoring components 1-5 as outlined in the September 19, 2002 letter from the Forest to the Service, "Moose Post-Fire Project EIS, Additional Information Regarding Culverts on Bermed Roads," (Appendix A). Additionally, culverts identified as high risk of failure during monitoring shall either be replaced or fill shall be removed to the extent practicable and an overflow design shall be implemented prior to high water the following year. A report of monitoring activities shall be submitted by the Forest fisheries biologist to the Service, in a format agreed upon by the Forest and the Service, by January 31 of each year for the previous year's activities. This report shall include, but is not limited to the size of pipe and amount of fill. If the Forest fails to turn in the monitoring report to the Service, consultation shall be reinitiated. • 4. For the 10 culverts to remain on decommissioned roads 315, 1692, 5286 and 316E, fill shall be removed to the extent practicable and an overflow design shall be implemented. The design shall be reported to and agreed upon by the Service prior to decommissioning. These culverts shall be monitored and reported in the same manner established in term and condition 3.	Lower Big Creek Upper Big Creek Hallowat Creek Coal Creek Lower
Spotted Beetle Project (March 2002)	• The Forest Service shall ensure through yearly inspections that roads closed by gates or berms have properly functioning culverts and effective surface drainage to minimize surface erosion. Culvert maintenance and roadbed restoration shall be accomplished as soon as practicable to prevent large erosive events from occurring.	Sullivan Creek

The intent of all the Terms and Conditions issued to date is sound in terms of mitigating the risk to bull trout habitat in the places where their associated Biological Opinions apply. However the areas where

the opinions apply are somewhat scattered across the forest and have resulted in an inefficient and sometimes duplicative monitoring requirement. Furthermore, not every bull trout watershed has an opinion that requires culvert monitoring.

For the most part, current Terms and Conditions require annual monitoring of culverts. In most cases, annual culvert monitoring may be duplicative, unless there are major disturbances that would cause changes in hydrologic and sediment regimes. Where hydrologic and stream channel conditions are relatively stable, it is unlikely that culvert conditions would change appreciably over a one year period. A 5-10 year period may be more reasonable to detect changes in culvert conditions and/or trends.

The culvert monitoring plan described below has two purposes. The first is to meet the intent of all Terms and Conditions contained in the Biological Opinions issued to date. The second purpose is to ensure that risks to bull trout habitat from culvert failures is minimized, not only where current opinions apply, but in all bull trout habitats across the forest. The specifics of the culvert monitoring plan are provided below.

Culvert Inspection and Monitoring Plan

Forest-wide, roads overlap with eight core areas occupied by 28 local bull trout populations. The general approach of this monitoring plan is to sample groups of watersheds that contain local bull trout populations on a six year rotating panel (Figure 1). The groups were developed based on the logistics of monitoring and the relative miles of system road and historic road. This would allow all roads behind gates or berms in a given group to be sampled during a given field season, along with historic roads. In the vast majority of cases, roads that have been decommissioned (historic roads) had stream culverts removed. The groups and associated local populations are summarized in Table 2. Adjustments to the panel groups are anticipated, depending on past year's progress, efficiency, and logistics. Panel groups may also be adjusted based on disturbance events such as fires or floods.

Table 2. Core areas, bull trout local populations, and panel group numbers.

Panel Group	Core Area	Local Population	Closed Road Miles	Historic Road Miles
1	Flathead Lake	Trail Creek		
1	Flathead Lake	Whale Creek		
1	Flathead Lake	Red Meadow Creek		
1	Frozen Lake	Frozen Creek (part in BC)	75.0	71.0
1	Upper Stillwater Lake	Stillwater River		
1	Upper Whitefish Lake	East Fork Swift Creek		
1	Whitefish Lake	Swift Creek		
2	Flathead Lake	Coal Creek		
2	Flathead Lake	Big Creek	106.7	122.6
2	Cyclone Lake	Cyclone Creek		
3	Flathead Lake	Morrison Creek		
3	Flathead Lake	Granite Creek		
3	Flathead Lake	Bear Creek	170.8	75.1
3	Hungry Horse Reservoir	Spotted Bear River		
3	Hungry Horse Reservoir	Sullivan Creek		

3	Hungry Horse Reservoir	Wheeler Creek		
3	Hungry Horse Reservoir	Wounded Buck		
4	Holland Lake	Holland Creek		
4	Swan Lake	Goat Creek		
4	Swan Lake	Lion Creek	100.0	14.7
4	Swan Lake	Soup Creek		
4	Swan Lake	Lost Creek		
5	Swan Lake	Jim Creek		
5	Swan Lake	Piper Creek	111.3	2.5
5	Swan Lake	Woodward Creek		
6	Swan Lake	Elk Creek		
6	Swan Lake	Cold Creek	138.1	13.5
6	Lindbergh Lake	Swan River		

All culverts associated with armored stream channels will be inspected by field crews. The crews will gather data electronically using a tablet or enhanced GPS recorder. Data at each culvert would be collected using the data dictionary shown in Appendix A. Prior to entering data on culvert conditions, the inlets would be cleared of any debris or sediment that may contribute to failure using hand tools. Photos of each culvert will be logged. If the degree of cleaning is beyond what can be done in a short period of time with hand tools, then these needs would be documented in the notes. Therefore, data entered into the data recorders will reflect conditions of the culvert when the crews leave them.

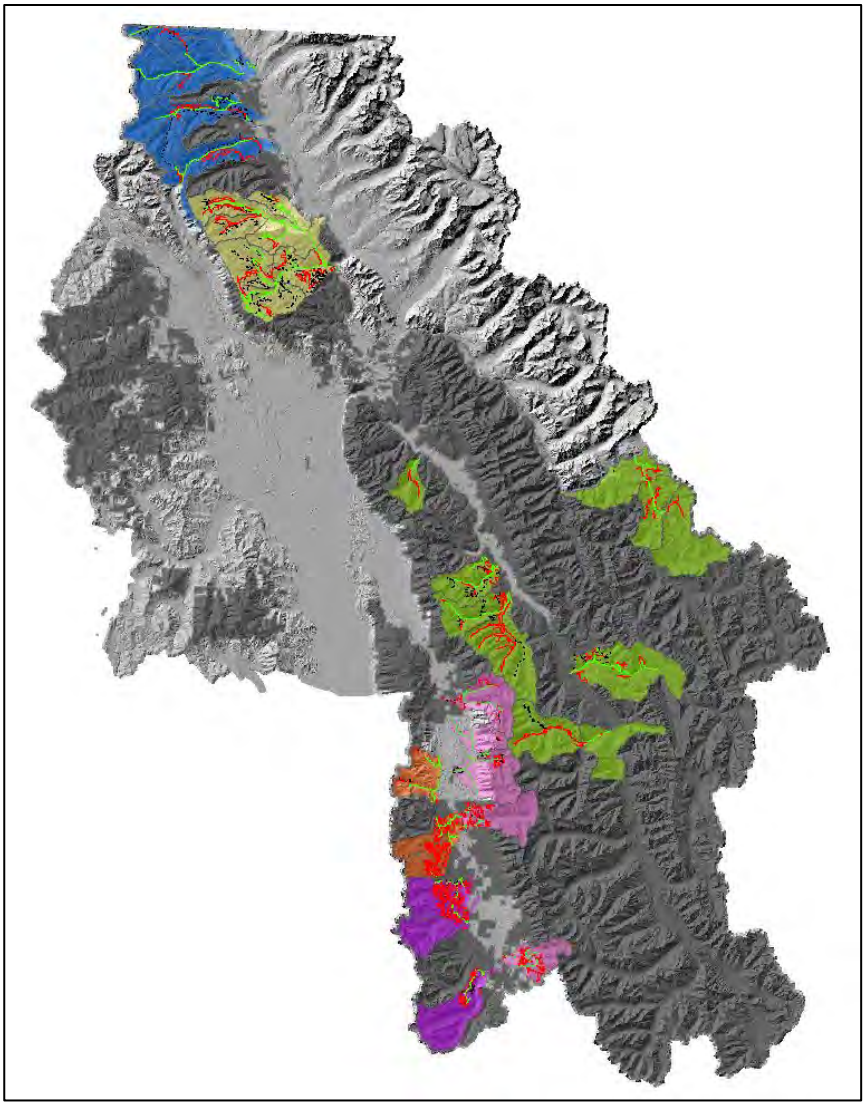


Figure 1. Panel groups of bull trout watersheds.

Annual Reporting

At the end of each field season, all culvert monitoring data will be exported into a spreadsheet. The data will include all attributes in the data dictionary (Appendix A). This spreadsheet will be e-mailed to the USFWS by the Flathead National Forest. General conclusions about the status of culverts in that year's panel will be provided, along with any information about corrective actions taken to reduce the risk of culvert failure.

Once the annual report is submitted, a meeting will be scheduled with the USFWS to discuss results. This annual meeting will also provide the opportunity to discuss potential changes to the monitoring plan, based on previous year's monitoring (adaptive management). The Flathead National Forest is responsible for preparing the annual report and scheduling the follow-up meeting with the USFWS.

Adaptive Management

This culvert monitoring plan is intended to be adaptive. The sampling strategy, as shown in Figure 1 may be adjusted based on the amount of culvert inspections completed during each field season. For example, if crews complete all culverts in a given panel before the season is over, they may move to the next panel. Therefore, the watersheds contained in each panel may change, based on the progress of crews during each field season. The sampling strategy may also change due to fire and/or floods. For example, if a fire burns a large proportion of land within a panel, it may be critical to inspect culverts within that panel during Burned Area Emergency Response. The data dictionary shown in Appendix A may also be adjusted based on lessons learned in the field.

If this plan cannot be implemented for any reason, the forest will revert back to the original monitoring requirements defined in the Biological Opinions listed in Table 1. This monitoring plan is designated as Version 1.0. Revisions will be designated as 2.0, 3.0, and so on.

Remedial Actions

If culverts are found to be in the imminent process of failing (i.e. partially or entirely plugged and/or with evidence of road fill undercutting or fill slope eroding, etc.), they will be removed or replaced. The USFWS will be contacted if such culverts are found and the optimum timing of remedial work will be agreed upon. If culverts are found to be at high risk of failure, a plan and schedule will be developed to remove or upgrade such culverts. All culverts that are in the imminent process of failing or at high risk of failing will be highlighted in the annual report submitted to the USFWS, and also discussed during the annual meeting.

Financial Plan

The annual cost of the monitoring program is itemized in Table 3 below. This cost includes four seasonal employees that would be divided into two separate crews, with each crew having one vehicle. Individual line item costs may fluctuate from year to year, but the total cost of the program is expected to be approximately $45,000.

Table 3. Financial Plan.

Employee/Cost	Days	Cost
Forest Aquatics Specialist (GS-9)	10	$3,000
Forest Civil Engineer (GS-9)	20	$6,000
Engineering Technician (GS-4)	60	$7,200
Engineering Technician (GS-4)	60	$7,200
Engineering Technician (GS-4)	60	$7,200
Engineering Technician (GS-4)	60	$7,200
Supplies	n/a	$1,500
Fleet (two rigs)	n/a	$4,000
Total Program Cost		**$44,800**

Appendix A

Culvert Inspection Data Dictionary

	Stream Crossing Information	
Field Number	**Field Name**	**Menu Choices**
1	Date	Enter Date
2	Road Number	Enter Number and Letters
3	Stream Name (if known)	Enter Name
4	Culvert Type	Round, arch, box, bottomless arch, other
5	Culvert Construction	Galvanized steel, concrete, wood
6	Culvert Width (feet)	Enter Number
7	Culvert Height (feet)	Enter Number
8	Stream Bankfull Width	Enter Number
9	Upstream Fill Height (feet)	Enter Number (use range finder if necessary)
10	Downstream Fill Height (feet)	Enter Number (use range finder if necessary)
	Risk Assessment	
Field Number	**Field Name**	**Menu Choices (Yes is bad, No is good)**
11	Culvert Inlet Cleaned Prior to Assessment	Yes, No
12	Shrubs, Debris, or Sediment Blocking Inlet	Yes, No
13	Inlet Below Stream Grade	Yes, No
14	Outlet Below Stream Grade	Yes, No
15	Inlet Rust Line >33%	Yes, No
16	Evidence of Flooding, Backwater, or Overflow	Yes, No
17	Significant Culvert Damage*	Yes, No
18	Floatable Debris Upstream	Yes, No
19	Channel Alignment >15 Degrees	Yes, No
20	Unstable or eroding banks Upstream	Yes, No
21	Notes	Enter notes if needed

*Barrel broken, beaver activity, inlet bent, invert worn through, inlet or outlet plugged, water flowing under culvert

Canada Lynx

Appendix A: Northern Rockies Lynx Management Direction

Introduction

The habitat direction from the Northern Rockies Lynx Management Direction (NRLMD) is retained in this forest plan through standard FW-STD-WL-04. The forest plan will carry forward the objectives, standards, and guidelines that were developed to conserve lynx. The use of the terms "goals," "standards," and "guidelines" in the NRLMD is consistent with the definitions of these terms found on pages 4 and 5 of the forest plan. The definition of "objectives" in the NRLMD is consistent with the definition of "desired conditions" in the forest plan. The forest plan thus defines the NRLMD "objectives" as "desired conditions." The NRLMD plan components are being incorporated by reference throughout the forest plan (e.g., in the terrestrial ecosystems and vegetation, wildlife species, recreation, and infrastructure sections).

Forest-specific modifications to VEG S6 (to add an exception category aimed at protecting mature rust-resistant whitebark pine trees) and HU G11 (for areas identified as suitable for over-snow motorized recreational vehicle use) are indicated in bold type in VEG S6 and HU G11 in this appendix. These plan components are also replicated in the plan as FW-STD-TE&V-02 and FW-GDL-REC-03 because they were modified.

The NRLMD record of decision applies to lynx habitat on National Forest System lands presently occupied by Canada lynx, as defined by the Amended Lynx Conservation Agreement between the Forest Service (FS) and the U.S. Fish and Wildlife Service (FWS) (USDA FS and USDI FWS 2006a). The Flathead National Forest is listed as occupied lynx habitat.

Background

The FWS listed Canada lynx as a threatened species in March 2000, saying the main threat was "the lack of guidance for conservation of lynx and snowshoe hare habitat in National Forest Land and Resource Plans and BLM Land Use Plans" (USDI FWS 2000a). Following the listing, the FS signed a Lynx Conservation Agreement with the FWS in 2001. The FS agreed to consider the Lynx Conservation Assessment and Strategy during project analysis and to not proceed with projects that would be "likely to adversely affect" lynx until the forest plans were amended to conserve the lynx. The Lynx Conservation Agreement was renewed in 2005 and again in 2006, when it was extended for 5 years (until 2011) or until all relevant forest plans had been updated (USDA FS and USDI FWS 2000, 2005, 2006a, 2006b).

In 2007, the Northern Rockies Lynx Management Direction amended the existing forest plans of 18 national forests in Montana, Idaho, Wyoming, and Utah, including the Flathead National Forest. The record of decision was signed by the regional foresters of the Northern Region, Intermountain Region, and Rocky Mountain Region on March 23, 2007.[9]

The purpose of the NRLMD was to incorporate management direction in forest plans that conserves and promotes recovery of Canada lynx by reducing or eliminating adverse effects from land management

[9] The NRLMD final environmental impact statement and record of decision are available at https://www.fs.usda.gov/detail/r1/landmanagement/resourcemanagement/?cid=stelprdb5160650.

activities on National Forest System lands while preserving the overall multiple use direction in existing forest plans.

The NRLMD relied upon the scientific information and recommendations in:

- Ecology and Conservation of Lynx in the United States (Ruggiero et al. 2000), which summarized lynx ecology;
- Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000), which recommended conservation measures for activities that could place lynx at risk by altering their habitat or reducing their prey;
- The Canada Lynx Recovery Outline issued by the FWS on Sept. 12, 2005 (USDI Fish and Wildlife Service 2005); and
- Numerous publications cited in the NRLMD final environmental impact statement and record of decision.

Subsequent to adoption of the NRLMD, several key pieces of new information have become available. These include

6. a final rule designating lynx critical habitat prepared by the FWS in 2014[10];
7. an update to the Lynx Conservation Assessment and Strategy prepared by the Interagency Lynx Biology Team in 2013[11]; and
8. additional published scientific information about lynx and lynx habitat.

Monitoring information from the 10 years of implementation of the NRLMD has also been compiled. We considered and addressed this new information in the following ways.

- The revised forest plan includes additional plan components that affect Canada lynx and their critical habitat, consistent with the 2012 planning rule.
- The final environmental impact statement and the biological assessment for the revised forest plan describe critical habitat, which is the primary constituent element identified in the FWS's final rule for critical habitat, and analyze the effects of the alternatives on critical habitat unit #3, including the Flathead National Forest.
- A full revision of the LCAS was completed in 2013. The 2013 LCAS states the intent to provide updated information that may serve to inform updates or refinements of existing land management plans (p. 89). The revised forest plan final environmental impact statement and biological assessment referenced the 2013 LCAS and carefully considered conservation measures that are applicable to core areas.
- New scientific information about lynx and lynx habitat was extensively reviewed and cited in the final environmental impact statement and biological assessment.

[10] USFWS (2014), Final environmental assessment: Revised designation of critical habitat for the contiguous United States distince population segment of the Canada lynx, retrieved from https://www.fws.gov/mountain-prairie/es/canadaLynx.php.

[11] Interagency Lynx Biology Team (2013), Canada lynx conservation assessment and strategy (3rd ed.), USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service, Forest Service Publication R1-13-19, Missoula, MT, retrieved from https://www.fs.fed.us/biology/resources/pubs/wildlife/index.html.

- Monitoring information regarding fuels treatment and vegetation management conducted based upon exemptions and exceptions to the standards has been compiled each year since approval of the NRLMD and has been reported to the FWS. Monitoring indicates that the Forest has remained well within the limits required under the terms and conditions of the incidental take statement since the NRLMD was implemented.
- For the Forest's final environmental impact statement and biological assessment, the estimated acres of vegetation management treatments that may occur in lynx habitat were updated to reflect a 15-year time period following implementation of the revised forest plan. The FWS considered this information in preparing its biological opinion.

The following NRLMD is being incorporated into the Flathead National Forest plan. Changed language in VEG S6 and HU G11 is indicated in bold.

Northern Rockies Lynx Management Direction

This management direction includes a goal, objectives, standards, and guidelines related to all activities (ALL), vegetation management (VEG), grazing management (GRAZ), human uses (HU), and linkage (LINK).

GOAL[14][12]

Conserve the Canada lynx.

All Management Practices and Activities (ALL)

The following objectives, standards, and guidelines apply to all management projects in lynx habitat in lynx analysis units (LAUs) in occupied habitat and in linkage areas, subject to valid existing rights. They do not apply to wildfire suppression, or to wildland fire use.

Objective[30] ALL O1

Maintain[26] or restore[40] lynx habitat[23] connectivity[16] in and between LAUs[21], and in linkage areas[22].

Standard[44] ALL S1

New or expanded permanent development[33] and vegetation management[49] projects[36] must maintain[26] habitat connectivity[16] in an LAU[21] and/or linkage area[22].

Guideline[15] ALL G1

Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways[18] or forest highways[12] across federal land. Methods could include fencing, underpasses, or overpasses.

Standard[44] LAU S1

Changes in LAU[21] boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.

[12] Note: In this section, superscript numbers refer to numbered definitions in the glossary.

Vegetation Management Activities and Practices (VEG)

The following objectives, standards, and guidelines apply to vegetation management projects[36] in lynx habitat within lynx analysis units (LAUs) in occupied habitat. With the exception of Objective VEG O3 that specifically concerns wildland fire use, the objectives, standards, and guidelines do not apply to wildfire suppression, wildland fire use, or removal of vegetation for permanent developments such as mineral operations, ski runs, roads, and the like. None of the objectives, standards, or guidelines apply to linkage areas.

Objective[30] VEG O1

> Manage vegetation[49] to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.

Objective VEG O2

> Provide a mosaic of habitat conditions through time that support dense horizontal cover[19], and high densities of snowshoe hare. Provide winter snowshoe hare habitat[51] in both the stand initiation structural stage and in mature, multi-story conifer vegetation.

Objective VEG O3

> Conduct fire use[11] activities to restore[40] ecological processes and maintain or improve lynx habitat.

Objective VEG O4

> Focus vegetation management[49] in areas that have potential to improve winter snowshoe hare habitat[51] but presently have poorly developed understories that lack dense horizontal cover.

Standard[44] VEG S1

Where and to what this applies: Standard VEG S1 applies to all vegetation management[49] projects[36] that regenerate[38] forests, except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

> Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). *In addition, fuel treatment projects may not result in more than three adjacent LAUs exceeding the standard.*
>
> For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.
>
> **The standard:** Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages[45] limit disturbance in each LAU as follows:
>
> If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects[36].

Standard VEG S2

Where and to what this applies: Standard VEG S2 applies to all timber management[47] projects[36] that regenerate[38] forests, except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The standard: Timber management[47] projects[36] shall not regenerate[38] more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period.

Standard VEG S5

Where and to what this applies: Standard VEG S5 applies to all precommercial thinning[35] projects[36], except for fuel treatment[13] projects36 that use precommercial thinning as a tool within the wildland urban interface50 (WUI) as defined by HFRA17, subject to the following limitation:

Fuel treatment projects[36] within the WUI50 that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The Standard: Precommercial thinning projects[36] that reduce snowshoe hare habitat may occur from the stand initiation structural stage[45] until the stands no longer provide winter snowshoe hare habitat only:

1. Within 200 feet of administrative sites, dwellings, or outbuildings; or
2. For research studies[39] or genetic tree tests evaluating genetically improved reforestation stock; or
3. Based on new information that is peer reviewed and accepted by the regional level of the Forest Service, and state level of FWS, where a written determination states:
   a. that a project[36] is not likely to adversely affect lynx; or
   b. that a project[36] is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat; or
4. For conifer removal in aspen, or daylight thinning[5] around individual aspen trees, where aspen is in decline; or
5. For daylight thinning of planted rust-resistant white pine where 80 % of the winter snowshoe hare habitat[51] is retained; or
6. To restore whitebark pine.

Exceptions 2 through 6 shall only be utilized in LAUs where Standard VEG S1 is met.

Standard VEG S6

Where and to what this applies: Standard VEG S6 applies to all vegetation management[49] projects[36] except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI50 see guideline VEG G10.

The Standard: Vegetation management projects[36] that reduce snowshoe hare habitat in multi-story mature or late successional forests[29] may occur only:

1. Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or
2. For research studies[39] or genetic tree tests evaluating genetically improved reforestation stock; or
3. For incidental removal during salvage harvest[42] (e.g. removal due to location of skid trails).
4. **For noncommercial felling of trees larger than sapling size within 200 feet of whitebark pine trees (in stands that contain trees identified for cone/scion/pollen collection) to make whitebark pine more likely to survive wildfires, more resistant to mountain pine beetle attack, and more likely to persist in future environments.**

Exceptions 2, 3, and 4 shall only be utilized in lynx analysis units where standard VEG S1 is met.

Note: Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover (e.g., uneven-aged or even-aged management systems could be used to create openings in coniferous forests in the stem exclusion structural stage where there is little understory so that new forage can grow).

Guideline VEG G1

Vegetation management[49] projects[36] should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available.

Priority for treatment should be given to stem-exclusion, closed-canopy structural stage[46] stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat[51] should be near denning habitat[6].

Guideline VEG G4

Prescribed fire[34] activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.

Guideline VEG G5

Habitat for alternate prey species, primarily red squirrel[37], should be provided in each LAU.

Guideline VEG G10

Fuel treatment projects[36] within the WUI[50] as defined by HFRA[17] should be designed considering Standards VEG S1, S2, S5, and S6 to promote lynx conservation.

Guideline VEG G11

Denning habitat[6] should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects[36] should be designed to retain some coarse woody debris[4], piles, or residual trees to provide denning habitat[6] in the future.

Livestock Management (GRAZ)

The following objectives and guidelines apply to grazing projects in lynx habitat in lynx analysis units (LAUs) in occupied habitat. They do not apply to linkage areas.

Objective[30] GRAZ O1

Manage livestock grazing to be compatible with improving or maintaining[26] lynx habitat[23].

Guideline[15] GRAZ G1

In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.

Guideline GRAZ G2

In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.

Guideline GRAZ G3

In riparian areas[41] and willow carrs[3], livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.

Guideline GRAZ G4

In shrub-steppe habitats[43], livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs[21], to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.

Human Use Projects (HU)

The following objectives and guidelines apply to human use projects, such as special uses (other than grazing), recreation management, roads, highways, and mineral and energy development, in lynx habitat in lynx analysis units (LAUs) in occupied habitat, subject to valid existing rights. They do not apply to vegetation management projects or grazing projects directly. They do not apply to linkage areas.

Objective[30] HU O1

Maintain[26] the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat[23].

Objective HU O2

Manage recreational activities to maintain lynx habitat and connectivity[16].

Objective HU O3

Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat.

Objective HU O4

Provide for lynx habitat needs and connectivity when developing new or expanding existing developed recreation[9] sites or ski areas.

Objective HU O5

Manage human activities, such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors, to reduce impacts on lynx and lynx habitat.

Objective HU O6

Reduce adverse highway[18] effects on lynx by working cooperatively with other agencies to provide for lynx movement and habitat connectivity[16], and to reduce the potential of lynx mortality.

Guideline[15] HU G1

When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris[4], so winter snowshoe hare habitat[51] is maintained.

Guideline HU G2

When developing or expanding ski areas, lynx foraging habitat should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.

Guideline HU G3

Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat[23].

Guideline HU G4

For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction.

Guideline HU G5

For mineral and energy development sites and facilities that are closed, a reclamation plan that restores[40] lynx habitat should be developed.

Guideline HU G6

Methods to avoid or reduce effects on lynx should be used in lynx habitat[23] when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.

Guideline HU G7

New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity[16]. New permanent roads and trails should be situated away from forested stringers.

Guideline HU G8

Cutting brush along low-speed[25], low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.

Guideline HU G9

On new roads built for projects[36], public motorized use should be restricted. Effective closures should be provided in road designs. When the project[36] is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.

Guideline HU G10

When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat[10], if it has been identified as a need.

Guideline HU G11

To provide ecological conditions to support Canada lynx on NFS lands at a forestwide scale, there should be no net increase in miles of designated routes for motorized over-snow vehicle use, groomed routes, or areas where motorized over-snow vehicle use is identified as suitable. The "no net increase" is in comparison to the suitability displayed in forest plan figure B-11.

This guideline does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.

Guideline HU G12

Winter access for non-recreation special uses and mineral and energy exploration and development, should be limited to designated routes[8] or designated over-the- snow routes[7].

Linkage Areas (LINK)

The following objective, standard, and guidelines apply to all projects within linkage areas in occupied habitat, subject to valid existing rights.

Objective[30] LINK O1

In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat.

Standard[44] LINK S1

When highway[18] or forest highway[12] construction or reconstruction is proposed in linkage areas[22], identify potential highway crossings.

Guideline[15] LINK G1

NFS lands should be retained in public ownership.

Guideline LINK G2

Livestock grazing in shrub-steppe habitats[43] should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.

Required Monitoring

Map the location and intensity of snow compacting activities and designated and groomed routes that occurred inside LAUs during the period of 1998 to 2000. The mapping is to be completed within one year of this decision, and changes in activities and routes are to be monitored every five years after the decision.

When project decisions are signed report the following:

1. Fuel treatments:

    a) Acres of fuel treatment in lynx habitat by forest and LAU, and whether the treatment is within or outside the WUI as defined by HFRA.

    b) Whether or not the fuel treatment met the vegetation standards or guidelines. If standard(s) are not met, report which standard(s) are not met, why they were not met, and how many acres were affected.

    c) *Whether or not 2 adjacent LAUs exceed standard VEG S1 (30% in a stand initiation structural stage that is too short to provide winter snowshoe hare habitat), and what event(s) or action(s) caused the standard to be exceeded.*

2. Application of exception in Standard VEG S5

a) For areas where any of the exemptions 1 through 6 listed in Standard VEG S5 were applied: Report the type of activity, the number of acres, and the location (by unit, and LAU) and whether or not Standard VEG S1 was within the allowance.

3. Application of exceptions in Standard VEG S6

1. For areas where any of the exemptions 1 through 3 listed in Standard VEG S6 were applied: Report the type of activity, the number of acres, and the location (by unit, and LAU) and whether or not Standard VEG S1 was within the allowance.

2. Application of guidelines

Document the rationale for deviations to guidelines. Summarize what guideline(s) was not followed and why.

Directions in italics were terms and conditions that were incorporated from the FWS Biological Opinion (USDI FWS 2007).

NRLMD Glossary

[1] *Area of consistent snow compaction* – An area of consistent snow compaction is an area of land or water that during winter is generally covered with snow and gets enough human use that individual tracks are indistinguishable. In such places, compacted snow is evident most of the time, except immediately after (within 48 hours) snowfall.

These can be areas or linear routes, and are generally found in or near snowmobile or cross-country ski routes, in adjacent openings, parks and meadows, near ski huts or plowed roads, or in winter parking areas. Areas of consistent snow compaction will be determined based on the acreage or miles used during the period 1998 to 2000.

[2] *Broad scale assessment* – A broad scale assessment is a synthesis of current scientific knowledge, including a description of uncertainties and assumptions, to provide an understanding of past and present conditions and future trends, and a characterization of the ecological, social, and economic components of an area. (LCAS)

[3] *Carr* – Deciduous woodland or shrub land occurring on permanently wet, organic soil. (LCAS)

[4] *Course woody debris* – Any piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses on the ground or in streams. (LCAS)

[5] *Daylight thinning* – Daylight thinning is a form of precommercial thinning that removes the trees and brush inside a given radius around a tree.

[6] *Denning habitat (lynx)* – Denning habitat is the environment lynx use when giving birth and rearing kittens until they are mobile. The most common component is large amounts of coarse woody debris to provide escape and thermal cover for kittens.

Denning habitat must be within daily travel distance of winter snowshoe hare habitat – the typical maximum daily distance for females is about three to six miles. Denning habitat includes mature and old growth forests with plenty of coarse woody debris. It can also include young regenerating forests with piles of coarse woody debris, or areas where down trees are jack-strawed.

[7] *Designated over-the-snow routes* – Designated over-the-snow routes are routes managed under permit or agreement or by the agency, where use is encouraged, either by on-the- ground marking or by publication in brochures, recreation opportunity guides or maps (other than travel maps), or in electronic media produced or approved by the agency.

The routes identified in outfitter and guide permits are designated by definition; groomed routes also are designated by definition. The determination of baseline snow compaction will be based on the miles of designated over-the-snow routes authorized, promoted or encouraged during the period 1998 to 2000.

[8] *Designated route* – A designated route is a road or trail that has been identified as open for specified travel use.

[9] *Developed recreation* – Developed recreation requires facilities that result in concentrated use. For example, skiing requires lifts, parking lots, buildings, and roads; campgrounds require roads, picnic tables, and toilet facilities.

[10] *Security habitat (lynx)* – Security habitat amounts to places in lynx habitat that provide secure winter bedding sites for lynx in highly disturbed landscapes like ski areas.

Security habitat gives lynx the ability to retreat from human disturbance. Forest structures that make human access difficult generally discourage human activity in security habitats. Security habitats are most effective if big enough to provide visual and acoustic insulation and to let lynx easily move away from any intrusion. They must be close to winter snowshoe hare habitat. (LCAS)

[11] *Fire use* – Fire use is the combination of wildland fire use and using prescribed fire to meet resource objectives. (NIFC) Wildland fire use is the management of naturally ignited wildland fires to accomplish resource management objectives in areas that have a fire management plan. The use of the term wildland fire use replaces the term prescribed natural fire. (Wildland and Prescribed Fire Management Policy, August 1998)

[12] *Forest highway* – A forest highway is a forest road under the jurisdiction of, and maintained by, a public authority and open to public travel (USC: Title 23, Section 101(a)), designated by an agreement with the FS, state transportation agency, and Federal Highway Administration.

[13] *Fuel treatment* – A fuel treatment is a type of vegetation management action that reduces the threat of ignition, fire intensity, or rate of spread, or is used to restore fire- adapted ecosystems.

[14] *Goal* – A goal is a broad description of what an agency is trying to achieve, found in a land management plan. (LCAS)

[15] *Guideline* – A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations may be documented, but amending the plan is not required. (LCAS modified)

[16] *Habitat connectivity (lynx)* – Habitat connectivity consists of an adequate amount of vegetation cover arranged in a way that allows lynx to move around. Narrow forested mountain ridges or shrub-steppe plateaus may serve as a link between more extensive areas of lynx habitat; wooded riparian areas may provide travel cover across open valley floors. (LCAS)

[17] *HFRA (Healthy Forests Restoration Act)* – Public Law 108-148, passed in December 2003. The HFRA provides statutory processes for hazardous fuel reduction projects on certain types of at-risk National Forest System and Bureau of Land Management lands. It also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships. (Modified from Forest Service HFRA web site.)

[18] *Highway* – The word highway includes all roads that are part of the National Highway System. (23 CFR 470.107(b))

[19] *Horizontal cover* – Horizontal cover is the visual obscurity or cover provided by habitat structures that extend to the ground or snow surface primarily provided by tree stems and tree boughs, but also includes herbaceous vegetation, snow, and landscape topography.

[20] *Isolated mountain range* – Isolated mountain ranges are small mountains cut off from other mountains and surrounded by flatlands. On the east side of the Rockies, they are used for analysis instead of sub-basins. Examples are the Little Belts in Montana and the Bighorns in Wyoming.

[21] *LAU (Lynx Analysis Unit)* – An LAU is an area of at least the size used by an individual lynx, from about 25 to 50 square miles (LCAS). An LAU is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

[22] *Linkage area* – A linkage area provides connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas, where basins, valleys, or agricultural lands separate blocks of lynx habitat, or where lynx habitat naturally narrows between blocks. (LCAS updated definition approved by the Steering Committee 10/23/01)

[23] *Lynx habitat* – Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir, and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas-fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas-fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat. (LCAS)

[24] *Lynx habitat in an unsuitable condition* – Lynx habitat in an unsuitable condition consists of lynx habitat in the stand initiation structural stage where the trees are generally less than ten to 30 years old and have not grown tall enough to protrude above the snow during winter. Stand replacing fire or certain vegetation management projects can create unsuitable conditions. Vegetation management projects that can result in unsuitable habitat include clearcuts and seed tree harvest, and sometimes shelterwood cuts and commercial thinning depending on the resulting stand composition and structure. (LCAS)

[25] *Low-speed, low-traffic-volume road* – Low speed is less than 20 miles per hour; low volume is a seasonal average daily traffic load of less than 100 vehicles per day.

[26] *Maintain* – In the context of this decision, maintain means to provide enough lynx habitat to conserve lynx. It does not mean to keep the status quo.

[27] *Maintenance level* – Maintenance levels define the level of service provided by and maintenance required for a road. (FSH 7709.58, Sec 12.3) Maintenance level 4 is assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most level 4 roads have double lanes and an aggregate surface. Some may be single lane; some may be paved or have dust abated. Maintenance level 5 is assigned to roads that provide a high degree of user comfort and convenience. Normally, level 5 roads are have double lanes and are paved, but some may be aggregate surfaced with the dust abated.

[28] *Mid-seral or later* – Mid-seral is the successional stage in a plant community that is the midpoint as it moves from bare ground to climax. For riparian areas, it means willows or other shrubs have become established. For shrub-steppe areas, it means shrubs associated with climax are present and increasing in density.

[29] Multi-story mature or late successional forest – This stage is similar to the old multistory structural stage (see below). However, trees are generally not as old, and decaying trees may be somewhat less abundant.

[30] *Objective* – An objective is a statement in a land management plan describing desired resource conditions and intended to promote achieving programmatic goals. (LCAS)

[31] *Old multistory structural stage* – Many age classes and vegetation layers mark the old forest, multistoried stage. It usually contains large old trees. Decaying fallen trees may be present that leave a discontinuous overstory canopy. On cold or moist sites without frequent fires or other disturbance, multi-layer stands with large trees in the uppermost layer develop. (Oliver and Larson, 1996)

[32] *Old growth* – Old growth forests generally contain trees that are large for their species and the site, and are sometimes decadent with broken tops. Old growth often contains a variety of tree sizes, large snags, and logs, and a developed and often patchy understory.

[33] *Permanent development* – A permanent development is any development that results in a loss of lynx habitat for at least 15 years. Ski trails, parking lots, new permanent roads, structures, campgrounds, and many special use developments would be considered permanent developments.

[34] *Prescribed fire* – A prescribed fire is any fire ignited as a management action to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements met, before ignition. The term prescribed fire replaces the term management ignited prescribed fire. (NWCG)

[35] *Precommercial thinning* – Precommercial thinning is mechanically removing trees to reduce stocking and concentrate growth on the remaining trees, and not resulting in immediate financial return. (Dictionary of Forestry)

[36] *Project* – All, or any part or number of the various activities analyzed in an Environmental Impact Statement, Environmental Analysis, or Decision Memo. For example, the vegetation management in some units or stands analyzed in an EIS could be for fuel reduction, and therefore those units or stands would fall within the term *fuel treatment project* even if the remainder of the activities in the EIS are being conducted for other purposes, and the remainder of those units or stands have other activities prescribed in them. All units in an analysis do not necessarily need to be for fuel reduction purposes for certain units to be considered a *fuel reduction project*.

[37] *Red squirrel habitat* – Red squirrel habitat consists of coniferous forests of seed and cone-producing age that usually contain snags and downed woody debris, generally associated with mature or older forests.

[38] *Regeneration harvest* – The cutting of trees and creating an entire new age class; an even-age harvest. The major methods are clearcutting, seed tree, shelterwood, and group selective cuts. (Helms, 1998)

[39] *Research* – Research consists of studies conducted to increase scientific knowledge or technology. For the purposes of Standards VEG S5 and VEG S6, research applies to studies financed from the forest research budget (FSM 4040) and administrative studies financed from the NF budget.

[40] *Restore, restoration* – To restore is to return or re-establish ecosystems or habitats to their original structure and species composition. (Dictionary of Forestry)

[41] *Riparian area* – An area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation. (LCAS)

[42] *Salvage harvest* – Salvage harvest is a commercial timber sale of dead, damaged, or dying trees. It recovers economic value that would otherwise be lost. Collecting firewood for personal use is not considered salvage harvest.

[43] *Shrub steppe habitat* – Shrub steppe habitat consists of dry sites with shrubs and grasslands intermingled.

[44] *Standard* – A standard is a required action in a land management plan specifying how to achieve an objective or under what circumstances to refrain from taking action. A plan must be amended to deviate from a standard.

[45] *Stand initiation structural stage* – The stand initiation stage generally develops after a stand-replacing disturbance by fire or regeneration timber harvest. A new single-story layer of shrubs, tree seedlings, and saplings establish and develop, reoccupying the site. Trees that need full sun are likely to dominate these even-aged stands. (Oliver and Larson, 1996)

[46] *Stem exclusion structural stage (Closed canopy structural stage)* – In the stem exclusion stage, trees initially grow fast and quickly occupy all of the growing space, creating a closed canopy. Because the trees are tall, little light reaches the forest floor so understory plants (including smaller trees) are shaded and grow more slowly. Species that need full sunlight usually die; shrubs and herbs may become dormant. New trees are precluded by a lack of sunlight or moisture. (Oliver and Larson, 1996)

[47] *Timber management* – Timber management consists of growing, tending, commercially harvesting, and regenerating crops of trees.

[48] *Understory re-initiation structural stage* – In the understory re-initiation stage, a new age class of trees gets established after overstory trees begin to die, are removed, or no longer fully occupy their growing space after tall trees abrade each other in the wind. Understory seedlings then re-grow and the trees begin to stratify into vertical layers. Alow to moderately dense uneven-aged overstory develops, with some small shade- tolerant trees in the understory. (Oliver and Larson, 1996)

[49] *Vegetation management* – Vegetation management changes the composition and structure of vegetation to meet specific objectives, using such means as prescribed fire or timber harvest. For the purposes of this decision, the term does not include removing vegetation for permanent developments like mineral operations, ski runs, roads and the like, and does not apply to fire suppression or to wildland fire use.

[50] *Wildland urban interface (WUI)* – Use the definition of WUI found in the Healthy Forests Restoration Act. The full text can be found at HFRA § 101. Basically, the wildland urban interface is the area adjacent to an at-risk community that is identified in the community wildfire protection plan. If there is no community wildfire protection plan in place, the WUI is the area 0.5 mile from the boundary of an at-risk community; or within 1.5 miles of the boundary of an at-risk community if the terrain is steep, or there is a nearby road or ridgetop that could be incorporated into a fuel break, or the land is in condition class 3, or the area contains an emergency exit route needed for safe evacuations. (Condensed from HFRA. For full text see HFRA § 101.)

[51] *Winter snowshoe hare habitat* – Winter snowshoe hare habitat consists of places where young trees or shrubs grow densely – thousands of woody stems per acre – and tall enough to protrude above the snow during winter, so snowshoe hare can browse on the bark and small twigs (LCAS). Winter snowshoe hare habitat develops primarily in the stand initiation, understory reinitiation and old forest multistoried structural stages.

NRLMD References

[note: This is the complete reference list from the NRLMD record of decision.]

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Lynx and other Meso-Carnivore Monitoring

Note that Northern Rockies Lynx Management Direction plan components are preceded by VEG and can be found above.

Monitoring Question	Plan Component(s)	Potential Indicator(s)
MON-T&E-LYNX-01: How much of lynx critical habitat does not yet provide PCE1a, but is progressing towards providing PCE1a?	**VEGS1, VEGS2**	**IND-WLD-** **17**: Percentage of lynx critical habitat on NFS lands in each lynx analysis unit that is not yet winter snowshoe hare habitat due to wildfire. **18.** Percentage of lynx critical habitat on NFS lands in each lynx analysis unit that is not yet winter snowshoe hare habitat due to vegetation management projects.
MON-T&E-LYNX-02: What is the percentage of lynx critical habitat that has vegetation treatments in stand initiation hare habitat (PCA1a)?	**VEGS5**	**IND-WLD-** **19**. Number of acres of lynx critical habitat on NFS lands in each lynx analysis unit that were precommercially thinned using exceptions to VEGS5 **20**. Number of acres of lynx habitat or critical habitat on NFS lands in each lynx analysis unit that were precommercially thinned using wildland-urban interface exemptions to VEGS5
MON-T&E-LYNX-03: If modified precommercial thinning techniques are used in lynx critical habitat do they increase PCE1a and/or its persistence?	**VEGS5**	**IND-WLD-** **21**. Number of acres of lynx critical habitat that were treated with modified thinning techniques under VEG S5 exception #2 or 3 **22**. The percentage of dense horizontal cover over time in treatment areas in comparison to untreated plots
MON-T&E-LYNX-04: What is the percentage of lynx critical habitat that has vegetation treatments in multistoried hare habitat (PCE1a)?	**VEGS6**	**IND-WLD-** **23**. Number of acres of multistory hare habitat in lynx critical habitat on NFS lands in each lynx analysis unit that were treated using exceptions to VEGS6 **24**. Number of acres of multistory hare habitat in lynx critical habitat on NFS lands in each lynx analysis unit that were treated using wildland-urban interface exemptions to VEGS6
MON-WL- 17: What is the occupancy of forest meso-carnivores (e.g., lynx, wolverine, fisher) on the Flathead National Forest?	**FW-DC-WL SCC-01** **FW-DC-WL DIV-01**	**IND-WLD-** **75.** Number of each meso-carnivore species detected on the Forest in cooperation with other partners.

Grizzly Bear

Preferred alternative for initiation of ESA section 7 consultation: Flathead National Forest Plan Revision Alternative B modified

The following set of plan components are consistent with the other amendment forests in the NCDE. The Flathead National Forest has additional plan components which affect the grizzly bear and these are also discussed in the biological assessment. The full set of plan components are listed in the revised Flathead National Forest Plan (2017), available on CD.

Wildlife (WL)

Desired Conditions

FW-DC-WL-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area; see figure B-010), bear attractants on NFS lands are stored in a manner that reduces the risk of grizzly bear-human conflicts in the NCDE.

FW-DC-WL-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), grizzly bear habitat on NFS lands contributes to sustaining recovery of the grizzly bear population in the NCDE and contributes to connectivity with neighboring grizzly bear recovery zones.

FW-DC-WL-03. The risk of grizzly bear-human conflicts is reduced by information, education, and design features or criteria for management activities.

Standards

FW-STD-WL-01. Grizzly bear habitat on NFS lands in the NCDE shall be delineated and managed as the primary conservation area, zone 1 (including the Salish demographic connectivity area) (see figure B-10 or subsequent USFWS updates, if applicable).

FW-STD-WL-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area; see figure B-10), food/wildlife attractant storage special order(s) shall apply to all NFS lands.

FW-STD-WL-03. In each bear management subunit within the NCDE primary conservation area, temporary changes in the open motorized route density, total motorized route density, and secure core shall be calculated for roads used for projects (as defined by "project (in grizzly bear habitat in the NCDE)" during the non-denning season (see glossary). Calculations will include estimated changes for each year of the anticipated duration of the project and shall be incorporated into the 10-year running average required by standard FW-STD-IFS-03.

Guidelines

FW-GDL-WL-01. Within the NCDE primary conservation area, zone 1 (including the Salish demographic connectivity area), contractors, permittees, lessees, operators, and their employees should be informed of procedures for safely working and recreating in grizzly bear country and of food/wildlife attractant storage special order(s) prior to turn-out of livestock or beginning work and annually thereafter, in order to reduce the risk of grizzly bear-human conflicts.

FW-GDL-WL-02. Within the NCDE primary conservation area, zone 1 (including the Salish demographic connectivity area), if a contractor, permittee, lessee, operator, or their employee elects to camp on NFS lands other than in a developed recreation site, the site should be evaluated and written authorization (i.e., a campsite agreement that includes the food/attractant storage special order) should be

provided before the campsite is established. The purpose is to reduce the risk of grizzly bear-human conflicts.

FW-GDL-WL-03. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), clover should not be used in seed mixes on NFS lands. Native seed mixes or those that are less palatable to grizzly bears should be used so that seeded areas do not become an attractant.

Infrastructure (IFS) and Recreation (REC)

Desired Conditions

FW-DC-IFS-01. Within the NCDE primary conservation area, motorized access provides for multiple uses (such as harvesting of timber and non-timber forest products; hunting, fishing, and recreation opportunities) on NFS lands and also provides open motorized route density, total motorized route density, and secure core levels that contribute to sustaining the recovery of the grizzly bear population in the NCDE.

FW-DC-REC-01. Within the NCDE primary conservation area, the number, capacity, and improvements of developed recreation sites (NCDE definition) provide for user comfort and safety while minimizing the risk of grizzly bear-human conflicts on NFS lands.

FW-DC-REC-02. Within each bear management unit in the primary conservation area, increases in the number and capacity of developed recreation sites (NCDE definition) on NFS lands that are designed and managed for overnight use during the non-denning season are at levels that contribute to sustaining the recovery of the grizzly bear population in the NCDE.

Standards

FW-STD-IFS-01. Within the NCDE primary conservation area, motorized use of roads with public restrictions shall be permitted for administrative use (see glossary), as long as it does not exceed either six trips (three round trips) per week *or* one 30-day unlimited use period during the non-denning season (see glossary).

The exception to this standard is:

- emergency situations as defined by 36 CFR § 218.21.

Note: Administrative use is not included in baseline calculations and is not included in calculations of net increases or decreases. If the level of administrative use exceeds this standard, the use is counted as a project (see "project (in grizzly bear habitat in the NCDE)" in the glossary).

FW-STD-IFS-02. In each bear management subunit within the NCDE primary conservation area, there shall be no net decrease to the baseline (see glossary) for secure core and no net increase to the baseline open motorized route density or total motorized route density on National Forest System lands during the non-denning season (see glossary). The following conditions are not considered a net increase/decrease from the baseline:

- administrative use (see glossary);
- temporary use of a motorized route for a project (see "project in grizzly bear habitat in the NCDE" definition in the glossary and FW-STD-IFS-03);
- mining activities (as authorized under the Mining Law of 1872) and oil and gas activities (as authorized under the Federal Onshore Oil and Gas Leasing Reform Act of 1987) conducted in accordance with valid existing rights and applicable standards and guidelines;

- updated/improved data on a motorized route without an actual change on the ground;
- changes in technology or projections that result in changed open motorized route density, total motorized route density, or secure core values without actual change on the ground (e.g., a switch from the North American Datum of 1927 to the North American Datum of 1983 geodetic reference system);
- a road closure location is moved a short distance (e.g., to the nearest intersection or turnout) to a better location to allow turn-arounds providing for public safety, to reduce vandalism, or to improve enforcement of the road closure;
- the agency exchanges, acquires, buys, or sells lands;
- a change in a motorized route is necessary to comply with Federal laws (e.g., Federal Rehabilitation Act);
- a change in a motorized route is necessary to address grizzly bear-human conflicts, human safety concerns, or resource damage/concerns (e.g., a road paralleling a stream may be decommissioned and replaced by a new upslope road to reduce water quality impacts);
- a change is made by an adjacent landowner that decreases secure core or increases motorized route densities on a particular national forest;
- emergency situations as defined by 36 CFR § 218.21; and
- temporary roads (see glossary).

FW-STD-IFS-03. In each bear management subunit within the NCDE primary conservation area, temporary changes in the open motorized route density, total motorized route density, and secure core shall be allowed for projects (as defined by "project (in grizzly bear habitat in the NCDE)" in the glossary).

- 5 percent temporary increase in open motorized route density in each subunit (i.e., open motorized route density baseline plus 5 percent);
- 3 percent temporary increase in total motorized route density in each subunit (i.e., total motorized route density baseline plus 3 percent);
- 2 percent temporary decrease in secure core in each subunit (i.e., secure core baseline minus 2 percent).

Exceptions to this standard include:

- emergency situations as defined by 36 CFR 218.21;
- actions where valid existing rights preclude or constrain agency discretion (e.g., certain contracts, permits, leases, etc.).

Refer to appendix 1 for examples of how to calculate and apply the 10-year running average and temporary increase/decrease.

FW-STD-IFS-04. Within the NCDE primary conservation area, the number and capacity of developed recreation sites on NFS lands that are designed and managed for overnight use by the public during the non-denning season (e.g., campgrounds, cabin rentals, huts, guest lodges, recreation residences) shall be limited to one increase above the baseline (see glossary) in number or capacity per decade per bear management unit. The following conditions are not considered an increase from the baseline:

- the agency obtains better information or updated information in its database(s);

- the agency acquires land that contains developed recreation sites;
- the agency increases the number or capacity of a developed recreation site in order to comply with Federal laws;
- the agency maintains or modifies an existing overnight developed or dispersed recreation site in such a way that does not increase the number or capacity of the site (e.g., installing a pit toilet to avoid damage to water resources or installing a bear-resistant food storage structure to reduce grizzly bear-human conflicts);
- the agency modifies an existing developed recreation site to enhance human safety (e.g., enlarging a road pull-out to allow trailers to turn around safely); or
- the agency operates a developed recreation site to allow overnight use only during the denning season (see glossary).

The agency makes a corresponding reduction in the number or capacity of overnight developed recreation sites in the same bear management unit through any of the following means: (1) equal reduction in capacity at another site; (2) closure of a developed site(s); or (3) consolidation and/or elimination of dispersed camping, when and where it can be enforced effectively and it is reasonably sure that new dispersed sites will not develop nearby. Note: If these measures are used to offset an increase in number or capacity, they must be in place before the initiation of the increase. If the agency reduces the number or capacity of developed sites below baseline levels, these reductions may be used at a future date to mitigate equivalent impacts of an increase, expansion, or change of use in developed sites within that bear management unit.

Note: This standard does not apply to dispersed recreation sites or to developed recreation sites managed for day-use only (e.g., outfitter camps, roadside trail crossings or interpretive pull-outs; trailheads, picnic areas, or boat launches that are closed at night; ski areas that do not have overnight lodging).

FW-STD-REC-02. Within the NCDE primary conservation area, new or reauthorized recreation permits shall include a clause providing for modification, cancellation, suspension, or temporary cessation of activities if needed to resolve a grizzly bear-human conflict situation.

FW-STD-REC-04. Within the NCDE primary conservation area, new or reauthorized permits for ski areas on NFS lands that operate during the non-denning season shall include measures to limit the risk of grizzly bear-human conflicts (e.g., a requirement to store garbage in a bear-resistant manner).

FW-STD-REC-05. Within grizzly bear denning habitat modeled by MTFWP in the NCDE primary conservation area, there shall be no net increase in percentage of area or miles of routes designated for motorized over-snow vehicle use on NFS lands during the den emergence time period (see glossary).

Guidelines

FW-GDL-IFS-01. In each bear management subunit within the NCDE primary conservation area, each project (as defined by "project (in grizzly bear habitat in the NCDE)" in the glossary) should be designed so that on-the-ground implementation does not exceed 5 years to reduce the potential of grizzly bears being disturbed or displaced. Exceptions may be made where necessary to accommodate, for example,

- actions where existing rights preclude or constrain agency discretion (e.g., certain contracts, permits, leases);
- prescribed burning (including slash disposal), best management practices to protect water quality, or required reforestation activities; or

- emergency situations as defined by 36 CFR § 218.21.

If an extension to the five-year time limitation is required (e.g., to meet contractual obligations or to complete on-the-ground treatments), the reasons should be documented in writing prior to authorization of the extension.

FW-GDL-IFS-02. Within the NCDE primary conservation area, levels of secure core, open motorized route density, and total motorized route density should be restored to pre-project levels (as defined by "project (in grizzly bear habitat in the NCDE)" in the glossary) within one year after completion of the project in order to reduce the duration of grizzly bear displacement or disturbance due to project-related activities. Exceptions may be made where necessary to accommodate, for example,

- actions where existing rights preclude or constrain agency discretion (e.g., certain contracts, permits, leases);
- prescribed burning (including slash disposal), best management practices to protect water quality, or required reforestation activities; or
- emergency situations as defined by 36 CFR § 218.21.

If an extension to the one-year time limitation is made (e.g., to meet contractual obligations or to complete on-the-ground treatments), the reasons should be documented in writing prior to authorization of the extension.

FW-GDL-REC-01. Within the NCDE primary conservation area, if the number or capacity of day use or overnight developed recreation sites is increased, the project should include measures to reduce the risk of grizzly-bear human conflicts in that bear management unit (e.g., with additional public information and education; by providing backcountry food-hanging poles or bear-resistant food or garbage storage devices; by including design criteria that would limit capacity increases to those needed for public health and safety; by increasing law enforcement and patrols).

Terrestrial Ecosystems Vegetation (VEG)

Desired Conditions

FW-DC-TE&V-01. Within the NCDE primary conservation area, the amount, type, and distribution of vegetation provides for the ecological, social, and economic sustainability of NFS lands while also providing habitat components that contribute to sustaining the recovery of the grizzly bear population in the NCDE.

FW-DC-TE&V-02. Within the NCDE primary conservation area, there is a mosaic of successional stages to provide for grizzly bear habitat needs over the long term.

Guidelines

FW-GDL-TE&V-01. Within the NCDE primary conservation area, measures to reduce the risk of disturbance to the grizzly bear population should be incorporated into vegetation and fuels project design criteria, which vary on a site-specific basis (e.g., some activities should be restricted in spring habitat during the spring time period; areas with low levels of human activity should be provided adjacent to areas with high levels of disturbance). Note: Management activities such as pre-commercial thinning, burning, weed spraying, and implementation of road best management practices may need to be completed during the spring time period in order to meet resource objectives (especially if needed to prevent resource damage), in which case other measures should be used to reduce the risk of disturbance (e.g., limiting the duration of the activity or limiting the use of closed roads).

FW-GDL-TE&V-02. Within the NCDE primary conservation area, vegetation management activities should be designed to avoid detrimental effects on the grizzly bear population and to include one or more measures to protect, maintain, increase, and/or improve grizzly habitat quantity or quality (e.g., promoting growth of berry-producing shrubs, forbs, or grasses known to be bear foods) in areas where it would not increase the risk of grizzly bear-human conflicts.

FW-GDL-TE&V-03. Within the NCDE primary conservation area, measures to retain cover (where present) along a portion of grass/forb/shrub openings, riparian wildlife habitat, or wetlands should be incorporated in project design criteria (this varies on a site-specific basis).

FW-GDL-TE&V-04. Within the NCDE primary conservation area, vegetation management projects (including timber sales and other non-commercial vegetation management contracts) should include a provision providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve grizzly bear-human conflict situations.

FW-GDL-TE&V-05. To reduce the risk of grizzly-bear human conflicts within the NCDE primary conservation area, vegetation management activities designed to enhance grizzly habitat (e.g., to increase huckleberry production) should not occur in or next to campgrounds, administrative facilities, or other developed recreation sites that operate during the non-denning season.

Grazing (GRZ)

Desired Condition

FW-DC-GR-01. Within the NCDE primary conservation area, the number, capacity of, and improvements on livestock grazing allotments support ecologically sustainable grazing, and temporary grazing permits are used effectively for management of noxious weeds, while minimizing the risk of bear-human conflicts on NFS lands. See also FW-DC-WL-01 and 02.

Standards

FW-STD-GR-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), new or reauthorized livestock grazing permits and annual operating plans shall incorporate requirements to reduce the risk of grizzly bear-human conflicts (e.g., food/wildlife attractant storage special order). New or reauthorized permits shall include a clause providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation.

NCDE-STD-GR-02. Within the NCDE primary conservation area and zone 1, a sheep grazing permit in non-use status shall not be allowed to increase allowable animal unit months beyond what was previously permitted prior to being in non-use when it is returned to use. Note: The Flathead National Forest does not have any sheep allotments.

FW -STD-GR-03. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), permits for livestock grazing shall include a provision that requires reporting livestock carcasses within 24 hours of discovery, which shall be followed by proper disposal of the carcass. Boneyards shall not be established on NFS lands.

FW -STD-GR-04. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), there shall be no net increase in the number of active sheep allotments on NFS lands. Note: The Flathead National Forest does not have any sheep allotments.

FW-STD-GR-05. Within the NCDE primary conservation area, there shall be no increase in the number of active cattle grazing allotments above the baseline (see glossary) on NFS lands. Note: Existing allotments may be combined or divided as long as that does not result in grazing allotments in currently unallotted lands.

FW-STD-GR-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), temporary permits for grazing by small livestock for purposes such as controlling invasive exotic weeds or reducing fire risk, or for trailing of small livestock across NFS lands, shall not result in an increase in bear-small livestock conflicts. See also FW-STD-GR-01.

Guidelines

FW-GDL-GR-02. Within the NCDE primary conservation area, an allotment management plan and plan of operations should specify any needed measures to protect key grizzly bear food production areas (e.g., wet meadows, stream bottoms, aspen groves, and other riparian wildlife habitats) from conflicting and competing use by livestock (this varies on a site-specific basis).

Other Forest Products (OFP)

Desired Condition

FW-DC-OFP-01. Provide a variety of public services and special forest products (such as mushrooms, huckleberries, firewood) from NFS lands while minimizing the risk of grizzly bear–human conflicts on NFS lands in the NCDE.

Standard

FW-STD-OFP-01. Special-use permits for apiaries (beehives) located on NFS lands shall incorporate measures including electric fencing to reduce the risk of grizzly bear–human conflicts, as specified in the food/wildlife attractant storage special order.

Renewable/Non-Renewable Energy and Mineral Resources (MIN)

Desired Condition

FW-DC-E&M-01. Mineral materials are available based upon public interest, in-service needs, material availability, and valid existing rights, where consistent with desired conditions for other resources.

Standards

FW-STD-E&M-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), mining activities (as authorized under the Mining Law of 1872) and oil and gas activities (as authorized under the Federal Onshore Oil and Gas Leasing Reform Act of 1987) occurring on NFS lands, where feasible, shall avoid, minimize, and/or mitigate environmental impacts to grizzly bears or their habitat, subject to existing rights. Stipulations or mitigation measures already included in existing leases, permits, or plans of operation on NFS lands shall not be changed, nor will additional stipulations or mitigation measures be added without the agreement of the holder of the lease, permit, or plan of operation.

FW-STD-E&M-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), new or reauthorized permits, leases, and/or plans of operation shall include a clause providing for modification or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation.

FW-STD-E&M-03. New plans of operation, permits, and/or leases for mineral activities shall include measures to reasonably mitigate potential impacts of mineral development for the following:

- land surface and vegetation disturbance;
- water table alterations that affect bear foods on the surface; and

- construction, operation, and reclamation of mine-related facilities such as impoundments, rights of way, motorized routes, pipelines, canals, transmission lines or other structures.

FW-STD-E&M-04. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), in addition to measures included in the food/wildlife attractant storage special order(s), new plans of operation, permits, and/or leases for mineral activities shall include the following measures regarding grizzly bear attractants:

- bear resistant food storage and garbage containers shall be used at development sites and at any campgrounds or dispersed sites where exploration or production-related human occupancy is anticipated;
- garbage shall be removed in a timely manner;
- road kills shall be removed daily during active operating periods to a designated location determined in close coordination with Montana Fish, Wildlife and Parks;
- feeding of wildlife shall not be allowed;
- locations of work camps shall be approved in advance of operations. Food storage requirements shall be strictly adhered to in any work camps.

FW-STD-E&M-05. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), if minerals activities have the potential to adversely affect grizzly bears or their habitat as determined by a site-specific analysis, new plans of operation, permits, and/or leases for mineral activities shall include the following mitigation measures, stipulations, and surface use criteria regarding grizzly bear habitat:

- Ground-disturbing activities in identified grizzly bear spring habitat (as identified in a site-specific biological evaluation or other environmental document) shall be avoided between April 1 and June 30. If timing restrictions are not practicable, other measures shall be taken to reasonably mitigate negative impacts of mineral activity to grizzly bears.
- Seismic activity in identified grizzly bear denning habitat (as identified in a site-specific biological evaluation or other environmental document) shall be avoided during the denning season (see glossary). If timing restrictions are not practicable, other measures shall be taken to reasonably mitigate negative impacts of mineral activity to grizzly bears.
- Cumulative impacts of multiple, concurrent seismic and/or drilling operations shall be limited by timing restrictions. If timing restrictions are not practicable, reasonable and appropriate measures shall be taken to mitigate negative impacts to the grizzly bear.
- Reasonable and appropriate measures regarding the maintenance, rehabilitation, restoration, or mitigation of functioning aquatic systems and riparian management zones shall identify how reclamation will occur, plant species to be used in reclamation, a time frame of when reclamation will be completed, and monitoring criteria.
- Reclamation and revegetation of motorized routes, drilling pads, and other areas disturbed from mineral activities shall be completed as soon as practicable by the operator.

FW-STD-E&M-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), if mineral activities have the potential to adversely affect grizzly bears or their habitat as determined by a site-specific analysis, new plans of operations, permits, and/or leases shall include the following mitigation measures regarding motorized access:

- public motorized use that is not associated with minerals activities shall be prohibited on motorized routes constructed for exploration and/or development;

- a traffic management plan shall be developed as part of the proposed activity to identify when and how motorized routes will be used, maintained, and monitored (if required) and how motorized route standards and guidelines will be implemented after activities have ended;
- helicopter use associated with seismic activity, exploration, drilling, or development must follow an approved plan or permit; and
- speed limits shall be adopted on motorized routes if needed to prevent or reduce collisions with grizzly bears.

FW-STD-E&M-07. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), minerals contractors or lessees shall require employees to attend training related to safely living near and working in grizzly bear habitat prior to starting work and on an annual basis thereafter.

FW-STD-E&M-08. Within the NCDE primary conservation area, new leases for leasable minerals shall include a no surface occupancy stipulation (see glossary).

Guidelines

FW-GDL-E&M-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), in addition to forestwide guidelines, the following guidelines apply to new leasable minerals activities including leases, surface use plans for proposed wells or operations, or permits to conduct seismic exploration or drilling. To reduce potential grizzly bear disturbance or displacement, helicopter use plans should:

- avoid establishing recurring helicopter use (see glossary), especially in spring habitats or other known important grizzly bear habitats or use areas;
- avoid establishing landing zones, especially in spring habitats or other known important grizzly bear habitats or use areas. If a landing zone is deemed necessary for safe implementation of the seismic or surface use plan or permit to drill, the landing zone should be constructed only in an area that has had site-specific analysis and approval.

FW-GDL-E&M-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), leasable energy activities should use the best available noise-reduction technology on equipment and motorized vehicles to reduce potential disturbance or displacement of grizzly bears, whenever possible.

FW-GDL-E&M-03. Within the NCDE primary conservation area and zone 1 (including the Salish and demographic connectivity area), along motorized routes, seismic corridors, and pipelines constructed for leasable energy activities, wildlife cover should be maintained at regular intervals, where present (this varies on a site specific basis), in order to provide habitat connectivity for grizzly bears.

FW-GDL-E&M-04. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), for locatable and non-energy leasable minerals activities with the potential to adversely affect the grizzly bear or its habitat, the following tiered measures should be used to mitigate impacts to grizzly bear habitat. Beginning at step 1, any subsequent steps would be implemented only if the prior steps are not possible or achievable.

- Step 1: The operator should reclaim the affected area back to suitable bear habitat that has similar or improved characteristics and qualities compared to the original habitat (such as the same native vegetation).
- Step 2: If step 1 is not attainable, operators should either acquire a perpetual conservation easement (or easements) or purchase comparable or better replacement grizzly bear habitat within the primary conservation area. Acquisition of habitat within connectivity corridors could

also be considered for mitigation, when appropriate. Habitat acquired for mitigation may require a purchase rate of > 1:1 on an acreage basis, depending on the quality of habitat degraded and the habitat available for acquisition.

- Step 3: If steps 1 and 2 are not achievable, the next option is to offset negative effects to bears and grizzly bear habitat with other appropriate types of actions.

FW-GDL-E&M-05. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), carrying bear spray should be recommended to mineral permittees, lessees, and operators to reduce the risk of grizzly bear-human conflicts.

FW-GDL-E&M-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), available resources at existing gravel pits should be used before constructing new pits to reduce the risk of grizzly bear disturbance or displacement associated with blasting of rock or crushing of gravel.

How changes in route density and secure core would be implemented

As stated in FW-STD-IFS-03, in each bear management subunit within the NCDE primary conservation area, temporary changes in the open motorized route density, total motorized route density and secure core shall be calculated for projects (as defined by "project (in grizzly bear habitat in the NCDE)" in the glossary).

The 10-year running average for open motorized route density, total motorized route density, and secure core numeric parameters shall not exceed the following limits per bear management subunit:

- 5% temporary increase in open motorized route density in each subunit (i.e., open motorized route density baseline plus 5%);
- 3% temporary increase in total motorized route density in each subunit (i.e., total motorized route density baseline plus 3%);
- 2% temporary decrease in secure core in each subunit (i.e., secure core baseline minus 2%).

Hypothetical example

The following hypothetical example (displayed as Table D-2 and Table D-3) shows how temporary changes in open motorized route density (OMRD), total motorized route density (TMRD), and secure core would be implemented for a project.

Hypothetical example of how temporary changes in OMRD, TMRD, and Secure Core would be implemented for a project. Table D-2 shows the baseline values in a BMU subunit for OMRD, TMRD, and Secure Core from previous years and anticipated increases during the project (i.e., years 11 – 14).

Table D-3 uses the data from table D-2 to show the 10 year running averages for OMRD, TMRD, and Secure Core before, during, and after project completion, demonstrating that these 10-year running averages do not violate the Application Rules for Temporary Changes in Motorized Access. It should be noted that in this hypothetical example, another project in this subunit would not be possible until yr 24, unless that project did not require any changes in values for OMRD, TMRD, or Secure Core.

Table D-7. Values in a bear management subunit for OMRD, TMRD, and secure core for project in years 11 through 14

Variable	Baseline Value	Allowed Value for Project	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	project year 11	project year 12	project year 13	project year 14	year 15	year 16	year 17
OMRD	19	24	19	19	19	19	19	19	19	19	19	19	31	31	31	31	19	19	19

TMRD	19	22	19	19	19	19	19	19	19	19	19	19	22	22	22	22	19	19	19
Secure Core	69	67	69	69	69	69	69	69	69	69	69	69	63	63	63	63	69	69	69

Table D-8. Using data from table 5 to show the 10-year running averages for OMRD, TMRD, and secure core before, during, and after project completion

Variable	Before yr 1-10	During yr 2-11	During yr 3-12	During yr 4-13	During yr 5-14	During yr 6-15	After yr 7-16	After yr 8-17
OMRD	19	20	21	23	24	24	24	24
TMRD	19	19	20	20	20	20	20	20
Secure Core	69	69	68	67	67	67	67	67

Flathead NF - Zone 1

Desired Conditions

GA-SM-DC-01 Within the Flathead National Forest portion of NCDE zone 1 (including the Salish demographic connectivity area) (see figure B-10), roads and trails provide for public and administrative access to NFS lands. Grizzly bear habitat in zone 1 contributes to sustaining recovery of the grizzly bear population in the NCDE. The demographic connectivity area provides habitat that can be used by female grizzly bears and allows for bear movement between grizzly bear ecosystems.

GA-SM-DC-03 In areas between the primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. National Forest System lands in the Swift Creek-Stillwater connectivity area (see figure B-30) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges.

Standards

GA-SM-STD-01 Within the Flathead National Forest portion of NCDE zone 1 *outside* the Salish demographic connectivity area (see figure B-10), there shall be no net increase above the baseline (see glossary) in the density of roads open to public motorized use on NFS lands. *Inside* the Salish demographic connectivity area, there shall be no net increase above the baseline (see glossary) in the density of roads and trails open to public motorized use during the non-denning season on NFS lands. Density is calculated by dividing the total miles open to public motorized use on NFS lands during the non-denning season, by the total square miles of NFS lands in that same area. This standard does not apply to the following:

- motorized use by agency personnel or others authorized by the appropriate agency personnel;
- the temporary opening of a road for a short period of time to allow for public firewood gathering and other authorized uses (see also standard FW-STD-IFS-04);
- updated/improved road data without an actual change on the ground;
- changes in technology or projections that result in changed calculations without actual changes on the ground (e.g., a switch in geodetic systems from the North American Datum of 1927 to the North American Datum of 1983);
- moving a road closure location a short distance (e.g., to the nearest intersection or turnout) to a better location to allow turn-arounds that provide for public safety, to reduce vandalism, or to improve enforcement of the road closure;
- exchanging, acquiring, buying, or selling lands by the agency;
- a change in an open road that is necessary to comply with Federal laws (e.g., the Architectural Barriers Act of 1968, as amended);
- motorized use for mining activities (as authorized under the Mining Law of 1872) and oil and gas activities (as authorized under the Federal Onshore Oil and Gas Leasing Reform Act of 1987) because these types of permitted resource development are subject to existing rights and have a separate set of standards and guidelines;
- a change in an open road that is necessary to address grizzly bear-human conflicts, human safety concerns, or resource damage or concerns (e.g., a road paralleling a stream may be decommissioned and replaced by a new upslope road to reduce water quality impacts);
- motorized use for emergency situations as defined by 36 CFR § 218.21;

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- temporary roads (see glossary).

Grizzly Bear Monitoring

Plan monitoring questions and indicators for grizzly bear

Monitoring Question	Plan Component(s)	Potential Indicator(s)
MON-NCDE-01: Within the NCDE primary conservation area, what is the level of secure core, open motorized route density (> 1 square mile) and total motorized route density (> 2 square miles) within each bear management subunit during the non-denning season?	**FW-STD-IFS-02**	**IND-WLD-** For each grizzly bear subunit in the PCA: **01**. Open motorized route density percentage **02**. Total motorized route density percentage **03**. Secure core percentage
MON-NCDE-02: Within the NCDE PCA, what is the number and overnight capacity of developed recreation sites designed and managed for overnight use on NFS lands within each bear management unit, and how does this compare to the baseline? Within the NCDE primary conservation area, what is the status of administrative sites, day-use developed recreation sites, and trailheads in each bear management unit?	**FW-STD-REC-01** **FW-GDL-REC-01**	**04.** Number of developed recreation sites (NCDE definition) managed for overnight use in each grizzly bear management unit. **05.** Capacity of sites managed for overnight developed recreation use in each grizzly bear management unit. **06.** If increases in number or capacity occur, measures used to reduce the risk of grizzly-bear human conflicts. **07.** Number of new administrative sites, day-use developed recreation sites or trailheads (NCDE definition) in each grizzly bear management unit.
MON- NCDE-03: Within the NCDE primary conservation area, is there a change in the number of allotments? Have conflicts occurred between grizzly bears and livestock on NFS lands?	**FW-STD-GR-05**	**IND-WLD-** **08**. Number of livestock allotments in the PCA (by livestock type). **09**. Permitted animal unit months for sheep allotments. **10.** Number of grizzly bear-livestock conflicts on NFS lands by grizzly bear management zone (e.g., PCA, DCA) and livestock type.
MON- NCDE-04: If new leasable and locatable mineral activities occur in the PCA, do the record of decision and permit/plan of operation include a monitoring plan for changes in habitat and/or measures to avoid, minimize, or mitigate environmental impacts to grizzly bears or their habitat?	**FW-STD-E&M-01, 03 through 06**	**IND-WLD-** **11**: Number of permits authorized in the PCA and mitigation measures included in the permit/plan of operations where it is determined there is potential for adverse effects to the grizzly bear population or its habitat resulting from leasable or locatable mineral activities.
MON- NCDE-05: Within the NCDE primary conservation area, what is the status of grizzly bear subunits that have temporary increases in motorized access due to projects (see glossary)?	**FW-STD-IFS-03**	**IND-WLD-** **12**. Percent change in the 10-year running average of open motorized route density, total motorized route density, and secure core for each subunit that has had temporary increases in projects (see appendix C for examples of methods). If the 10-year running average allowed by FW-STD-IFS-03 is exceeded, what are the reasons?

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Monitoring Question	Plan Component(s)	Potential Indicator(s)
MON-NCDE-06: Within the NCDE primary conservation area, are projects (see glossary) completed within the five-year time period specified by guideline FW-GDL-IFS-01?	**FW-GDL-IFS-01**	**IND-WLD-** **13**. For each grizzly bear subunit in the PCA with a project (see glossary): Number of years to complete a project (see the definition of "project (in grizzly bear habitat in the NCDE)" in the glossary)**.** If an extension to a project beyond five years is necessary, what is the reason?
MON-NCDE-07: In the Salish DCA, what is the density of roads and motorized trails on NFS lands that are open to public use during the non-denning season? In zone 1 outside the Salish DCA, what is the density of roads on NFS lands that are open to public use during the non-denning season?	**GA-SM-STD-01**	**IND-WLD-** **14.** Density of roads and motorized trails on NFS lands in the DCA that are open to public motor vehicle use during the non-denning season. **15.** Density of roads on NFS lands in zone 1 outside the DCA that are open to public motor vehicle use during the non-denning season.
MON-NCDE-08: What is the risk of human disturbance in areas modeled as grizzly bear denning habitat during the den emergence time period (see glossary)?	**FW-STD-REC-05**	**IND-WDL-** **16.** Percentage of modeled grizzly bear denning habitat where public motorized over-snow vehicle use is allowed during the den emergence time period (MFWP model for the NCDE or subsequent updates).

NCDE Glossary

The following terms, and definitions, are to be used only where they apply within the Northern Continental Divide Ecosystem (NCDE) for grizzly bears.

administrative site a location or facility constructed for use primarily by government employees to facilitate the administration and management of public lands. Examples on National Forest Service lands include, but are not limited to, ranger stations, warehouses, and guard stations.

administrative use a generic term for authorized agency activity. Specifically, in the portion of the NCDE for grizzly bears mapped as the primary conservation area, motorized use of roads closed to the public is permitted for Federal agency personnel or personnel authorized to perform duties by appropriate agency officials, as long as it does not exceed either 6 trips (3 round trips) per week OR one 30-day unlimited use period during the non-denning season (see **non-denning season**).

baseline the baseline for the NCDE is defined as conditions as of December 31, 2011, as modified by changes in numbers that were evaluated and found to be acceptable through the Endangered Species Act Section 7 consultation with USFWS while the grizzly bear was listed as Threatened. The baseline will be updated to reflect changes allowed under the standards and guidelines.

bear management subunit an area of a bear management unit, in the portion of the NCDE for grizzly bears mapped as the primary conservation area, representing the approximate size of an average annual female grizzly bear home range (e.g., 31-68 mi^2 [Mace and Roberts 2012]).

bear management unit an area about 400 m^2, in the portion of the NCDE for grizzly bears mapped as the primary conservation area that meets yearlong habitat needs of both male and female grizzly bears.

best management practice (BMP) the method(s), measure(s), or practice(s) selected by an agency to meet its nonpoint source control needs. BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (36 CFR 219.19).

boneyard an established site that is used by a grazing permittee for disposing of entire animal carcasses.

capacity (of developed recreation sites within the NCDE primary conservation area) the number of sites available for overnight use (e.g. the number of sites in a campground; the number of rooms available for lodging (as a commercial rental); or the number of cabins, bunkhouses, or recreation residences managed under a special use permit).

cover the elements of the environment used by an animal for hiding. Cover varies depending upon the species or the time of year and may include a variety of vegetation types as well as topography. The amount and quality of cover needed depends on the animal's size, mobility, and reluctance or willingness to venture into relatively open areas.

demographic connectivity area an area intended to allow female grizzly bear occupancy and potential dispersal beyond the NCDE to other recovery areas.

den emergence time period the spring-time period when a grizzly bear emerges from its den and remains in the vicinity before moving to lower elevations. The den emergence time period occurs at the beginning of the non-denning season. Females with cubs usually emerge later and spend more time (a few days to a few weeks) near the den after emergence, than do male bears.

denning season the typical time period, within the NCDE, during which most grizzly bears are hibernating in dens. There are no restrictions on motorized use related to grizzly bears during the denning season, which occurs:

- west side of the Continental Divide: from 1 December through 31 March.
- east of the Continental Divide: from 1 December through 15 April.

emergency situation a circumstance on National Forest System lands for which immediate implementation of all or part of a decision is necessary for relief from hazards threatening human health and safety or natural resources on those National Forest System or adjacent lands; or that would result in substantial loss of economic value to the Federal Government if implementation of the decision were delayed. (36 CFR 218.21)

grazing allotment a designated area of land that is available for livestock grazing and is represented on a map. A grazing allotment can include National Forest Service (NFS) and non-NFS lands. Permits are issued for the use of allotments or portions of allotments. Allotments may be:

- **active**: Livestock grazing allotments that are in use, including pack and saddle stock allotments.
- **closed**: Areas having suitable livestock range that have been closed to livestock grazing by administrative decision or action.
- **combined**: An allotment that has been combined into another allotment and therefore, no longer exists as an independent allotment.
- **vacant**: An allotment that does not have a current grazing permit issued. (Forest Service Manual 2205)

grazing permit in non-use status a term that applies to livestock numbers. Non-use of a term grazing permit, in whole or in part, must be approved by a Forest Supervisor and is allowed for permittee convenience, resource protection or development, or range research (Forest Service Manual 2231.7).

grazing permit in inactive status all permitted uses have expired, been cancelled, or been waived.

grizzly bear–human conflict an interaction between a grizzly bear and human in which bears either do, or attempt to, injure people, damage property, kill or injure livestock, damage beehives, obtain anthropogenic foods or attractants or agricultural crops.

livestock a type of domestic animal raised for commercial production purposes, e.g., cattle. Small livestock includes animals smaller than a cow, such as sheep, goats, and llamas.

motorized route a National Forest System road or trail that is designated for motorized use on a motor vehicle use map pursuant to 36 CFR 212.51.

motorized use the designation of roads, trails, and areas that are open to motor vehicle use as specified in Federal Register / Vol. 70, No. 216 / Wednesday, November 9, 2005 /36 CFR Parts 212, 251, 261, Travel Management; Designated Routes and Areas for Motor Vehicle Use; Final Rule.

moving window analysis a geographic information system procedure that quantifies the density of roads and trails by incrementally moving a template across a digital map.

net change the difference in a measurement (such as road density) after on-the-ground changes are accounted for pre- and post-project; allows for temporary changes during a project.

no surface occupancy (NSO) a fluid mineral leasing stipulation that prohibits use or occupancy of the land surface in order to protect identified resource values. Lessees may develop the oil and gas or geothermal resources under the area restricted by this stipulation through use of directional drilling from sites outside the no surface occupancy area.

Northern Continental Divide Ecosystem a region identified in the Grizzly Bear Conservation Strategy encompassing about 27.3 million acres of land in western and central Montana that is one of five areas in the lower 48 states where grizzly bear populations occur.

NCDE Coordinating Committee an interagency group that evaluates implementation of the NCDE grizzly bear conservation strategy, promotes the exchange of data and information about the NCDE grizzly bear population among agencies and the public, and makes recommendations to the management agencies regarding implementation of the NCDE grizzly bear conservation strategy. Members of the interagency group may include Montana Fish, Wildlife and Parks; U.S. Fish and Wildlife Service; U.S. Park Service; U.S. Forest Service; APHIS-Wildlife Services; U.S. Geological Survey; U.S. Bureau of Land Management; Blackfeet Tribe, and the Confederated Salish and Kootenai Tribes.

non-denning season the time period when grizzly bears typically are not hibernating:

- west side of the Continental Divide: from 1 April through 30 November.
- east side of the Continental Divide: from 16 April through 30 November.

open motorized route density a moving window analysis calculation that applies to the primary conservation area portion of the NCDE and includes Federal, State, and Tribal roads and motorized trails that are open to wheeled motor vehicle use by the public for any part of the non-denning season. *Note*: Motorized routes closed only by sign or order are considered to be open for purposes of this calculation. See also **moving window analysis**.

primary conservation area an area identified in the NCDE Grizzly Bear Conservation Strategy to be managed as a source area for the grizzly bear population, where continuous occupancy by grizzly bears would be maintained. Habitat within the primary conservation area would receive the most stringent protection. The primary conservation area is the same area as the NCDE grizzly bear recovery zone identified in the Recovery Plan (http://www.fws.gov/mountain-prairie/species/mammals/grizzly/ [U.S. Fish and Wildlife Service 1993]).

project an organized effort to achieve an outcome on National Forest System lands identified by location, tasks, outputs, effects, times, and responsibilities for execution (36 CFR 219.19).

project (in grizzly bear habitat in the NCDE) a project in grizzly bear habitat in the NCDE, for purposes of the motorized access standards and guidelines in the primary conservation area of the NCDE, refers to any temporary activity requiring construction of new roads, temporary roads, reconstruction or opening of restricted roads during the non-denning season, if such use exceeds administrative use levels (see **administrative use**). Activities involving recurring helicopter use (see **recurring helicopter use**) are also considered to be a project.

recreation site a defined, public recreation area. The Forest Service uses two categories for recreation sites: dispersed and developed. Both types may have improvements needed to protect resources such as signs, road closure devices, bear resistant food storage devices, and/or sanitation facilities. Some developed recreation sites are designed and managed for overnight use and some are designed and managed for day-use only (e.g., interpretive signs at roadside pull-outs; trailheads at roadside pull-outs or at road closures; day-use picnic areas or boat launches; ski areas that do not have overnight lodging).

- Developed recreation sites have agency improvements made out of manmade materials that are intended to provide for public recreation and user comfort/convenience. Examples on National Forest Service lands include, but are not limited to: ski areas, campgrounds, sites with cabins, huts, lodges, recreation residences, visitor centers, and trailheads.

- Dispersed recreation sites have minimal to no agency improvements made out of manmade materials. Dispersed sites may include outfitter camps or other primitive camping spots along a road, trail, water body, or at a road closure.

recurring helicopter use a type of helicopter flight that involves multiple trips/passes each day consisting of low-altitude (< 500 m above-ground-level) flights that continues for a duration longer than 48 consecutive hours.

road a motor vehicle route more than 50 inches wide, unless identified and managed as a trail. (36 CFR 212.1, FSM 7705):

1. decommissioned: The stabilization and restoration of an unneeded road to a more natural state (36 CFR 212.1). Decommissioned roads do not count towards Total Motorized Route Density as long as they meet the definition of impassable.
2. forest road or trail: A route wholly or partly within or adjacent to and serving the National Forest Service (NFS) that is necessary for the protection, administration, and utilization of the NFS and the use and development of its resources (36 CFR 212.1 – Definitions)
3. impassable: A road that has been treated in such a manner that the road is blocked and there is little resource risk if road maintenance is not performed on a regular basis (self-maintaining).These roads are not counted in the total motorized route density as long as the road (generally the first 50 to 300 feet) has been treated to make it inaccessible to wheeled motorized vehicles during the non-denning season. Roads may become impassable as a result of a variety of means, including but not limited to one or more of the following: natural vegetation growth, road entrance obliteration, scarified ground, fallen trees, boulders, culvert or bridge removal, etc. Impassable roads may remain on the inventoried road system if use of the road is anticipated at some point in the future. Some, but not all, roads placed in intermittent stored service may be impassable. [GBCS]
4. intermittent stored service/intermittent service road, closed to traffic: The road is in a condition that there is little resource risk if maintenance is not performed.
5. maintenance level: A term for the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria (Forest Service Handbook 7709.59, 62.32)

   Level 1: These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns.

   Level 2: Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations.

   Level 3: Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities

   Level 4: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds

Level 5: Assigned to roads that provide a high degree of user comfort and convenience.

6. National Forest System: A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority (36 CFR 212.1)
7. temporary: A road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road and that is not included in a forest transportation atlas (36 CFR 212.1). In the NCDE primary conservation area, temporary roads will meet the definition of impassable when no longer needed. [GBCS]

running average a method for computing the average of a stream of numbers for a specified period. A 10-year running average computes the mean for the values in the current year plus the previous 9 years. A running average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

secure core (grizzly bear) an area of the NCDE primary conservation area 500 meters or more from (1) a route open to public wheeled motorized use during the grizzly bear non-denning season, (2) a gated route, or (3) a route closed only with a sign that is greater than or equal to 2,500 acres in size. Roads restricted with physical barriers (not gates), decommissioned roads, impassable roads, temporary roads, over-the-snow motorized routes/areas, and non-motorized trails are allowed within secure core, unless otherwise restricted (e.g., by other national forest plan direction). Note: for suitability for over-the-snow motorized routes/areas during the non-denning season, see Flathead National Forest revised plan figures B-11 and B-12.

total motorized route density a moving window analysis calculation that applies to the primary conservation area portion of the NCDE and includes Federal, State, and Tribal roads and motorized trails that do not meet the definition of an impassable road. See also **moving window analysis**.

zone 1 an area surrounding the grizzly bear primary conservation area in the NCDE, where the intent is to maintain occupancy by grizzly bears, but at expected lower densities than inside the primary conservation area. Zone 1 also includes two demographic connectivity areas.

zone 2 an area adjacent to the grizzly bear zone 1 and/or zone 3 in the NCDE, where grizzly bears, particularly males, would have the opportunity to move between the NCDE and adjacent ecosystems. The intent of the zone 2 area is to allow for resource management and recreational opportunities while responding to grizzly bear-human conflicts with appropriate management actions.

zone 3 the area that primarily consists of areas where grizzly bears do not have enough suitable habitat to support population growth. The intent is that grizzly bear occupancy is not actively discouraged in zone 3 and the management emphasis is on conflict response.

Water howellia and Spalding's catchfly

Refer to the bull trout plan components for riparian management zone and other aquatic-related plan components (specifically **FW-STD-RMZ-01**).

Plant species currently designated threatened, endangered, proposed, or candidate (PLANT)

Desired Conditions (FW-DC-PLANT)

01 Habitat conditions support the recovery or long-term persistence of plant species listed as threatened and endangered under the Endangered Species Act, which currently include Spalding's catchfly (*Silene spaldingii*) and water howellia (*Howellia aquatilis*).

02 Vegetation conditions and ecological processes within a 300-foot riparian management zone surrounding ponds that provide *Howellia aquatilis* habitat (occupied and unoccupied) create a favorable physical environment that protects against hydrological changes that may adversely impact the species. The structural and floristic diversity of the vegetation in the riparian management zone is maintained.

Guidelines (FW-GDL-PLANT)

01 Ground-disturbing vegetation treatments within 300 feet of ponds providing habitat for *Howellia aquatilis* should occur only if the vegetative, physical, and/or hydrologic features required for long-term habitat conservation are maintained or improved. Treatments should develop vegetation conditions consistent with natural ecological processes and should sustain soil quality and functioning to support the long-term persistence of *Howellia aquatilis*.

02 Road maintenance on roads within 300 feet of ponds providing habitat for *Howellia aquatilis* should maintain or improve hydrological integrity to protect habitat conditions for *Howellia aquatilis*.

03 To protect habitat conditions for *Howellia aquatilis*, water drafting (for invasive plant control or fire management activities) should not occur in occupied or unoccupied but suitable water howellia ponds.

Non-Native Invasive Plants/Noxious Weeds (NNIP)

Desired Conditions (FW-DC-NNIP)

01 Native plant species and plant communities dominate the landscape, whereas invasive plant species are at low abundance or non-existent, especially in areas identified of high priority, including wilderness areas, native grassland plant communities, riparian areas (particularly those associated with water howellia ponds), research natural areas (management area 4a), around known populations of plant species of conservation concern, and in special areas (management area 3b).

02 No new non-native invasive plant species become established in terrestrial or aquatic plant communities on the Forest.

03 Terrestrial communities at risk of negative impacts from non-native invasive plants are able to retain or regain function, process, and structure after disturbance.

04 Invasive plant species are controlled with integrated pest management approaches in a strategic and adaptive manner. These approaches include an effective prevention and education program, combined with mechanical, biological, cultural, and chemical methods of weed control. Technological advances in weed treatments are capitalized on if they are shown to be equivalent to or more effective than existing treatments.

Objective (FW-OBJ-NNIP)

01 Treat 12,000 to 16,000 acres to contain or reduce non-native invasive plant density, infestation area, and/or occurrence. Greatest attention will be given to treating potential invaders or new invaders most likely to negatively impact native plant communities and ecosystem integrity, especially in areas identified as high priority (see FW-DC-NNIP-01)

Guidelines (FW-GDL-NNIP)

01 To reduce the probability of establishment of new non-native invasive plant populations, areas where soils are disturbed by management activities conducted or authorized by the USFS should be reseeded as soon as practical using USFS-certified weed-free seed mixes.

Sustainable Recreation—General (SREC)

Guidelines (FW-GDL-REC)

02 To protect resources, new solid and sanitary waste facilities should be located outside of the inner riparian management zone.

Lands and Special Uses (LSU)

Guidelines (FW-GDL-LSU)

02 To maintain or improve habitat conditions for fish, water, and other riparian associated species and resources, authorizations for new special-use permits should include requirements for best management practices and at the conclusion of the permit should restore in-stream and riparian conditions if necessary.

03 To protect riparian and aquatic habitat new support facilities should be located outside of riparian management zones. Support facilities include any facilities or improvements (e.g., workshops, housing, switchyards, staging areas, transmission lines) not directly integral to the production of hydroelectric power or necessary for the implementation of prescribed protection, mitigation, or enhancement measures. At time of permit reissuance, the removal of such support facilities, where practical, should be considered.

Energy and Minerals (E&M)

Guidelines (FW-GDL-E&M)

07 To protect water quality and inland native fish habitat, wildlife and other riparian-associated resources, mineral operations should not be authorized in riparian management zones. If the riparian management zone cannot be avoided, the authorization should include measures to maintain, protect, and rehabilitate fish and wildlife habitat that may be affected by the operations.

Grazing (GR)

Standard (FW-STD-GR)

07 New or reauthorized livestock grazing permits shall incorporate requirements that reduce the risk of impacts to native fish or riparian habitat (e.g., through modifying accessibility of riparian areas to livestock, length of grazing season, stocking levels, timing of grazing, etc.).

08 New livestock handling and/or management facilities must be located outside of riparian management zones. New areas for livestock trailing, bedding, watering, salting, loading, and other handling or management efforts shall be limited to those areas and times that would not adversely affect listed animal and plant species or animal and plant species of conservation concern.

Guideline (FW-GDL-GR)

01 During allotment management planning, grazing practices (e.g., length of grazing season, stocking levels, timing of grazing) should be adjusted if needed to achieve desired conditions for riparian management zones (this varies on a site-specific basis).

03 Livestock trailing, bedding, watering, salting, loading, and other handling activities should be avoided in riparian management zones.

Plant species at risk Monitoring

Also refer to Bull Trout (Aquatic) Monitoring (e.g. MON-WTR-03) above.

Monitoring Question(s)	Plan Component(s)	Potential Indicator(s)
MON-PLANT-01: What is the status of water howellia in areas where disturbances (natural or human-caused) have occurred?	**FW-DC-PLANT-01**	**IND-PLANT-01**: Presence/absence of water howellia in habitat that has been disturbed.
Monitoring Question(s)	**Plan Component(s)**	**Potential Indicator(s)**
MON-NNIP-01: What is the status of plant communities at highest risk of negative impacts to their system functions from established or new invaders?	**FW-DC-NNIP-01**	**IND-NNIP-01**: Percent of invasive plant species cover within identified high-risk/high-priority areas. These would include such areas as forests on the warm-dry biophysical setting, dry grassland plant communities, wilderness trailheads, and management area 3b (special areas).
MON-NNIP-02: What management actions are contributing to coordination and cooperation with adjacent landowners and partners in managing non-native invasive weeds?	**FW-DC-P&C-16**	**IND-NNIP-02**: Number and type of weed management actions conducted involving coordination and cooperation with partners and adjacent land owners

Appendix E: Primary Constituent Elements for Bull Trout Critical Habitat and Critical Habitat Maps

The following describe how the Matrix of Pathway Indicators for the species is related to a crosswalk evaluation of each PCE for bull trout designated critical habitat. Table E-1 displays that crosswalk relationship. For maps of critical habitat for bull trout refer to the Figure E-1, Figure E-2, Figure E-3, and Figure E-4 at the end of this appendix.

1. ***Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.***

The analysis of *floodplain connectivity* considers the hydrologic linkage of off-channel areas with the main channel and overbank-flow maintenance of wetland function and riparian vegetation and succession. Floodplain and riparian areas provide hydrologic connectivity for springs, seeps, groundwater upwelling and wetlands and contribute to the maintenance of the water table. The analysis of *changes in peak/base flows* addresses subsurface water connectivity and *substrate embeddedness* addresses inter-gravel flows. *Increase in drainage network* and *road density and location* address potential changes to groundwater sources and subsurface water connectivity. *Streambank condition*, *floodplain connectivity* and *riparian conservation areas* address groundwater influence. C*hemical contamination/nutrients* address concerns regarding groundwater water quality.

2. ***Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers***.

Physical, biological or chemical barriers to migration are addressed directly through water quality habitat indicators, including *temperature*, *sediment, chemical contamination/nutrients* and *physical barriers*. The analysis of these indicators assess whether barriers have been created due to impacts such as high temperatures or high concentrations of turbidity or contaminants. Analysis of *change in peak/base flows* and *average wetted width/maximum depth ratio* assess whether changes in flow might create a seasonal barrier to migration. An analysis of *refugia* considers the habitat's ability to support strong, well distributed, and connected populations for all life stages and forms of bull trout.

3. ***An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.***

Floodplain connectivity and *riparian conservation areas* provide habitat to aquatic invertebrates, which in turn provide a forage base for bull trout. *Pool frequency and quality* and *substrate embeddedness* contributes to the variety and density of aquatic invertebrates and other fish species. Changes in *temperature*, *sediment*, and *chemical contaminants and nutrients* affect aquatic invertebrate production, floodplain and riparian areas provide habitat to aquatic invertebrates, which in turn provide a forage base for bull trout. The combined analyses of all the Matrix habitat indicators and the other seven PCEs provide information to assess whether there is an abundant food base in the analysis area. Therefore, any impairment to the food base will be addressed by way of summarizing the biological and habitat indicators.

4. ***Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates, to provide a variety of depths, gradients, velocities, and structure.***

Large woody debris increases channel complexity and creates pools and undercut banks, so the analysis of the current amounts and sources of *large woody debris* available for recruitment is pertinent to this PCE. *Pool frequency and quality* considers the number of pools per mile as well as the amount of cover and temperature of water in the pools. *Average wetted width/maximum depth ratio* is an indicator of channel shape and pool quality. Low ratios suggest deeper, higher quality pools. *Large pools,* consisting of a wide range of water depths, velocities, substrates and cover, are typical of high quality habitat and are a key component of channel complexity. Analysis of *off-channel habitat* describes side-channels and other off-channel areas. *Streambank condition* analyzes the stability of the banks, including features such as undercut banks. The analysis of riparian *conservation areas* and *floodplain connectivity, disturbance history, and disturbance regime* includes the maintenance of habitat and channel complexity, the recruitment of large woody debris, and the connectivity to off-channel habitats or side channels. Complex habitats provide refugia for bull trout and in turn, analysis of *refugia* assesses complex stream channels.

All of these habitat indicators consider the numerous characteristics of instream bull trout habitat and quantify critical components that are fundamental to creating and maintaining complex in-stream habitat over time.

5. ***Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat; and local groundwater influence.***

This PCE is addressed directly by the analysis of *temperature*. It is also addressed through consideration of *refugia*, which by definition is high quality habitat of appropriate temperature. Availability of refugia is also considered in analysis of *pool frequency and quality* and *large pools*. *Average wetted width/maximum depth ratio* is an indication of water volume, which indirectly indicates water temperature, i.e., low ratios indicate deeper water, which in turn indicates possible refugia. This indicator in conjunction with *change in peak/base flows* is an indicator of potential temperature and refugia concerns particularly during low flow periods. *Streambank condition*, *floodplain connectivity,* r*oad density and location* and *riparian conservation areas* address the components of shade and groundwater influence, both of which are important factors of water temperature. Stable streambanks and intact riparian areas, which include part of the floodplain, typically support adequate vegetation to maintain thermal cover to streams during low flow periods. *Road density and location* addresses the potential contributions of warm water discharges from storm water ponds.

6. ***Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount (e.g., less than 12 percent) of fine substrate less than 0.85 mm (0.03 in.) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.***

The analyses for *sediment* and *substrate embeddedness* assess substrate composition and stability in relation to the various life stages of the bull trout as well as the sediment transportation and deposition. *Large woody debris* and *pool frequency and quality* affect sediment transport and redistribution within a stream and assessment of these indicators will clarify substrate composition and amounts. Analysis of *streambank condition* will provide insight into the amount of fine sediment contribution.

7. ***A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, they minimize departures from a natural hydrograph***.

The analysis of *change in peak/base flows* considers changes in hydrograph amplitude or timing with respect to watershed size, geology, and geography. Analyses of *floodplain connectivity*, *increase in drainage network, road density and location, disturbance history,* and *riparian conservation areas* provides further information regarding possible interruptions in the natural stream hydrology. *Floodplain connectivity* considers the hydrologic linkage of off-channel areas with the main channel. Roads and vegetation management both have effects strongly linked to a stream's hydrograph. *Disturbance regime* ties this information together to consider how a watershed reacts to disturbance and the time required to recover back to pre-disturbance conditions.

8. ***Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.***

The quantity of permanent water will be considered in the analyses for PCE 4 natural hydrograph and PCE 5 springs, seeps, and groundwater, which include *floodplain connectivity*, *changes in peak/base flows*, *drainage network increase*, *disturbance history,* and *disturbance regime*. Analysis of *temperature, sediment, and chemical contaminates and nutrients* consider the quality of permanent water. Current listing under 303(d) and 305(d) status should be considered, as well as the causes for that listing. Analysis pertinent to sediment should address turbidity.

9. ***Few or no nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.***

This PCE is addressed in terms of the subpopulation characteristics, as analyzed in *life history and diversity* and *persistence and genetic integrity*. Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout. Analysis of these indicators and the associated baseline provides an understanding of biological implications of non-native species. Non-native species can be affected by changed habitat conditions in a subwatershed and the population status can provide information on the existing condition of a local population.

Table E-1. MPI indicators relevant to each of the PCEs of bull trout designated critical habitat

Diagnostic Pathway/Indicator	PCE 1 Springs, seeps, groundwater	PCE 2 Migratory habitats	PCE 3 Abundant food base	PCE 4 Complex habitats	PCE 5 Water temperature	PCE 6 Substrate features	PCE 7 Natural hydrograph	PCE 8 Water quality and quantity	PCE 9 Predators and competitors
Water Quality									
Temperature		x	x		x			x	
Sediment		x	x			x		x	
Chemical	x	x	x					x	
Habitat Access									
Physical Barriers	x	x	x						x
Habitat Elements									
Substrate	x		x			x			
Large Woody Debris				x		x			
Pool Frequency and			x	x		x			
Large Pools				x	x				
Off-Channel Habitat				x					
Refugia		x			x				x
Channel Conditions									
Wetted		x		x	x				
Streambank	x			x	x	x			
Floodplain	x		x	x	x		x	x	
Flow/Hydrology									
Changes in	x	x			x		x	x	
Drainage Network	x						x	x	
Watershed									
Road Density and	x				x		x		
Disturbance History				x			x	x	x
Riparian	x		x	x	x		x		
Disturbance Regime				x			x	x	

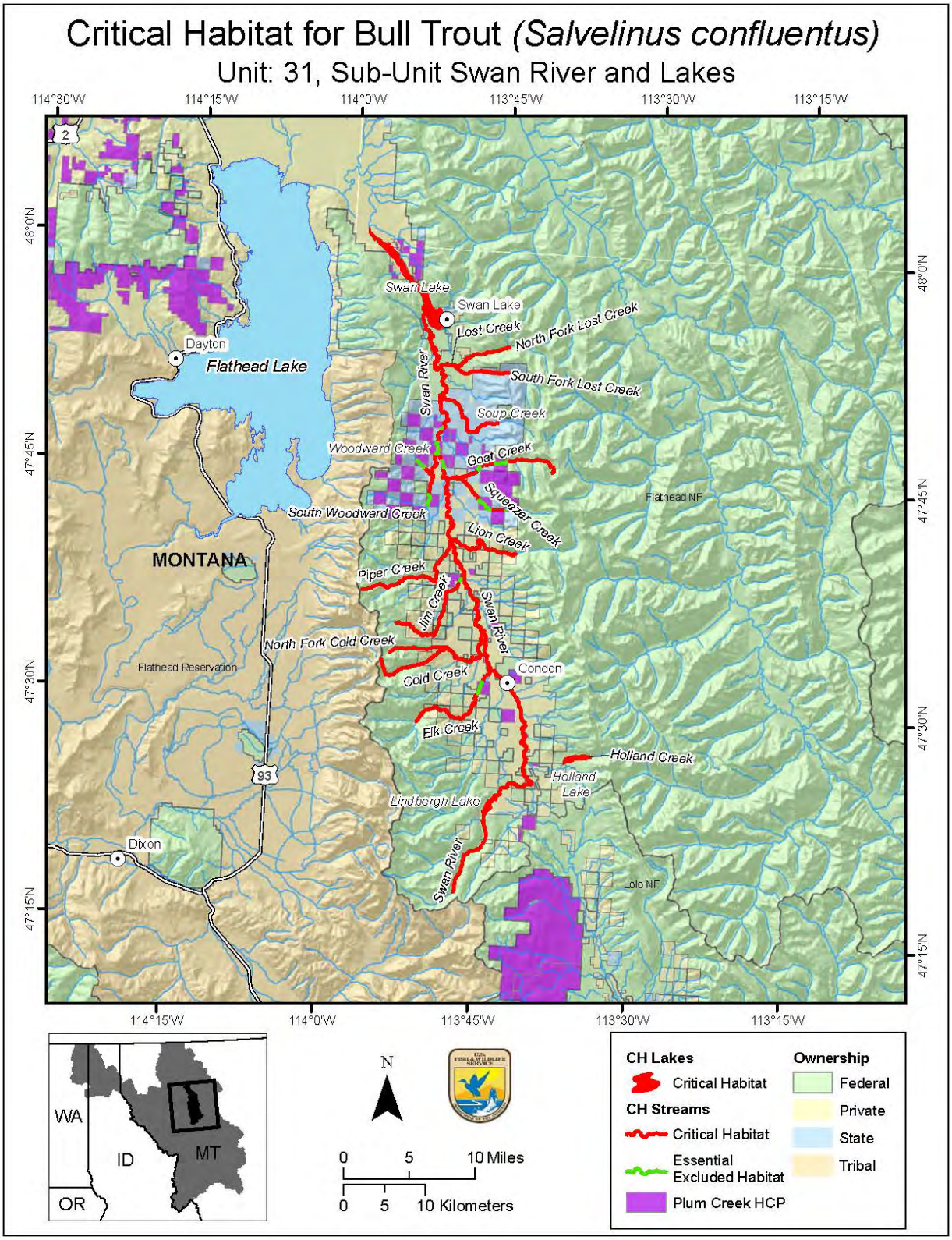


Figure E-1. Critical habitat for bull trout, unit 31 Swan River and Lakes.

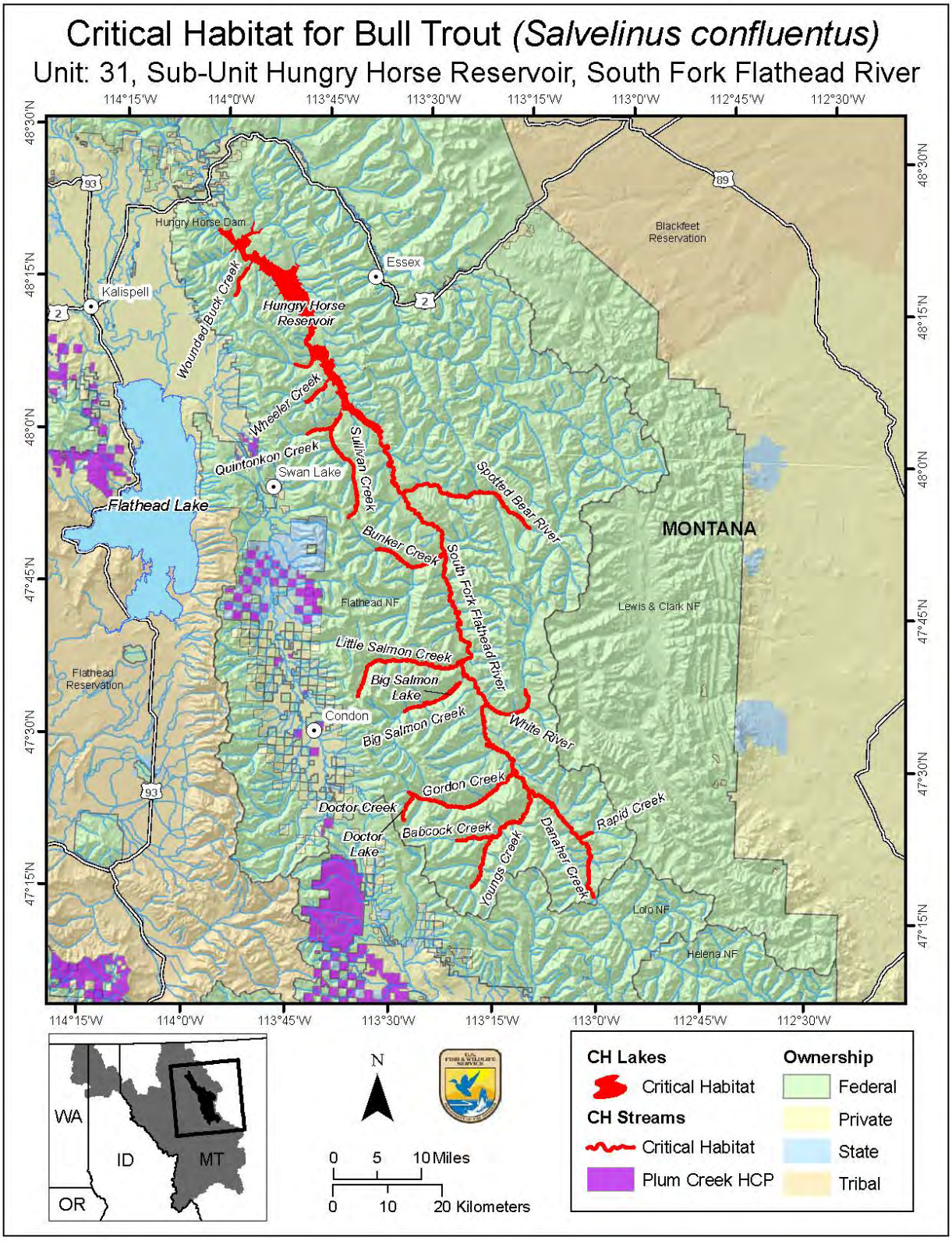


Figure E-2. Critical habitat for bull trout, unit 31, Hungry Horse Reservoir, South Fork of the Flathead River.

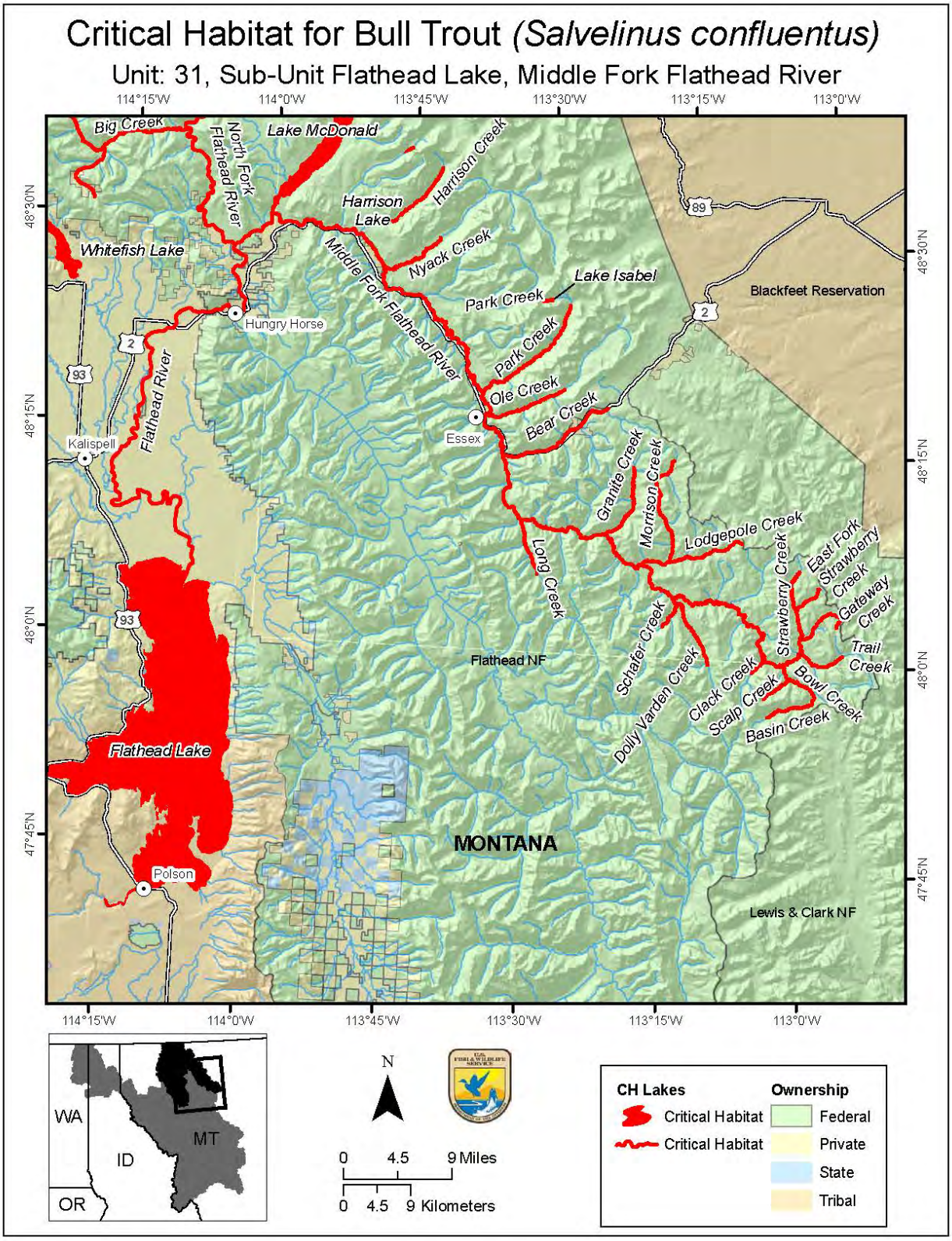


Figure E-3. Critical habitat for bull trout, unit 31, sub-unit Flathead Lake Middle Fork of the Flathead River.

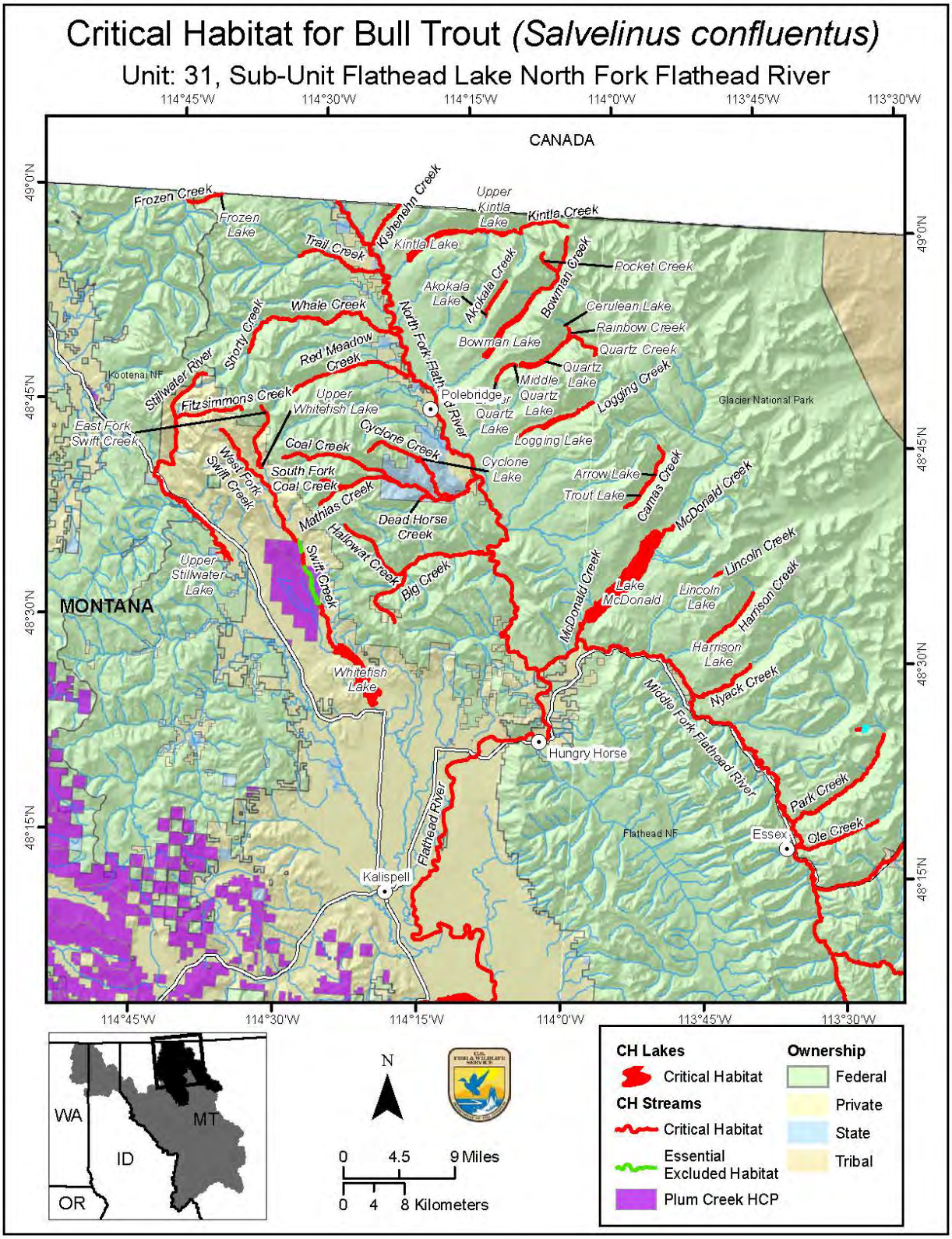


Figure E-4. Critical habitat for bull trout, unit 31, sub-unit Flathead Lake North Fork of the Flathead River.

Appendix F: Bull Trout Baselines

The bull trout baselines are updated with the 2017 GIS runs from the Bull Trout Conservation Strategy.

The maps at the end of this appendix display the following:

- Figure F-1. 2017 Barrier call in bull trout priority watersheds.
- Figure F-2. 2017 Large woody debris call in bull trout priority watersheds.
- Figure F-3. 2017 Sediment call in bull trout priority watersheds.
- Figure F-4. 2017 Temperature call in bull trout priority watersheds.
- Figure F-5. 2017 Integrated call in bull trout priority watersheds.

Acronyms

FA	functioning acceptable
FAR	functioning at risk
FUR	functioning at unacceptable risk
HUC	hydrologic unit code
MWMT	maximum weekly maximum temperature
NA	not applicable
OPPS	opportunities

Flathead Lake Core Area

Local Population: Trail Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
30-50	Stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. Unknown potential impacts forthcoming from Cline Mine in British Columbia (BC), Canada. Large groundwater influence keeps spawning gravels cleansed. Trail Creek subs naturally at caves near Thoma Creek. This prevents upstream spawners in fall. Juvenile bull trout are primarily non-existent above this point. Very little impact seen from 2003 Wedge Canyon Fire. Slump on Rd. 114 fixed in 2007. Very little habitat restoration needs to occur in this drainage. No improvements proposed at this time as habitat conditions appear to be optimum.

Confidence in your assessment (high, medium, low): High

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

HUC6 (name and #): Trail 311							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Pop: Low, primarily provides clean water, spawning is in HUC below							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FAR	NA				
Barriers	FA	FA	NA				
Pools	FAR	FAR	NA				
Sediment	FAR	FAR	NA				
Integrated	FAR	FAR	NA				

Temperature: GIS rating= FA, data and professional judgment = FA. Temperature in Trail Creek is largely regulated by the underground springs that surface near Thoma Creek. The majority of bull trout spawning occurs just downstream of this reach.

Barriers: GIS rating = FA and FA, data and professional judgment = FA. There are no man-made barriers to bull trout waters in Trail Creek.

Pools: GIS rating = FAR in Trail, professional judgment = FA. There hs been no riparian harvest along Trail Cr. and surveys conducted during annual redd counts reveal high pool numbers in high quality.

Sediment: GIS rating = FAR in Trail, professional judgment = FA. Percent fines as measured by McNeil core samples have fluctuated little over the last decade despite a major fire in 2003.

HUC6 (name and #): Tuchuck 310							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High, Primary spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Whale Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
95-105	Stable	Adfluvial	2	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. There are no bull trout above Whale Falls in HUC 204. Unknown potential impacts forthcoming from Cline Mine in BC. Large groundwater influence keeps spawning gravels cleansed. Very little impact was seen from 2003 Wedge Canyon Fire. Shorty Creek Rd. was decommissioned in 2010 other than that no barriers or improvements are needed except for some decommissioning low in the drainage. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Shorty-404							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High, Primary spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FA	FA					
Integrated	FA	FA					

HUC6 (name and #): Upper Whale -405							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Pop: Low, primarily provides clean water, spawning is in HUC below. Natural barrier at Whale Falls.							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	5	1			
Barriers	FA	FA	5	1			
Pools	FA	FA	5	1			
Sediment	FA	FA	5	1			
Integrated	FA	FA	5	1			

HUC6 (name and #): Lower Whale-406
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve

% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High, Primary spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FAR	FA	5	1	10k	L	H
Integrated	FAR	FA	5	1			

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

Temperature: GIS rating = FA, data and professional judgment = FA. In 2009, a relatively warm summer, stream temperature varied little over 9 miles from upstream to downstream. Downstream temperatures remained cool due to the tremendous ground water effect.

Barriers: GIS rating = FA, data and professional judgment = FA. There are no man made barriersin Whale Creek affecting bull trout.

Pools: GIS rating FA, data and professionl judgment = FA. Riparian harvest has occurred in Whale Creek over the past. However, recruitment of wood has been substantial over the last decade primarily from the 2003 Wedge Canyon Fire. Based upon surveys when conducting redd counts on an annual basis, pools are abundant and of high quality, i.e., depth and size.

Sediment: GIS rating = FAR in Lower Whale, data and professional judgment = FA. Percent fines have varied little over the last 2 decades, increasing slightly following the 2003 fire.

Local Population: Red Meadow Creek

# Spawning Adults	**Short-Term (5yr) Pop Trend**	**Life History, Connectivity**	**# Known Spawn Reaches**	**Nonnative Species, threat**
10	Depressed	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	**Vulnerability to Climate Change**	**Unique Population Attributes**
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. Unknown potential impacts forthcoming from Cline Mine in BC. Redd counts only during basin-wide years, unsure why counts are down. Rd. 1684 will be decommissioned under Red Whale Decision (2009). BMPS have been updated on most other roads. No bull trout culvert barriers. Habitat restoration is not recommended at this time.. Main road RD 115 will not be decommissioned to provide fire escape route over Whitefish Divide. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Red Meadow- 208
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve

% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Pop: Low, Red Meadow population is small.							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA	15				
Barriers	FUR	FA	15				
Pools	FUR	FA	15				
Sediment	FUR	FAR	15				
Integrated	FUR	FAR	15	3	10K	L	M

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

Temperature: GIS rating FAR, data and professional judgment rating = FA. The turnover in the lake is reflected by the cooling temperatures at the beginning of September. Groundwater affects appear to be less than in other drainages.

Barriers: GIS rating = FUR, data and professional judgment = FA. There are no known man made barriers in Red Meadow that affect bull trout distribution and thus GIS rating appears to be an error.

Pools: GIS rating = FUR, data and professional judgment = FA. Pools are abuundant and in high quality based upon basin wide redd surveys.

Sediment: GIS rating = FUR, data and professional judgment = FA. There are no McNeil Core samples for Red Meadow Creek, however substrate scores have been taken by Tom Weaver, MFWP since 1988. A score over 10 exhibits good rearing conditions for juvenile salmonids as interstitial spaces between gravels are not filled. The higher the score the better the rearing conditions.

Local Population: Coal Creek

# Spawning Adults	**Short-Term (5yr) Pop Trend**	**Life History, Connectivity**	**# Known Spawn Reaches**	**Nonnative Species, threat**
0-5	Stable	Adfluvial	1	Lake Trout in Flathead
Significance of geographical location		**Vulnerability to Climate Change**		**Unique Population Attributes**
Low		Low-Heavy ground water influence		Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. Unknown potential impacts forthcoming from Cline Mine in BC. Large groundwater influence keeps spawning gravels cleansed and temperatures regulated. Population has reached a bottle neck due to low redd counts over an extended period of years. We contracted with Traci Sylte, hydrologist on the Lolo National Forest, to look at restoration opportunities due to low redd counts but none were found other than some road decommissioning options. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Upper Coal-505
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve

% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Pop: Low, primarily provides clean water, spawning is in HUC below							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	5	1			
Barriers	FA	FA	5	1			
Pools	FAR	FA	5	1			
Sediment	FUR	FAR	5	1			
Integrated	FUR	FAR	5	1	15K	L	H

HUC6 (name and #): SF Coal -504							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High, Primary spawning reach							
Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FA	FA	5	1			
Barriers	FA	FA	5	1			
Pools	FA	FA	5	1			
Sediment	FA	FA	5	1			
Integrated	FA	FA	5	1		L	H

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

Temperature: GIS rating = FA, data and professional judgment rating = FA. Temperatures are cooler downstream once again due to the groundwater influence. Very few days were over 55 degrees despite a warm summer in 2009.

Barriers: GIS rating = FA, data and profesional rating = FA. There are no man made barriers in Coal Creek that affect bull trout distribution. A culvert on road 10801 in the very headwaters of Coal Creek was removed in 2009.

Pools: GIS rating = FA, data and professional judgment rating = FA. There is a large amount of bedload in Coal Creek that ahs caused stream braiding anc channel avulsions. Many pools have been filled due to aggradation. Large Wood is abundant despite a fair amount of past riparian harvest.

Sediment: GIS rating FA, data and professional judgment rating = FA. Core samples have been consistently belwo 35% over the last 20 years.

Local Population: Big Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
55-65	Depressed	Adfluvial	2	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. Unknown potential impacts forthcoming from Cline Mine in BC. Habitat was heavily impacted from 1950s-era logging and road building. Numerous channel avulsions and aggradation have occurred. Moose Fire 2001 impacted the Hallowat Creek spawning reach; however a LWD addition project in 2008 has increased the number of juvenile bull trout within the reach. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Upper Big-604							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High, spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	15	1			
Barriers	FA	FA	15	1			
Pools	FAR	FA	15	1			
Sediment	FAR	FA	15	1			
Integrated	FAR	FA	15	1	10K	L	M

HUC6 (name and #): Lower Big- 605							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 50%							
Functional Significance to Local Pop: Mod. Below spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	15	1			
Barriers	FA	FA	15	1			
Pools	FAR	FA	15	1			
Sediment	FAR	FA	15	1			
Integrated	FUR	FAR	15	1	20K	L	m

HUC6 (name and #): Hallowat- 603							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	15	1			
Barriers	FA	FA	15	1			
Pools	FAR	FA	15	1			
Sediment	FAR	FA	15	1			
Integrated	FAR	FA	15	1	20K	L	M

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

Temperature: GIS rating = FA, data and professional rating = FA. Temperatures were about 8 degrees warmer on average at the lower site compared to the upper site in Big Creek.

Barriers: GIS rating = FA, data and professional judgment rating = FA. There are no man made barriers that affect bull trout distribution in Big Creek.

Pools: GIS rating = FAR, data and professional judgment rating = FAR. Big Creek functions similar to Coal Creek in terms of aggraded reaches and multiple channels. LWD is abundant in most reaches and was added to Hallowat Creek in 2008. Quality of pools are impacted.

Sediment: GIS rating = FAR, data and professional judgment rating = FA. Percent fines have been below 35% since 1994.

Local Population: Strawberry Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
10-15	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Strawberry-101							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Basin and Bowl Creeks

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
5-10	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Basin & Bowl- 103							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Clack Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
5-10	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving Factors Determining Bull Trout Population: Wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Clack- 107							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				

Local Population: Schafer Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
5-10	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Schafer- 106							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Dolly Varden Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
5-10	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Dolly Varden- 106
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve
% Forest Service Ownership in HUC: 100%
Functional Significance to Local Population: High- spawning reach

Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Morrison and Lodgepole Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
30-40	stable	Adfluvial	2	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Headwaters are out of wilderness. Beaver Dam affects upstream migration. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (H, M, L): High

HUC6 (name and #): Morrison and Lodgepole Creeks- 201							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Granite Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
15-25	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Headwaters out of wilderness. Downstream reaches are in wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Granite Creek- 203							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Temperature: GIS rating = FA, data and professional judgment rating = FAR. Challenge Creek is about a mile upstream of the spawning reach. A thermograph just upstream of the spawning reach in 2010 was out of water.

Barriers: GIS rating = FA, data and professional judgment rating = FA. There are no known man made barriers that affect bull trout distribution in Granite Creek.

Pools: GIS rating = FA, data and professional judgment rating = FA. Pools are abuindant and of high quality throughout Granite Creek as observed during annual bull trout redd surveys.

Sediment: GIS rating = FA, data and professional rating = FA. The soils in the Granite Creek area are highly erosive and it can be expected that the sediment levels are near base level.

Local Population: Long Creek

# Spawning Adults	**Short-Term (5yr) Pop Trend**	**Life History, Connectivity**	**# Known Spawn Reaches**	**Nonnative Species, threat**
10-15	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	**Vulnerability to Climate Change**	**Unique Population Attributes**
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Wilderness Stream. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Long- 205
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve

% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FAR	FAR	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Bear Creek

# Spawning Adults	**Short-Term (5yr) Pop Trend**	**Life History, Connectivity**	**# Known Spawn Reaches**	**Nonnative Species, threat**
10-15	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	**Vulnerability to Climate Change**	**Unique Population Attributes**
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. Other impacts associated with HWY 2. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Bear- 301							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FUR	FA	NA				
Pools	FAR	FA	NA				
Sediment	FAR	FA	NA				
Integrated	FUR	FAR	NA				

Local Population: Upper Stillwater River and Fitzsimmons

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
2 year average is 28 x 3.2= 90 adults	Stable?	Migratory Connected	2 reaches	EB, high LT, high NP, high

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Disjunct core population that is thought to be a fraction of historic size	Unknown	May have experienced genetic bottleneck but still persists. Fluvial rather than adfluvial?

Driving factors determining bull trout population: This core population was once thought to occupy both Upper and Lower Stillwater Lakes but is now greatly reduced due to non-native species. May have experienced genetic bottleneck in the 1990s but still seems to persist. Redd count surveys are intermittent. Some uncertainty if population is mostly fluvial now since bull trout are rarely observed in lakes. Confidence in your assessment (high, medium, low): Low

HUC6 (name and #): 170102100505							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive Restoration							
% Forest Service Ownership in HUC: Flathead 10%, Kootenai 20% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low?							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA						
Barriers	FA						
Pools	FA						
Sediment	FAR	FA					

Only available data is coring data in spawning reach of Stillwater River (up until 2007). 5 year average is 25% fines. No other information. Spawning habitat entirely within Stillwater State Forest ownership.

Hungry Horse Reservoir Core Area

Local Population: Danaher Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
100	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: None, wilderness stream. Confidence in your assessment (high, medium, low): High

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

HUC6 (name and #): Danaher- 101, 102, 103, 107							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Youngs Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
100	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving Factors Determining Bull Trout Population: None, wilderness stream. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Youngs- 104, 105, 106
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve
% Forest Service Ownership in HUC: 100%
Functional Significance to Local Population: High- spawning reach

Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Gordon Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
100-140	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: None, wilderness stream. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Gordon- 201, 202							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: White River

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
70-90	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: None, wilderness stream. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): White River- 207, 208, 209, and 210							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Little Salmon

# Spawning Adults	**Short-Term (5yr) Pop Trend**	**Life History, Connectivity**	**# Known Spawn Reaches**	**Nonnative Species, threat**
30-60	stable	Adfluvial	1	None
Significance of geographical location		**Vulnerability to Climate Change**		**Unique Population Attributes**
Low		Low-Heavy ground water influence		Low

Driving factors determining bull trout population: None, wilderness stream. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Little Salmon- 303							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FA	FA					
Integrated	FA	FA					

Local Population: Big Salmon

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
50-100	stable	Adfluvial Big Salmon Lake	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Adjunct pop. None, wilderness stream. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Big Salmon- 301, 302 Spawning in 301 only							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FA	FA					
Integrated	FA	FA					

Local Population: Bunker Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
10	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Great habitat. Barrier falls just above (1/4 mile) Gorge Cr. Trailhead. Not much is needed for habitat improvement. Roads in upper Bunker except for main road have been decommissioned. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Bunker- 502, 503, and 504
Strategy (Active Restoration, Passive Restoration, Conserve): Passive
% Forest Service Ownership in HUC: 100%
Functional Significance to Local Population: High- spawning reach

Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FA	FA	NA	3			
Barriers	FA	FA	NA	3			
Pools	FA	FA	NA	3			
Sediment	FAR	FA	NA	3			
Integrated	FAR	FA	NA	3			

Local Population: Spotted Bear River

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
20-40	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: None, wilderness stream in headwaters. Bull trout spawn below Dean Falls and above any potential affects from roads downstream. 1964 flood had greatest impact and river is still recovering from that due to braided channels. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Spotted Bear- 401, 402, 403, 404, 405, and 406							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA	NA	3			
Barriers	FA	FA	NA	3			
Pools	FAR	FA	NA	3			
Sediment	FAR	FA	NA	3			
Integrated	FAR	FA	NA	3			

Local Population: Sullivan Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
50-75	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: The bull trout population in Sullivan Creek is stable. Ball, Branch, Conner roads are no longer used and could be decommissioned. They have been surveyed in the past and there are no deep fill culverts. Risks of failure are moderate while consequences of the failures are low due to the amount of fill and low number of culverts. Sullivan Creek road has a natural slump that is at the lower end of bull trout spawning. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Sullivan- 601							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	10	1			
Barriers	FA	FA	10	1			
Pools	FAR	FA	10	1			
Sediment	FAR	FA	10	1			
Integrated	FAR	FA	10	1	30K	M	H

Local Population: Quintonkon Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
20-40	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Barrier falls above Rock Cr. BMPS done in 2009 on rd. 381. Large substrate limits spawning. Some opportunities to reduce roads. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Quintonkon- 603
Strategy (Active Restoration, Passive Restoration, Conserve): Passive
% Forest Service Ownership in HUC: 100%
Functional Significance to Local Population: High- spawning reach

Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FAR	FA	10	2			
Barriers	FA	FA	10	2			
Pools	FAR	FA	10	2			
Sediment	FAR	FA	10	2			
Integrated	FAR	FA	10	2			

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

Local Population: Wheeler Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
15-25	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Limited spawning habitat below waterfall and high road densities. Surveyed Rd 1611 in 2009 which has been decommissioned. Need to survey Mink/Martin drainages. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Wheeler- 604							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA	10	1			
Barriers	FA		10	1			
Pools	FAR	FA	10	1			
Sediment	FA	FA	10	1			
Integrated	FAR	FA	10	1	10K	L	H

Local Population: Wounded Buck Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
10-40	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

FS-107648

Driving factors determining bull trout population: Large rain event in 2007 scoured channel and took out bridge on Rd 5339. Temp put in 2009. Pipes above have been pulled. Really no habitat improvements needed. Substrate is rather large and spawning is somewhat limited relative to other South Fork of the Flathead tributaries. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Wounded Buck- 702							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA	3			
Barriers	FUR	FA	NA	3			
Pools	FAR	FA	NA	3			
Sediment	FAR	FA	NA	3			
Integrated	FUR	FUR	NA	3			

Swan Lake Core Area

Local Population: Elk Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 168 redds x 3.2= 537 adults	Stable	Migratory Connected	1 great big reach	EB, low LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan local populations are fairly close to each other. Elk is the southern most & largest pop	Low. Groundwater system with natural flow regimes	Only local population with almost no EBT.

Driving factors determining bull trout population: This is a large, secure local population with good habitat. This is only local population with minimal brook trout invasion. The only threat is the lake trout invasion in Swan Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): 170102110201 - Elk Creek							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: Maybe 80 %, soon to be 85% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: None. No restoration needs							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA					
Barriers	FA	FA					
Pools	FAR	FA					
Sediment	FA	FA					

Temperature: 2008 data found MWMT in rearing at 10C.

Barriers: 2002 inventory found no barriers.

Pools: 1997 r1/r4 survey found 24.9 pools per mile, optimal is >18 per mile. Many deep pools observed as well.

Sediment: 2001-2006 coring average 31.34%

Local Population: Cold Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 6.5 redds x 3.2=21 adults	Decreasing	Migratory, mostly connected. Several isolated tributaries may harbor fish?	1 long reach with scattered redds. May also support small resident population.	EB, High LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Medium. Some groundwater input but unnatural flow regimes	If residents exist, that would be unique

Driving factors determining bull trout population: This population declined substantially since 1995 (unlike others), and likely has brook trout hybrids. Older data suggests possibility of resident fish, but relatively little investigations or monitoring has taken place. Watershed is heavily roaded and logged. Habitat restoration may help but main threat is brook trout. More investigation on status and a recovery plan is needed. Confidence in your assessment (high, medium, low): Low

HUC6 (name and #): 1701021100202 – Cold Creek							
Strategy (Active Restoration, Passive Restoration, Conserve): Active Restoration							
% Forest Service Ownership in HUC: Currently about 30%, soon to be about 85% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Moderate							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	30 years	3	$0	L	L
Barriers	FAR	FA	5 years	2	$150K	L	H
Pools	FAR	FA					
Sediment	FUR	FA	10 years	2	$150K	M	H

Temperature: 2008 MWMT just above spawning is 8.8C. However 2005-2007 monitoring at mouth (rearing habitat) found increasing MWMT from 15 to 17C. Suspected impacts from old harvests and numerous roads which altered channel shape, but may also be natural. Riparian area should passively heal over time. Decommissioning roads may also slightly help channel shape but should not be done solely for temp restoration.

Barriers: 2002 inventory found 7 barriers on tributaries and one marginal one within spawning habitat. Since migratory fish currently pass this marginal pipe, does not seem a high priority to fix. Several barriers already fixed, more investigation is needed before fixing others. Some funding potential to fix since this area is acquired by Legacy Land Act. However, even if all barriers are fixed, this would probably have little impact to bull trout since they are on tributary streams.

Pools: 2007 and 2008 PIBO surveys (in different locations) found 36-60 pools per mile. Optimal range is >18. Fairly good depths of pools noted too.

Sediment: No coring data available. 2007 and 2008 PIBO surveys have 22-40% fine sediments based on pebble counts. 1994 Plum Creek visual surveys estimated 17.9% fine sediments. These values are on the high side but just barely within 1 SD of similar wilderness streams. Substrate looks very embedded in lower 3 miles of stream spawning reach. Local citizens comment that stream has more fines than earlier. Culprit is likely legacy of old road construction. Several chronic erosion sites are known, a restoration plan is needed. Opportunities to reduce road surface sediment and remove constricting culverts especially due to new land acquisition. However, it is unclear if this would have a significant benefit to bull trout since data does not suggest serious habitat limitation. It is concluded reducing sediment would have a modest benefit and bull trout may respond. The primary threat of brook trout remains.

Local Population: Jim Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 54 redds x 3.2= 173 adults	Stable? Was stable until 2009. Currently sharp decline	Migratory, connected	1 reach	EB, medium LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Medium. Has groundwater but also beaver ponds	

Driving factors determining bull trout population: Redd counts highly variable, bounce around from 30s to 90s. Several large beaver dams may occasionally block migratory fish and increase water temperature. TMDL listed stream. MT DEQ cites sedimentation from past logging. Plum Creek has been critical of this determination and submitted reports stating habitat is unimpaired. Confidence in your assessment (high, medium, low): Medium

HUC6 (name and #): 170102110204 – Jim Creek							
Strategy (Active Restoration, Passive Restoration, Conserve): Active Restoration							
% Forest Service Ownership in HUC: Roughly 50%, soon to be about 90% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA					
Barriers	FUR	FA	10 years	3	$100K	L	M
Pools	FUR	FA					
Sediment	FUR	FA	10 years	3	$25	L	L

Temperature: 2008 inventory in spawning found MWMT at 10C. Although dataset is small, this seems fairly accurate. Uncertain if any restoration is possible, this may be natural.

Barriers: 2002 inventory found 2 barriers on tributary. Unlikely they are blocking bull trout but investigation is needed. Potential to fix since it is newly acquired land.

Pools: 1994 Plum Creek survey found 45 pools per mile, 2003 PIBO found 89 per mile and 2008 PIBO (different location found 85 per mile). Optimal range is > 18-23 per mile.

Sediment: Coring data indicates declining fine sediments since the 1990s (when DEQ listed the stream). Average from 2001-2006 (most recent data) is 35.7%. Pebble counts in PIBO surveys also found sediments on edge of 1 SD of wilderness streams. Sediment source was likely controversial PCTC riparian logging in late 1980's. This is healing over time. A partial road inventory in 2002 suggested very little sediment coming from roads. A more thorough inventory might uncover some spot opportunities but impact to bull trout would be minor.

Local Population: Piper Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 6.2 redds x 3.2= 20 adults	Declining. No redds in 2009	Migratory, connected	1 reach	EB, high LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Medium, relatively little groundwater, medium elevation	

Driving factors determining bull trout population: This local population appears to have never been very large and declined in recent years. No redds found in 2009. Brook trout seem to be primary limiting factor. Hybrids have been observed. Confidence in your assessment (high, medium, low): Medium

HUC6 (name and #): 170102110206 - Piper							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: Roughly 80%, soon to be 90% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA					
Barriers	FA	FA					
Pools	FUR	FA					
Sediment	FUR	FA					

Temperature: 2002 MWMT in spawning was 13C. 2008 MWMT just above spawning is 10.5C. There is one beaver dam on stream that may have some impact. Temperature situation is assumed natural.

Barriers: 2002 inventory found no barriers.

Pools: 1994 Plum Creek watershed assessment found avg 79 pools per mile in spawning reaches, goal is 48. 2008 PIBO subsample found 67 pools per mile, goal is 23.

Sediment: No coring data. 2008 PIBO found 15.3% fines, well within range of reference streams. Road sediment survey by Plum Creek in 1994 found very few erosion point sources.

Local Population: Lion Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 116 redds x 3.2=371	Stable	Migratory, Connected	1 big reach	EB, high LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Low. Groundwater system with natural flow regimes	Tolerates higher than average sedimentation

Driving factors determining bull trout population: This is large, stable population. Only threats are from brook trout (and lake trout in Swan Lake, of course). Habitat in natural condition. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): 170102110207 – Lion Creek							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: Roughly 75%, soon to be 95% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FAR	FAR					

Temperature: MWMT is 8.8C.

Barriers: 2002 inventory found no barriers.

Pools: 2009 PIBO found 23.3 per mile, goal is 18.

Sediment: Coring data since 1987. Peaked at 45% in 1991 and has since stabilized between 35-40%. Believed natural. DEQ seems to agree and removed stream from 303 list.

Local Population: Goat Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 158 redds x 3.2=506	Stable? Squeezer has declined since 2007	Migratory, Connected	2 big reaches, one in Goat and one in Squeezer	EB, medium LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Low. Groundwater system with natural flow regimes	

Driving factors determining bull trout population: This is a large population that seems stable other than Squeezer in recent years. Squeezer drop may be due to difficult surveying conditions in recent years. It is TMDL listed stream due to prior logging but habitat conditions seem much improved. No known habitat restoration needs. PCTC hydrologist reports past road erosion is stabilized. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): 170102110303							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: Roughly 45% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FA	FA					

Temperature: only data is at stream mouth. 15 MWMT from 2005-2007. No known temp problems.

Barriers: 2002 inventory found no barriers. 1994 Plum Creek watershed assessment found 79 pools per mile avg, goal is 23. Coring data from 2002-2007 found 28% in Goat and 27% Squeezer avg.

Local Population: Woodward Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 86 redds x 3.2 = 275	Declining	Migratory, Connected	2 reaches. South Woodward and mainstem	EB, high LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Medium. Groundwater system but low elevation	Seems to tolerate high percentage of fines in rearing habitat (not spawning)

Driving factors determining bull trout population: This is a large population but was significantly down in 2009. Seems to be persisting in spite of high density of brook trout. Hybrids not common. Seems to tolerate silty/sandy rearing habitat. I do not know enough about watershed to speculate if this is a natural condition or response from DNRC practices. Confidence in your assessment (high, medium, low): Low

HUC6 (name and #): 170102110304 - Woodward							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive Restoration							
% Forest Service Ownership in HUC: Roughly 15% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low? Moderate?							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA	1 year	3	$150	L	L
Pools	FA	FA					
Sediment	FA	FA					

Temperature: no known data. Just have to assume it is adequate in spawning areas.

Barriers: 2002 inventory found 4 barriers but all seem to be upstream of known bull trout spawning. Replacing lowest barrier may have a very slight benefit to juvenile rearing. This is a complicated culvert, will be pricey. Cost estimate is only for lowest barrier.

Pools: 2001 DNRC r1/r4 survey of mainstem found 4.5 pools per mile, well below goal of 18. However 50% of these pools are high quality.

Sediment: Recent work by electrofishing crews noted deep silt and sand beds in rearing areas (lots of storage). 2001 DNRC r1/r4 survey found 24.6% fines in pebble counts, which is within reference range. 5 year average of coring data in spawning habitat on mainstem is 36% but South fork is 26%. No upward or downward trend. I have no clue if condition is natural.

Local Population: Lost Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 23.2 redds x 3.2= 74 adults.	Declining. Last 2 years are down	Migratory, Connected	2 reaches. South Fork monitored annually. North Fork sparsely monitored.	EB, high LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	High. Limited groundwater input. Naturally dewaters at mouth and vulnerable to further loss	Migratory fish somehow negotiate past dewatered area.

Driving factors determining bull trout population: Bull trout apparently negotiate past chronic de-watered area near the mouth. Perhaps they migrate earlier than others? South Fork appears to contribute about 2/3 of local population. North Fork is monitored infrequently. Brook trout hybrids observed in South Fork. Watershed was subject to severe degradation from 1910 logging but seems to have bounced back. Confidence in your assessment (high, medium, low): M

HUC6 (name and #): 170102110306							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: Roughly 70% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FAR	FA					
Sediment	FAR	FA					

Temperature: 1999, 2002, 2003 readings in North Fork spawning areas found MWMT 10-11C. Groundwater fairly sparse, believed natural condition. 2001-2004 readings in South Fork spawning found MWMT 11-13C. Some groundwater here but daily fluctuations noted. 2006 DNRC EIS characterizes it as a natural condition.

Barriers: 2002 inventory found a single barrier in North Fork headwaters. This was fixed in 2003.

Pools: 2002 r1/r4 inventory of South Fork spawning reaches found 11-24 pools per mile, goal is 39. Cause unknown, stream has plenty of wood. 1998 r1/r4 survey on North Fork spawning reach found 33-41 pools per mile, goal is 39. No pools were of high quality. Possible lingering impact from past harvest. No identified restoration.

Sediment: South Fork road previously contributed 19 tons per year but DNRC moved the road in 2008. 5 year avg of coring data on South Fork is 31% fines, no upward or downward trend.

Local Population: Soup Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 7.7 redds x 3.2=25 adults	Declining	Migratory, Connected	1 reach	EB, high LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	High. Stream seems to have little or no groundwater & a small population to begin with.	

Driving factors determining bull trout population: Small population with recent downward trend. Very high densities of brook trout. 2008 effort to collect juvenile bull trout could not find any. Note: Soup Creek does NOT have proposed critical habitat. Confidence in your assessment (high, medium, low): L

HUC6 (name and #): 170102110305 - Soup							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 20% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Moderate							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FAR	FA					
Sediment	FAR	FA	5 years	3	$30K	L	H

Temperature: 2001-2004 measurements found 16-19C MWMT. Cause unknown. DNRC EIS in 2006 suggests some potential impact from past road construction but no restoration identified.

Barriers: 2006 DNRC EIS reports no barriers.

Pools: 2002 r1/r4 inventory by DNRC found 27.8 pools per mile, goal is 48. Plenty of wood. Unknown if this is a natural state or reflection of past land management impacts.

Sediment: 5 year average of coring is 38% and appears to be increasing. 2006 EIS identified about 30 tons per year coming from road network.

Local Population: Upper Swan River Lindbergh Lake

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
5 redds in 2008 x 3.2=16	Unknown	Migratory Connected	1 very short reach. Just 200m	EB, low LT in lake, currently low threat
Significance of geographical location		**Vulnerability to Climate Change**		**Unique Population Attributes**
Quasi-disjunct core population in headwaters of Swan River valley. Thought to be thermally isolated		Medium. Warm and stable flows but local patch of groundwater.		Juvenile fish rear in lake

Driving factors determining bull trout population: This is a small, somewhat disjunct population. Very limited spawning habitat. Only 4 intermittent redd counts completed in the past 14 years, making it difficult to determine status. If lake trout become established, there is currently no plan to suppress them. Confidence in your assessment (high, medium, low): L

HUC6 (name and #): 170102110102							
Strategy (Active Restoration, Passive Restoration, Conserve): Active Restoration							
% Forest Service Ownership in HUC: Roughly 90%, soon to be 96% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FUR	FA					
Barriers	FA	FA					
Pools	FUR	FA					
Sediment	FAR	FA					

No habitat data available. Spawning stream is in wilderness and assumed to be in natural state.

Local Population: Holland Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 8.6 redds x 3.2=27 adults	Stable	Migratory Connected	1 very short reach. Just 280m	EB, low LT suspected in lake, currently low threat
Significance of geographical location		**Vulnerability to Climate Change**		**Unique Population Attributes**
Quasi-disjunct core population in headwaters of Swan River valley. Thought to be thermally isolated		High. Very little groundwater. Invasive species (EBT) may get more established.		Juvenile fish rear in lake.

Driving factors determining bull trout population: This is a small, somewhat disjunct population. Very limited spawning habitat. Appears to have a long, gradual decline in numbers and stabilized at lower number. If lake trout become established, there is currently no plan to suppress them. Spawning reach is well-known and vulnerable to poaching. 1980 riparian logging caused some degradation but since then watershed is untouched. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): 170102110103							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive Restoration							
% Forest Service Ownership in HUC: 100%							
Relative Contribution of Habitat in Limiting Local Population: Moderate							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA					
Barriers	FAR	FA					
Pools	FUR	FA	20 years		0	M	L
Sediment	FUR	FA					

Temperature: 2005 measurement found MWMT at 11.6C Since then, a new beaver dam may have elevated it further. Stream appears to have little groundwater to begin with. 1980 logging damaged stream bank cover & shade. Will continue to slowly heal.

Barriers: None. No roads

Pools: No data available. May be still lingering impacts from 1980 logging. As riparian vegetation matures, stream banks should stabilize and new pools develop. Seedlings already growing, so no active restoration needed.

Sediment: 2005 pebble count found 9.6% fines, well within reference condition.

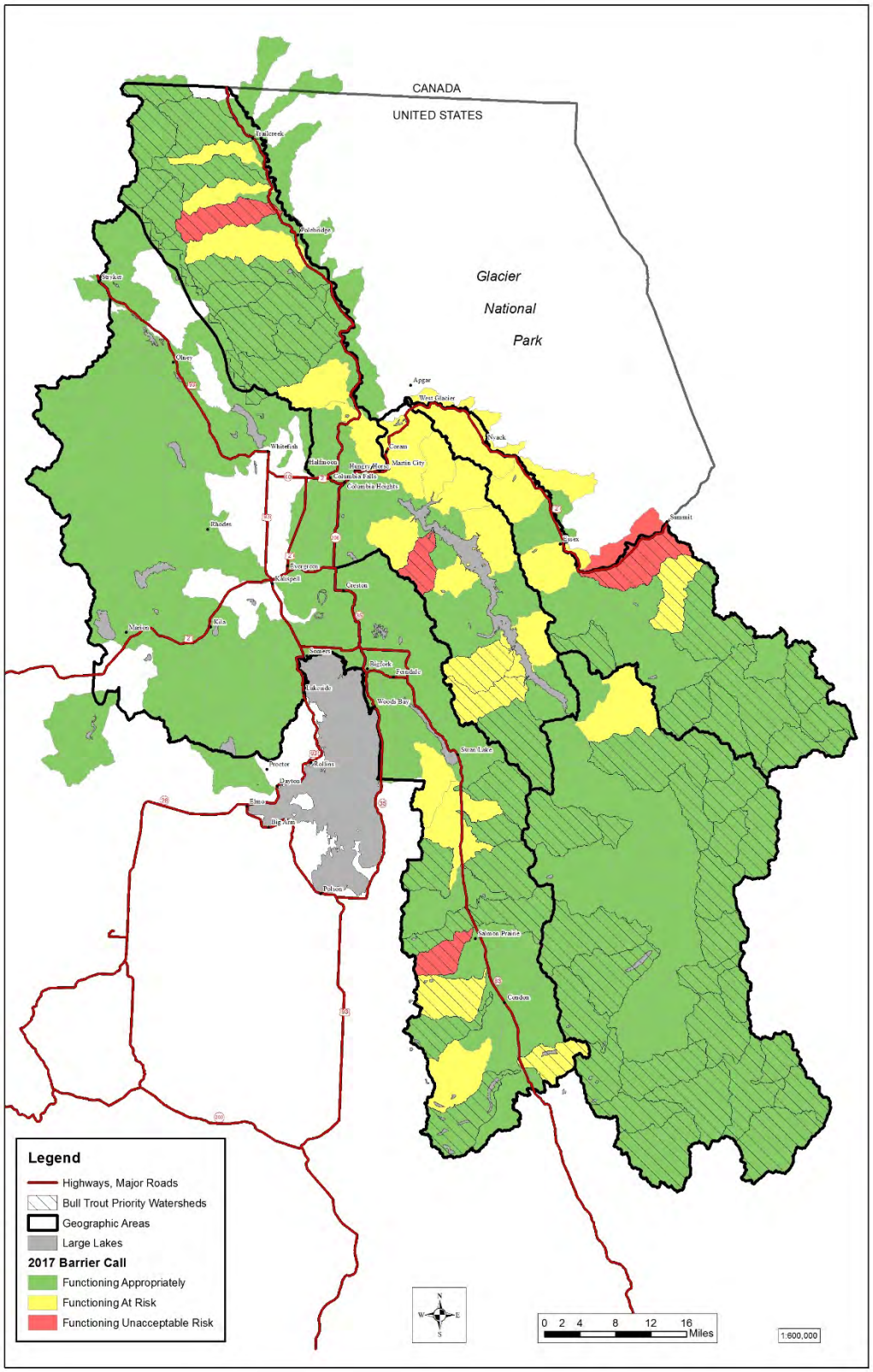


Figure F-1. 2017 Barrier call in bull trout priority watersheds.

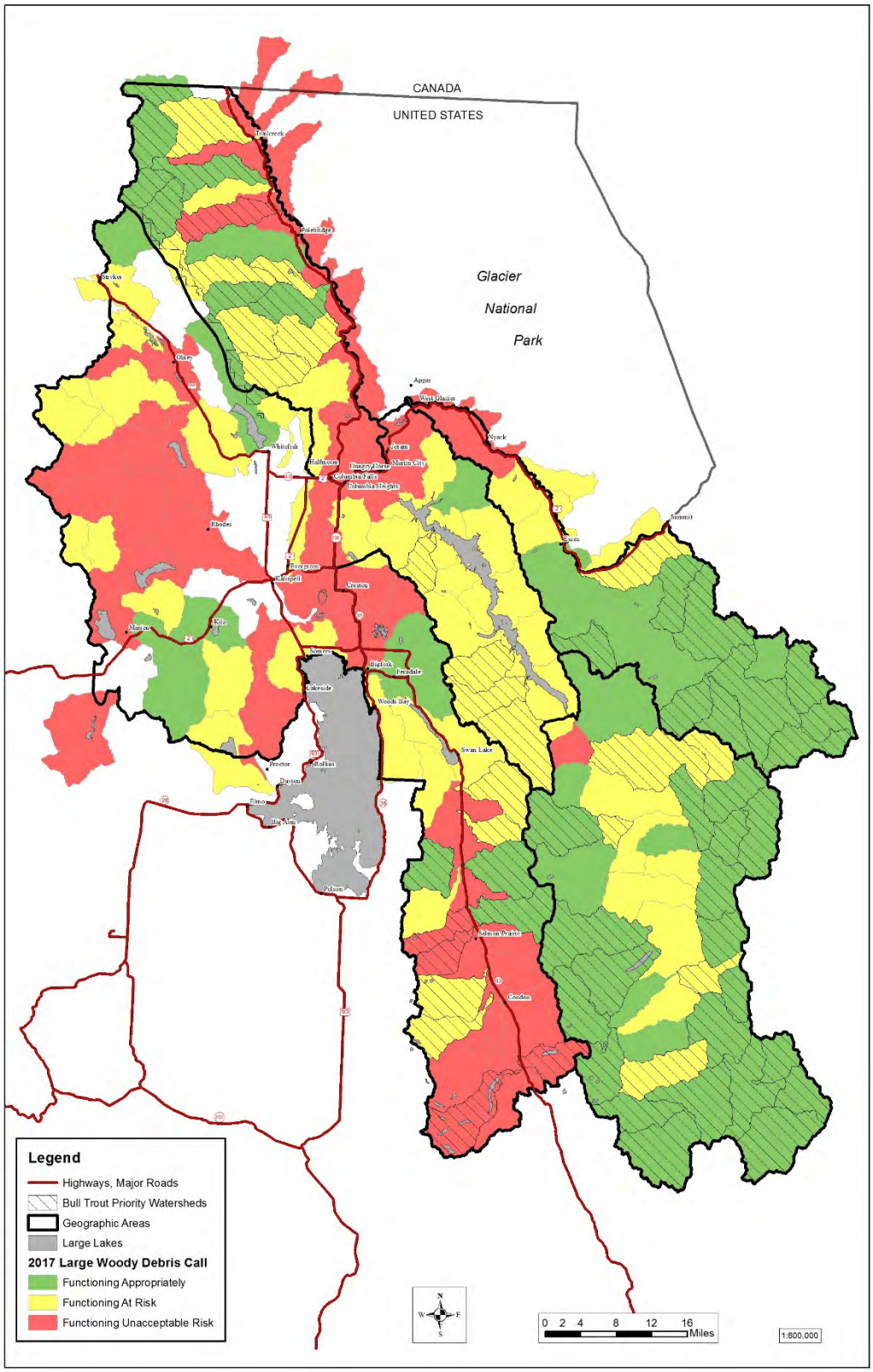


Figure F-2. 2017 Large woody debris call in bull trout priority watersheds.

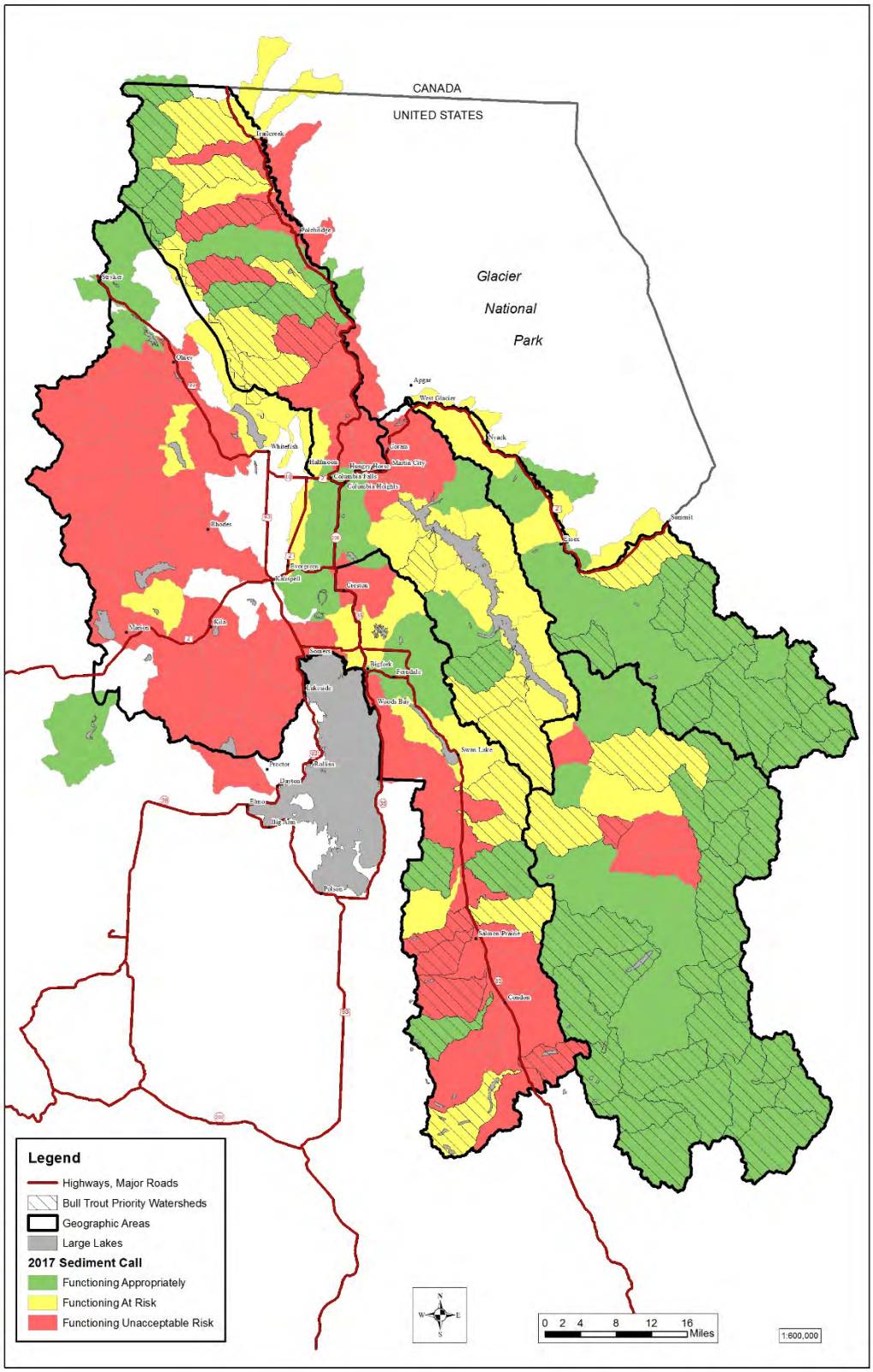


Figure F-3. 2017 Sediment call in bull trout priority watersheds.

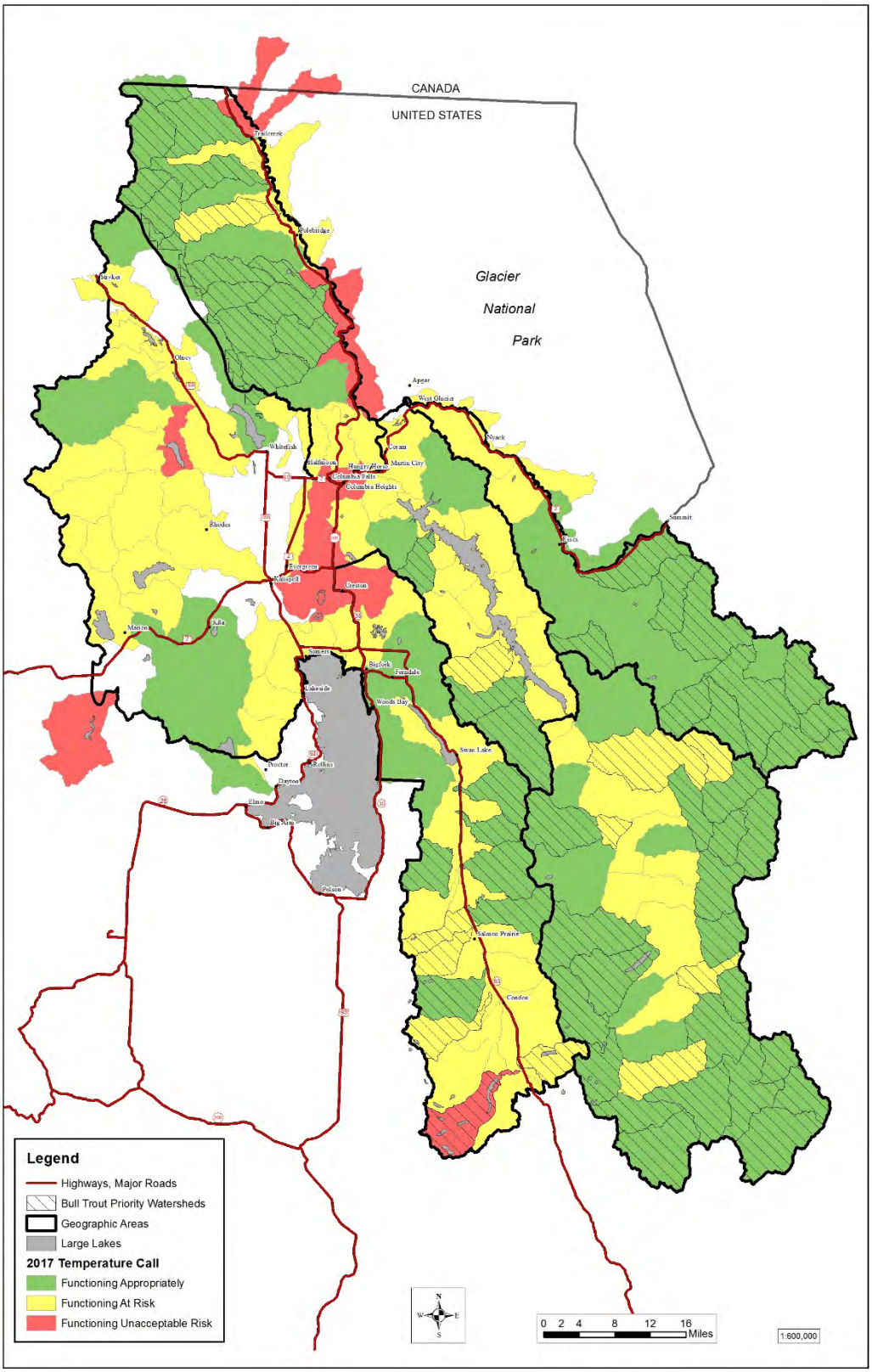


Figure F-4. 2017 Temperature call in bull trout priority watersheds.

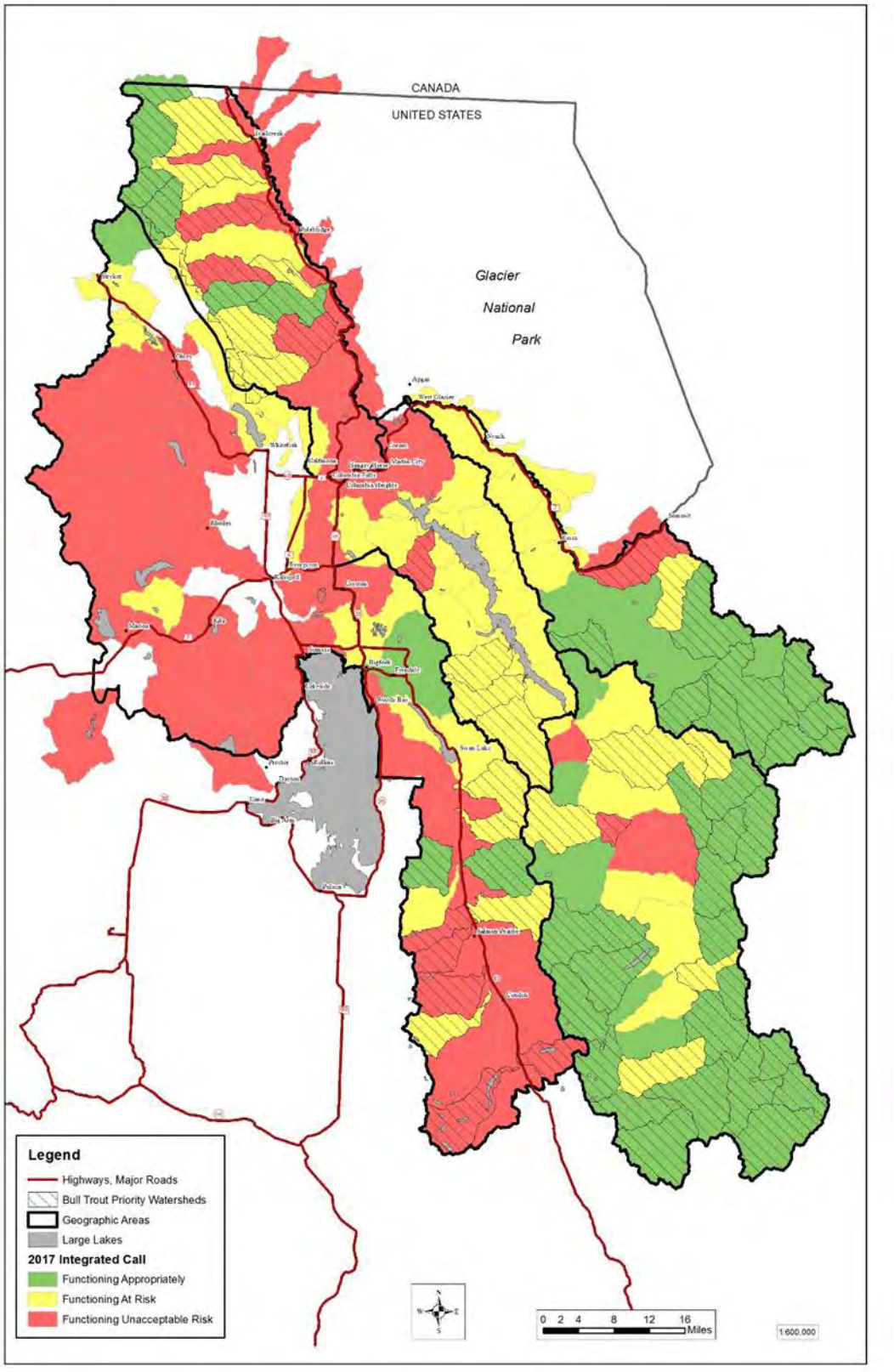


Figure F-5. 2017 Integrated call in bull trout priority watersheds.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

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In Reply Refer To:
File: M.19 Flathead National Forest (F)
TAILS Number: 06E11000-2016-F-0370

November 22, 2017

Chip Weber, Forest Supervisor
U.S. Forest Service
Flathead National Forest
650 Wolfpack Way
Kalispell, Montana 59901

Dear Mr. Weber,

This is in response to the U.S. Forest Service's (Forest Service) request for consultation with the U.S. Fish and Wildlife Service (Service) regarding the Revised Land and Resource Management Plan for the Flathead National Forest (Revised Plan). On March 17, 2017, we received your letter requesting consultation and the final biological assessment for effects of the proposed action on threatened, endangered, and proposed species. Additional information was also exchanged between the Forest Service and Service through October, 2017.

The biological assessment determined that the Revised Plan may affect, and is likely to adversely affect bull trout (*Salvelinus confluentus*), bull trout critical habitat, grizzly bear (*Ursus acrtos horribilis*), Canada lynx (*Lynx canadensis*), and Canada lynx critical habitat. The biological assessment also determined that Revised Plan may affect, but is not likely to adversely affect water howelia (*Howellia aquatilis*), and may affect, but is not likely to jeopardize North American wolverine (*Gulo gulo*).

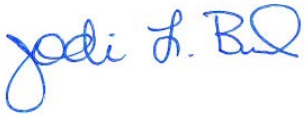
Upon review, the Service concurs with the determinations made for water howellia and North American wolverine. Our concurrence is based on the information and analyses provided in the biological assessment; information received during the consultation process; and information in our files. Therefore, pursuant to 50 C.F.R. § 402.13 (a), formal consultation on these species is not required.

The attached biological opinion addresses the effects of the Revised Plan on bull trout, bull trout critical habitat, grizzly bears, Canada lynx and Canada lynx critical habitat. Our biological opinion is based on information provided by the Forest Service in the biological assessment, additional information received during the consultation process, and information in our files. The biological opinion was prepared in accordance with section 7 of the Endangered Species Act

(Act) of 1973, as amended (16 U.S.C. § 1531 et seq.). A project file of this consultation will remain available at the Service's Montana Ecological Services Office.

We appreciate your efforts to ensure the conservation of threatened and endangered species as part of your responsibilities under the Act. If you have further questions pertaining to this consultation, please contact Kevin Aceituno at kevin_aceituno@fws.gov or 406-758-6871.

Sincerely,



Jodi L. Bush
Office Supervisor

Enclosure

ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

BIOLOGICAL OPINION

on the
Revised Forest Plan for the
Flathead National Forest

TAILS Number: 06E11000-2016-F-0370 FS

Agency:

U.S. Forest Service
Flathead National Forest
Kalispell, Montana

Consultation Conducted by:

U.S. Fish and Wildlife Service
Montana Ecological Services Office
Kalispell, Montana

NOVEMBER 22, 2017

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Chapter I. Introduction

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A. INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has prepared this biological opinion on the effects of the USDA Forest Service (USFS) revised Land and Resource Management Plan (Revised Forest Plan or Revised Plan) for the Flathead National Forest (FNF) on the listed species identified (Table I-1), in accordance with the Endangered Species Act, as amended (ESA), (16 U.S.C. 1531 et seq.). For ease of discussion throughout this document, the Flathead National Forest will be referred to as the FNF or the Forest when referencing the single administrative unit, the staff that administers the unit, or the National Forest System (NFS) lands within the unit.

The USFS submitted an aquatic and terrestrial Biological Assessment (BA) documenting that the Revised Forest Plan is likely to adversely affect three listed species: grizzly bear (*Ursus arctos horribilis*), Canada lynx (*Lynx canadensis*) and bull trout (*Salvelinus confluentus*), as well as designated critical habitat for Canada lynx and bull trout. Further, the BA determined that the Revised Forest Plan is not likely to adversely affect water howelia (*Howellia aquatilis*) and will have no effect on Spalding's Campion (*Silene spaldingii*). The BA also determined that the Revised Plan may affect, but is not likely to jeopardize wolverine (*Gulo gulo luscus*). The Final BA and letter requesting formal consultation under section 7 of the Endangered Species Act (ESA) was received by the Service on March 17, 2017. As described in this biological opinion, and based on the BA and other information collected during the consultation process, the Service has concluded that the Revised Forest Plan, as proposed, is not likely to jeopardize the continued existence of grizzly bears, Canada lynx, and bull trout, or adversely modify designated critical habitat of Canada lynx and bull trout.

This biological opinion does not provide an analysis for effects of specific actions. Rather, the effects analysis is a broad-scale examination of the types of projects and activities conducted under the Revised Forest Plan that could potentially occur in listed species habitat and result in effects on listed species. This broad-scale analysis will then be used to determine the potential for the Revised Plan direction to jeopardize the affected populations of listed species.

The FNF retains its responsibility under the ESA to consult on future projects (conducted under the Revised Forest Plan) that may affect listed species regardless of the project's consistency with the proposed action considered in this biological opinion. Future projects and their potential to adversely affect a listed species, or critical habitat, will be analyzed at the project level and a separate jeopardy/adverse modification determination will be made at that time.

This biological opinion is based on information provided in the FNF's BA (USFS 2017) for the proposed action, the draft Revised Plan (USFS 2016a) and related draft Environmental Impact Statement (EIS) (USFS 2016), personal communications with researchers and experts, and scientific literature, unpublished reports, field investigations, and other sources of information cited herein.

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Table I-1. Federally designated species on the Flathead National Forest.

Common Name	Scientific Name	ESA Status	Designated Critical Habitat?
Grizzly bear	*Ursus arctos horribilis*	Threatened	No
Canada lynx	*Lynx canadensis*	Threatened	Yes, (79 FR 54782, Sept. 12, 2014)
Bull trout	*Salvelinus confluentus*	Threatened	Yes, (75 FR 63898, Oct. 18, 2010)
Spalding's champion (or "catchfly")	*Silene spaldingii*	Threatened	No
Water howellia	*Howellia aquatils*	Threatened	No
Wolverine	*Gulo gulo luscus*	Proposed	N/A
Meltwater lednian stonefly	*Lednia tumana*	Candidate	N/A
Whitebark pine	*Pinus albicaulis*	Candidate	N/A

Endangered - Any species that is in danger of extinction throughout all or a significant portion of its range.
Threatened - Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
Candidate - Those taxa for which the Service has sufficient information on biological status and threats to propose to designate them as threatened or endangered. We encourage their consideration in environmental planning and partnerships, however, none of the substantive or procedural provisions of the Act apply to candidate species.
Proposed - Once a species is proposed, a year-long review period commences at the end of which the Service will make a final listing determination. ESA regulation 50 C.F.R. 402.10(a) states: "Each Federal Agency shall confer with the Secretary on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed." Conferencing is not required for anything less than a jeopardy call, but conferencing or concurrence may be requested by the action agency.
Candidate - A species for which the Service has sufficient information on the biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing is precluded by other higher priority activities.
Critical Habitat - The specific area (i) within the geographic area occupied by a listed species, at the time it is listed, on which are found those physical or biological features (I) essential to conserve the species and (ii) that may require special management considerations or protection: and (iii) specific areas outside the geographic area occupied by the species at the time it is listed upon determination that such areas are essential to conserve the species.

B. CONSULTATION HISTORY

The history of ESA section 7 consultation on the proposed action is summarized chronologically in Table I-2. A complete record of this consultation is on file at the Service's Montana Ecological Services Office in Helena, Montana. The consultation summary below includes meetings between the FNF and Service, but some events were attended by other agencies as well. FNF-specific communications between individual FNF staff and the Service are also

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indicated in the table. For the purposes of the consultation process, separate BAs were prepared for terrestrial and aquatic species then combined prior to submission to the Service.

Table I-2. Summary of the consultation between the Flathead National Forest (FNF) and the USFWS Montana Ecological Services Office (Service) on its Revised Plan.

Date	Event
June 3, 2016	NOI published in Federal Register for revised Flathead National Forest plan alternatives and DEIS; alternatives and DEIS for amendment of Kootenai, Helena, Lewis and Clark, and Lolo Forest Plans to incorporate habitat management direction for the NCDE grizzly bear population.
June 20, 2016	Meeting with FNF wildlife biologists (R. Kuennen and N. Warren), fisheries biologist (P. Van Eimeren), silviculturist (H Trechsel), planning team leaders (J. Kruger and R. Carlin), and the Service consultation team (B. Conard, K. Dixon, and K. Aceituno was held to discuss consultation strategy, timelines, roles, and responsibilities.
August 2, 2016	An ESA Section 7 Consultation Agreement was finalized. The document outlined proposed timelines, agency tasks, and staffing assignments.
September 23, 2016	FNF sends draft BAs to the Service including: • A broad description of the action to be consulted on, • A description of the specific area that may be affected by the action, • The current status and habitat use of listed species in the action area, and identification of designated critical habitat within the action area, • Discussion of the methods and scientific information used, • Environmental baseline for each threatened or endangered species and critical habitat.
November 30, 2016	FNF wildlife biologists meet with the Service's consultation team to discuss draft BA sections on grizzly bear and Canada lynx, and to discuss the development of a preferred alternative for the final Revised Plan.
December 8, 2016	FNF wildlife and fisheries biologists meet with the Service's consultation team to discuss draft BA sections pertaining to bull trout, Canada lynx, critical habitats, water howelia, and proposed (wolverine) and candidate species (meltwater lednian stonefly and whitebark pine).
January 10, 2017	FNF fisheries biologist, planning team lead and Service fish and wildlife biologist meet to discuss aquatic components of the Revised Plan.
January 25, 2017	The Service and the FNF meet to discuss proposed actions and their effects; sections on grizzly bear, Canada lynx, critical habitats, proposed and candidate species. The FNF informs the Service that they will be submitting draft BA sections in mid-February due to need for USFS regional office review.
February 21, 2017	In response to comments on prior drafts, the FNF submits another draft BA to the Service for review.
March 6, 2017	A conference call was conducted between the FNF and the Service. During

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Date	Event
	the call the FNF updated the Service on new timelines for formal consultation. FNF agrees to submit final BA to the Service by mid-March, 2017. The Service agrees to discuss draft terms and conditions, conservation measures and reporting requirements in April, 2017. The Service expresses their concern that they may need 90 days (until mid-June) to complete consultation on Flathead BA due to ongoing litigation, regional USFS priorities and additional complexities with the FNF's BA.
March 17, 2017	The FNF submits the Biological Assessment for Threatened, Endangered, and Proposed Species: Revised Land and Resource Management Plan for the Flathead National Forest, and officially requests initiation of formal section 7 consultation.
March 17, 2017	The statutory 135-day formal consultation timeline begins{50 CFR 402.14 (e-g)}
June 12, 2017	The FNF submits an updated Biological Assessment to the Service. The updated Biological Assessment included newly calculated Canada lynx critical habitat acreage on the Flathead National Forest, as well as updated language that would limit the spatial extent of an individual project to three adjacent grizzly bear subunits on the Flathead National Forest.
June 19, 2017	The Service and USFS meet to discuss grizzly bear topics associated with the FNF Revised Forest Plan consultation and the NCDE Conservations Strategy Amendments consultation. The meeting was attended by the Service's consultation team and Grizzly Bear Recovery Program leaders, as well as the USFS wildlife biologists and planning team.
July 5, 2017	FNF fisheries biologist submits a revised culvert monitoring plan to the Service. The submission includes correspondence that indicates the FNF will include the culvert monitoring plan as part of the "proposed action" under the Revised Forest Plan consultation.
July 26, 2017	The Service and FNF meet to discuss consultation progress and changes that will need to be made to the Biological Assessment submitted on June 12, 2017. Changes pertained to increased day-use sites allowed by the Revised Forest Plan, and how these increases will include measures to reduce the risk of grizzly bear-human conflicts.
September 8, 2017	A meeting is held between the Service and FNF wildlife biologists and planning team members. The meeting was proposed to outline minor changes in the Biological Assessment and to discuss consultation timelines.
September 19, 2017	The FNF submits an updated Biological Assessment to the Service that includes updated calculations of Canada lynx critical habitat on the Flathead National Forest, and acreages that will be designated as certain "Management Areas" under the Revised Forest Plan.
September 20, 2017	The Service submits drafts of the Introductory and Bull Trout Chapters, and Appendices 1-5 of the BO to the FNF for inter-agency review.
September 28, 2017	The Service submits a draft of Grizzly Bear Chapter of the BO to the FNF for inter-agency review.

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Date	Event
October 4, 2017	A meeting is held between the Service and FNF to address comments from inter-agency review of the draft BO.
October 12, 2017	The Service submits a draft of Canada Lynx Chapter of the BO to the FNF for inter-agency review.
October 23, 2017	The FNF and the Service meet to discuss inter-agency review comments on the Canada Lynx Chapter of the BO.

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C. ORGANIZATION OF THIS BIOLOGICAL OPINION

This biological opinion includes four chapters. This is the introductory chapter, Chapter I. Chapter I of the biological opinion provides a description of the proposed action. This section describes the project area, the species in the project area, and an overview of the proposed Revised Forest Plan. The biological opinion for bull trout and bull trout critical habitat is contained in Chapter II, the biological opinion for grizzly bear is contained in Chapter III, and the biological opinion for Canada lynx and Canada lynx critical habitat is contained in Chapter IV. This biological opinion also contains appendices that include supporting material cited throughout the various chapters. The species-specific chapters (i.e., Chapters II, III, IV) provide additional descriptions of the proposed action relative to measures contained in the Revised Forest Plan to address the conservation needs of the species. Each species-specific chapter will contain its own literature cited section.

D. DESCRIPTION OF THE PROPOSED ACTION

This section describes the project area, provides background on the development of the Revised Forest Plan, describes implementation of the plan and summarizes the key elements of the Revised Plan providing forest-wide, management area, and geographic area direction on forest management.

1. Description of the Project Area

The FNF is located in the northern Rocky Mountains of Western Montana (Figure 1, USFS 2017) and is encircled by the Kootenai, Helena-Lewis and Clark, and Lolo National Forests; Glacier National Park; and Canada. The FNF administers approximately 2.4 million acres of public land in portions of Flathead, Lake, Lewis and Clark, Lincoln, Missoula, and Powell counties. The FNF Supervisor's office is located in Kalispell, Montana, and the FNF is split among five ranger districts: Swan Lake, Hungry Horse, Glacier View, Tally Lake and Spotted Bear. The FNF includes large designated wilderness areas, such as the Bob Marshall Wilderness Complex and the Mission Mountains Wilderness, in concert with other special areas such as wild and scenic river systems, the Jewel Basin Hiking Area, other undeveloped backcountry areas, lands managed for production of timber, and lands interspersed with private development provide habitat for diverse plant and animal species. Under the proposed action, the analysis area for an individual species may be larger area than the Flathead National Forest, as described in the individual species sections.

2. Species in the Project Area

As described in the Introduction, five listed species can be found within the project area: grizzly bear, Canada lynx (lynx), bull trout, Spalding's campion and water howelia. Additionally, one proposed species (wolverine) and two candidate species (meltwater lednian stonefly and whitebark pine) can also be found in the project area (Table I-3)

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Table I-3. Federally designated species on the Flathead National Forest.

Common Name	Scientific Name	Status[1]	Range – Montana
Bull Trout	*Salvelinus confluentus*	Threatened; Critical Habitat	Clark Fork, Flathead, Kootenai, St Mary, and Belly river basins; cold water rivers and lakes
Grizzly Bear	*Ursus arctos horribilis*	Threatened	Resident and transient; Alpine/subalpine coniferous forest
Canada Lynx	*Lynx canadensis*	Threatened; Critical Habitat	Resident; western Montana – montane spruce/fir forests
Spalding's Campion (or "catchfly")	*Silene spaldingii*	Threatened	Upper Flathead River Fisher River drainages; Tobacco Valley – open grasslands with rough fescue or bluebunch wheatgrass
Water Howellia	*Howellia aquatilis*	Threatened	Wetlands; Swan Valley, Lake, and Missoula Counties
Wolverine	*Gulo gulo luscus*	Proposed	High elevation alpine and boreal forests that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season
Meltwater Lednian Stonefly	*Lednia tumana*	Candidate	High-elevation meltwater glacial areas; Glacier National Park
Whitebark Pine	*Pinus albicaulis*	Candidate	Forested areas in central and western Montana in high-elevation, upper montane habitat near treeline

1. **Endangered** - Any species that is in danger of extinction throughout all or a significant portion of its range.

Threatened - Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Candidate - Those taxa for which the Service has sufficient information on biological status and threats to propose to designate them as threatened or endangered. We encourage their consideration in environmental planning and partnerships, however, none of the substantive or procedural provisions of the Act apply to candidate species.

Critical Habitat - The specific area (i) within the geographic area occupied by a listed species, at the time it is listed, on which are found those physical or biological features (I) essential to conserve the species and (ii) that may require special management considerations or protection: and (iii) specific areas outside the geographic area occupied by the species at the time it is listed upon determination that such areas are essential to conserve the species.

Proposed - Once a species is proposed, a year-long review period commences at the end of which the Service will make a final listing determination. ESA regulation 50 C.F.R. 402.10(a) states: "Each Federal Agency shall confer with the Secretary on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed." Conferencing is not required for anything less than a jeopardy call, but conferencing or concurrence may be requested by the action agency.

The FNF supports 12 bull trout core areas. Three of these core areas are considered "complex" core areas as defined in the bull trout Recovery Plan (USFWS 2015). The remaining core areas are considered "simple" core areas, and all are within of the Columbia River Headwaters Recovery Unit. A core area is the closest approximation of a biologically functioning unit for bull trout, meaning it has both the habitat that could supply all elements for the long-term security of bull trout and a group of one or more local bull trout populations. The FNF also contains designated critical habitat for bull trout in each of the core areas.

The FNF is within the grizzly bear North Continental Divide Ecosystem (NCDE). Over 2.1 million acres of the FNF is included in the NCDE recovery zone/primary conservation area (PCA). This is approximately 37% of the total area of the PCA.

The project area also lies within the Northern Rocky Mountain Region of the United States distinct population segment of Canada lynx. There are 109 lynx analysis units (LAUs) on the FNF totaling nearly 2.4 million acres. The FNF also lies within lynx critical habitat Unit 3.

Two species of listed plant species are found on, or near the FNF. Spaulding's catchfly occurs in close proximity to the FNF, with the closes known population occurring three miles from forest lands. Water howelia is an aquatic plant found in wetlands of the Swan Lake ranger district. There are 304 global occurrences of water howelia, with 220 occurring in Montana's Swan Valley. Of these 220, 177 occur wholly or partially on lands administered by the FNF.

3. Description of the Proposed Action

The FNF is proposing to revise its Land and Resource Management Plan (Forest Plan) based on legal requirements, changed conditions, and topics identified in the Assessment of the Flathead National Forest. Revision is needed because the 1986 Forest Plan is beyond the 10- to 15-year duration provided by the National Forest Management Act (16 U.S.C. 1606(e)(5)(A)). Like the 1986 plan, the Revised Forest Plan provides forest-wide management direction, and describes desired conditions, objectives, guidelines, standards, and suitability meant to aid in the implementation of future land management decisions. The purpose of the Revised Forest Plan is to provide for social, economic and ecological sustainability, and to allow multiple uses of the land and resources managed by the Flathead National Forest (USFS 2016a). . Additionally, the Revised Forest Plan contributes to the social and economic well-being of local communities by promoting sustainable use of renewable natural resources.

Purpose of the Proposed Action

The purpose of the Revised Forest Plan is to provide land management direction for the FNF by guiding programs, practices, uses and projects. The Revised Plan provides guidance for project and activity decision-making on the FNF for the next 15 years. This guidance includes:

- Forest-wide components to provide for integrated social, economic, and ecological sustainability, and ecosystem integrity and diversity, while providing for ecosystem services and multiple uses. Components must be within Forest Service authority and consistent with the inherent capability of the plan area (36 Code of Federal Regulations (CFR) 219.7 and CFR 219.8–219.10).

- Recommendations to Congress (if any) for lands suitable for inclusion in the National Wilderness Preservation System and/or rivers eligible for inclusion in the National Wild and Scenic Rivers System (36 CFR 219.7(2)(v) and (vi)).

- The plan area's distinctive roles and contributions within the broader landscape.

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- Identification or recommendation (if any) of other designated areas (36 CFR 219.7 (c)(2)(vii).

- Identification of suitability of areas for the appropriate integration of resource management and uses, including lands suited and not suited for timber production (36 CFR 219.7(c)(2)(vii) and 219.11).

- Identification of the maximum quantity of timber that may be removed from the plan area (36 CFR 219.7 and 219.11 (d)(6)).

- Identification of geographic area- or management area-specific plan components (36 CFR 219.7 (c)(3)(d).

- Identification of watersheds that are a priority for maintenance or restoration (36 CFR 219.7 (c)(3)(e)(3)(f).

- Plan monitoring program (36 CFR 219.7 (c)(2)(x) and 219.12.

The Revised Forest Plan would guide natural resource management activities on the FNF and address changed conditions and direction that have occurred since the 1986 Forest Plan was prepared and amended while meeting the objectives of federal law, regulation, and policy. It is important to note that the revised forest plan does not authorize site-specific prohibitions or activities; rather, it establishes broad direction, similar to zoning in a community. Project or activity decisions will be made following appropriate procedures and site/project-specific analyses would still need to be conducted in assess compliance with federal regulations (e.g., ESA, NEPA).

In addition to updating the 1986 Forest Plan, there is a need to incorporate habitat related direction from the Northern Continental Divide Ecosystem Grizzly Bear Conservation Strategy into the Flathead National Forest's plan so that the USFS will be able to demonstrate to the Service that adequate regulatory mechanisms exist to support a delisted NCDE grizzly bear population. In 2013, the Service announced the availability of a draft Grizzly Bear Conservation Strategy (GBCS) for the NCDE grizzly bear population for public review and input (USFWS 2013). The NCDE GBCS contains habitat-related management direction that pertains to the portions of national forests that are within the NCDE, including the Flathead, Kootenai, Helena-Lewis and Clark, and Lolo National Forests. Habitat conditions and management on the Flathead, Kootenai, Helena-Lewis and Clark, and Lolo National Forests have contributed importantly to the increased population size and improved status of the grizzly bear across the NCDE. Supporting the continued recovery of the grizzly bear population will depend on continued, effective management of the NCDE grizzly bear's habitat. The USFS will implement direction related to habitat management on lands in the NCDE to contribute to sustaining recovery of the grizzly bear population. When finalized, the GBCS would become the post-delisting management plan for the NCDE grizzly bears and their habitat.

Development of the Revised Forest Plan

The Revised Forest Plan was developed with guidance from the USFS 2012 planning rule (USFS 2012). Within the requirements set forth in the 2012 planning rule, land management plans provide a programmatic framework and the sideboards to guide decisions for all natural resource management activities on their respective NFS units. Plans include plan components (desired conditions, objectives, standards, guidelines, and suitability of areas) that influence the design and choice of future proposals for projects and activities in a plan area, and also include monitoring items. They provide additional definition of resource management activities needed to implement and achieve desired conditions and objectives and, through suitability determinations, standards, and guidelines, they establish constraints upon the decision space for on-the-ground management decisions.

A forest plan provides the framework and text guiding day-to-day resource management. It is strategic and programmatic and does not provide project-level decisions or result in irreversible or irretrievable commitments of resources. The purpose of the revised forest plan is to guide management toward the attainment of long-term desired conditions. Given the multiple resource nature of land management, the many types of projects, and the various activities that can occur over the life of the revised forest plan, it is not likely that a project or activity would maintain or contribute to the attainment of all desired conditions. Additionally, not all desired conditions are relevant to every activity (e.g., recreation desired conditions may not be relevant to a fuels treatment project). Most projects and activities are developed specifically to maintain or move conditions toward one or more of the desired conditions of the revised forest plan. It should not be expected that each project or activity would contribute to all desired conditions in a plan. Instead, a project or activity will typically contribute to one, or a subset, of desired conditions.

The Revised Plan is the result of public engagement efforts dating back to 2013. During the development of the Revised Plan, a variety of scoping efforts, public informational and comment meetings, field trips, invited group presentations, and workgroup meetings were conducted. Additionally, the Revised Plan was developed with input from tribal partners, agency partners, and elected officials at various communities in and around the Forest. A detailed description of the development process is provided in the BA (USFS 2017).

Programmatic Nature of the Revised Forest Plan

The Revised Forest Plan is programmatic in scope, meaning it provides the framework for future site-specific actions but does not authorize, fund, or carry out future site-specific actions. Future project-level activities must be consistent with the direction in the Revised Plan and must undergo separate project level analyses, including National Environmental Policy Act (NEPA) planning and decision-making procedures, and Endangered Species Act (ESA) section 7 consultation if appropriate. The management direction contained in the revised forest plan will go into effect once the final record of decision is signed by the Forest Supervisor. Project-level environmental analysis will still need to be completed for proposals that would implement the direction in the forest plan.

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Management Areas

Every forest plan must have management areas or geographic areas or both. A forest plan may identify designated or recommended designated areas as management areas or geographic areas (36 CFR 219.7(d)). These areas are assigned sets of plan components such as desired conditions, suitable uses, and in some areas either standards or guidelines or both. Geographic area desired conditions describe what the Forest wants to achieve in specific geographic areas that are not necessarily covered by forestwide desired conditions. While all resources have been considered for forest-wide direction, plan components have been developed for geographic areas to further refine plan direction within each respective geographic area.

Designated areas or features are identified and managed to maintain their unique special character or purpose. Some categories of designated areas may be designated only by statute and some categories may be established administratively in the land management planning process or by other administrative processes of the Federal executive branch. Examples of statutorily designated areas are national heritage areas, national recreational areas, national scenic trails, inventoried roadless areas, wild and scenic rivers, wilderness areas, and wilderness study areas. Examples of administratively designated areas are experimental forests, research natural areas, scenic byways, botanical areas, and significant caves (36 CFR 219.19).

The Revised Forest Plan designates seven management area (MAs) types across the FNF: Wilderness (Designated, Recommended, Wilderness Study Area, and Primitive); Wild and Scenic Rivers (Designated, and Eligible); Administrative/Special Areas; Research Natural Areas and Experimental Forests; Backcountry; General Forest; and Focused Recreation Areas. The 1986 Forest Plan contained a different set of management areas than what is proposed under the Revised Plan. As a result, the BA includes a cross-referenced table to link the 1986 management areas to those used in the Revised Plan (See Table 2 in the BA; USFS 2017). The seven designated MA themes are further broken down into 11 individual MAs, which are summarized in Table I-4.

Allocation to a specific MA does not mandate or direct the Forest Service to propose or implement any action; rather, the MAs provide direction on desired conditions and allowable activities and uses, including timber harvest/timber production, commercial and personal use of special forest products and firewood, the use of prescribed and natural (unplanned) fire, livestock grazing, recreation (including wheeled and over-snow motorized vehicle use), road construction and reconstruction, and minerals development (leasable and materials). Table I-4 summarizes the allowable uses by MA under the Proposed Action. The MAs are characterized as follows:

MA-1: Wilderness

- MA-1a: Designated Wilderness
  The FNF manages three Congressionally designated wilderness areas—the Bob Marshall, Great Bear, and Mission Mountains—as part of the National Wilderness Preservation System. These three areas contain 1,072,040 acres, which accounts for approximately 45% of the FNF. If, over the life of the Revised Plan, Congress designates any additional wilderness areas on the FNF, those areas would be allocated to this MA.

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- MA-1b: Recommended Wilderness
  These areas are recommended as additions to the National Wilderness Preservation System. The Revised Plan designates 190,403 acres of recommended wilderness throughout the FNF. The wilderness characteristics and potential for each area recommended to be included in the National Wilderness Preservation System are to remain intact until Congressional action is taken. Areas of recommended wilderness under the Revised Plan are detailed later in this opinion, or in the BA.

MA-2: Wild and Scenic Rivers

- MA-2a: Designated Wild and Scenic Rivers
  These river segments and adjacent lands have been designated as part of the Wild and Scenic Rivers System under the authority granted by the Wild and Scenic Rivers Act of 1968, as amended. Currently the FNF contains 219 miles of designated wild and scenic river, all of which are on North, Middle and South Fork Flathead River. If, over the life of the Revised Plan, Congress designates any additional wild and scenic rivers on the Forest, those areas would be allocated to this MA

- MA-2b: Eligible Wild and Scenic Rivers
  This MA applies to river segments that have been identified as eligible for inclusion as part of the Wild and Scenic Rivers System under the authority granted by the Wild and Scenic Rivers Act of 1968, as amended. The Revised Plan designates 284 miles as eligible for inclusion as part of the Wild and Scenic River System. These areas are managed to protect the free-flowing nature of these rivers, and outstandingly remarkable scenic, recreational, geologic, fish, wildlife, historic, cultural, or other similar values for the benefit and enjoyment of present and future generations.

MA-3: Special or Administrative Areas

- MA-3a: Administrative Areas
  Administrative areas are facilities or infrastructure necessary to support FNF employees, equipment and activities required for administration and management of the FNF.

- MA-3b: Special Areas
  These are administratively designated areas that are managed to protect and conserve the values for which they were identified. The FNF currently has one special area, the Condon Creek Botanical Area.

MA-4: Research Natural Areas, Experimental Forest and Demonstration Forest

- MA-4a: Research Natural Areas
  These areas are established to provide for research, observation, study, and conservation

of biological diversity. Research natural areas are designated jointly with the appropriate Forest Service research station.

- MA-4b: Experimental and Demonstration Forests
  These areas are established to study ecology and silviculture of species on the FNF, as well as to study the effect of fire and other silvicultural treatments on regeneration and other forest conditions. Currently, the FNF has two such areas. The Coram Experimental Forest was established in 1933, and its management is the responsibility of the USFS' Rocky Mountain Research Station. The Miller Creek Demonstration Forest was set aside in 1989, and its management is the responsibility of the FNF.

MA-5: Backcountry

This management area consists of a relatively large area characterized by an environment that is influenced primarily by natural ecological processes (e.g., fire, natural succession, insects, disease). These areas also provide a variety of backcountry recreational opportunities, ranging from non-motorized year-round to motorized summer and over-snow areas/routes. They also include areas from the 1986 Forest Plan that have a high level of other amenity values or site conditions that would limit vegetation treatments and are unsuitable for timber production (e.g., high scenic value in elk winter range, non-forest vegetation types, riparian areas). This MA is further divided according to motorized use opportunities:

- MA-5a
  Provides opportunities for year-round non-motorized use.

- MA 5b
  Provides opportunities for year-round non-motorized use and motorized use on designated roads, trails, and in designated areas.

- MA-5c
  Provides opportunities for year-round non-motorized use and over-snow vehicle use on designated routes and in designated areas.

- MA-5d
  Provides opportunities for year-round non-motorized use and wheeled motorized use during the summer on designated routes.

MA-6: General Forest

These general forest areas would provide a wide range of uses, including habitat for wildlife, commercial and non-commercial forest products, and a variety of recreation uses. In these areas active vegetation management (e.g., prescribed fire, thinning, harvest), as well as other activities, would be used to achieve desired vegetative and wildlife conditions. This management area has been further divided into three categories designated to reflect the anticipated level of timber harvest. These designations are described below:

- MA-6a: Low
  These areas will not have regularly scheduled timber harvest. The reasons for this low intensity could range from unsuitable vegetative conditions or other resource considerations have a higher priority (e.g., grizzly bear core areas, Canada lynx foraging habitat, large game winter range).

- MA-6b: Medium
  Areas under this designation are expected to receive regularly scheduled timber harvest prescriptions. These areas still have other resource concerns or site limitations, but to a lesser degree that areas under the MA-6a designation.

- MA-6c: High
  A higher intensity of timber harvest is anticipated in these areas. Site limitations and/or other resource priorities are not expected to interfere with regularly scheduled timber harvest.

MA-7: Focused Areas

These are management areas that will provide for a variety of recreational uses and receive special attention. Typically these areas will center around a high use feature, such as large lake, reservoir, developed ski area, year-round resort, large campground, or trail systems.

Table I-4. Summary of existing management area allocations and proposed action management area allocations (single designation based upon established hierarchy) as of January 18, 2017.

Management Area	Existing Plan [b] (percent)	Revised Plan (percent)
1a Designated wilderness	1,072,040 (45%)	1,072,040 (45%)
1b Recommended wilderness	98,388 (4%)	190,403 (8%)
2a Designated wild and scenic rivers	17,605 (1%)	17,592 (1%)
2b Eligible wild and scenic rivers	0[c]	20,473 (1%)
3a Administrative areas	1,918 (< 1%)	435 (< 1%)
3b Special areas	226	1,579 (< 1%)
4a Research natural areas	9,870 (< 1%)	7,820 (< 1%)
4b Experimental and demonstration forests	6,602 (< 1%)[d]	11,544 (< 1%)
5a Backcountry non-motorized year-round	--	149,258 (6%)
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	--	50,002 (2%)
5c Backcountry: motorized over-snow vehicle use	--	107,656 (4%)
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	--	9,854 (< 1%)

Management Area	Existing Plan [b] (percent)	Revised Plan (percent)
5a-d Backcountry Total	381,685[e] (16%)	317,770 (13%)
6a General forest low	93,714 (4%)	123,693 (5%)
6b General forest medium	--	297,674 (12%)
6c General forest high	--	271,895 (11%)
General Forest medium to high	703,454 (29%)	--
6a-c General forest **Total**	797,168 (33%)	693,262 (29%)
7 Focused recreation areas	7,305 (< 1%)[f]	60,888 (3%)
Total Forest acres	2,392,807 acres (100%)	2,392,807 acres (100%)

a. Acres and percentage from GIS dataset. The official acres for NFS lands and wilderness areas can be found in the land area report.

b. Alternative A, the no-action alternative, is included even though it does not use the management areas shown in the draft forest plan.

c. Acres of eligible wild and scenic rivers in the existing plan are the same as in the action alternatives (see Table 5). However, they were not assigned a MA in the existing 1986 forest plan, and were not mapped for the DEIS.

d. Miller Creek Demonstration Forest (4,942 acres) was not assigned a management area in the existing 1986 plan.

e. The existing plan does not differentiate backcountry areas like the action alternatives; thus all backcountry acres are combined.

f. There is no MA in the existing 1986 forest plan equivalent to Focused Recreation Areas. These acres are the Round Meadow and Essex cross country ski areas and the mapped developed recreation sites.

Components of the Revised Forest Plan

The following are the definitions and, where necessary, a description of the context of the required plan components (36 CFR 219.7(e)).

Desired condition

A desired condition is a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be described in terms that are specific enough to allow progress toward their achievement to be determined but must not include completion dates (36 CFR 219.7(e)(1)(i)).

Desired conditions are not commitments or final decisions approving projects and activities. The desired condition for some resources may currently exist, but for other resources they may only be achievable over a long time period.

The Revised Plan presents three types of desired conditions:

1. Forest-wide desired conditions apply across the landscape but may be applicable to specific areas as designated on a map.

2. Management area desired conditions are indications of what future conditions would typically be desired. They help clarify the general suitability of various parts of the Forest for different activities and management practices. These desired conditions clarify

what outcomes might be expected in land areas with different general suitability descriptions.

3. Geographic area desired conditions are specific to an area or place, such as a river basin or valley, and reflect community values and local conditions within the area. They do not substitute for, or repeat, forest-wide desired conditions. These desired conditions allow focus on specific circumstances in specific geographic locations. The Forest is divided into six geographic areas (see Figure 1).

Objective

An objective is a concise, measurable, and time-specific statement of a desired rate of progress toward a desired condition or conditions. Objectives should be based on reasonably foreseeable budgets (36 CFR 219.7(e)(1)(ii)). Objectives describe the focus of management in the plan area within the plan period. Objectives will occur over the life of the forest plan, considered to be over the first 15 years of plan implementation, unless otherwise specified. Objectives can be forest-wide or specific to management areas or geographic areas. Refer to Appendix C of the BA (USFS 2017) for possible strategies to achieve certain objectives.

It is important to recognize that objectives were developed considering historic and expected budget allocations as well as professional experience with implementing various resource programs and activities. It is possible that objectives could either exceed or not meet a target based upon a number of factors, including budget and staffing increases/decreases, increased/decreased planning efficiencies, and unanticipated resource constraints.

Standards

A standard is a mandatory constraint on project and activity decision-making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iii)). Standards can be developed for forest-wide application or be specific to a management area or geographic area.

Guidelines

A guideline is a constraint on project and activity decision-making that allows for departure from its terms, so long as the purpose of the guideline is met. Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iv)). A guideline can be forest-wide or specific to a management area or a geographic area.

Suitability of lands

Specific lands within the FNF are identified as suitable for various multiple uses or activities based on the desired conditions applicable to those lands. The Revised Plan identifies lands within the FNF as not suitable for uses that are not compatible with desired conditions for those lands. The suitability of lands are not identified for every use or activity following guidance provided at 36 CFR 219.7 (e)(1)(v)).

The identification of suitability of lands for a particular use in the forest plan indicates that the use may be appropriate but does not make a specific commitment to authorize that use. If certain lands are identified as not suitable for a use, then that use or activity may not be authorized. Prohibiting an existing or authorizing a new use requires subsequent, site-specific NEPA analysis. Generally, lands on the FNF are suitable for uses and management activities appropriate for national forests, such as outdoor recreation or timber, unless identified as not suitable. For suitability determinations, refer to Chapters 2 and 3 of the BA (USFS 2017).

Monitoring program

The monitoring program is designed to test assumptions used in developing plan components and to evaluate relevant changes and management effectiveness of the plan components. Typically, monitoring questions seek additional information to increase knowledge and understanding of changing conditions, uncertainties, and risks identified in the best available scientific information as part of an adaptive management framework. The best available scientific information can identify indicators that address associated monitoring questions. The best available scientific information is also important in the further development of the monitoring program as it may help identify protocols and specific methods for the collection and evaluation of monitoring information (from Forest Service Handbook 1909.12 07.11). See chapter 5 for the monitoring program and additional information about adaptive management.

Other required plan content

In addition to requiring that a plan have components, the 2012 planning rule requires that a plan have "other required content" (36 CFR 219.7(f)(1)) addressing priority watersheds, the distinctive roles and contributions of the plan area, a plan monitoring program, and proposed and possible actions.

The components of the Revised Plan described above guide future projects, activities and the monitoring program. Plan components are not commitments or final decisions approving projects or activities. Desired conditions, objectives, standards, guidelines, suitability, and monitoring questions and monitoring indicators have been given alpha-numeric identifiers for ease in referencing within the Revised Plan. The identifiers are described below:

- the level of direction (e.g., forest-wide = FW, management area = MA, or geographic area = GA; note that with management area or geographic area direction, the management area number and the geographic area acronym are also included);
- the type of direction (where DC = desired condition, OBJ = objective, STD = standard, GDL = guideline, SUIT = suitability, MON = monitoring question, IND = monitoring indicator);
- the resource (for forest-wide direction), e.g., WTR = watersheds and TE&V = terrestrial ecosystems and vegetation; and
- a unique number (i.e., numerical order starting with "01").

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Thus, forest-wide direction for desired conditions associated with watersheds would be identified starting with FW-DC-WTR-01; management area direction for desired conditions in management area 2b would be identified starting with MA-2b-DC-01, and desired conditions for the Hungry Horse geographic area would be identified starting with GA-HH-DC-01. The identifiers are included as part of the headings in chapters 2 through 4, with the unique number preceding each plan component.

If the component is based upon the Grizzly Bear Conservation Strategy (GBCS), then it will reference the Northern Continental Divide Ecosystem (NCDE) and the management zone to which it applies: recovery zone/primary conservation area, zone 1, and/or demographic connectivity area (e.g., within the NCDE primary conservation area).

Direction of the Revised Forest Plan

The following provides a summary of the Revised Forest Plan using the terms and definitions described above. A comprehensive description of the Revised Plan can be found in FNF's BA (USFS 2017). Revised Forest Plan components that are pertinent to federally listed species will be discussed in detail in later chapters.

Vegetation Management, Timber Production, and Fire and Fuels Management

Desired conditions for vegetation are based on maintaining and promoting forest conditions that are resilient in the face of potential future disturbances and climate change and that contribute to social and economic sustainability. Under the Revised Plan, a variety of vegetation management techniques would be employed, including timber harvesting, planting, thinning, fuel treatments, natural unplanned ignitions, and prescribed burns. The role of fire, both planned and unplanned ignitions, as a tool to achieve desired vegetation and wildlife habitat conditions is articulated in the plan, and direction related to its use and management is provided. Direction is also provided for fuels management to protect identified values, such as in wildland urban interface areas. Biodiversity is addressed by providing desired conditions and management direction associated with a diverse array of plant communities and species, such as aquatic and riparian areas, deciduous forests, burned forests, grasslands, shrublands and whitebark pine. Fens and other unique botanical or geological areas are given special emphasis by designation as special areas.

Timber harvest is conducted to provide for societal goods and to move the vegetation towards desired conditions. Approximately 465,200 acres (20 % of the FNF) are suitable for timber production as defined by the 2012 planning rule (USFS 2017). This total represents the acres in suitable management areas minus inclusions that are not suitable (e.g., riparian management zones). Under the Revised Plan the projected timber sale quantity for the first decade would be 27.3 million board feet per year and the projected wood sale quantity would be 6.3 million cubic feet per year.

Fish and Wildlife Habitat

The Revised Plan includes forest-wide desired conditions, objectives, standards, and/or guidelines to support long-term persistence of species listed as threatened, endangered, or species of conservation concern (including proposed and candidate species) and to support key

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ecosystem characteristics for additional species, such as those that are of interest for hunting, trapping, observing, and subsistence. Diversity is addressed by coarse-filter plan desired conditions and management direction as well as species-specific desired conditions and management direction.

The Revised Plan includes 1,072,040 acres (45% of the FNF) in designated wilderness (management area 1a), 190,403 acres (8% of the FNF) in recommended wilderness (management area 1b), and 316,770 acres (13% of the FNF) in backcountry (management areas 5a through 5d). These designations will contribute to high levels of habitat security and connectivity over large land areas for species that are sensitive to higher levels of human disturbance (e.g., grizzly bear). These management areas also emphasize natural processes, with relatively high levels of habitat created by natural disturbances such as wildfire, insects, or disease. In all management areas across the forest, the close interrelationship of vegetation conditions and wildlife habitat is emphasized.

Revised Forest Plan components related to vegetation conditions provide key ecosystem characteristics that support wildlife habitat needs and diversity (e.g., species associated with old-growth forests, riparian habitats, deciduous trees, grass/forb/shrub habitats, dead and defective tree habitat, and habitat connectivity). Management direction is proposed to address key aquatic and riparian ecosystem characteristics and their integrity and to improve resilience in light of the changing climate and the anticipated future environment. Along with fish habitat and water quality, wildlife habitat is emphasized in riparian management zones, which are not suitable for timber production, but where timber harvest is allowable to meet desired conditions if it is compatible with other management direction. Outside of riparian management zones, coniferous forests in management areas 4b, 6b, 6c, and some management area 7 lands are suitable for timber production and provide opportunities for active management of vegetation to move towards desired vegetation composition, structure, function, and distribution.

Access and Recreation

Existing or slightly reduced levels of motorized road access could be expected to support social and economic sustainability while addressing desired ecological conditions for soils, water, fish, and wildlife. Some additional motorized trail access could occur in grizzly bear management zone 1, outside of the Salish demographic connectivity area. The Salish demographic connectivity area is one of two demographic connectivity areas established to provide for connectivity among grizzly bear ecosystems, and will provide opportunities for female grizzly bears to establish home ranges and exist at low densities (USFWS 2013). The Salish demographic connectivity area is discussed further in the grizzly bear chapter (Chapter III) of this biological opinion. The Revised Plan would provide the opportunity for public motorized vehicle use (suitable on designated roads and trails) on about 1,653 miles of the NFS lands. Motorized over-snow vehicle use would be suitable on about 31% of the FNF, and mechanized transport (e.g., mountain bikes) would be suitable on about 47% of the FNF. Based upon public collaboration and comment as well as on site-specific ecological conditions, the areas suitable for motorized over-snow vehicle use would be shifted from some parts of the Forest to others, resulting in a small (> 0.1%) increase in the amount of Forest suitable to motorized over-snow

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vehicle use (discussed further in the Canada lynx chapter, Chapter IV). Areas open to motorized over-snow vehicle use during the grizzly bear den emergence time period would be limited to about 3% of modeled grizzly bear denning habitat. To reduce the risk of grizzly bear-human conflicts on FNF lands in light of increasing human use of all national forests, there would be limits on the number and capacity of new developed recreation sites (those that are designed and managed for overnight use) in the primary conservation area for grizzly bears. The primary conservation area is an area that will be managed as a source of grizzly bears in the NDCE, and the objective is continual occupancy by grizzly bears and maintenance of habitat conditions that are compatible with a stable to increasing grizzly bear population (USFWS 2013). The primary conservation area is discussed further in the grizzly bear chapter (Chapter III) of this biological opinion. Outside of the primary conservation area, the number of developed recreation sites could be increased or the capacity of existing recreation sites could be expanded to meet desired conditions for increased recreation opportunity.

Recommended Wilderness

The Revised Plan recommends eight areas (totaling about 190,418 acres) for wilderness designation (MA1b)(See BA Figure B-2). Mechanized transport and motorized use would not be suitable within recommended wilderness areas. The boundaries of recommended wilderness were drawn so that existing trails with mechanized and motorized use were not included. Below is a description of the eight areas recommended for wilderness:

- In the North Fork geographic area, there is one area recommended for wilderness: Tuchuck-Whale (79,821 acres).

- In the Swan Valley geographic area, there is one area recommended for wilderness to be added to the Mission Mountains Wilderness, Elk Creek (1,442 acres). There is one area recommended for wilderness to be added to the Bob Marshall Wilderness; Swan Front (42,534 acres).

- In the Middle Fork geographic area, there are two areas recommended for wilderness: Java-Bear Creek (1,824 acres) and Slippery Bill-Puzzle (12,393acres).

- In the Hungry Horse geographic area, there is one area recommended for wilderness: Jewel Basin (18,462 acres).

- In the South Fork geographic area, there are two areas recommended for wilderness to be added to the Bob Marshall Wilderness: Limestone-Dean Ridge (15,026 acres) and Alcove-Bunker (18,901 acres).

Available Details

For further information and details on the Revised Plan elements summarized above, see the following section of the Revised Plan:

- Forestwide, management area, and geographic area desired conditions, objectives, standards, and guidelines (see revised forest plan chapters 2 and 3);

- The suitability of lands for specific multiple uses, including those lands suitable for timber production (see revised forest plan chapter 3, suitability determinations by management areas);

- An estimate of the long-term sustained yield and projected timber sale quantity (see revised forest plan chapter 2, production of natural resources);

- The identification of priority restoration watersheds (see revised forest plan appendix E);

- Possible management actions and strategies that may occur in the plan area over the life of the plan (see revised forest plan appendix C);

- Areas proposed to be recommended to Congress for inclusion in the National Wilderness Preservation System (see revised forest plan chapter 3, management area 1b);

- The rivers identified as eligible for inclusion as part of the wild and scenic river system (see revised forest plan chapter 3, management area 2b); and

- The plan monitoring program (see revised forest plan, chapter 5), including any focal species.

4. Implementing the Proposed Action (Revised Forest Plan)

The Revised Forest Plan provides a framework and text that guides day-to-day resource management options. It is a strategic, programmatic document and does not make project-level decisions or irreversible or irretrievable commitments of resources. These decisions will be made during a more detailed, site specific analysis of any proposed future action.

Project/Activity Consistency with the Revised Forest Plan

The National Forest Management Act (NFMA) requires that all projects and activities authorized by the National Forest Service be consistent with the associated Forest Plan. A project or activity approval document must describe how the action is consistent with applicable plan components by meeting the following criteria (36 CFR 219.15(d)):

- Desired Conditions and Objectives: The project or activity contributes to the maintenance or attainment of one or more desired conditions, or objectives, or does not foreclose the opportunity to maintain or achieve any desired conditions, or objectives, over the long-term.

- Standards: The project or activity complies with applicable standards.

- Guidelines: The project or activity:

    1. Complies with applicable guidelines as set out in the plan; or

    2. Is designed in a way that is effective in achieving the purpose of the applicable guidelines.

- Suitability: A project or activity would occur in an area:

    1. That the plan identifies as suitable for that type of project or activity; or

    2. the plan is silent with respect to its suitability for that type of project or activity.

Because of the many types of projects and activities that can occur over the life of a Revised Plan, it is not likely that a project or activity can contribute to the attainment of all desired conditions. Further, it is unlikely that all desired conditions will be relevant to every activity (e.g., recreation desired conditions may not be relevant to a fuels treatment project). Most projects and activities will be developed to maintain or move conditions toward one or more of the desired conditions in the Revised Plan. Each project or activity is not expected to contribute to all desired conditions in a plan, but usually to one or a subset.

Projects or Activities Not Consistent with the Revised Forest Plan

Where a proposed project or activity would not be consistent with Revised Plan direction, the responsible official has the following options:

- To modify the proposal so that the project or activity will be consistent:

- To reject the proposal; or

- To amend the Revised Plan so that the project or activity is consistent as amended. The amendment may be limited to apply only to the project or activity, and may be adopted at the same time as the approval of the project or activity.

Monitoring Program

A monitoring program will be implemented as part of the proposed action. The monitoring program will provide monitoring questions and measures, which will assist managers in evaluating the degree to which on-the-ground actions are making progress toward desired conditions presented in the Revised Plan. Further, the monitoring program will facilitate an adaptive management approach that will serve as the basis for continual improvement. Appendix D of the Revised Forest Plan BA (USFS 2017) fully describes the monitoring program for the FNF. Among the monitoring requirements, the FNF will monitor and report to the Service information pertinent to listed species. Some of these items are presented below, but a complete description of the monitoring program is provided in Appendices 1-3:

- Status of bull trout local populations on the FNF.

- Progress toward habitat objectives in native fish streams (including bull trout). These objectives are components of the Revised Forest Plan and are detailed further in the bull trout chapter (Chapter II) of this biological opinion.

- Conditions of grizzly bear management units and subunits on the FNF. Monitored conditions will include those related to access (i.e., road densities, secure core) and developed recreation.

- Motorized route density in the Salish Demographic Connectivity Area and Zone 1.

- Any grizzly bear conflicts that occur on the FNF.

- Percentage of lynx analysis units that comply with the Northern Rockies Lynx Management Direction.

- Acres of Canada lynx habitat treated under the Northern Rockies Lynx Management Direction incidental take statement (USFWS 2017).

E. SUMMARY OF PLAN ELEMENTS FOR FEDERALLY LISTED SPECIES

Below is a summary of the management direction resulting from the Revised Plan broken down by listed species. As mentioned in the introduction, each listed species will be covered in their own chapter of this biological opinion.

1. Bull Trout and Bull Trout Critical Habitat

The Inland Native Fish Strategy (USFS 1995), which is the current aquatic conservation strategy for the Forest, was designed to provide protection for native fish. Although it allowed for restoration, INFISH primarily provided direction for protection and passive restoration measures. With that amendment, the 1986 forest plan direction reduced the risk to watersheds, soils, riparian, and aquatic resources from new and ongoing activities primarily because of the standards and guidelines that influenced management within the Riparian Habitat Conservation Areas. For some resources, standards and guidelines in the 1986 forest plan contained general direction for repairing past damage, although INFISH direction was lacking for other resources, such as timber harvest. During implementation of the 1986 forest plan, the intensity and risks associated with new and ongoing land management activities has been greatly reduced, compared to the previous several decades, and it is anticipated that vegetation treatments associated with timber production, vegetation restoration, and other future projects will be lower than historic levels, as compared to the past 20 to 25 years.

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INFISH has been implemented considerably longer than its intended 18 months. The strategy has been documented to be effective in protecting aquatic resources through ongoing PACFISH/INFISH biological opinion (PIBO) effectiveness monitoring (C. Meredith et al., 2012); however, the one component identified as lacking in INFISH is an active restoration component. This was iterated clearly in the Service's 1998 BO for the 1986 forest plan (USFWS 1998). The absence of a clearly stated aquatic restoration goal in the existing plan was one of many items identified as needing to be changed in the plan revision process, and Revised Forest Plan direction is also intended to address the conservation recommendations in the Service's 1998 BO.

The Revised Forest Plan adds an active restoration component through desired conditions, objectives, guidelines, and standards that would supplement the retained passive components of INFISH. The Revised Forest Plan will also help move projects and activities towards the desired conditions and improve aquatic habitats, and the following elements provide additional protective measures for bull trout and their habitats. This direction will be applied across the entire landscape, although there are no objectives, standards, or guidelines specific to bull trout for individual management areas or geographic areas.

For Revised Forest Plan components related to bull trout, refer to Appendix D of the biological assessment, or Appendix 2 of this biological opinion.

2. Grizzly Bear

The 1986 Flathead National Forest plan contains management direction related to grizzly bear habitat to provide specifically for recovery of the threatened grizzly bear. In 1995, Amendment 19 (A19) of the 1986 forest plan was completed and resulted in the establishment of new management direction related to motorized use of roads and trails and security for grizzly bears. Forest plan A19 established limits on open motorized access density, total motorized access density, and security core for 54 of the 73 grizzly bear subunits across the Flathead National Forest portion of the Northern Continental Divide Ecosystem for grizzly bears (NCDE).

The grizzly bear population in the NCDE has now met or exceeded the demographic recovery goals of the recovery plan (see grizzly bear section for more details). In particular, habitat conditions and management actions on the national forests have contributed importantly to the increased population size, increased distribution, increased genetic diversity, and improved the status of the grizzly bear across the NCDE (Costello et al. 2016). Supporting continued recovery of the grizzly population will depend on the Forest Service's continued effective management of the NCDE grizzly bear habitat and implementation of the Final Grizzly Bear Conservation Strategy.

In 2013, the Service announced the availability of a draft Grizzly Bear Conservation Strategy (GBCS) for the NCDE population for public review and input. When finalized, the GBCS will become the post-delisting management plan for the NCDE grizzly bears and their habitat. Adopting this document is necessary for the Service to demonstrate the adequacy of regulatory mechanisms in order to delist this grizzly population. Incorporating this strategy in the FNF

Forest Plan would likewise demonstrate the adequacy of regulatory mechanisms on the Forest to support delisting. Thus, the FNF proposes to update its forest plan where necessary to incorporate the habitat-related desired conditions, standards, guidelines, objectives (called plan components), and monitoring items for management of National Forest System (NFS) lands to support recovery of the NCDE grizzly bear population. Once the FNF has completed consultation and issued a Record of Decision, the components included in the Revised Forest Plan would replace the 1986 Flathead National Forest plan in its entirety, including but not limited to A19, A24, the Swan Valley Grizzly Bear Conservation Agreement, and other Flathead National Forest plan direction related specifically to grizzly bears. Many components of past strategies are included in the revised forest plan and are discussed in detail in the grizzly bear section of this document (Chapter III).

The FNF planning team is also coordinating the NEPA effort to incorporate and amend habitat-related desired conditions, standards, guidelines, and monitoring items from the GBCS into the Helena-Lewis and Clark, Kootenai, and Lolo forest plans to provide consistent direction related to grizzly bear habitat management on National Forest System lands throughout the recovery zone/primary conservation area of the NCDE as well as management direction for what is identified as management zones 1, 2, and 3 in the grizzly bear conservation strategy.

Under the NCDE conservation strategy, grizzly bear management direction applies to the Primary Conservation Area (PCA; the same area as the recovery zone), as well as to zone 1 (about 4.8 million acres,), zone 2 (over 4.6 million acres), and zone 3 (over 12 million acres) (see Figure 10). See Chapter III Grizzly Bear (III-2) for definitions of these areas.

The FNF has lands in the primary conservation area and zone 1 (including the Salish demographic connectivity area). A summary of the habitat-related management direction for these zones on the FNF is as follows:

- Within the PCA, open motorized route density, total motorized route density, and secure core would be maintained at baseline levels (see the glossary in the revised forest plan) in each grizzly bear subunit. High-use non-motorized trails would no longer be counted in calculations of secure core, but the baseline would be updated to reflect this change. Temporary increases in open and total motorized route densities and temporary decreases in secure core would be allowed for projects (as defined in the glossary), as long as they comply with standards.

- Special orders for storage of food/wildlife attractants would apply across NFS lands in the primary conservation area and zone 1 (including the Salish demographic connectivity area).

- Within the primary conservation area, developed recreation sites designed and managed for overnight use would be limited to one new site or one increase in capacity in a bear management unit in a 10-year period, as described in the standard.

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- In the primary conservation area, vegetation management, livestock allotments, and minerals and energy development would be managed with consideration for grizzly bear habitat and to reduce the risk of grizzly bear-human conflicts.

- In zone 1, habitat protections would focus on maintaining miles of roads open to public motorized use during the non-denning season at baseline levels. In the Salish demographic connectivity area, motorized trails would also be limited.

Key management direction for grizzly bear habitat from the NCDE conservation strategy is integrated into forest plan components throughout sections of the Revised Forest Plan. For example, management direction related to roads and motorized trails is included in the "infrastructure" section of the revised plan whereas management direction related to developed recreation sites is included in the recreation section. Appendix 3 of this biological opinion lists key plan components for the grizzly bear that meet the intent of having a consistent set of management direction on National Forest System lands in the NCDE. The FNF's Revised Forest Plan contains some additional plan components whose effects are discussed in this document.

3. Canada Lynx and Canada Lynx Critical Habitat

The 1986 Forest Plan contains direction designed to conserve and promote the recovery of Canada lynx that was incorporated into the plan in 2007 when the plan was amended to include the Northern Rockies Lynx Management Direction (NRLMD) (USFS 2007). Since 2007, new information on Canada lynx has been published, including designation of critical habitat for Canada lynx (USFWS 2009a, 2014d), an updated version of the Lynx Conservation and Assessment Strategy (ILBT, 2013), scientific research results relevant to Canada lynx in northwest Montana (see literature cited section in Chapter IV). Additionally, an updated Incidental Take Statement for the NRLMD biological opinion (USFWS 2017), and a biological opinion for the effects of the NFLMD on Canada lynx critical habitat (USFWS 2017a) have been completed.

Based upon new information, the FNF has also updated its map of modeled lynx habitat (see Appendix C of the BA more details; USFS 2017). The Forest would carry forward the lynx management direction from the current forest plan, as amended (see Appendix F of the Revised Forest Plan), except for two site-specific changes:

- A modification to NRLMD vegetation standard VEG S6 to add an exception to allow noncommercial felling of trees that may contribute to multistoried hare habitat that are growing within 200 feet of mature, genetically resistant whitebark pine (a candidate species for listing) (see FW-STD-TE&V-03). Standard VEG S5 already has an exception that allows precommercial thinning to restore whitebark pine, but VEG S6 does not provide a comparable exception.

- A modification to NRLMD human use guideline HU G11 (see FW-GDL-REC-05) stating that there should be no net increase in miles of designated motorized over-snow vehicle routes, groomed routes, or areas where motorized over-snow vehicle use would

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be suitable. This modification will allow the FNF to better suit winter recreation needs, and will result in a decrease of 927 acres of lynx habitat that is suitable for motorized over-snow use on the FNF.

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CHAPTER II. BIOLOGICAL OPINION FOR BULL TROUT AND BULL TROUT CRITICAL HABITAT

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A. CONTEXT OF THE PROPOSED ACTION FOR BULL TROUT

The Flathead National Forest (FNF) determined in their biological assessment that activities conducted under the proposed action will be likely to adversely affect bull trout and designated bull trout critical habitat (USFS 2017).

This section describes the spatial context in which the Service conducts its ESA Section 7 consultation, jeopardy and adverse modification analysis; describes the relationship of the project area to bull trout occurrence; explains the relationship of the proposed action to existing management; and describes the desired condition for bull trout under the Revised Plan, as well as the guidelines and standards applied at the project level to achieve desired conditions.

This biological opinion will consider the effects of implementation of the proposed framework of the Revised Forest Plan. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species and critical habitat, and subsequent section 7 consultation when appropriate.

1. Relationship of the Project Area to Bull Trout

The proposed action (implementation of the Revised Forest Plan) would occur across the FNF. The FNF contains lands within 12 core areas of the Columbia Headwaters Recovery Unit (further discussed below). Additionally, the FNF contains designated bull trout critical habitat in four sub-units of the Clark Fork River Basin Critical Habitat Unit (also discussed further below).

2. Relationship of Proposed Action to Existing Management

Current management for bull trout on the FNF is directed by the Inland Native Fish Strategy (INFISH) (USFS 1995), which amended the 1986 Forest Plan. When first developed, INFISH was intended to provide guidance for 18 months while more detailed, watershed-specific direction could be developed. The INFISH standards and guidelines apply to all riparian habitat conservation areas (RHCAs), and to projects and activities in areas outside of RHCAs that would degrade conditions in RHCAs. The standards and guidelines address ten management issues in RHCAs and associated areas: timber management, roads management, grazing management, recreation management, minerals management, fire and fuels management, lands, general riparian area management, watershed and habitat restoration, and fisheries and wildlife restoration.

The INFISH strategy was designed to be an interim strategy to provide protection for native fish and has been the primary aquatic conservation strategy for the FNF since 1995. While it allows for restoration activities, its focus is passive restoration through protection of riparian and aquatic resources. With the INFISH amendment, Plan direction reduced the risk to watersheds, soils, riparian, and aquatic resources from new and ongoing activities (USFS 2017). Originally proposed as an interim direction, INFISH has been implemented considerably longer than its intended 18 months. The strategy has been documented to be effective in protecting aquatic

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resources through ongoing PACFISH/INFISH Biological Opinion (PIBO) effectiveness monitoring (Meredith et. al 2012); however, the one component identified as lacking in INFISH is an active restoration component. This was stated clearly by the Service in its 1998 Biological Opinion (USFWS 1998) for the INFISH amendment. The absence of a clearly stated aquatic restoration goal in the existing Forest Plan was one of the many items identified as a need for change in the plan revision process.

The Revised Plan adds an active restoration component through desired conditions, objectives, guidelines and standards that would supplement the retained passive components of INFISH. In an effort to improve upon INFISH direction that is over 20 years old, National Forests of the USFS are moving toward an Aquatic Riparian Conservation Strategy (ARCS) that will provide similar land management direction, but is based on more updated scientific information. The goal of the ARCS is to maintain or restore watershed conditions so that conditions in managed watersheds are moving toward, or are in concert with, conditions in reference watersheds when considered at the planning unit scale. The ARCS refines and replaces INFISH and is incorporated throughout the Revised Forest Plan in relevant resource sections.

As mention previously, INFISH was originally expected to last 18 months while an effort similar to the Northwest Forest Plan, the Interior Columbia Basin Ecosystem Management Project, was completed for the Interior Columbia River Basin. That strategy was never completed, but scientific information from that effort has been retained in the form of guidance for plan revisions occurring in areas covered by INFISH. In addition to following this guidance, the ARCS also follows direction in the 2012 USFS Planning Rule. Specifically, greater emphasis is placed on meeting improved and more refined desired conditions, and "Standards and Guidelines" that were not differentiated in PACFISH/ INFISH are separated into Standards or Guidelines in this strategy. The Revised Forest Plan will include similar guidance and adds an active restoration component through desired conditions, objectives, guidelines, and standards that would supplement the passive components of INFISH.

3. Description of the Proposed Action

The Revised Forest Plan components discussed in this chapter, and presented in Appendix 2, would be applied forest-wide as well as across the management areas and geographic areas. Management Areas have similar management characteristics and clarify the allowed uses on various parts of the Forest (see Table I-4 in Chapter I of this biological opinion). Geographic Areas (GA) have desired conditions that are specific to a locale, such as a river basin or valley. The GA desired conditions were developed to refine forest-wide management to better respond to local conditions and situations that may occur within a specific GA. The desired conditions in GAs for listed species would not exert additional effects on the species, rather, the desired condition would help the FNF achieve a forest-wide desired condition, objective, standard, or guideline for the species.

The direction contained in the Revised Forest Plan for aquatic habitats and aquatic species is to restore habitats where past management activities have affected stream channel morphology or wetland function and to maintain or improve the distribution of native aquatic and riparian

dependent species and contribute to the recovery of threatened and endangered aquatic species. This is primarily achieved through the implementation of ARCS and enhanced through the delineation of "designated priority watersheds" into "restoration and conservation watersheds" under the Revised Forest Plan.

INFISH "designated priority watersheds" were intended to provide a pattern of protection across the landscape, where habitat for inland native fish would receive special attention and treatment. Priority watersheds would have the highest priority for restoration, monitoring, and watershed analysis. Priority areas in good condition would serve as anchors for the potential recovery of depressed stocks, and also would provide colonists for adjacent areas where habitat had been degraded by land management or natural events (USFS 1995). While it allowed for restoration, INFISH primarily provided direction for protection and passive restoration measures. To correct this deficiency, the Revised Forest Plan adds an active restoration component through desired conditions, objectives, guidelines and standards that would supplement the retained passive restoration measures. This is meant to be consistent with the ARCS described above.

During the development of the Revised Forest Plan, watersheds were prioritized for conservation or restoration based on biological and physical aquatic resource values. Long-term persistence of aquatic species is dependent upon restoring watershed processes that create and maintain habitats across stream networks (Rieman et al. 2000) and the use of ecologically compatible land use polices that ensure the long-term productivity of aquatic and riparian ecosystems (Thurow et al. 1997). Emphasis was placed on watersheds supporting native species, which includes bull trout and designated bull trout critical habitat, especially where there was a high likelihood for successful restoration given current methods and funding levels. These restoration watersheds are intended to provide a pattern of protection across the landscape, where habitat for inland native fish would receive special attention and treatment.

Implementation of the Revised Forest Plan will include the establishment of a Conservation Watershed Network (CWN). The CWN would identify watersheds considered native fish strongholds with appropriately functioning aquatic habitats. CWN watersheds are 10 to 12th code hydrological unit codes (HUCs) intended to protect stronghold populations of native salmonids and complement restoration efforts. Through Revised Forest Plan direction, CWN watersheds will maintain high quality habitat and functionally intact ecosystems that are contributing to and enhancing conservation and recovery of bull trout. Planning components associated with the CWN are discussed in further detail below (see Section G.1. *Effects of the Action*) and the plan components can also be found in Appendix D of the biological assessment, or Appendix 2 of this biological opinion.

The overall desired conditions for aquatic habitat and aquatic species related to bull trout under the Revised Forest Plan are discussed in further detail in this chapter of this biological opinion, and contained in the aquatic section of the BA (USFS 2017). Desired Condition FW-DC-P&C-16 in the Revised Forest Plan states that bull trout trend toward recovery through cooperation and coordination with the Service, other state and federal agencies, tribes, and interested groups. This desired condition will be achieved by using the Bull Trout Recovery Plan and Columbia Headwaters Recovery Unit Implementation Plan (USFWS 2015, 2105b) to identify threats to

bull trout core areas on the FNF, and the Western Montana Bull Trout Conservation Strategy (USFS 2013) to identify actions that can be taken to address threats.

The FNF determined that including bull trout recovery as a specific desired condition in the Revised Forest Plan was the most effective way to benefit bull trout and minimize adverse effects due to ongoing management (USFS 2017). The Western Montana Bull Trout Conservation Strategy (USFS 2013) will be used to inform baseline data needs and management direction as it relates to bull trout and designated critical habitat on the Flathead National Forest. The conservation strategy was developed by the Western Montana Level 1 Team (made up of Forest Service and U.S. Fish and Wildlife Service fisheries biologists) to provide direction affected forests within Region 1 of the USFS to implement bull trout recovery actions. The strategy is inspired by the final recovery plan and as such fits with the revised plan's stated desired condition for bull trout and designated critical habitat.

B. STATUS OF THE SPECIES

This section provides information about the bull trout's life history, habitat preferences, geographic distribution, population trends, threats, and conservation needs. This includes description of the effects of past human activities and natural events that have led to the current status of the bull trout. This information provides the background for analyses in later sections of the biological opinion.

1. Listing Status

The coterminous United States population of the bull trout was listed as threatened on November 1, 1999 (USFWS 1999, 64 FR 58910). The threatened bull trout occurs in the Klamath River Basin of south-central Oregon; the Jarbidge River in Nevada; the Willamette River Basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers in Idaho, Oregon, Washington, and Montana, within the Columbia River Basin; and the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Bond 1992, Brewin and Brewin 1997, Cavender 1978, Howell and Buchanan 1992, Leary and Allendorf 1997, USFWS 1999, 64 FR 58910).

The final listing rule for the United States coterminous population of the bull trout discusses the consolidation of five distinct population segments (DPSs) into one listed taxon, the application of the jeopardy standard under section 7 of the ESA relative to this species, and established five interim recovery units (RUs) for purposes of consultation and recovery (USFWS 1999, 64 FR 58930). However, in 2010 six RUs were identified base on the best available information. The Service determined that these six RUs were needed to ensure a resilient, redundant, and representative distribution of bull trout populations throughout the range of the listed entity (USFWS 2010, 75 FR 93898). In 2015, the six RUs were formalized in the final *Recovery Plan for the Coterminous United States Population of Bull Trout (Salvelinus confluentus)* (Recovery Plan; USFWS 2015). The final RUs replace the previous five interim RUs and are used in the application of the jeopardy standard for ESA section 7 consultation procedures.

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2. Reasons for Listing

Throughout its range, the bull trout is threatened by a wide variety of factors. These include: habitat degradation and fragmentation, instream flow alterations associated with water diversions, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality; incidental angler harvest, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species (USFWS 1999, 64 FR 58910). Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats. Since the time of coterminous listing of the species (USFWS 1999, 64 FR 58910) and designation of its critical habitat (USFWS 2005, 70 FR 56212; USFWS 2010, 75 FR 63898), a great deal of new information has been collected on the status of bull trout. The Service's Science Team Report (Whitesel et al 2004), the bull trout core areas templates (USFWS 2005a), Conservation Status Assessment (USFWS 2005b), and 5-year Reviews (USFWS 2008, 2015g) have provided additional information about threats and status. The final Recovery Plan lists many other documents and meetings that compiled information about the status of bull trout (USFWS 2015). The most recent 5-year status review (USFWS 2015g) maintains the listing status as threatened based on the information compiled in the final bull trout recovery plan (USFWS 2015) and the Recovery Unit Implementation Plans (RUIPs) (USFWS 2015a-f)

When first listed, the status of bull trout and its threats were reported by the Service at subpopulation scales. In 2002 and 2004, the draft recovery plans (USFWS 2002, 2004a, 2004b) included detailed information on threats at the recovery unit scale (i.e., similar to subbasin or regional watersheds), thus incorporating the metapopulation concept with core areas and local populations. In the 5-year Review, the Service established threats categories (i.e., dams, forest management, grazing, agricultural practices, transportation networks, mining, development and urbanization, fisheries management, small populations, limited habitat, and wildfire) (USFWS 2008, 2015g). In the final Recovery Plan, threats are described at RU scale that typically incorporates multiple watersheds. The plan also describes threats for 109 core areas, local populations, forage/migration/overwintering areas, and includes research needs areas (USFWS 2015).

3. Emerging Threats

Climate change was not addressed as a known threat when bull trout were originally listed in 1999. The 2015 Recovery Plan and RUIPs summarize the threat of climate change and acknowledge that some extant bull trout core area habitats will likely change (and may be lost) over time due to anthropogenic climate change effects. It was determined that use of best available information to identify and ensure future conservation efforts will offer the greatest long-term benefit to sustain bull trout and their required cold water habitats (USFWS 2015, USFWS 2015a-f).

Mote et al. (2014) summarized climate change effects to include rising air temperature, changes in the timing of streamflow related to changing snowmelt, increases in extreme precipitation events, lower summer stream flows, and other changes. A warming trend in the mountains of

western North America is expected to decrease snowpack, hasten spring runoff, reduce summer stream flows, and increase summer water temperatures (Poff et al. 2002, Koopman et al. 2009). Lower flows as a result of smaller snowpack could reduce habitat, which might adversely affect bull trout reproduction and survival. Warmer water temperatures could lead to physiological stress and could also benefit non-native fishes that prey on or compete with bull trout. Increases in the number and size of forest fires could also result from climate change (Westerling et al. 2006) and could adversely affect watershed function by resulting in faster runoff, lower base flows during the summer and fall, and increased sedimentation rates.

Lower flows also may result in increased groundwater withdrawal for agricultural purposes and resultant reduced water availability in certain stream reaches occupied by bull trout (USFWS 2015c). Although all salmonids are likely to be affected by climate change, bull trout are particularly vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Battin et al. 2007, Rieman et al. 2007). Climate change is expected to reduce the extent of cold water habitat (Isaak et al. 2015), and increase competition with other fish species (e.g., lake trout, brown trout, brook trout, and northern pike) for resources in remaining suitable habitat. Several authors project that brook trout, a fish species that competes for resources with and predates on the bull trout, will continue increasing their range in several areas (an upward shift in elevation) due to the effects from climate change (Isaak et al. 2010, 2014, Peterson et al. 2013).

4. Life History and Population Dynamics

Distribution

The historical range of bull trout includes major river basins in the Pacific Northwest at about 41 to 60 degrees North latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in the Northwest Territories, Canada (Cavender 1978; Bond 1992). To the west, the bull trout's range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992). Bull trout occur in portions of the Columbia River and tributaries within the basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south-central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and Montana, and in the MacKenzie River system in Alberta and British Columbia, Canada (Cavender 1978; Brewin and Brewin 1997).

Reproductive Biology

Bull trout typically reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (i.e., they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Fraley and Shepard 1989; Leathe and Graham 1982; Pratt 1992; Rieman and McIntyre 1996). The iteroparous reproductive strategy (i.e., fish that spawn multiple times, and therefore require safe two-way passage upstream and downstream) of bull trout has important repercussions for the management of this species. Bull trout require passage both upstream and downstream, not only for repeat spawning but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous salmonids (i.e., fishes

that spawn once and then die, and require only one-way passage upstream). Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a safe downstream passage route. Additionally, in some core areas, bull trout that migrate to marine waters must pass both upstream and downstream through areas with net fisheries at river mouths. This can increase the likelihood of mortality to bull trout during these spawning and foraging migrations.

Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1996). Depending on water temperature, incubation is typically 100 to 145 days (Pratt 1992). Post hatching, fry remain in the substrate, with time from egg deposition to emergence potentially surpassing 220 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Early life stages of fish (specifically the developing embryo) require the highest inter-gravel dissolved oxygen (IGDO) levels and are the most sensitive life stage to reduced oxygen levels. The oxygen demand of embryos depends on temperature and on stage of development, with the greatest IGDO required just prior to hatching. A literature review conducted by the Washington Department of Ecology (WDOE 2002) indicates that adverse effects of lower oxygen concentrations on embryo survival are magnified as temperatures increase above optimal (for incubation). Normal oxygen levels seen in rivers used by bull trout during spawning ranged from 8 to 12 mg/L (in the gravel), with corresponding instream levels of 10 to 11.5 mg/L (Stewart et al. 2007). In addition, IGDO concentrations, water velocities in the water column, and especially the intergravel flow rate, are interrelated variables that affect the survival of incubating embryos (ODEQ 1995). Due to their long incubation period (220+ days), bull trout are particularly sensitive to inadequate IGDO levels. An IGDO level below 8 mg/L is likely to result in mortality of eggs, embryos, and fry.

Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more (Goetz 1989; Pratt 1985). The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho in 1949 (Simpson and Wallace 1982).

Population Structure

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Goetz 1989). Migratory bull trout spawn in tributary streams where juvenile fish rear for 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989; Goetz 1989), or saltwater (anadromous form) to rear as sub-adults and to live as adults (Brenkman and Corbett 2005; McPhail and Baxter 1996; WDFW et al. 1997).

Bull trout are believed to be naturally migratory, which allows them to capitalize on temporally abundant food resources and larger downstream habitats. However, resident forms likely develop where barriers (either natural or manmade) occur or where foraging, migrating, or overwintering habitats for migratory fish are minimized (Brenkman and Corbett 2005; Goetz et al. 2004). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002). Parts of this river system have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Snake River. Such multiple life history strategies help to maintain the stability of bull trout populations and allow persistence following environmental changes. Benefits to migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized if local populations suffer a catastrophic loss (Frissell 1999; MBTSG 1998; Rieman and McIntyre 1993). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger size fish with higher fecundity is lost (Rieman and McIntyre 1993).

Whitesel et al. (2004) noted that although there are multiple resources that contribute to the subject, Spruell et al. (2003) best summarized genetic information on bull trout population structure. Spruell et al. (2003) analyzed 1,847 bull trout from 65 sampling locations, four located in three coastal drainages (Klamath, Queets, and Skagit Rivers), one in the Saskatchewan River drainage (Belly River), and 60 scattered throughout the Columbia River Basin. They concluded that there is a consistent pattern among genetic studies of bull trout, regardless of whether examining allozymes, mitochondrial DNA, or most recently microsatellite loci. Typically, the genetic pattern shows relatively little genetic variation within populations, but substantial divergence among populations. Microsatellite loci analysis supports the existence of at least three major genetically differentiated groups (or evolutionary lineages) of bull trout (Spruell et al. 2003). These three groups are characterized below:

1. “Coastal”, including the Deschutes River and all of the Columbia River drainage downstream, as well as most coastal streams in Washington, Oregon, and British Columbia. A compelling case also exists that the Klamath Basin represents a unique evolutionary lineage within the coastal group.

2. “Snake River”, which also included the John Day, Umatilla, and Walla Walla rivers. Despite close proximity of the John Day and Deschutes Rivers, a striking level of divergence between bull trout in these two systems was observed.

3. “Upper Columbia River”, which includes the entire basin in Montana and northern Idaho. A tentative assignment was made by Spruell et al. (2003) of the Saskatchewan River drainage populations (east of the continental divide), grouping them with the upper Columbia River group.

Spruell et al. (2003) noted that within the major assemblages, populations were further subdivided, primarily at the level of major river basins. Taylor et al. (1999) surveyed bull trout populations, primarily from Canada, and found a major divergence between inland and coastal populations. Costello et al. (2003) suggested the patterns reflected the existence of two glacial refugia, consistent with the conclusions of Spruell et al. (2003) and the biogeographic analysis of Haas and McPhail (2001). Both Taylor et al. (1999) and Spruell et al. (2003) concluded that the Deschutes River represented the most upstream limit of the coastal lineage in the Columbia River Basin. More recently, the Service identified additional genetic units within the coastal and interior lineages (Ardren et al. 2011). Based on a recommendation in the 5-year review of the species' status (USFWS 2008), the Service reanalyzed the 27 recovery units identified in the 2002 draft bull trout recovery plan (USFWS 2002) by utilizing, in part, information from previous genetic studies and new information from additional analysis (Ardren et al. 2011). In this examination, the Service applied relevant factors from the joint U.S. Fish and Wildlife Service and National Marine Fisheries Service Distinct Population Segment (DPS) policy (USFWS 1996) and subsequently identified six draft recovery units that contain assemblages of core areas that retain genetic and ecological integrity across the range of bull trout in the coterminous United States. These six draft recovery units were used to inform designation of critical habitat for bull trout by providing a context for deciding what habitats are essential for recovery (USFWS 2010). The six draft recovery units identified for bull trout in the coterminous United States include: Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Saint Mary, and Upper Snake. These six draft recovery units were adopted, described, and identified in the final bull trout recovery plan (USFWS 2015) and RUIPs (USFWS 2015a-f).

Population Dynamics

Although bull trout are widely distributed over a large geographic area, they exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993). Increased habitat fragmentation reduces the amount of available habitat and increases isolation from other populations of the same species (Saunders et al. 1991). Burkey (1989) concluded that when species are isolated by fragmented habitats, low rates of population growth are typical in local populations and their probability of extinction is directly related to the degree of isolation and fragmentation. Without sufficient immigration, growth in local populations may be low and the population may have a higher probability of extinction (Burkey 1989; Burkey 1995).

The metapopulation concepts of conservation biology have been suggested relative to the distribution and characteristics of bull trout, although empirical evidence is relatively scant (Rieman and McIntyre 1993; Dunham and Rieman 1999; Rieman and Dunham 2000). A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994). For inland bull trout, metapopulation theory is likely most applicable at the watershed scale where habitat consists of discrete patches or collections of habitat capable of supporting local populations; local populations are for the most part independent and represent discrete reproductive units; and long-term, low-rate dispersal patterns among component populations influences the persistence of at least some of the local populations. Ideally, multiple local populations distributed throughout a watershed provide a mechanism for spreading risk because the simultaneous loss of all local populations is unlikely (Rieman and Dunham 2000). However, habitat alteration, primarily through the construction of impoundments, dams, and water diversions has fragmented habitats,

eliminated migratory corridors, and in many cases isolated bull trout in the headwaters of tributaries (Rieman and Clayton 1997; Dunham and Rieman 1999; Spruell et al. 1999; Rieman and Dunham 2000).

Human-induced factors as well as natural factors affecting bull trout distribution have likely limited the expression of the metapopulation concept for bull trout to patches of habitat within the overall distribution of the species (Dunham and Rieman 1999). However, despite the theoretical fit, the relatively recent and brief time period during which bull trout investigations have taken place does not provide certainty as to whether a metapopulation dynamic is occurring (e.g., a balance between local extirpations and recolonizations) across the range of the bull trout or whether the persistence of bull trout in large or closely interconnected habitat patches (Dunham and Rieman 1999) is simply reflective of a general deterministic trend towards extinction of the species where the larger or interconnected patches are relics of historically wider distribution (Rieman and Dunham 2000). Research does, however, provide genetic evidence for the presence of a metapopulation process for bull trout, at least in the Boise River Basin of Idaho (Whiteley et al. 2003), while Whitesel et al. (2004) identified that bull trout fit the metapopulation theory in several ways.

Habitat Characteristics

The habitat requirements of bull trout are often generally expressed as the four "Cs": cold, clean, complex, and connected habitat. Cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout throughout all hierarchical levels.

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Howell and Buchanan 1992; Pratt 1992; Rich 1996; Rieman and McIntyre 1993; Rieman and McIntyre 1995; Sedell and Everest 1991; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout all watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), bull trout should not be expected to simultaneously occupy all available habitats.

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout since migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to non-natal streams (Rieman and McIntyre 1993). Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a long time (Rieman and McIntyre 1993;

Spruell et al. 1999). Migration also facilitates access to more abundant or larger prey, leading to increases in growth and reproduction. Additional benefits of migration and its relationship to foraging are discussed below under "Diet." Cold water temperatures play an important role in determining bull trout habitat quality, as these fish are primarily found in colder streams, and spawning habitats are generally characterized by temperatures that drop below 9 °C in the fall (Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1993).

Thermal requirements for bull trout appear to differ among life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993). Optimum incubation temperatures for bull trout eggs range from 2 °C to 6 °C whereas optimum water temperatures for rearing range from about 6 °C to 10 °C (Buchanan and Gregory 1997; Goetz 1989). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 °C to 9 °C, within a temperature gradient of 8 °C to 15 °C. In a landscape study relating bull trout distribution to maximum water temperatures, Dunham et al. (2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 11 °C to 12 °C. Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin (Buchanan and Gregory 1997; Fraley and Shepard 1989; Rieman and McIntyre 1993; Rieman and McIntyre 1995). Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers (Myrick et al. 2002).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Pratt 1992; Rich 1996; Sedell and Everest 1991; Watson and Hillman 1997). Maintaining bull trout habitat requires natural stability of stream channels and maintenance of natural flow patterns (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993). Pratt (1992) indicated that increases in fine sediment reduce egg survival and emergence.

Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Fish growth depends on the quantity and quality of food that is eaten, and as fish grow their foraging strategy changes as their food changes, in quantity, size, or other characteristics (Quinn 2005). Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987; Donald and Alger 1993; Goetz 1989). Subadult and adult migratory bull trout generally feed on various fish species (Donald and Alger 1993; Fraley and Shepard 1989; Leathe and Graham 1982). Bull trout of all sizes other than fry have been found to eat fish half their length (Beauchamp and VanTassell 2001). In near-shore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand

lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (Goetz et al. 2004; WDFW et al. 1997).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies, and their environment. Migration allows bull trout to access optimal foraging areas which facilitates exploitation of a wider variety of prey resources. For example, in the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route (WDFW et al. 1997). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005; Goetz et al. 2004).

5. Conservation Status and Needs

Bull Trout Recovery Planning

The 2015 Recovery Plan for the Coterminous United States Population of Bull Trout (USFWS 2015) documented the primary strategy for recovery of bull trout in the coterminous United States. The Recovery Plan established the following approach: (1) conserve bull trout so that they are geographically widespread across representative habitats and demographically stable in six recovery units; (2) effectively manage and ameliorate the primary threats in each of six recovery units at the core area scale such that bull trout are not likely to become endangered in the foreseeable future; (3) build upon the numerous and ongoing conservation actions implemented on behalf of bull trout since their listing in 1999, and improve our understanding of how various threat factors potentially affect the species; (4) use that information to work cooperatively with our partners to design, fund, prioritize, and implement effective conservation actions in those areas that offer the greatest long-term benefit to sustain bull trout and where recovery can be achieved; and (5) apply adaptive management principles to implementing the bull trout recovery program to account for new information (USFWS 2015).

Information presented in prior draft Recovery Plans published in 2002 and 2004 (USFWS 2002, 2004, 2004a) have served to identify recovery actions across the range of the species and to provide a framework for implementing numerous recovery actions by our partner agencies, local working groups, and others with an interest in bull trout conservation. The 2015 Recovery Plan integrates new information collected since the 1999 listing regarding bull trout life history, distribution, demographics, conservation successes, etc., and integrates and updates previous bull trout recovery planning efforts across the range of the single distinct population segment (DPS) listed under the Act.

The Service has developed a recovery strategy that: (1) focuses on the identification of and effective management of known and remaining threat factors to bull trout in each core area; (2) acknowledges that some extant bull trout core area habitats will likely change (and may be lost) over time; and (3) identifies and focuses recovery actions in those areas where success is likely to meet our goal of ensuring the certainty of conservation of genetic diversity, life history features, and broad geographical representation of remaining bull trout populations so that the protections of the Act are no longer necessary (USFWS 2015).

To implement the recovery strategy, the 2015 recovery plan establishes four categories of recovery actions for each of the six Recovery Units (USFWS 2015):

1. Protect, restore, and maintain suitable habitat conditions for bull trout.

2. Minimize demographic threats to bull trout by restoring connectivity or populations where appropriate to promote diverse life history strategies and conserve genetic diversity.

3. Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.

4. Work with partners to conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks, and considering the effects of climate change

Bull trout recovery is based on a geographical hierarchical approach. Bull trout are listed as a single DPS within the five-state area of the coterminous United States. The single DPS is subdivided into six biologically-based recovery units: (1) Coastal Recovery Unit; (2) Klamath Recovery Unit; (3) Mid-Columbia Recovery Unit; (4) Upper Snake Recovery Unit; (5) Columbia Headwaters Recovery Unit; and (6) Saint Mary Recovery Unit (Figure 4, USFWS 2015). A viable recovery unit should demonstrate that the three primary principles of biodiversity have been met: representation (conserving the genetic makeup of the species); resiliency (ensuring that each population is sufficiently large to withstand stochastic events); and redundancy (ensuring a sufficient number of populations to withstand catastrophic events) (ibid.).

Each of the six recovery units contains multiple bull trout core areas, 116 total, which are non-overlapping watershed-based polygons. Each core area includes one or more local populations. Currently there are 109 occupied core areas, which comprise 611 local populations (USFWS 2015). There are also six core areas where bull trout historically occurred but are now extirpated, and one research needs area where bull trout were known to occur historically, but their current presence and use of the area are uncertain. Core areas are further described as either complex or simple core areas (ibid.). Complex core areas contain multiple bull trout local populations, are found in large watersheds, have multiple life history forms (i.e., fluvial, adfluvial, resident), and have migratory connectivity between spawning and rearing habitat (SR) and foraging, migration, and overwintering habitats (FMO). Simple core areas are those that contain one bull trout local population. These core areas are relatively small in scope, isolated from other core areas by natural barriers, and may contain unique genetic or life history adaptations.

A local population is a group of bull trout that spawn within a particular stream or portion of a stream system (USFWS 2015). A local population is considered to be the smallest group of bull trout that is known to represent an interacting reproductive unit. For water bodies where specific information is lacking, a local population may be represented by a single headwater tributary or

complex of headwater tributaries. Gene flow may occur between local populations (e.g., those within a core population), but is assumed to be infrequent compared with that among individuals within a local population.

Population Units

The final Recovery Plan (USFWS 2015) designates six bull trout recovery units as described above. These units replace the 5 interim recovery units previously identified (USFWS 1999). The Service will address the conservation of these final recovery units in our section 7(a)(2) analysis for proposed Federal actions. The Recovery Plan identified threats and factors affecting the bull trout within these units. A detailed description of recovery implementation for each recovery unit is provided in separate Recovery Unit Implementation Plans (USFWS 2015a-f), which identify conservation actions and recommendations needed for each core area, forage/ migration/ overwinter (FMO) areas, historical core areas, and research needs areas. Each of the following recovery units (below) is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

Coastal Recovery Unit

The Coastal Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015a). The Coastal Recovery Unit is located within western Oregon and Washington, and is divided into three regions: Puget Sound, Olympic Peninsula, and the Lower Columbia River Regions. This recovery unit contains 20 core areas comprising 84 local populations and a single potential local population in the historic Clackamas River core area where bull trout had been extirpated and were reintroduced in 2011. Further, the recovery unit has four historically occupied core areas that could be re-established (USFWS 2015, 2015a). Core areas within Puget Sound and the Olympic Peninsula currently support the only anadromous local populations of bull trout. This recovery unit also contains ten shared FMO habitats which are outside core areas and allows for the continued natural population dynamics in which the core areas have evolved (USFWS 2015a). There are four core areas within the Coastal Recovery Unit that have been identified as current population strongholds: Lower Skagit, Upper Skagit, Quinault River, and Lower Deschutes River (USFWS 2015). These are the most stable and abundant bull trout populations in the recovery unit. The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, loss of functioning estuarine and near-shore marine habitats, development and related impacts (e.g., flood control, floodplain disconnection, bank armoring, channel straightening, loss of instream habitat complexity), agriculture (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation, livestock grazing), fish passage (e.g., dams, culverts, instream flows) residential development, urbanization, forest management practices (e.g., timber harvest and associated road building activities), connectivity impairment, mining, and the introduction of non-native species. Conservation measures or recovery actions implemented include relicensing of major hydropower facilities that have provided upstream and downstream fish passage or complete removal of dams, land acquisition to conserve bull trout habitat, floodplain restoration, culvert removal, riparian revegetation, levee setbacks, road removal, and projects to protect and restore important near-shore marine habitats.

Klamath Recovery Unit

The Klamath Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015c). The Klamath Recovery Unit is located in southern Oregon and northwestern California. The Klamath Recovery Unit is the most significantly imperiled recovery unit, having experienced considerable extirpation and geographic contraction of local populations and declining demographic condition, and natural re-colonization is constrained by dispersal barriers and presence of nonnative brook trout (USFWS 2015). This recovery unit currently contains three core areas and eight local populations (USFWS 2015, 2015c). Nine historic local populations of bull trout have become extirpated (USFWS 2015c). All three core areas have been isolated from other bull trout populations for the past 10,000 years (USFWS 2015c). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, habitat degradation and fragmentation, past and present land use practices, agricultural water diversions, nonnative species, and past fisheries management practices. Conservation measures or recovery actions implemented include removal of nonnative fish (e.g., brook trout, brown trout, and hybrids), acquiring water rights for instream flows, replacing diversion structures, installing fish screens, constructing bypass channels, installing riparian fencing, culver replacement, and habitat restoration.

Mid-Columbia Recovery Unit

The Mid-Columbia Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015d). The Mid-Columbia Recovery Unit is located within eastern Washington, eastern Oregon, and portions of central Idaho. The Mid-Columbia Recovery Unit is divided into four geographic regions: Lower Mid-Columbia, Upper Mid-Columbia, Lower Snake, and Mid-Snake Geographic Regions. This recovery unit contains 24 occupied core areas comprising 142 local populations, 2 historically occupied core areas, 1 research needs area, and 7 FMO habitats (USFWS 2015, 2015d). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, agricultural practices (e.g. irrigation, water withdrawals, livestock grazing), fish passage (e.g. dams, culverts), nonnative species, forest management practices, and mining. Conservation measures or recovery actions implemented include road removal, channel restoration, mine reclamation, improved grazing management, removal of fish barriers, and instream flow requirements.

Upper Snake Recovery Unit

The Upper Snake Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015f). The Upper Snake Recovery Unit is located in central Idaho, northern Nevada, and eastern Oregon. The Upper Snake Recovery Unit is divided into seven geographic regions: Salmon River, Boise River, Payette River, Little Lost River, Malheur River, Jarbidge River, and Weiser River. This recovery unit contains 22 core areas and 207 local populations (USFWS 2015), with almost 60 percent being present in the Salmon River Region. The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, dams, mining, forest management practices, nonnative species, and agriculture (e.g., water diversions, grazing). Conservation measures or recovery actions implemented include instream habitat

restoration, instream flow requirements, screening of irrigation diversions, and riparian restoration.

Columbia Headwaters Recovery Unit

The Columbia Headwaters Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015b). The Columbia Headwaters Recovery Unit is located in western Montana, northern Idaho, and the northeastern corner of Washington. The Columbia Headwaters Recovery Unit is divided into five geographic regions: Upper Clark Fork, Lower Clark Fork, Flathead, Kootenai, and Coeur d'Alene Geographic Regions (USFWS 2015b). This recovery unit contains 35 bull trout core areas; 15 of which are complex core areas as they represent larger interconnected habitats and 20 simple core areas as they are isolated headwater lakes with single local populations. The 20 simple core areas are each represented by a single local population, many of which may have persisted for thousands of years despite small populations and isolated existence (USFWS 2015b). Fish passage improvements within the recovery unit have reconnected some previously fragmented habitats (USFWS 2015b), while others remain fragmented. Unlike the other recovery units in Washington, Idaho, and Oregon, the Columbia Headwaters Recovery Unit does not have any anadromous fish overlap. Therefore, bull trout within the Columbia Headwaters Recovery Unit do not benefit from the recovery actions for salmon (USFWS 2015b). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, historic mining and legacy contamination by heavy metals, expanding populations of nonnative fish predators and competitors, modified instream flows, migratory barriers (e.g., dams), habitat fragmentation, forest practices (e.g., logging, roads), agriculture practices (e.g. irrigation, livestock grazing), and residential development. Conservation measures or recovery actions implemented include habitat improvement, fish passage, and removal of nonnative species.

Saint Mary Recovery Unit

The Saint Mary Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015e). The Saint Mary Recovery Unit is located in Montana but is heavily linked to downstream resources in southern Alberta, Canada. Most of the Saskatchewan River watershed, which the St. Mary flows into, is located in Canada. The United States portion includes headwater spawning and rearing habitat and the upper reaches of FMO habitat. This recovery unit contains four core areas, and seven local populations (USFWS 2015e) in the U.S. Headwaters. The current condition of the bull trout in this recovery unit is attributed primarily to the outdated design and operations of the Saint Mary Diversion operated by the Bureau of Reclamation (e.g., entrainment, fish passage, instream flows), and, to a lesser extent habitat impacts from development and nonnative species.

C. STATUS OF CRITICAL HABITAT

1. Legal Status

The Service published a final critical habitat designation for the coterminous United States population of bull trout on October 18, 2010 (75 FR 63898), and the rule became effective on November 17, 2010. A justification document was also developed to support the rule and is available on the Service's website (http://www.fws.gov/pacific/bulltrout). The scope of the designation involved the species' coterminous range, which includes the Jarbidge River, Klamath River, Columbia River, Coastal-Puget Sound, and Saint Mary River population segments (also considered as interim recovery units at the time of final designation).

Designated bull trout critical habitat is of two primary use types: 1) spawning and rearing (SR), and 2) foraging, migration, and overwintering (FMO). Bull trout critical habitat includes both reservoirs/lakes and stream/shoreline miles, and was broken up into 32 Critical Habitat Units (CHU) as bull trout critical habitat. The 2010 revision increased the amount of designated bull trout critical habitat by approximately 76 percent for miles of stream/shoreline and by approximately 71 percent for acres of lakes and reservoirs compared to the 2005 designation. For the Columbia River Basin 16,915.9 miles of stream and 427,044 acres of reservoirs/lakes were designated as critical habitat. The final rule also identified and designated approximately 822.5 miles of streams/shorelines and 16,701.3 acres of lakes/reservoirs of unoccupied habitat to address bull trout conservation needs in specific geographic areas in several areas not occupied at the time of listing. In contrast, no unoccupied habitat was included in the 2005 designation. These unoccupied areas were determined by the Service to be essential for restoring functioning migratory bull trout populations based on currently available scientific information. These unoccupied areas often include lower main stem river environments that can provide seasonally important migration habitat for bull trout. This type of habitat is essential in areas where bull trout habitat and population loss over time necessitates reestablishing bull trout in currently unoccupied habitat areas to achieve recovery. A break-down of designated bull trout critical habitat by state is presented below in Table II-1.

Table II-1. Stream/shoreline distance and reservoir/lake area designated as bull trout critical habitat by state.

State	Stream/Shoreline Miles	Stream/Shoreline Kilometers	Reservoir/ Lake (acres)	Reservoir/ Lake (hectares)
Idaho	8,771.6	14,116.5	170,217.5	68,884.9
Montana	3,056.5	4,918.9	221,470.7	89,626.4
Nevada	71.8	115.6	-	-
Oregon	2,835.9	4,563.9	30,255.5	12,244.0
Oregon/Idaho	107.7	173.3	-	-
Washington	3,793.3	6,104.8	66,308.1	26,834.0
Washington (marine)	753.8	1,213.2	-	-
Washington/Idaho	37.2	59.9	-	-
Washington/Oregon	301.3	484.8	-	-
Total	19,729.0	31,750.8	488,251.7	197,589.2

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The final rule continues to exclude some critical habitat segments based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Critical habitat does not include: (1) waters adjacent to non-Federal lands covered by legally operative incidental take permits for habitat conservation plans (HCPs) issued under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (Act), in which bull trout is a covered species on or before the publication of this final rule; (2) waters within or adjacent to Tribal lands subject to certain commitments to conserve bull trout or a conservation program that provides aquatic resource protection and restoration through collaborative efforts, and where the Tribes indicated that inclusion would impair their relationship with the Service; or (3) waters where impacts to national security have been identified (75 FR 63898). Excluded areas are approximately 10 percent of the stream/shoreline miles and 4 percent of the lakes and reservoir acreage of designated critical habitat. Each excluded area is identified in the relevant CHU text, as identified in paragraphs (e)(8) through (e)(41) of the final rule. It is important to note that the exclusion of water bodies from designated critical habitat does not negate or diminish their importance for bull trout conservation. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

2. Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63943). The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. CHUs generally encompass one or more core areas and may include FMO areas, outside of core areas, that are important to the survival and recovery of bull trout. As previously noted, 32 CHUs within the geographical area occupied by the species at the time of listing are designated under the final rule. Twenty-nine of the CHUs contain all of the physical or biological features identified in this final rule and support multiple life-history requirements. Three of the mainstem river units in the Columbia and Snake River basins contain most of the physical or biological features necessary to support the bull trout's particular use of that habitat, other than those physical and biological features associated with Primary Constituent Elements (PCEs) 5 and 6, which relate to breeding habitat (see list below).

The primary function of individual CHUs is to maintain and support core areas, which (1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993); (2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish (MBTSG 1998; Rieman and McIntyre 1993); (3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations (MBTSG 1998; Rieman and McIntyre 1993); and (4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (MBTSG 1998; Rieman and Allendorf 2001; Rieman and McIntyre 1993).

The Olympic Peninsula and Puget Sound CHUs are essential to the conservation of anadromous bull trout, which are unique to the Coastal-Puget Sound population segment. These CHUs contain marine near-shore and freshwater habitats, outside of core areas, that are used by bull trout from one or more core areas. These habitats, outside of core areas, contain PCEs that are critical to adult and subadult foraging, migrating, and overwintering.

In determining which areas to propose as critical habitat, the Service considered the physical and biological features that are essential to the conservation of bull trout and that may require special management considerations or protection. These features are the PCEs laid out in the appropriate quantity and spatial arrangement for conservation of the species. The PCEs for bull trout are those habitats components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering (75 FR 63898). The PCEs of designated critical habitat are:

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.

2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including, but not limited to, permanent, partial, intermittent, or seasonal barriers.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.

5. Water temperatures ranging from 2 to 15 C (36 to 59 F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.

6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the- year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.

7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departures from a natural hydrograph.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

9. Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

3. Current Range-Wide Condition of Critical Habitat

The condition of designated bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historic range, bull trout occur at low numbers in many areas, and populations are considered depressed or declining across much of its range (67 FR 71240). This status reflects the condition of bull trout critical habitat.

The primary land and water management activities impacting the physical and biological features essential to the conservation of bull trout include timber harvest and road building, agriculture and agricultural diversions, livestock grazing, dams, mining, urbanization and residential development, and non-native species presence or introduction (75 FR 2282). There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that contribute to degraded PCEs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows:

1. Fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements (Dunham and Rieman 1999; Rieman and McIntyre 1993).

2. Degradation of spawning and rearing habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, resulting from forest and rangeland practices and intensive development of roads (Fraley and Shepard 1989; MBTSG 1998).

3. The introduction and spread of nonnative fish species, particularly brook trout and lake trout, as a result of fish stocking and degraded habitat conditions, which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout (Leary et al. 1993; Rieman et al. 2006).

4. In the Coastal-Puget Sound region where anadromous bull trout occur, degradation of mainstem river FMO habitat, and the degradation and loss of marine near-shore foraging and migration habitat due to urban and residential development.

5. Degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

One objective of the final rule was to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features described in PCEs 1,2, 3, 5, 7, 8, and 9. Protecting bull trout strongholds and cold water refugia from disturbance and ensuring connectivity among populations were important considerations in addressing this potential impact. Additionally, climate change may exacerbate habitat degradation impacts both physically (e.g., decreased base flows, increased water temperatures) and biologically (e.g., increased competition with non-native fishes).

D. ANALYTICAL FRAMEWORK FOR JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

This biological opinion only considers programmatic direction by the action agency that has undergone consultation. Effects to the species and/or designated critical habitat from programmatic direction that has not been consulted on are not included in the jeopardy or adverse modification determination. In situations where programmatic consultation has been completed for one but not the other, this BO provides an independent analysis for the species or designated critical habitat that does not rely on effects of the programmatic consultation to the other. For example, the adverse modification determination would be an independent analysis that does not rely on programmatic direction that has only been consulted upon for the species.

1. Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this BO relies on four components: (1) the Status of the Species, which evaluates the bull trout's range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which evaluates the condition of the bull trout in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the bull trout; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the bull trout; and (4) Cumulative Effects, which evaluates the effects on bull trout of future non-federal activities reasonably certain to occur in the action area. In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed federal action in the context of the bull trout's current status, taken together with cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the bull trout in the wild.

Recovery Units (RU) for the bull trout were defined in the final Recovery Plan for the Coterminous United States Population of [the] Bull Trout (USFWS 2015). Pursuant to Service policy, when a proposed federal action impairs or precludes the capacity of a RU from providing both the survival and recovery function assigned to it, that action may represent jeopardy to the species. When using this type of analysis, the BO describes how the proposed action affects not only the capability of the RU, but the relationship of the RU to both the survival and recovery of the listed species as a whole.

The jeopardy analysis for the bull trout in this BO considers the relationship of the action area and affected core areas (discussed below under the Status of the Species section) to the RU and the relationship of the RU to both the survival and recovery of the bull trout as a whole as the context for evaluating the significance of the effects of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Within the above context, the Service also considers how the effects of the proposed federal action and any cumulative effects impact bull trout local and core area populations in determining the aggregate effect to the RU(s). Generally, if the effects of a proposed federal action, taken together with cumulative effects, are likely to impair the viability of a core area population(s) such an effect is likely to impair the survival and recovery function assigned to a RU(s) and may represent jeopardy to the species (70 C.F.R. 56258).

2. Adverse Modification Determination

The adverse modification analysis in this BO relies on four components: (1) the Status of Critical Habitat, which evaluates the range-wide condition of designated critical habitat for the bull trout in terms of primary constituent elements (PCEs); the factors responsible for that condition and the intended recovery function of the critical habitat overall; (2) the Environmental Baseline, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how those effects are likely to influence the recovery role of affected critical habitat units or subunits; and (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how those effects are likely to influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on bull trout critical habitat are evaluated in the context of the range-wide condition of the critical habitat, together with any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) and continue to serve its intended recovery role for bull trout. The analysis in this BO places an emphasis on using the intended range-wide recovery function of bull trout critical habitat, especially in terms of maintaining and/or restoring habitat conditions that are necessary to support viable core area populations, and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

3. Scales of Analysis

The scale of analysis for a bull trout jeopardy determination from largest to smallest is as follows: Recovery Unit, Major Geographic Region, Core Area, Local Population. The scale of analysis for a bull trout critical habitat adverse modification determination from largest to

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smallest is as follows: Range of Bull Trout, Critical Habitat Unit (CHU), Critical Habitat Sub-Unit (CHSU), Stream Segment/Waterbody. The specific scales of analysis for jeopardy and adverse modification determinations used in this BO are presented in Tables II-4 and II-5 in Section E.3 *Species and Critical Habitat Affected*.

E. ANALYTICAL FRAMEWORK FOR DETERMINING BASELINE CONDITIONS AND EFFECTS OF THE ACTION

The following sections describe; (1) the parameters used to assess baseline conditions and effects of the action to bull trout, (2) the action area for the Revised Plan, and (3) the relationship of the action area to the hierarchical approach to bull trout recovery described in the Recovery Plan for the Coterminous United States Population of Bull Trout (USFWS 2015).

1. Baseline Conditions and Effect to Species and Habitat Indicators

To assess baseline conditions and effects to bull trout and bull trout critical habitat, the Service created "A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale" (Framework/Matrix; USFWS 1998). The Framework provides a stand-alone method to systematically assess baseline conditions and project-related effects to bull trout using four Species Indicators to assess Subpopulation Characteristics and six Habitat Pathways incorporating 19 Habitat Indicators. Habitat Indicators are generally arranged from a finer to broader scale within each Habitat Pathway. For example, under the pathway for Habitat Elements, substrate embeddedness is considered at the reach level, large woody debris, pool frequency and quality, and large pools are at the grouped reach level, off-channel habitat is for the entire stream length, and refugia is at the complete subpopulation watershed (USFWS 1998). Ratings of the species and habitat indicators are then used to derive an "Integration of Species and Habitat Conditions" rating. Individual indicators and the rating integrating habitat and subpopulation conditions are intended to help arrive at a determination of the potential effects of land management activities on bull trout.

Although the same indicators are used to assess effects to both bull trout and designated critical habitat, the analysis for jeopardy determination and adverse modification are conducted independently. The results of neither analysis affect the outcome of the other. Additionally, the magnitude and context of the indicators are used differently for addressing effects to the species and to critical habitat. For the determination of effects to the species, influences to individual indicators and their resulting effects to bull trout are assessed. To assess the physical and biological features ascribing bull trout critical habitat, assemblages of indictors indirectly describe the attributes within each PCE of critical habitat. The combined influence to these multiple indicators assesses the effects to critical habitat. Subsequently, the jeopardy determination for bull trout and the adverse modification of designated critical habitat determination are independent analysis.

Baseline conditions of individual indicators and the integrated value are rated as "functioning appropriately" (FA), "functioning at risk" (FAR), and "functioning at unacceptable risk" (FUR). Indicators rated FA provide habitats that maintain strong and significant populations, are

interconnected and promote recovery of a proposed or listed species or its critical habitat to a status that will provide self-sustaining and self-regulating populations. When a habitat indicator is FAR, they provide habitats for persistence of the species but in more isolated populations and may not promote recovery of a proposed or listed species or its habitat without active or passive restoration efforts. FUR indicates the proposed or listed species continues to be absent from historical habitat, or is rare or being maintained at a low population level; although the habitat may maintain the species at this low persistence level, active restoration is needed to begin recovery of the species. Indicators and parameters describing indicator ratings can be found in Appendix 3 Table A3-1.

Baseline ratings have generally been determined for each of the four species indicators, 19 habitat indicators, and the Integration of Species and Habitat Indicators for every 6th field Hydrologic Unit Code (HUC) across the range of bull trout in Montana. Consistent with this recommended scale of analysis, watershed baseline conditions and the Conservation Strategy for Bull Trout on USFS lands in Western Montana (USFS 2013) are conducted at the 6th field sub-watershed scale.

The Framework/Matrix can also be used to determine effects of a proposed action on habitat indicators. Project effects are considered to either "maintain," "restore," or "degrade" habitat indicators relative to existing or baseline conditions. Effects are characterized as either "major" effects that will likely produce a change in one functional level to baseline conditions (e.g., change FAR to FA), or "minor" effects that may result in an incremental or cumulative effect but will not result in a functional change within the HUC.

2. Baseline Conditions and Effects to Primary Constituent Elements (PCEs) of Critical Habitat

Designated critical habitat for bull trout is comprised of the nine PCEs described above. PCEs encompass the physical and biological features of critical habitat that cannot be measured by a single metric. As indicated in Table II-2, assemblages of species and habitat indicators from the Framework (USFWS 1998) are used to describe the components of each PCE. Some indicators explain a greater proportion of the physical and biological components of a PCE, but there is not a one-to-one relationship between any of the indicators and the PCEs of critical habitat.

The descriptive relationships between specific indicators and components of each PCE can be found in Appendix 3 (Table A3-2). The refugia indicator is relevant to all PCEs because in order for the refugia indicator to be rated "functioning appropriately," most - if not all - of the PCEs must be adequately represented. The PCEs are predominately based on habitat indicators rather than species indicators. Only one of the species indicators applies to the evaluation of any PCE; persistence and genetic integrity is used with two habitat indicators (temperature and refugia) to address PCE 9.

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Table II-2. Relationship between Diagnostic Indicators and critical habitat PCEs

Diagnostic Indicator	PCE's of Bull Trout Critical Habitat								
	PCE 1	PCE 2	PCE 3	PCE 4	PCE 5	PCE 6	PCE 7	PCE 8	PCE 9
Species Indicators									
Subpopulation Characteristics									
Subpopulation Size	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Growth & Survival	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Life History Diversity & Isolation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Persistence & Genetic Integrity	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X
Habitat Indicators									
Water Quality									
Temperature	X	X			X			X	X
Sediment	X	X	X	X		X			
Chemical Contaminants/Nutrients	X	X	X					X	
Habitat Access									
Physical Barriers		X							
Habitat Elements									
Substrate Embeddedness	X	X	X	X		X			
Large Woody Debris			X	X					
Pool Frequency & Quality			X	X					
Large Pools				X	X				
Off Channel Habitat	X		X	X	X				
Refugia	X	X	X	X	X	X	X	X	X
Channel Condition & Dynamics									
Wetted Width/Depth Ratio		X		X	X			X	
Streambank Condition	X		X	X	X	X	X	X	
Floodplain Connectivity	X		X	X	X	X	X	X	
Flow Hydrology									
Change in Peak/Base Flows	X	X			X		X	X	
Drainage Network Increase	X				X	X	X	X	
Watershed Conditions									
Road Density & Location	X			X	X	X	X	X	
Disturbance History	X				X		X		
Riparian Conservation Areas	X		X	X	X	X	X	X	
Disturbance Regime				X		X		X	

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3. Species and Critical Habitat Affected

Action Area

The action area is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 C.F.R. § 402.02). It is based upon the geographic extent of the physical, chemical, and biological effects to land, air, and waters resulting from the proposed action, including direct and indirect effects. For bull trout, 5th or 6th field HUCs are the recommended geographic scale for analysis of effects (USFWS 1998).

This biological opinion addresses the effects on bull trout related to the revision of the FNF's Forest Plan; therefore, the action area for the proposed action is the entire Forest. A total of 12 bull trout core areas are located on the FNF. Nine of these core areas are considered simple core areas (i.e., one local population per core area), and three are complex core areas (i.e., multiple local populations per core area). Eight of these core areas are located primarily on lands administered by the FNF. However, four of the core areas have less than ten percent of their land base within the FNF boundary.

The action area also includes four critical habitat sub-units. All four of the sub-units are located within the Clark Fork River Basin CHU (CHU 32). A more detailed description and discussion of each core area within the action area is presented in Tables II-6 through II-8, and in Section F. *Environmental Baseline* of this document.

Relationship of the Action Area to the Hierarchy of Bull Trout and Critical Habitat Analysis Units

The bull trout recovery plan considers a hierarchical order of demographic units ranging from local populations to the range of bull trout within the coterminous United States. This stepdown organization is important for implementing recovery, tracking consultation under section 7 of the Endangered Species Act, identifying and protecting critical habitat, and other aspects of planning and coordination. Core areas represent the closest approximation of a biologically functioning unit for bull trout, containing habitat that could supply all elements for the long-term security of bull trout and one or more local bull trout populations (USFWS 2015). Local populations are considered the smallest group of fish that are known to represent an interacting reproductive unit. Generally smaller, more adjunct resident populations of bull trout that do not meet the criteria for designation as local populations by the U.S. Fish and Wildlife Service also exist. As discussed above, the action area includes 12 bull trout core areas. These core areas are within the Flathead Lake Geographic Region, of the Columbia Headwaters Recovery Unit (Table II-3).

Table II-3. Hierarchy of bull trout demographic units of analysis. Note: (C or S) after each core area indicates if that core area is complex or simple.

Bull Trout Analysis Scale	Hierarchical Relationship
Coterminous United States (DPS)	Range of bull trout
Columbia Headwaters Recovery Unit	One of six Recovery Units in the range of the species within the coterminous United States

Flathead Lake Geographic Region	One of five Geographic Regions in the Columbia Headwaters Recovery Unit
Multiple Core Areas: Flathead Lake (C), Frozen Lake (S), Cyclone Lake (S), Upper Stillwater Lake (S), Upper Whitefish Lake (S), Whitefish Lake (S), Hungry Horse Reservoir (C), Doctor Lake (S), Big Salmon Lake (S), Swan Lake (C), Lindbergh Lake (S), Holland Lake (S)	12 of 22 Core Areas in the Flathead Geographic Region
41 Local Populations (see description below for each local population)	41of 55 local populations within the 12 Core Areas presented above

The action area also contains lakes/reservoirs and stream segments from four critical habitat sub-units (CHSU): Flathead Lake North Fork Flathead River, Flathead Lake Middle Fork Flathead River, Flathead Lake South Fork Flathead River, and Swan River and Lakes. All four of the CHSUs are part of the Clark Fork River Basin Critical Habitat Unit (Unit 31; Table II-4).

Table II-4. Hierarchy of bull trout critical habitat units of analysis.

Bull Trout Critical Habitat Scale	Hierarchical Relationship
Coterminous United States (DPS)	Range of bull trout
Clark Fork River Basin Critical Habitat Unit	One of 32 Critical Habitat Units in the range of bull trout within the coterminous United States
Flathead Lake North Fork Flathead River, Flathead Lake Middle Fork Flathead River, Flathead Lake South Fork Flathead River, and Swan River and Lakes Critical Habitat Sub-Units	Four of 12 Critical Habitat Sub-Units within the Clark Fork River Basin Critical Habitat Unit
Multiple stream segments/water bodies (see description below for more detail)	Many stream segments/water bodies designated as critical habitat within the four Critical Habitat Sub-Units presented above.

F. ENVIRONMENTAL BASELINE

This section assesses the effects of past and ongoing human and natural factors that have led to the current status of the species, its habitat and ecosystem in the action area. Environmental baseline is defined as "…the past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early Section 7 consultation, and the

impact of State or private actions that are contemporaneous with the consultation in process." (50 CFR 402.02)

Environmental baseline conditions for bull trout in this BO were assessed using information in the BA (USFS 2017), Bull Trout Core Area Templates (USFWS 2005a), the Columbia Headwaters Recovery Unit Implementation Plan (USFWS 2015b) and the Conservation Strategy for Bull Trout on USFS lands in Western Montana (USFS 2013).

1. Status of Bull Trout in the Action Area

The status of bull trout in the action area is described below by core area. Information on status is derived from the BA (USFS 2017), the Conservation Strategy for Bull Trout on USFS Lands in Western Montana (USFS 2013), and the bull trout core area assessments and 5-year reviews (USFWS 2005a, 2005b, 2015g).

Flathead Lake Core Area

The Flathead Lake Core Area is considered one of the largest, most complex, and best-documented bull trout core areas in the upper Columbia River watershed. The Flathead Lake Core includes all of Flathead Lake, the North Fork Flathead River, Middle Fork Flathead River, and South Fork Flathead River (up to Hungry Horse Dam). In addition to the mainstem rivers, the Flathead Lake Core Area also includes all tributaries within these described areas. The South Fork Flathead River above Hungry Horse Dam forms the separate Hungry Horse Core Area and will be discussed separately in this BO. The Whitefish and Stillwater River systems makeup separate core areas. These core areas are insignificant contributors of bull trout to the Flathead Lake Core Area, largely due to low population densities and decreased distribution within the core area.

The bull trout population in the Flathead Lake Core Area is greatly reduced relative to historic levels. Estimates range from 10 percent to 50 percent of the historical population. It is estimated that approximately 1,600 spawning adult bull trout inhabit Flathead Lake (USFS 2013). This value was derived from redd counts, and only represents bull trout that are mature enough to spawn. The absolute number of bull trout in the Flathead Lake Core Area is likely twice that number given that many non-spawning individuals are not accounted for in redd-based population estimates.

The distribution of populations throughout the core area is likely similar to historic patterns as. local populations are still relatively widespread in about 22 tributaries and occur in all historically occupied systems (occurrence is based largely on the presence of cold water). Life history expression is probably also similar to historic conditions, as most populations are dominated by the adfluvial life history form (USFS 2013).

Bull trout populations in the Flathead Lake Core Area were likely first exposed to significant human-caused impacts in the late 1800s. Prior to this time, bull trout were fished for by native Salish and Pend d'Oreille peoples and maintained relatively robust and widespread populations throughout the Flathead Lake Core Area (USFS 2013). Beginning in the late 1800s, European settlement in the area increased, which brought more fishing pressure and intensive land uses

that directly affected bull trout and their habitats. Logging by private landowners in the Flathead Valley, soon followed by timber harvesting by the Forest Service in the early 1900s, was directly and indirectly responsible for extensive changes in habitat (ibid.). Further, the main-stem Flathead River upstream of Flathead Lake was subjected to intensive log removal and channel clearing to facilitate steamboat traffic upstream from Flathead Lake (ibid.).

In the 1950s-1960s, another era of extensive logging in the Flathead River Core Area watersheds began. These practices included the construction of extensive road networks to access timber. These resulted in increased sediment delivery to streams and a proliferation of small-scale fish barriers at road/stream crossings throughout the Flathead Lake Core Area. In addition to directly affecting bull trout habitat, these roads also facilitated increased fishing and harvest or poaching of spawning bull trout in many tributaries. These impacts occurred on FNF lands, as well as state forest lands and other private lands throughout most of the Flathead Lake Core Area.

Currently, non-native fish species represent the primary threat to bull trout in the Flathead Lake Core Area (USFWS 2015e). The early 1900's saw a series of introductions in Flathead Lake that had impacts to bull trout (USFS 2013). Yellow perch, brook trout, lake trout, Yellowstone cutthroat trout, rainbow trout, and kokanee were all stocked in the Flathead Lake system between 1910 and 1916. Brook trout are often cited as contributing to the decline of native fish (MBTSG 1998). The nature of negative interactions between bull trout and brook trout is thought to include competition, predation, and hybridization. The result of species interaction is suspected to be detrimental to bull trout given the apparent overlapping niches of these two species (Leary et al. 1993). Kanda et al. (2002) found that hybridization tends to occur between male brook trout and female bull trout indicating a greater reproductive wasted effort for bull trout than brook trout. Rich et al. (2003) suggested that bull trout may resist brook trout invasion in streams with high habitat complexity and "strong" neighboring bull trout populations.

Perhaps the single greatest threat to bull trout in the Flathead Lake Core Area is the invasion and proliferation of lake trout (USFWS 2015b). From the time of their introduction, lake trout likely had negative effects on bull trout through direct predation and competition for similar food resources in Flathead Lake. However, it was not until the introduction of Mysis shrimp into Flathead Valley lakes in 1967 that the negative interaction between lake trout and bull trout was fully realized (USFWS 2015b). The establishment of Mysis shrimp in Flathead Lake provided juvenile lake trout with a consistent prey base in their deep water habitats. This deep water prey base was not available prior to Mysis introduction and allowed the lake trout population in Flathead Lake to surge. Spencer et al. (1991) concluded that the benefit Mysis shrimp introduction has on lake trout was responsible for the collapse of a formerly strong population of kokanee salmon through direct predation by lake trout. Further, it has been determined that predation, competition, or other forms of negative interaction with lake trout is the factor most responsible for the currently depressed condition of bull trout in this core area (MFWP-CSKT 2000, Fredenberg 2008).

In the mid-1990s greater angling restrictions were instituted on bull trout harvest in the Flathead Lake Core Area. There is currently no harvest of bull trout allowed in the Flathead Lake Core Area, but some incidental mortality is associated with the heavy angling pressure for lake trout in

Flathead Lake and heavy angler use on the Flathead River system, and there is also some limited mortality associated with gillnetting lake trout in the lake.

Many of the past direct habitat impacts associated with logging and road construction have been reduced or eliminated. In addition, much of the habitat where bull trout spawn and rear is protected by a variety of land designations (e.g., Wilderness, Wild and Scenic River). On FNF lands where bull trout exist, there has been minimal development of new roads for timber sales and a strong emphasis on road decommissioning and application of BMPs, in large part due to grizzly bear concerns.

Though Hungry Horse Dam on the South Fork Flathead River isolated a substantial portion (approximately 38 percent) of the spawning and rearing habitat in the core area, the integrity and connectivity of the remaining habitat in the North and Middle Fork Flathead River drainages of this core area is high. The Flathead Lake Core Area is a large core area, with some natural barriers in headwaters and occasional temporary barriers resulting from beaver dams or other natural activities. However, there are no known human-caused barriers on bull trout spawning and rearing streams, and bull trout from Flathead Lake have been documented to travel as far as 150 miles upstream to spawn in headwaters of the North Fork and Middle Fork, as well as into Canada.

Despite the recent improving trend in bull trout habitat, some concerns remain due to the potential for long-term increases in water temperatures, future effects of rain-on-snow precipitation patterns, and potential future land management in the headwaters. Recently, additional emphasis has been placed on identifying and evaluating important bull trout habitat in the British Columbia headwaters of the Flathead, given threats of expanded coal, oil, and gas exploration and development and timber extraction.

An extensive redd count monitoring program was developed and implemented by MFWP beginning in 1980. Based on data collected from eight index tributary streams in the North Fork and Middle Fork of the Flathead River (collectively representing about 45 percent of the known spawning in the basin), bull trout index redd counts ranged from about 300-600 in the 1980s (averaging 392), then dropped drastically in the early 1990s to a range of 83-243 in the seven years prior to listing (averaging 137 between 1991 and 1997). From 1998 through 2017, index redd counts ranged from 130 to 251 redds, averaging 195 (MFWP pers comm.). Some counts were considered minimum counts due to poor conditions during portions of the survey. Based on these counts, the recent trend appears relatively stable at a level roughly half of that in the 1980s.

Flathead River Basin-wide counts were made sporadically in 11 of survey years, representing “all 31 stream sections known to be used by Flathead Lake spawners” (MFWP, pers. comm.). The Basin-wide total has ranged from lows of 236 (1997) and 291 (1992) to highs of 1,156 (1982) and 850 (1986). The Basin-wide count in 2012 was 500, approaching the average count of 578 for the 11 Basin-wide counts conducted since 1980.

Currently, the primary threats to bull trout in the Flathead Lake Core Area are non-native species and fisheries management (USFWS 2015b). In the 1980’s, non-native lake trout expanded in the

Flathead Lake and mainstem Flathead River FMO habitat. We discussed this expansion in detail above.

Flathead Lake Core Area Summary

There are 13 local populations within the Flathead Lake Core Area on the FNF. Eight of these local populations are considered "index reaches" in MFWP's redd monitoring program. The index reaches are Trail Creek, Whale Creek, Coal Creek, Big Creek, Morrison Creek, Lodgepole Creek (tributary to Morrison Creek), Granite Creek, and Ole Creek. Although adfluvial bull trout do spawn in other tributaries, these eight streams support the larger adfluvial spawning runs, and redd numbers within them appear to represent about 45 percent of the total adfluvial spawning that occurs in the Flathead Lake Core Area Basin.

Park Creek and Nyack Creek are not included in this discussion because over 95 percent of the land base is in Glacier National Park. Frozen Lake is a simple core area. Cyclone Lake, Upper Stillwater Lake, Upper Whitefish Lake, and Whitefish Lake (also simple core areas) are not discussed here because 90 percent or more of the land base is under state ownership. As a result, direction provided in the Revised Forest Plan would not pertain to these simple core areas because the FNF does not administer lands within, or upstream of these watersheds.

Table II-5 summarizes relevant information from each of the local populations of the Flathead Lake Core Area that occur on FNF lands. This summary is adopted from the bull trout conservation strategy (USFS 2013) and provides an overall assessment of the importance of restoration activities for the entire Flathead Lake Core Area within the borders of the FNF. It does not include necessary restoration activities in watersheds where the FS has no ownership that may be critical for overall restoration of the bull trout population in the core area.

All of the local bull trout populations are also part of the Conservation Watershed Network. The intent is to identify habitat networks of existing strongholds with robust populations and high quality habitat that will support expansion and recolonization to adjacent watersheds. These areas should conserve key processes likely to influence the persistence of populations or metapopulations.

Table II-5. Summary of important local population attributes and conservation recommendations for the Flathead Lake Core Area (USFS 2013).

Local Population	Relative Importance to Core Area	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Trail Creek	High	Upper Trail Creek	Low	Low	Conserve
		Lower Trail Creek	High	Low	Conserve
Whale Creek	High	Upper Whale Cr	Low	Low	Conserve
		Shorty Creek	High	Low	Conserve
		Lower Whale Creek	High	Low	Conserve
Red Meadow Creek	High	Red Meadow Creek	Low	Low	Conserve

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Coal Creek	High	Upper Coal Creek	Low	Low	Conserve
		South Fork Upper Coal Creek	High	Low	Conserve
Big Creek	High	Hallowat Creek	High	Moderate	Active
		Upper Big Creek	High	Moderate	Active
		Lower Big Creek	Moderate	Low	Active
Strawberry Creek	High	Strawberry Creek	High	Low	Conserve
Bowl Creek	High	Bowl Creek	High	Low	Conserve
Clack Creek	High	Clack Creek	High	Low	Conserve
Schafer Creek	High	Schafer Creek	High	Low	Conserve
		Dolly Varden Creek	High	Low	Conserve
Morrison Creek	High	Morrison Creek	High	Low	Conserve
Granite Creek	High	Granite Creek	High	Low	Conserve
Long Creek	High	Long Creek	High	Low	Conserve
Bear Creek	Medium	Bear Creek	High	Low	Conserve
Frozen Lake*	Low	Frozen Creek	High	Low	Passive

[a] **Active restoration** is management intervention systematically focused on improving a degraded habitat condition or dysfunctional watershed processes such that the improved habitat can be maintained via restored processes and removal of impairments; **passive restoration** is a restoration process more typified by simply reducing or eliminating the sources of degradation that may allow recovery over time. **conservation** is a strategy intended to maintain one or more existing local populations, habitats, and processes that, compared to other areas in the Core, are functioning well enough to provide a foundation from which other populations can anchor to and reconnect with as active improvements occur in other Core Area locations.

Hungry Horse Reservoir Core Area

The Hungry Horse Reservoir Core Area includes all of Hungry Horse Reservoir and the South Fork Flathead River and all tributaries upstream of the dam. Hungry Horse Dam, completed in 1953, isolates the South Fork Flathead River drainage from its former connectivity with the remaining Flathead Lake system, isolating about 38 percent of the spawning and rearing habitat that would otherwise occur in the Flathead Lake Core Area (Zubik and Fraley 1987). The Hungry Horse Reservoir Core Area bull trout population originated from adfluvial Flathead Lake stocks that were trapped upstream of Hungry Horse Dam. There is no evidence of resident fish occurrence in this core area.

In 1998, the status and trend of bull trout in the Hungry Horse Reservoir Core Area was considered “strong” and “stable” based on information available at the time of listing (USFWS 1998). This was the only Montana core area designated with that combination of attributes and is in sharp contrast to most core areas in western Montana, where current bull trout densities are typically well below historic levels. Since 1998, the population has continued to remain stable and even increase, suggesting that the status and trend designations were accurate. The distribution of bull trout populations throughout this core area is probably similar to historic

patterns, as is life form expression (dominated by adfluvial adults). This is a large core area with some natural barriers in headwaters and occasional temporary barriers resulting from beaver dams or other natural activities. There are no known human-caused barriers on bull trout spawning and rearing streams. In recent years, the reservoir has been held at more stable levels (as opposed to drawdowns of up to 200 feet in the early 1990s), further improving connectivity with reservoir tributaries and the upstream watershed. Hungry Horse Dam (564 feet high) is a complete barrier to all upstream and most downstream movement of bull trout. Entrainment of bull trout through the dam probably occurs at low levels but has not been an issue, likely due to the depth and configuration of penstock withdrawal. The South Fork Flathead River upstream of Hungry Horse Dam is a *de facto* native fish refugium, and the barrier the dam presents to upstream movement of non-native species (e.g., lake trout) is currently considered an asset to bull trout recovery.

Hungry Horse Reservoir and the South Fork of the Flathead is the largest bull trout habitat in northwest Montana with a predominantly native fish species assemblage. MFWP has recognized the importance of this and is implementing measures to systematically remove non-native salmonids in the limited headwater lake basins where they occur (as a result of historical stocking programs with rainbow trout and Yellowstone cutthroat trout). The entire upper watershed of the Hungry Horse Reservoir Core Area is within the Bob Marshall Wilderness.

Historic bull trout redd counts are not available. The number, size, and age composition of bull trout that were trapped upstream of the dam at closure in 1953 are unknown. It is likely that numbers were lowest immediately following the construction of the dam and filling of the reservoir and then quickly rebounded with the new habitat and food resources afforded by the reservoir. The population likely expanded for a period of several years through the 1960s (USFS 2013). However, heavy angling, logging on non-wilderness lands surrounding the reservoir, and extreme reservoir drawdowns are surmised to have caused the bull trout population to decline during the 1970s and 1980s. In 1993, due to pending Endangered Species Act action, angling for bull trout was restricted. This facilitated a long-term increase in the population that has sustained itself despite limited angling opportunity and the harvest that was reinitiated beginning in 2004.

Current bull trout densities in the Hungry Horse Core Area appear to be relatively stable or increasing at about 2,500 to 3,000 adults, based on MFWP redd count data from 1993 to present. Because the Hungry Horse Reservoir Core Area was formed by a reservoir that inundated a portion of the previous migratory corridor for fish from Flathead Lake, there was no established previous record of natural carrying capacity for this portion of the system in isolation. Rather, this core area incorporated about 38 percent of the spawning and rearing habitat for the Flathead Lake Core Area (Zubik and Fraley 1987). The loss statement for the Hungry Horse Dam mitigation program concluded that the dam construction eliminated between 1,840 and 2,089 adult bull trout from the Flathead Lake population (Zubik and Fraley 1987). Based on that analysis, we can conclude that the adult bull trout population occupying this core area (estimated at 2,500-3,000 fish) is similar in size to the natural carrying capacity of the area when it was still attached to Flathead Lake. However, it must be noted that although Hungry Horse Reservoir is a large, deep, cold body of water that provides generally excellent foraging, migrating, and overwintering habitat for subadult and adult bull trout, it is not nearly as productive as the natural habitat of Flathead Lake. As a consequence, adult adfluvial bull trout in Hungry Horse

Reservoir are typically not as large as the Flathead Lake fish and their condition factors are not as high.

In contrast to many core areas in western Montana, habitat in the Hungry Horse Reservoir Core Area is large, connected, and secure. In addition, the population has the added benefit of having a large reservoir rearing area, providing habitat that is relatively buffered from environmental extremes and supports adequate natural food resources for a robust bull trout population. A 1985 analysis of 125 stomachs of bull trout from Hungry Horse Reservoir found that native fish made up 99.7 percent of the diet, by weight (May et al. 1988), dominated numerically by northern pikeminnow (39 percent), mountain whitefish (28 percent), suckers (26 percent), and westslope cutthroat trout (7 percent). Currently, the greatest threats are angling (legal or illegal) and reservoir operations (USFWS 2008).

The recreational bull trout fishery on Hungry Horse Reservoir has continued since 2004 and is being closely monitored (Hensler and Benson 2007, Rosenthal 2009, 2010, Rosenthal and Hensler 2008). Angler catch and harvest (in parentheses) of bull trout from Hungry Horse Reservoir has been estimated as follows: 2004-05 catch = 355 (48); 2005-06 catch = 2,154 (58); 2006-07 catch = 623 (56); 2007-08 catch = 533 (57); 2008-09 catch = 621 (74); 2009-10 catch = 832 (97). In addition, anglers participating in the catch-and-release fishery authorized in the upper end of the reservoir and in the South Fork Flathead River into the Bob Marshall Wilderness were estimated to have caught 173 bull trout in 2004, 531 bull trout in 2005, 380 bull trout in 2006, roughly 320 bull trout in 2007, 405 bull trout in 2008, and 370 bull trout in 2009. In total, nearly 13,000 angler days of recreation in the combined reservoir and river fisheries has occurred over the 6-year period, and nearly 7,300 bull trout have been caught, of which 390 (roughly 5 percent) were harvested. The fishery is closely monitored and is not assumed to be a high threat because of the ability to adjust regulations quickly if needed.

Operations of the Federal Columbia River Power System in the past have led to extreme variability in the pool of Hungry Horse Reservoir, at times being drawn down over 200 feet from full. Although drawdowns of that magnitude have been eliminated in recent years, the State of Montana continues to express concern over the effect of water level fluctuation on native fish and recreation. Despite these variable pools, we are not aware of any data indicating bull trout populations have shown any measurable negative response.

In 2003, a series of major fires burned large portions of the bull trout habitat in the South Fork of the Flathead River drainage, which are the headwaters of this core area. In recent years, logging activities have been minimal with the exception of some post-fire salvage. Rain-on-snow events heavily impacted west-side reservoir tributaries in 2003 and again in 2006, with large debris flows and several culvert and bridge blowouts. Despite this, or perhaps related to these flushing flows, bull trout spawning numbers in several of these streams (e.g., Wounded Buck and Wheeler Creeks) increased through the period 2006-2008 (MFWP redd count data, pers. comm.). There are eight bull trout spawning index reaches in the Hungry Horse Core Area. Collectively, these eight reaches represent up to 85 percent of the total Basin-wide spawning of bull trout. The data show that the four index streams in the wilderness support approximately 70 percent of the bull trout spawning in the Hungry Horse Core Area (MFWP redd count data, pers. comm.).

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Hungry Horse Reservoir Core Area Summary:

There are ten local populations within the Hungry Horse Reservoir Core Area on the FNF. All ten local populations in the core area support adfluvial bull trout spawning, as there are no known resident populations. A similar pattern, in terms of importance, may have existed historically between these streams and today as they provide the largest amount of high quality groundwater-influenced spawning and rearing habitat due to their relative size and quality.

Table II-6 below summarizes relevant information from each of local populations in the Hungry Horse Reservoir Core Area. It should be noted that Table II-6 also includes two simple core areas (Big Salmon and Doctor Lake). These two simple core areas are included in the Hungry Horse Reservoir Core Area discussion because they are within the Hungry Horse Reservoir watershed, but the bull trout in these lakes do not demonstrate interchange with the larger reservoir downstream. Thus, they are considered simple core areas as they have one designated spawning and rearing stream and one FMO water body (i.e., Big Salmon and Doctor Lakes).

The following table is a summary that provides an overall assessment of the estimated cost, timeframe, and importance of restoration activities for the entire Hungry Horse Core Area within the borders of the Flathead National Forest. It does not include necessary restoration activities in watersheds where the Forest has no ownership that may be critical for overall restoration of the bull trout population in the core area.

Table II-6. Summary of important local population attributes and conservation recommendations for the Hungry Horse Core Area (USFS 2013).

Local Population	Relative Importance to Core Area	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Danaher Creek	High	Lower Danaher Creek	High	Low	Conserve
		Upper Danaher Creek	High	Low	Conserve
		Basin Creek	High	Low	Conserve
		Rapid Creek	High	Low	
Youngs Creek	High	Lower Youngs Creek	High	Low	Conserve
		Upper Youngs Creek	High	Low	Conserve
		Babcock Creek	High	Low	Conserve
Gordon Creek	High	Lower Gordon Creek	High	Low	Conserve
Little Salmon Creek	High	Little Salmon Creek	High	Low	Conserve
Bunker Creek	Low	Lower Bunker Creek	High	Low	Passive
		Upper Bunker Creek	High	Low	Passive

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Local Population	Relative Importance to Core Area	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
		Gorge Creek	High	Low	Conserve
Spotted Bear River	High	Lower Spotted Bear River	High	Low	Passive
		Dean Creek	High	Low	Conserve
		Middle Spotted Bear River	High	Low	Conserve
		Wall Creek	High	Low	Conserve
		Spotted Bear River Headwaters	High	Low	Conserve
Sullivan Creek	High	Sullivan Creek	High	Moderate	Active
Wheeler Creek	High	Wheeler Creek	High	Moderate	Active
Wounded Buck Creek	High	Wounded Buck Creek	High	Low	Passive
Doctor Lake Core Area	High	Upper Gordon Creek –	High	Low	Conserve
Big Salmon Lake Core Area	High	Big Salmon Lake	High	Low	Conserve

[a] **Active restoration** is management intervention systematically focused on improving a degraded habitat condition or dysfunctional watershed processes such that the improved habitat can be maintained via restored processes and removal of impairments; **passive restoration** is a restoration process more typified by simply reducing or eliminating the sources of degradation that may allow recovery over time. For instance, INFISH standards and guidelines are intended to reduce new or ongoing management pressures to riparian areas that can degrade or maintain degraded riparian and stream conditions; **conservation** is a strategy intended to maintain one or more existing local populations, habitats, and processes that, compared to other areas in the Core, are functioning well enough to provide a foundation from which other populations can anchor to and reconnect with as active improvements occur in other Core Area locations.

Swan Lake Core Area

The Swan Lake Core Area includes all of Swan Lake and the Swan River and all tributaries upstream. The Swan system is an important component of the overall Flathead River aquatic ecosystem. However, warm water temperatures in the lower Swan River (below Swan Lake) have most likely limited the degree of bull trout movement between Flathead Lake and the Swan Lake system (USFS 2013). The Swan Lake Core Area has therefore likely always functioned primarily as a separate core area from the Flathead Lake Core Area (ibid.).

Swan Lake is recognized as a bull trout stronghold. Current bull trout densities in the Swan Lake Core Area are roughly half of what they were historically. This is in contrast to most core areas in western Montana, where densities are much less than their historic level. Like the Flathead Lake and Hungry Horse Reservoir Core Areas, the distribution of populations throughout the Swan Lake Core Area is likely similar to historic patterns with populations still relatively widespread where suitably sized streams exist. Life form expression in this core area is dominated by adfluvial adults. This is likely similar to historical patterns, as no major barriers exist in the core area. Bigfork Dam, located approximately two miles upstream of Flathead Lake, is the only large barrier. However, the impact of the dam on bull trout movement is probably minimal due to the thermal barrier described above.

Bull trout populations in the Swan Lake Core Area were likely first exposed to significant human-caused impacts in the late 1800s. During this time, European settlement in the area increased, which brought more fishing pressure and intensive land uses that directly affected bull trout and their habitats. Logging on both private land and the national forest in the early 1900s was responsible for much of the change in habitat, as intensive harvest activities and road building took place.

In the 1950s-1960s, another era of extensive logging in the Swan Lake Core Area began. During this time additional roads were constructed to access the timber, which resulted in increased sedimentation into bull trout tributaries. Further, increased road building led to a proliferation of small-scale fish barriers at road and stream crossings. These roads not only affected habitat but also facilitated increased fishing and excessive harvest or poaching of spawning bull trout in many tributaries. These impacts occurred on both Forest Service and private and corporate lands throughout most of the Swan Lake Core Area.

As with the Flathead Lake Core Area, the early 1900's also saw the introduction of a number of non-native fish species. Yellow perch, brook trout, Yellowstone cutthroat trout, rainbow trout, and kokanee salmon were all stocked at various locations within the Swan Lake Core Area between 1910 and 1936. Brook trout represented the greatest threat to bull trout in the core area through direct competition for resources and hybridization. These threats continue today, primarily in a number of spawning and rearing tributaries of the Swan River. In several major bull trout spawning tributaries in the Swan Lake Core Area over half the *Salvelinus* biomass is composed of brook trout or bull trout × brook trout hybrids (USFS 2013). The introduction of kokanee, on the other hand, likely had a positive effect on bull trout populations by providing an abundant high-quality food source in Swan Lake. Although kokanee salmon may have largely replaced the native westslope cutthroat trout, this effect may have bolstered the bull trout population by creating an unnaturally elevated prey base. In the period from approximately 1930 to 1960, bull trout populations were more carefully managed with increased angling protection and were observed to have increased in the Swan Lake Core Area.

The mid to late 1900's saw yet another wave of non-native species introductions into the Swan Lake Core Area. Mysis shrimp were introduced into Swan Lake in 1967, and northern pike began appearing in Swan Lake around 1970. The introduction of Mysis shrimp had a beneficial effect on bull trout populations because they supplemented the food chain by providing forage for Swan Lake's kokanee salmon population. However, northern pike had a negative effect on bull trout in Swan Lake by preying upon juvenile bull trout, and also by competing with adult bull trout for resources. Bull trout and northern pike have been somewhat more compatible in Swan Lake than some other systems through the past four decades, likely due in large part to the partitioning of available habitat and limited northern pike recruitment combined with robust productivity of bull trout in the system.

The 2015 Columbia Headwaters Recovery Unit Implementation Plan (RUIP) for Bull Trout (USFWS 2015b) identified non-native fish as the primary threat to bull trout in the Swan Lake Core Area. Of non-native species, the greatest threat to bull trout is the recent introduction of lake trout into the system. In 1998 anglers in both Swan Lake and the Swan River began catching adult sized (20-30 inches) lake trout. These occurrences led to wide-spread concern given the ability for lake trout to rapidly dominate lacustrine fish communities with Mysis shrimp (Martinez 2009). In 2003, the level of concern was compounded when biologists

gillnetted juvenile lake trout from Swan Lake during standard low-intensity sampling efforts, indicating that wild reproduction was occurring. Since 2003, lake trout catch by anglers as well as during biological sampling has continued to increase, another indication that the population was reproducing in the wild. Research efforts from 2006-2008 focused on lake trout population demographics and exploring potential techniques to reduce numbers while minimizing bull trout bycatch. Based on case histories from nearby waters, managers determined that developing long-term management actions to control this increasing lake trout population was necessary (Rosenthal and Fredenberg 2017). In 2009, a three-year experimental removal of lake trout in Swan Lake began (ibid.). This removal experiment was a feasibility study to determine the effectiveness of using targeted gillnetting as a technique to reduce the number of Lake Trout and thus minimize threats to bull trout. The project resulted in the removal of over 20,000 lake trout from Swan Lake between 2009 and 2011. The effort was extended for five years in 2012 (through 2016) to further evaluate the long-term effectiveness of lake trout suppression on Swan Lake. In total, over 59,700 lake trout were removed from Swan Lake (Rosenthal and Fredenberg 2017). The results of this assessment are under consideration by the Swan Valley Bull Trout Working Group, a group of representatives from state and federal agencies (including the Service, USFS, MFWP) and other interested groups (e.g., Trout Unlimited). At the time this biological opinion was written, the Service is recommending that lake trout suppression on Swan Lake continues in an effort to address the primary threat to the Swan Lake Core Area. This recommendation has been made to the remaining members of the Swan Valley Bull Trout Working Group, but a consensus on the need for continued lake trout suppression has not been met. The Service is continuing to engage with all members of the working group to try and identify a path forward, and address the impact that invasive lake trout are having on bull trout populations in the Swan Lake Core Area.

In the mid-1990s, greater angling restrictions were instituted on bull trout harvest within the Swan Lake Core Area. Perhaps most significantly, the four most important spawning streams (Lion, Goat, Squeezer, and Elk Creeks) allow no recreational fishing at all, thus eliminating any incidental mortality. This action, along with habitat practices, helped generate a noticeable increase in the Swan Lake Core Area bull trout population for the next decade or more. Until very recently, the Swan Lake Core Area was considered strong enough to permit a limited recreational fishery on Swan Lake.

Many of the past direct habitat impacts associated with logging and road construction have been reduced or eliminated, and therefore some stressors on the population no longer play as large a role as they did historically. Most spawning streams have relatively good habitat conditions. Recent inventory and monitoring work has found that many streams are within a standard deviation of unmanaged, reference streams (USFS 2013). Beginning in the 1990s and continuing into the early 2000s many historic, undersized culverts were replaced and best management practices on road surfaces greatly reduced the legacy impact of roads. Since 2006, acquisition and conservation easements on more than 85,000 acres of lands through the Montana Legacy Project, The Nature Conservancy, BPA, Trust for Public Lands, the Service, congressional appropriation, and MFWP, as well as other improvements through programs such as the Montana Department of Natural Resources and Conservation's Habitat Conservation Plan, should continue to contribute to this positive habitat trend.

Despite improved habitat practices and elimination of all angler harvest, bull trout populations in the Swan Lake Core Area appear to be steadily decreasing based on redd count data. Annual redd counts in the Swan Lake Core Areas four index streams (Elk, Goat, Squeezer and Lion Creeks) totaled 519 in 2000. By contrast, the total counts from those four streams in 2016 (the most recent counts available) was 177 (MFWP pers. comm.). There may be several reasons for this decline including the introduction of lake trout into Swan Lake, and expression of the inherently high variability in bull trout populations. While bull trout numbers in the Swan Lake Core Area have declined over the past decades relative to historic levels, they remain stronger than many core areas in the Columbia Headwaters Recovery Unit. Given the presence of tributaries dominated by hyporheic (i.e., groundwater) flow, it is likely that bull trout populations in the Swan Lake Core Area will remain strong if the lake trout threat can be successfully addressed.

Currently, the main factor limiting bull trout populations in the Swan Lake Core Area are non-native fish communities throughout the system (lake trout in Swan Lake and brook trout in tributaries). Other impacts, such as fishing mortality and poaching, also remain a concern.

It should be noted that there are two disjunct populations within the Swan Lake Core Area that are designated as separate core areas: the Holland Lake Core Area and Lindbergh Lake Core Area. Both of these are considered simple core areas, and they both occur wholly within the Swan Lake Core Area drainage. Unfortunately, lake trout have recently been documented in both the Holland Lake and Lindbergh Lake Core Areas. Introduction was likely from individual lake trout travelling up the Swan River from Swan Lake. While there may be a small degree of interchange between the Swan Lake, Holland Lake and Lindbergh Lake Core Areas, there is no evidence that suggests this occurs with any regularity. These two simple core areas are included in the Swan Lake Core Area discussion because they are within the Swan Lake watershed, but the bull trout in these lakes do not demonstrate interchange with the larger complex core area (Swan Lake).

Swan Lake Core Area Summary

There are nine local populations of bull trout within the Swan Lake Core Area (see Table II-7 below). Although adfluvial bull trout do spawn in other tributaries, these tributary streams support the majority of fluvial spawning, and redd numbers within them likely represent over 90 percent of the total adfluvial spawning that occurs in the core area.

Of the nine local populations in the core area, Lion Creek, Goat/Squeezer Creeks, and Elk Creek currently support the majority of adfluvial bull trout spawning. A similar pattern, in terms of importance, may have existed historically between these streams as they provide the largest amount of high quality groundwater-influenced spawning and rearing habitat due to their relative size and quality.

Table II-7 summarizes relevant information from each of the 6th field HUC local populations. This summary provides an overall assessment of the estimated cost, timeframe, and importance of restoration activities for the entire Swan Lake Core Area within the borders of the Flathead National Forest. It does not include necessary restoration activities in watersheds where the FNF has no ownership that may be critical for overall restoration of the bull trout population in the core area.

Table II-7. Summary of important local population attributes and conservation recommendations for the Swan Lake Core Area (USFS 2013).

Local Population	Relative Importance to Core Area	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Elk Creek	High	Elk Creek	High	Low	Conserve
Cold Creek	Low	Cold Creek	Low	Moderate	Active
Jim Creek	High	Jim Creek	High	Low	Active
Piper Creek	Medium	Piper Creek	Moderate	Low	Conserve
Lion Creek	High	Lion Creek	High	Low	Conserve
Goat Creek	High	Goat Creek	High	Low	Conserve
Woodward Creek	High	Woodward Creek	High	Low-Moderate	Passive
Soup Creek	Low	Soup Creek	Low	Moderate	Conserve
Lost Creek	Medium	Lost Creek	Moderate	Low	Conserve
Lindbergh Lake Core Area	High	Headwaters Swan River	High	Low	Active
Holland Lake Core Area	High	Holland Creek	Moderate	Moderate	Passive

[a] **Active restoration** is management intervention systematically focused on improving a degraded habitat condition or dysfunctional watershed processes such that the improved habitat can be maintained via restored processes and removal of impairments; **passive restoration** is a restoration process more typified by simply reducing or eliminating the sources of degradation that may allow recovery over time. For instance, INFISH standards and guidelines are intended to reduce new or ongoing management pressures to riparian areas that can degrade or maintain degraded riparian and stream conditions; **conservation** is a strategy intended to maintain one or more existing local populations, habitats, and processes that, compared to other areas in the Core, are functioning well enough to provide a foundation from which other populations can anchor to and reconnect with as active improvements occur in other Core Area locations.

2. Status of Critical Habitat in the Action Area

The baseline for critical habitat will be discussed for the core area as a whole. Critical habitat applies only to those specifically designated streams (75 FR 63898) and only to the area within the ordinary high watermark. The following description and discussion considers all designated critical habitat within each bull trout core area included in the Action Area. While much of the actual stream segments or lakes/reservoirs are not on lands administered by the FNF, these water bodies are still considered inside the Action Area due to their close proximity to FNF lands or potential downstream effects on FNF lands within the drainages.

Critical Habitat in the Flathead Lake Core Area

A total of 283 miles of streams rivers and 126,474 acres of lakes—Flathead Lake (122,318 acres), Cyclone Lake (141), Frozen Lake (22), Upper Stillwater Lake (593), Upper Whitefish Lake (80), and Whitefish Lake (3,320)—are included in the designation of critical habitat for the Flathead Lake Core Area on NFS lands.

The operation of Hungry Horse Reservoir and downstream temperature/flow influence may affect PCEs 4, 5, 7, and 8.

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PCE 9 is degraded because of the influence of lake trout within Flathead Lake. Brook trout abundance within this core area is absent to low, but interaction between bull trout and brook trout is greatest in Bear Creek.

Critical Habitat in the Hungry Horse Reservoir Core Area

A total of 223 miles of streams and 28,710 acres of reservoirs/lakes—Hungry Horse Reservoir (23,602 acres), Big Salmon Lake (973), and Doctor Lake (53)—are included in critical habitat for the Hungry Horse Reservoir Core Area. Forest management has relatively little influence in the reservoir. This core area exhibits perhaps the strongest record of an increasing/stable trend across the entire U.S. range of bull trout due to the majority of populations within the Bob Marshall Wilderness. Consequently, the PCEs in this core area appear to be functioning appropriately for the most part, with perhaps the exception of local populations outside the wilderness and the management of reservoir levels. Risk to the function of the PCEs appears minimal.

The large surface area of the reservoir allows for greater solar insolation and raises, water temperatures in the reservoir, although the impact on fish, if any, is unclear (PCE 5). The dam and its regulation based on energy production needs disrupt the natural hydrograph governing the timing and quantity of runoff (PCE 7) downstream of Hungry Horse Dam and subsequently Flathead River. The Hungry Horse Reservoir Core Area is most likely the only core area in Montana that does not have any local populations influenced by non-native species, and thus PCE is very strong.

Critical Habitat in the Swan Lake Core Area

A total of 90 miles of stream/river and 4,506 acres of lakes—Swan (3,275 acres), Holland (414), Lindbergh (817)—are included in the critical habitat for the Swan Lake Core Area. The greatest threat to critical habitat in this core area is non-native lake trout in Swan Lake, affecting PCE 9. Forestry practices have also had extensive impacts to this core area , affecting PCEs 3, 4, 6, and 8.

G. EFFECTS OF THE ACTION

Effects of the action are "…the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline." [50 CFR §402.02] These effects are considered along with the predicted cumulative effects to determine the overall effects to the species for purposes of preparing a BO on the proposed action. Direct effects are defined as those that result from the proposed action and directly or immediately impact the species or its habitat. Indirect effects are those that are caused by, or will result from, the proposed action and are later in time, but still reasonably certain to occur.

1. Factors to be Considered

Proposed forest-wide desired conditions, objectives, guidelines and standards will affect subsequent project design when implementing forest management activities in the future. These

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forest-wide desired conditions, objectives, guidelines and standards affect future management decisions, but authorize no immediate activities or changes to ongoing ones. Therefore, all effects of the Revised Forest Plan are indirect, and no direct effects occur to bull trout as a result of the proposed action. Project-level activities that result from implementation of forest plan direction will undergo site-specific environmental review and section 7 ESA consultation., as appropriate, as they are proposed.

Nearly all Forest Service management activities allowed within the different Management Area categories in the Revised Forest Plan have the potential to affect bull trout and their habitats, either directly or indirectly, where they overlap with occupied habitat. Land management activities that disturb the soil surface adjacent to or in occupied habitat have the greatest potential to result in adverse effects to bull trout and bull trout critical habitat. Those activities that have the greatest potential to affect bull trout and bull trout critical habitat include: vegetation management, fuels management, livestock grazing, roads, mining, recreation and aquatic restoration activities. In addition, watershed improvement designations in the Revised Forest Plan provide opportunities for activities to restore, improve, or rehabilitate habitat quantity and quality, thus contributing to bull trout recovery. The potential impact of these various management activities is discussed below.

Vegetation Management

General Effects of Vegetation Management

Vegetation management has the potential to cause accelerated erosion primarily through construction of temporary roads and skid trails to access treatment areas. Timber harvest may affect flow regimes by reducing evapotranspiration, interception, and snow accumulation patterns, and by increasing soil moisture and surface runoff. Timber harvest directly adjacent to streams and wetlands can reduce shade, raise water temperatures, and reduce the potential for recruitment of woody material. Greater temperature fluctuations (both diurnal and seasonal) can also occur when riparian vegetation is removed or decreased.

Studies have documented increased sediment erosion associated with timber harvest, but the primary agent is sediment from roads (Bilby et al. 1999, Sugden and Woods 2007). Management actions can control non-point delivery of sediment within harvest areas through the use of water and soil conservation practices and best management practices (USFS 2012). These efforts are typically focused on stabilization of log skidding and landing networks where erosion is most likely to occur. Elliot et al. (2000) found that erosion after disturbance from timber harvest typically lasted 1 to 3 years. They also found that following timber harvest and site preparation, regrowth of vegetation covers the soil surface with plant litter and soils armor, and potential erosion hazard becomes low (ibid.).

The loss of forest canopy in harvest sites can also alter the water balance of an aquatic ecosystem. Studies in the Pacific Northwest have documented cases where excess water from harvest areas influenced the peak and timing of stream flows (Keppeler and Ziemer 1990, Moore and Wondzell 2005, Stednick, 1996). In reviews, these cases depended largely on the extent of harvest and the climatic regime (Grant et. al 2008). The effect diminishes in time as vegetation re-establishes. Peak flow increases were raised as a concern due to their potential to alter stream

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morphology and degrade water quality. The altering of streamflow can also influence stream temperature (Swanston 1991); although, the principle factor in affecting stream temperature is changes to riparian cover that shades streams (Beschta et. al 1987, Gomi et. al 2006, Macdonald et. al 2003).

Prescribed fire associated with vegetation management can also have impacts to aquatic ecosystems. Burned areas can accelerate runoff due to soil sealing from ash that lowers the infiltration capacity of soils (Doerr et al. 2006, Larsen et al. 2009). These conditions vary spatially and decrease over the first year as products of burning in the soil degrade (Doerr et al. 2006, Wondzell and King 2003). Other factors that increase runoff from harvest and burn areas are steep slopes, low groundcover, and long slope lengths (Elliot 2013). Runoff transports loose soil particles and deposits sediment down the slope proportional to runoff energy.

Effects of Vegetation Management Specific to the Proposed Action

Under implementation of the proposed action, most vegetation management activities are anticipated to occur in management areas 6b and 6c (general forest). Vegetation management activities are allowed in management areas 3a (special areas), 4a (research natural areas), 4b (experimental forests), 5a, 5b, and 5c (backcountry), 6a, 6b, and 6c (general forest), and 7 (focused recreation areas), although only management areas 6b, 6c, and a portion of 7 are suitable for scheduled timber production.

The Revised Forest Plan would limit the effects of vegetation management activities to bull trout in the action area through direction provided in standards and guidelines that pertain to Riparian Management Zones (RMZs). Specifically, Revised Forest Plan standard FW-STD-RMZ-06 only allows vegetation management in the inner portion of the RMZ if that activity is required to restore or enhance aquatic and riparian-associated resources (see Appendix 2). As a result, entry into the inner zone of an RMZ will be limited due to the critical role this zone serves in terms of providing shade, large woody debris recruitment, bank stability, and sediment control. This standard ensures that riparian and aquatic processes and functions receive primary consideration within the inner RMZ.

The proposed action will also include Forest Plan components that will prohibit the construction of roads and landings associated with vegetation management within the RMZ (FW-GDL-RMZ-11), as well as prohibit the use of ground-based equipment within the RMZ (FW-GDL-RMZ-12). While limited vegetation management within the outer RMZ will be allowed under the proposed action, the Revised Forest Plan includes a number of elements that will ensure a diverse forest structure within the RMZ. Guidelines FW-GDL-RMZ-08 through 10 apply to the entire RMZ and direct actions in a manner that will retain live reserve trees and snags greater than 12 inches in diameter. With the implementation of RMZ-associated standards and guidelines, implementation of the Revised Forest Plan will only allow activities that provide a direct benefit to aquatic resources (inner RMZs), or do not retard riparian and stream function (outer portion of the RMZs).

Increase sediment resulting from vegetation management activities can affect aquatic habitats for bull trout. Revised Forest Plan direction is intended to protect bull trout and bull trout designated critical habitat from possible detrimental effects due to timber harvest. Desired

conditions for soils include maintaining soil productivity and hydrologic function as well as minimizing effects and recovering areas that have incurred detrimental disturbance (FW-DC-SOIL-01, 02, 03). The desired conditions, standards, and guidelines for soils will benefit bull trout by reducing negative effects resulting from sediment delivery to designated critical habitat. The plan components that provide direction for decommissioning temporary roads (FW-STD-SOIL 3 and 4) will provide improved conditions over the existing Forest Plan since temporary roads were not addressed.

Restoring soil productivity on previously impacted areas is a forest-wide objective (FW-OBJ-SOIL-01), and existing sediment issues would therefore continue to improve under the proposed action. Project-level design criteria contain direction to protect soils during vegetation treatments such as timber harvest and prescribed fire (FW-GDL-SOIL-01, 02, 03, 04). Further, soil productivity would be maintained or improved under the Revised Forest Plan. FW-GDL-RMZ-13 minimizes effects to RMZs by limiting ground-based logging equipment, skid trails, landings, and roads. As restoration activities trend vegetation towards desired conditions and road segments are improved to reduce likelihood of culvert failures (FW-GDL-CWN-01), watershed health is expected to improve. FW-DC-WTR-04 and 06 emphasize the protection of water quality and habitat during all management activities, and improved water quality will ultimately benefit bull trout.

Fuels Management

General Effects of Fuels Managment

Fuels management typically consists of wildfire suppression and prescribed fire associated with multiple resource objectives. Resource objectives associated with fire are typically driven by desired conditions for on-site vegetation.

Suppression of natural fire regimes has resulted in forests with more trees and associated leaf area. This results in higher evapotranspiration and interception levels, which decreases water volumes available for surface and sub-surface flow. Lower levels of instream flow can affect the aquatic species as a result of warmer water temperatures and changes in water chemistry. In addition, fire suppression can allow fuels to accumulate above natural levels, which results in wildfires that burn more severely. High intensity fire can change infiltration characteristics of the soil and change hydrologic characteristics in watersheds when they occur over large areas (Doerr et al. 2000, Cannon et al. 2010). Fire suppression tactics, such as retardant use and drafting water from streams also affect riparian and aquatic resources. Conversely, use of wildland fire for multiple objectives and prescribed fire can affect flow regimes by reducing evapotranspiration, interception, and snow accumulation patterns, and by increasing soil moisture and surface runoff.

The severity of fires along streambanks and shorelines can vary. Moderate to light severity fires generally have little influence on riparian vegetation and ground litter removal, and subsequent surface erosion. Severe fires may remove virtually all riparian vegetation and ground cover, and result in soil erosion and sedimentation to nearby water bodies and loss of important transitional habitats for aquatic dependent species (Zwolinski 2000).

Prescribed fire is commonly used on the forest to prepare sites for planting, improve wildlife forage, and reduce fuels for future fire suppression. Types of treatment are typically defined by their timing which is late spring just before green up or in the fall when the risk of wildfire is greatly reduced.

Spring burns typically are used to improve wildlife forage. They protect soils and retain some duff layer component due to the high soil moisture present in spring (Robichaud and Miller 1999). Fall burns typically expose about 20-30% mineral soil and are more typically associated with site preparation for replanting areas harvested for timber (USFS 2017). In both cases sediment production from the burned areas would be minimal. Some burn units may have fireline constructed which exposes bare soil. Standard erosion control practices or BMP's would be applied to minimize sediment production. Rare instances of storm-event erosion, channeling of water down soil depressions, or minor road surface erosion from equipment use may result in minor additional fine sediment loads in streams proximate to operations. The magnitude of the expected sediment change is small, and the minor additional load that may result from prescribed fire treatments typically results in immeasurable and discountable effects to bull trout and designated critical habitat.

Effects of the Fuels Management Specific to the Proposed Action

The proposed action would limit the impact of fire suppression activities on sensitive areas and RMZs. The Revised Forest Plan will carry forward forest plan components that will locate fire camps away from riparian areas where risk of sedimentation and degradation to water quality is highest (FW-GDL-RMZ-03). The Revised Plan will also include a guideline with stronger language to avoid degrading water quality from suppression activities by minimizing suppression activities in RMZs (FW-GDL-RMZ-05). Specifically, this will include specific direction to avoid fuel storage in RMZs that could contaminate streams (FW-GDL-RMZ-04).

Impacts to bull trout may still occur in certain circumstances when there are no other suitable locations for incident bases, camps, helibases, staging areas, etc. Delivery of chemical retardant, foam, and other additives near or on surface waters may occur when there is imminent threat to human safety and structures or when a fire may escape, causing more degradation to RMZs than would be caused by the addition of chemical, foam, or additive delivery to surface waters in RMZs.

Other fire suppression effects to water quality may occur during fire retardant drops. Large quantities of retardant can kill fish, and even indirectly applied fire retardant can kill stream invertebrates and cause eutrophication of downstream reaches (Spence et al. 1996). The Revised Forest Plan would improve direction for fire retardant drops. Rather than relying solely on resource advisors to avoid risks, areas of high risk would be mapped to improve the communication of where aerial operations need to avoid dropping fire retardant (FW-GDL-RMZ-02). Avoidance areas have been mapped in response to the Biological Opinion on Effects to Listed Species from U.S. Forest Service Aerial Application of Fire Retardants on National Forest System Lands (USFWS, 2011a). Potential meltwater stonefly habitat, defined as areas in proximity to ice masses, have been mapped and have been added to the retardant avoidance maps.

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Effects of wildfire on stream runoff, sedimentation, and nutrients are largely beyond the scope of forest planning because it is not possible to predict when and where wildfires will burn, and because wildfires are natural disturbance events. However, monitoring of these effects has shown mostly temporary, transient effects of wildfire on water quality. Monitoring by MFWP of percent fines in the North Fork Flathead River drainage in Trail, Whale, Coal and Big Creeks following the Moose Fire (2001) and the Robert Wedge Fire (2003) showed only small increases in sediment in the year following each fire, with a return to base levels within several years.

Access Management - Roads

General Effects of Roads

Road networks have been shown to have detrimental effects on water and aquatic resources in forested landscapes. Road systems can change a natural hydrologic regime by altering natural flow patterns and increasing sediment delivery to streams. Roads have been shown to destabilize side-casted material and hillsides, expand the lengths of gullies and stream channels, increase sediment delivery, and alter streamflow and channel adjustments (Furniss et al. 1991).

The presence of roads can also affect natural drainage patterns over the long-term. Roads intercept subsurface drainage in cutslopes, capture rainfall on hardened road surfaces, and route excess runoff into the stream channel system. These impacts increase as the road system becomes more connected, in terms of hydrology, to the natural channel network. Where a dense road network is well connected to the stream network, it can be an "extension" of the actual stream network and alter streamflow regimes. These alterations can increase the delivery of water to the mouth of a watershed during snow melts and storm events, which can increase peak flows in streams and water levels in ponds, lakes, and wetlands.

Sediment from the road system can be delivered to streams by direct erosion of cut and fill slopes associated with stream crossings or by surface runoff from roads and ditches that carries sediment-laden water directly or indirectly to streams (Al-Chokhachy et al. 2010, 2016). In general, roads lacking surface rock, those with steep grades and steep side slopes, and those that cross streams or are in proximity to streams are the greatest contributors of sediment from surface erosion. In steep terrain, roads can increase the rate of fill slope failures and soil mass wasting. Excessive fine sediment loading can lead to changes in channel morphology and water temperature because of pool filling, widening of the channel, and making the channel shallower, which can result in water temperature increases as a result of having a shortened water column that takes less solar energy to heat. Such changes in channel morphology are typically found at road-stream crossing locations and in response to mass failures associated with road runoff. Sometimes roads capture flow out of the channel and result in the stream rerouting down the road, which typically results in road failure and more sediment delivery to streams.

Vehicle traffic also contributes to sediment delivery from roads, particularly if ruts develop in the road and if traffic is heavy when the ground is more saturated. Log haul during timber sales is typically done on the same road system for weeks or months at a time, and thus the quantity and repeated nature of this traffic make it a systematic, recognizable source of sediment on forest roads (Al-Chokhachy et al. 2016, Cissel et al. 2014).

The location and design of valley bottom roads can also lead to long-term effects on aquatic resources. Poorly placed roads can encroach on stream channel and floodplain areas. Many historic roads were constructed very close to stream channel areas, often in the floodplain. In some cases, streams were straightened to accommodate road placement. Roads can affect stream channels directly if they are located on active floodplains or directly adjacent to stream channels. For example, a road located adjacent to a stream can be a chronic source of sediment. If the road changes the morphological characteristics of the stream, a chain reaction of channel adjustments that can result in accelerated bed and streambank erosion, which produces excessive sediment (Al-Chokhachy et al. 2016).

Not all sediment production from roadways reaches the aquatic system. Many of the aforementioned effects of roads can be mitigated by design changes that disperse rather than concentrate road runoff. Properly designed and maintained road treatments can decrease runoff and sediment loading to streams. Proper design provides stable cut and fill slopes, and adequate drainage that allows water to filter through vegetated strips or sediment traps before entering the stream channel. The effectiveness of vegetative strips generally increases with increased width and lower hillslope gradient, but the effects of chronic road problems may still impact streams even when streams are protected by wide and intact vegetative strips (Trombulak and Frissell 2000). Other design elements used to mitigate road interception and runoff are the addition of gravel surfacing and seasonal road closures. Road treatments can upgrade or remove problem culverts to allow sediment and wood to move downstream instead of accumulating upstream of roads, potentially leading to culvert blockages and failures. However, temporary, short-term, and long-term sediment and turbidity increases can occur from project implementation as well as from post-project stabilization.

Turbidity and sediment increases can also result from the construction of roads. This increase is typically due to the heavy equipment required for road grading, ditch cleaning, culvert replacement, road ripping/decompaction, and the installation of water bars. Minor amounts of fine sediment can be delivered to streams during implementation of road treatment activities and during the first substantial runoff event. Subsequent runoff events would contribute less sediment production over time, but these contributions can be expected to last up to one year later or until vegetation is established on bare-soil areas adjacent to streams. Design criteria and best management practices are used to minimize the amount of fine sediment entering stream channels while work is in progress and after the work is completed, including promoting vegetation establishment through seeding.

Roads that are at high risk of failure and have the potential to cause extensive resource damage are candidates for relocation or decommission. Preferred locations for roads are away from stream channels, riparian areas, steep slopes, high-erosion-hazard areas, and areas of high mass movement. Realignment of roads so they traverse riparian areas and streams at perpendicular angles rather than parallel angles can also improve the quality of riparian and aquatic habitats in presently impacted stream reaches by reducing chronic sediment sources.

The potential for roads to have detrimental effects on aquatic resources exists as long as the road is retained. Continued use of roadway segments poses a risk of erosion, slope failure, and sediment delivery to receiving waters. Road decommissioning reduces the long-term risk of

sediment delivery to streams from roads and roadside ditches through reducing culvert failures and landslides, eliminating vehicular traffic, improving infiltration of water into the ground through decompaction of road surfaces, and reducing overland and ditch flow into streams. Although a short-term increase in sediment delivery is typically expected during culvert removal and/or the road decommissioning process, the amount of sediment delivered in the long-term is usually expected to be significantly less than would occur if the roads were left under current maintenance. Cook and Dresser (2007) found that stream crossings that were restored through decommissioning delivered only 3 to 5 percent of the amount of fill material that was originally located at each crossing.

Removal or closure of roads adjacent to streams can have short- and long-term positive effects on soil hydrologic function, soil productivity, and stream water temperature. Trees and other riparian vegetation can recolonize a ripped roadbed and help provide shade. The magnitude of these improvements can depend on a variety of factors, including existing stream shade that blocks solar radiation and water temperature, stream size, and how much riparian road is removed or closed.

Effects of Roads Specific to the Proposed Action

The Revised Forest Plan does not include any objectives specifically for road construction as it relates to soil and aquatic resource protection or restoration. However, the plan does include an objective for 30 to 60 miles of road decommissioning or the placing of roads into intermittent storage (FW-OBJ-IFS- 01). These efforts are likely to occur on lands designated as management area 6, where active restoration opportunities present themselves through the implementation of site-specific projects. With the implementation of Revised Forest Plan direction, overall watershed conditions would improve with the reduction in road densities.

Current management activities to improve water quality and aquatic habitats have included a reduction in the number of stream crossings or rehabilitation of their condition. This emphasis on improving or removing stream crossings for the benefit of bull trout and other native fish would continue with implementation of the revised Forest Plan through standards, guidelines and objectives (FW-STD-IFS-7, FW-GDL-IFS- 3-11, 14, and 15. Revised Forest Plan objectives FW-OBJ-WTR-02 and 03 help to remove or mitigate risk factors associated with roads and to improve watersheds and water quality.

There are several guidelines (FW-GDL-4, 5, 6, and 11) that address roads that may be behind gates or berms, and provides direction that they should be treated to assure that they are hydrologically disconnected from the stream network and in a stable condition. The FNF has developed a culvert monitoring plan that will be implemented as part of the Revised Forest Plan as a monitoring requirement (USFS 2017). The monitoring plan develops a rotating panel of culverts on the FNF in an effort to survey the condition of existing culverts, and correct problems that may be identified. The comprehensive culvert monitoring plan can be found in Appendix D of the BA (USFS 2017).

Bull trout would benefit by the direction for the conservation watershed network, which has a desired condition to provide for cold water refugia in the face of climate change (FW-DC-CWN-1), and the objectives (FW-OBJ-CWN-01 and 02) will proactively stormproof open roads to

reduce the risk of culvert failures that might occur with increasing fall rain events, as well as not allowing a net increase of road network in these watersheds.

The Revised Forest Plan also contains an objective to decommission, or place into storage, between 30 and 60 miles of roads over the life of the plan (anticipated to be 15 year). When implemented with required design criteria, these activities are expected to have a beneficial effect on bull trout or their habitat. However, there will be times when these projects have adverse short-term effects on bull trout or their habitat.

Impacts stemming from road decommissioning may include increased sediment production at the points of soil disturbance, such as berm construction sites and along the road prisms where recontouring takes place. When the road surface becomes vegetated, the potential for sediment delivery is reduced. Road closure is often accomplished by blocking access to the road or road segment with a gate or earth berm. Culverts that remain in the road behind gates and berms that are not properly sized, positioned, and inspected will be considered for removal through implementation of the culvert monitoring plan.

Though hydrologic function of the hillslope is not restored when roads are closed or stored (versus decommissioned), a reduction or elimination of road use can result in a reduction in sediment generation and delivery, even if the road prism remains (Reid and Dunne 1984). Reduced road use by wheeled vehicles fosters vegetation of the road surface, ameliorating rainfall impacts and reducing erosion (Burroughs and King 1989). When decommissioning incudes recontouring and obliteration the road fill would be excavated and placing it in the road cut. The fill would be blended with the cut slope to re-establish the preconstruction or similar hillslope. All culverts and most other water handling devices are removed from the road prism. This type of road closure offers the greatest long-term benefit by reducing sediment delivery, reducing the risk of culvert failure, and the need for maintenance.

One of the principal concerns associated with road closures is the amount of exposed soil that is created as a result of road ripping, the removing of fill from culvert and bridge locations and the post obliteration slope. Roads that are obliterated that will likely adversely affect bull trout are typically those within close proximity to a stream channel. Exposed, unconsolidated soil near a stream channel has the potential to enter the stream through sheet, rill or localized channeled flow. While these activities may adversely affect bull trout or critical habitat in the short term, we anticipate that these activities will likely be beneficial to bull trout population in in the long-term.

Proposed forestwide direction would lead toward further improvement regarding the effects of roads on bull trout and designated critical habitat.

Livestock Grazing

General Effects of Livestock Grazing

Livestock grazing near streams can result in changes in channel morphology (Belsky et al. 1999). Livestock trailing, chiseling, and general soil displacement along stream bank areas can result in collapse of undercut bank areas and an overall increase in bank angle, loss of bank cover, and

stream widening along the entire stream reach, resulting in a change in channel type. Livestock trampling and hoof chiseling along streambanks can increase ground exposure, surface erosion, and increased sedimentation (Doumitt and Laye 2010). Concentrated livestock waste can cause eutrophication of lakes and ponds. Livestock grazing directly in wetlands or immediately adjacent to them can cause soil compaction, hummocking, and loss of vegetation, ultimately inhibiting sub-surface water flow.

Loss of riparian vegetation can influence the amount of solar radiation reaching a water body and increase water temperatures (Doumitt and Laye 2010). Greater temperature fluctuations (diurnal and seasonal) can also occur when riparian vegetation is removed or decreased. In addition, removal of riparian vegetation can increase nitrate levels which can increase the biological production in water. Livestock grazing has the potential to cause increased sediment delivery through trampling of stream banks and by removal of riparian vegetation.

Effects of Livestock Grazing Specific to the Proposed Action

Although livestock grazing is a minor component of management on the Forest, there may be localized effects of current and past management activities. Livestock numbers have decreased since the 1986 forest plan, as amended. Currently, there is one allotment in Piper Creek that has five cow-calf pairs that would be considered to be within a watershed that supports bull trout. The Holland Lake allotment is near the confluence with Swan River, and the outlet of Holland Lake is considered too warm to support bull trout.

The proposed action will include forest-wide standards and guidelines would protect and minimize the effects of grazing on aquatic resources. Three guidelines specific to grazing (FW-GDL-GR-03, 04, and 05) would help to reduce impacts on water quality. These guidelines would reduce bank trampling and minimize livestock operations within RMZs. Reducing the length and timing of the grazing season in RMZs allows for more growth of grasses and forbs that capture overland flow, prevent rills from forming, and prevent erosion from delivering sediment to water bodies, thereby lowering turbidity and fine sediment deposition in the waterbody. It would also reduce potential bacteria such as E. coli, which has been shown to affect nutrients.

Watershed conservation practices and updated grazing standards and guidelines designed to protect water quality and riparian areas would be included in allotment-management plans as they are revised and updated.

Recreation

General Effects of Recreation

Permanent development and campground facilities in riparian areas can result in sediment increases to nearby streams, loss of stream bank vegetation, and reduced water infiltration. Associated human activities, such as off-highway vehicle use on trails and stream bank trampling, can also decrease ground cover and increased soil disturbances. Direct effects to channel morphology include the loss of pool volumes, habitat complexity, and decrease in the size of stream channel substrate. Recreational use, primarily from ATVs, can cause soil compaction and loss of vegetation in wetlands and/or directly adjacent to them. This can reduce

sub-surface water flow and increase surface runoff. Increases in surface runoff may contribute sediment to streams and associated aquatic habitats, depending on the proximity or connectedness to the hydrologic network. Facilities can be similar to roads in terms of potential effects. Facilities can permanently affect wetlands by interrupting natural flow paths and reducing vegetation.

Motorized recreation is a growing concern as use increases and off-road vehicle technology improves. Off-highway vehicles are becoming more powerful, have better suspension, and better traction than ever before. With the advent of improved technology, visitors will be able to access areas previously inaccessible to off-highway vehicles, which may contribute cumulatively to effects on soils and aquatic resources. Off-road vehicle use is anticipated to increase even more into the future, as populations increase. Along with this increased use there may an associated increase in effects to soil and aquatic resources.

Non-motorized and motorized watercraft use can "disturb" or "stress" adult and juvenile fish. Typical activities associated with non-motorized use include floating, wading, and swimming in areas where fish are holding, rearing, or spawning. Studies conducted on the Rogue River in Oregon have shown that juvenile salmon and steelhead that were passed by non-motorized watercraft exhibited both behavioral and physiological signs of stress (Satterthwaite 1995). The energy expended by juvenile salmonids reacting to passing watercraft may result in a reduction in energy available for growth and development. A decrease in available energy stores may also reduce their effectiveness in competing for food, defending territories, or spawning.

Effects of Recreation Specific to the Proposed Action

A guideline to mitigate the effects from recreation facilities located within RMZs, FW-GDL-REC-06, would ensure new facilities or infrastructure are located to minimize impacts on water and riparian resources. Appendix C of the Revised Forest Plan (USFS 2016) includes strategies to address impacts from existing recreation facilities located in RMZs, including impacts on water quality in fish-bearing waters.

However, it is assumed that minor, localized impacts to riparian vegetation, woody debris, and water quality would still occur where recreation use and activities are allowed. Existing recreational facilities and actions within or affecting RMZs may need to be modified, discontinued, or relocated if they are identified as not fully meeting functional aquatic/riparian conditions and processes or improving conditions and processes. Modifying or relocating facilities may cause temporary affects to streams and riparian areas. Where facilities cannot be located outside of RMZs, effects would be minimized to the greatest extent possible but not completely eliminated.

Current management and future trends in recreation management are likely to include continued efforts to relocate trails and dispersed and developed recreational sites away from streams and riparian areas in order to protect and improve water quality and aquatic habitats.

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Mining/Minerals Development

General Effects of Mining/Minerals Development

Mining activities can reduce surface water flow, increase sedimentation, decrease pH, and leach heavy metals into surface waters supporting bull trout. Placer mining in stream channels causes direct increased sediment, affects aquatic insect communities, and disturbs channel substrate. Instream dredges can cause bank erosion, channel instability, and loss of riparian vegetation.

Leasable mineral development includes oil and natural gas extraction from underneath NFS lands. Salable minerals development includes extraction of common varieties of sand, stone, gravel, and decorative rocks. The USFS salable mineral material policy states that disposal of mineral material will occur only when the authorized officer determines that the disposal is not detrimental to the public interest and the benefits to be derived from proposed disposal will exceed the total cost and impacts of resource disturbance. The USFS uses materials such as gravel, riprap, and crushed aggregate for maintenance and new construction of roads, recreation sites and repair of damage caused by fire, floods, and landslides. These materials can come from pits and quarries located on NFS lands. The type, volume, and source location of in-service mineral material varies year by year and according to need. Free-use permits can be issued to any state, federal, or territorial agency, unit, or subdivision. As an example, the Glacier View Ranger District has issued crushed stone to Flathead County for maintenance and improvement of the North Fork Road. Free-use permits can also be issued to the general public. An individual may obtain a free-use permit to collect rock, as long as it is not for commercial use, sale, or barter. Only hand tools can be used to collect the rock; no digging is permitted, and only the collection of loose rock is authorized.

Effects of Mining/Minerals Development Specific to the Proposed Action

There are no existing mining operations on the Forest. Recreational mining, such as suction dredging, may occur, although the FNF has not received requests for special-use permits for recreational mining. Suction dredging is regulated by federal and state mining laws and regulations. The Montana Department of Environmental Quality has closed many of the FNF's bull trout and westslope cutthroat streams to suction dredging, and therefore impacts from mining will not be seen in those streams. Large increases in mining activity are not anticipated for the future but cannot be ruled out. The 1872 Mining Law limits Forest Service authority over mining activities but allows the setting of terms and conditions to minimize impacts to NFS lands. The Revised Forest Plan would require remedial action and protection of soil and water resources if permits are approved.

The North Fork Watershed Protection Act of 2013 (H.R. 2259) withdrew federal lands (430,000 acres) within the North Fork and Middle Fork of the Flathead River watershed from all forms of location, entry, and patent under mining laws and from disposition under all laws related to mineral or geothermal leasing. There are no active salable mineral leases on the FNF. Generally, gravel pits are situated away from riparian areas and tend not to affect watersheds or riparian areas. There would be no effects on fish, watersheds, or riparian areas from any of the alternatives from free-use permits to the general public. Any future special use permits that would allow mining on the FNF would be subject to project-specific analysis, including ESA section 7 consultation if appropriate.

FS-108056

Watershed Improvement

General Effects of Watershed Improvement

Restoring stream and riparian function would increase depth, complexity and shading within the affected streams providing for cooler water temperatures, reduced evaporation, and potentially more stable flows through the summer low flow period. Similar benefits would occur during winter low flows. Intact riparian communities provide an insulatory benefit that prevents streams from freezing during extreme cold. Deeper water also provides better rearing habitat as it is also less likely to freeze completely. Increasing the frequency of large woody debris (LWD) not only can increase instream complexity but also serves as a long-term nutrient supply. Increasing LWD generally also increases available habitat which in turn provides increased carrying capacity.

Culvert removal and replacements are one of the most common and effective improvements available for implementation. Restoring connectivity by removing culverts would prevent them from plugging and the associated fill slope failures from occurring, reducing the risk of large increases in stream channel sediment. A short-term increase in sediment can be expected with culvert removal, especially at live stream crossings. The amount of sediment input as a result of removals can be minimized by dewatering the disturbed area while the culverts are removed. Unnatural channel width, slope, and streambed form often occur upstream and downstream of stream crossings (Lee et al. 1997). The channel often times is reconstructed to minimize the adjustment process and resulting sedimentation following culvert removal. Large rocky substrate and woody debris would be used to armor the new channel. Additionally, mulch and seeding disturbed areas would also minimize sediment input.

Typically the effects to bull trout and their habitat are site specific and negligible. Minimization measures such as timing restrictions and BMP implementation are beneficial in reducing sediment entering the waterway and other potential effects to bull trout. Associated sediment transport is also very limited. The long-term benefits of reducing water routing and sediment input and restoring fish passage will outweigh the short-term effects of roadwork. Aquatic habitat elements to benefit in the long term include: connectivity, embeddedness, increased pool depth, decreased width to depth ratio, improved stream bank condition, restored drainage network, reduced road density and improved road location.

Effects of Watershed Improvement Specific to the Proposed Action

The proposed forest-wide objectives, standards, and guidelines described previously would protect bull trout and their habitats when implementing land management activities. Watershed, soil, riparian, and aquatic habitat conditions under the proposed action, in general, are expected to improve as a reflection of the current trend in reductions of timber harvest activities and associated ground disturbance as well as proposed conservation and habitat protection direction in the Revised Forest Plan. For example, forest-wide directions are designed to improve overall watershed condition (FW-OBJ-WTR-01 thru 04); protect soil conditions and soil quality; and restore riparian and aquatic habitats (FW-STD-SOIL-01 through 04, and FW-STD-RMZ-01 thru 06). Additionally, FW-DC-P&C-15 emphasizes cooperation and coordination to help recover bull trout.

Impacts to bull trout will be analyzed and consulted on individually during project-level implementation site-specific management activities such as travel management proposals, timber sales, and recreational site improvements.

Aquatic Conservation Strategy

The Inland Native Fish Strategy (INFISH) (USFS 1995), which is the existing aquatic conservation strategy for the FNF, was designed to provide protection for native fish. Although it allowed for restoration, INFISH primarily provided direction for protection and passive restoration measures. With the INFISH amendment in 1995, the FNF Forest Plan direction reduced the risk to watersheds, soils, and riparian and aquatic resources from new and ongoing activities primarily with standards and guidelines that influenced management within Riparian Habitat Conservation Areas (USFS 1995a). For some resources, standards and guidelines in the 1986 forest plan contained general direction for repairing past damage, although INFISH direction was lacking for other resources such as timber harvest. During implementation of the 1986 Forest Plan (as amended in 1995), the intensity and risks associated with new and ongoing land management activities have been greatly reduced compared to the decades prior.

In an effort to improve upon INFISH direction that is over 20 years old, the USFS is moving toward an Aquatic Riparian Conservation Strategy (ARCS) that will provide similar land management direction, but is based on more updated scientific information. The Revised Forest Plan will include similar ARCS guidance and adds an active restoration component through desired conditions, objectives, guidelines, and standards that would supplement the retained passive components of INFISH. The Revised Forest Plan would also help move projects and activities towards the desired conditions and improve aquatic habitats. Table II-8 provides a conceptual crosswalk between INFISH and comparable components in the Revised Forest Plan.

Table II-8. Crosswalk of Plan Components under INFISH to ARCS (adopted from USFS 2017).

1995 INFISH Component	Comparable INFISH component/strategy In 2017 Flathead Plan	Differences between 1995 INFISH and 2017 Flathead Plan	Rationale for Changes
Riparian goals	Component: Instead uses a required plan component (i.e., Desired Conditions)	More description listed in plan revision for desired conditions, focused on ecological conditions that sustain riparian and aquatic habitat	Goals are optional components in 2012 Rule that according to rule are "other than desired conditions, usually related to process or interaction with the public."
Riparian management objectives (RMOs)	Not carried forward as written in 1995 as BASI no longer supports a site by site approach without placing in context with conditions and drivers beyond the stream reach.	Flathead draft plan relies on desired conditions, which focus on retaining process function, in combination with PIBO monitoring data and analysis, which compares populations of managed conditions against populations of unmanaged conditions	BASI since 1995 has moved away from the expectation that numerical values found in high value habitat should occur everywhere at the same time: also, objectives in 2012 planning rule require a completion date, which would be difficult to predict for riparian instream conditions.
Riparian habitat	Component carried forward with Name change Riparian	Some adjustments to widths for wetlands	Changes made between proposed action and DEIS to

1995 INFISH Component	Comparable INFISH component/strategy In 2017 Flathead Plan	Differences between 1995 INFISH and 2017 Flathead Plan	Rationale for Changes
conservation areas (RHCAs)	Management Zone, to be consistent with Planning Rule	(Increase), otherwise draft plan components do require minimum widths same as 1995 Infish.	clarify intent and insure necessary protection continues under new plan.
Standards and guidelines (for activities in or affecting RHCAs)	Component carried forward with few exceptions; now distinguish between standard and guide	No longer just Standard and Guide, split into either Standard or a Guide. Also Some text changes in individual standards and guidelines	Concept was retained for S &G's but language was sometimes changed to ensure a standard or guideline was achievable, and/or to clarify intent. Split also aligns with 2012 Planning Rule.
Priority watersheds	Component-other required content Carried forward in 2 way: 1. priority watersheds as other plan content identified for WCF as required by 2012 rule; and objective for storm-proofing objective development of a Conservation Watershed Network (similar to 1990 priority list contained in Amendment #3).	2 watersheds under this revision will be identified as priorities for restoration activities on Forest to be compatible with 2012 rule. Objective for Conservation Watershed Network prioritizes the most important watersheds to treat for stormproofing during the span of the new plan	WCF recognizes the agency moving towards attaining desired outcomes from project, versus the standard outputs typically associated with target accomplishment.
Watershed analysis	Not carried forward as described in 1995 INFISH. Instead, Multi-Scale Analysis is included as a strategy in appendix C of the revised forest plan, consistent with ICEBMP 2014 Framework	Multi-scale analysis strategy provides guidance on integration commensurate with issues being addressed.	Watershed analysis as originally practiced became cumbersome and struggled to integrate resources. Existing data and analysis tools much greater than 1995, multi scale sharpens focus on the need to integrate information commensurate with issues
Watershed restoration	Component Carried forward in 2 way: 1. priority watersheds as other plan content identified for WCF as required by 2012 rule; and objective for storm-proofing objective development of a Conservation Watershed Network (similar to 1990 priority list contained in Amendment #3).	Often WCF identified priorities will focus on immediate watersheds needing focused attention. While they may not be the highest priorities for fish, the Conservation Watershed Network Objective does identify the most important watersheds for fish conservation.	WCF recognizes the agency moving towards attaining desired outcomes from project, versus the standard outputs typically associated with target accomplishment. Watersheds prioritized for stormproofing under Conservation Watershed Network objective are priorities for stormproofing to help watersheds be more resilient to climate change.
Monitoring	Other Plan material- ultimately, BLM and USDA Forest Service adopted PIBO monitoring Strategy	PIBO monitoring Strategy carried forward and strengthened development of data analysis tools.	

Summary

Nearly all activities allowed within the different management area categories in the Revised Forest Plan have the potential to affect bull trout and their habitats in a beneficial or negative manner. Land management activities that disturb the soil surface or require added use of already disturbed features such as road prisms have the greatest potential and risk of adverse effects. Activities that have the greatest potential to disturb soils and indirectly affect bull trout and designated critical habitat include vegetation management, fuels management, livestock grazing, roads, watershed restoration, and recreation. The effects on bull trout from land management activities are typically indirect, meaning it is difficult to predict exactly what would happen to bull trout habitat and populations as a result of implementation.

2. Analysis for Effects of Bull Trout

In addition to forest-wide direction discussed above, the potential indirect effects to bull trout stemming from the proposed action depend largely on the management area designation for a given area. Analysis of management area designation and the anticipated effects to bull trout are discussed for each core area below:

Flathead Lake Core Area

The majority of the Flathead Lake Core Area (64 percent) on the FNF is allocated to management areas 1a and 1b (62 percent), or 2 (2 percent) (Tables II-9 and II-10). Management area 1a is a wilderness designation, and management area 1b is recommended wilderness and has the greatest restriction on all uses. Management area 2 is a wild and scenic river designation that also limits Forest activities. An additional 16 percent of the Flathead Lake Core Area is allocated to management area 5 with is designated as backcounty (Table II-9). A wide range of uses are allowed in management area 5; however, these lands are anticipated to be relatively large areas, without roads, that would provide a variety of motorized and non-motorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would mostly be temporary. The allocation of 80 percent of the Flathead Lake Core Area to management areas 1, 2, and 5 would limit the likelihood of adverse effects on bull trout and bull trout critical habitat in these areas.

Approximately 19 percent of FNF lands within the Flathead Lake Core Area are designated as management area 6 (Table II-9). NFS lands designated management area 6 across this core area will be affected by scheduled timber harvest, recreation, prescribed fire, and access management. These land management strategies may result in increased sediment, substrate embeddedness, and other direct or indirect effects from project-level activities.

In Big, Coal, and Red Meadow Creeks, the majority of acres are allocated to management areas 5 and 6. As described above, effects on bull trout would be reduced with a management area 5 allocation, but may occur in association with recreational trail improvements and access. The next highest allocation is management area 6b in these watersheds where moderate intensity timber harvest and general forest activities would occur. Effects would be greater than in management area 5 primarily due to road management activities, but effects to bull trout from management activities would be minimized through implementation of RMZ standards and

guidelines, as well as standards that require the FNF to maintain baseline conditions for road densities within the NCDE primary conservation area for grizzly bears (see grizzly bear chapter of this document for details). Restoration such as storm-proofing roads in these watersheds may result in additional short-term adverse effects related to sedimentation or in-stream activities. However, these actions are anticipated to result in long improvements in conditions for bull trout.

The Frozen Lake, Trail Creek and Whale Creek watersheds have the majority of their acres in management area 1b (recommended wilderness). This is expected to be beneficial to bull trout since these areas are located within the headwaters of these local populations. Management areas 6a and 6b are designated lower within the watersheds and primarily below bull trout spawning. This reduces the likelihood of sediment generated from management activities to affect bull trout spawning habitat, as well as egg/larval survival. Further, Trail and Whale Creeks are prioritized for upgraded culverts and reducing road-related effects as part of the Conservation Watershed Network. These upgrades may have short-term effects that will result in long-term benefits by storm-proofing these watersheds in the face of climate change. Trail and Whale Creeks would also receive additional protection due to being recommended as Wild and Scenic Rivers. This designation provides additional riparian and stream protections to these local populations by establishing a ¼-mile corridor along each side of the stream where management will be limited.

Bear, Morrison, and Granite Creeks are in a mix of management areas 1a, 1b, 5, 6a and 6b. The largest allocation is in management areas 1a and 1b, with a range of 43-94 percent, and management area 6 is 24 percent in both Bear and Granite Creeks (Table II-9). Soils in this area are erosive when compared to other areas on the FNF and, unlike other bull trout watersheds in the Middle Fork Flathead River, the headwaters are outside of designated wilderness. Revised Forest Plan components to implement BMPs and avoid areas with mass failure potential will minimize sediment in the headwaters. Morrison and Granite Creeks both have middle reaches inside wilderness, which provides a high degree of protection. Bear Creek parallels Highway 2 and the BNSF railroad. Coordination with the Montana Department of Transportation and BNSF will continue to ensure that maintenance operations are conducted on FNF lands through special-use permits that would have requirements to reduce sediment into Bear Creek.

The other bull trout watersheds within the Middle Fork of the Flathead River in the Flathead Lake Core Area are within wilderness and receive a high degree of protection. However, potential impacts to bull trout can still occur from outfitter and guide operations. The FNF and the Service went through formal section 7 consultation on the issuance of the permits that allows these operations to take place (USFWS 2015h). The subsequent BO issued to the FNF contained a variety of terms and conditions from previous consultations to provide measures in special-use permits to reduce impacts to bull trout.

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Table II-9. Flathead Lake Core Area - acres and percentages of bull trout-occupied drainages in the action area by management area (MA).

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the FLCA
Trail Creek	32,693 (77)	4,443 (11)	0	0	84 (< 1)	4,977 (12)	0	42,197
Whale Creek	24,142 (63)	4,247 (11)	0	0	1,168 (3)	8,659 (23)	0	38,216
Red Meadow Creek	2,716 (15)	18 (< 1)	0	0	5,076 (28)	10,556 (57)	0	18,366
Coal Creek	0	0	0	0	24,592 (61)	15,785 (39)	0	40,626
Big Creek	0	0	0	0	19,666 (38)	29,578 (57)	2,807 (4)	52,051
Bear Creek	12,253 (52)	47 (< 1)	0	0	5,467 (23)	5,735 (24)	0	23,455
Granite Creek	7,918 (43)	44 (< 1)	0	0	5,978 (33)	4,399 (24)	0	18,295
Morrison Creek	30,235 (94)	75 (< 1)	0	0	465 (1)	1,522 (5)	0	32,297
Strawberry Creek	17,303 (100)	0	0	0	0	0	0	17,303
Bowl Creek	18,428 (100)	0	0	0	0	0	0	18,428
Clack Creek	37,595 (100)	0	0	0	0	0	0	37,595
Schafer Creek	16,136 (100)	0	0	0	0	0	0	16,136
Dolly Varden Creek	16,465 (100)	0	0	0	0	0	0	16,465
Long Creek	14,078 (100)	0	0	0	0	0	0	14,078
Basin	11,720 (100)	0	0	0	0	0	0	11,720
Trail (Middle Fork)	12,495 (100)	0	0	0	0	0	0	12,495
Frozen Lake	5,922 (69)	0	0	0	2,654 (31)	0	0	8,576

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Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the FLCA
Total acres (%) in core area	260,099 (62)	8,874 (2)	0	0	65,150 (16)	81,211 (19)	0	418,299

Table II-10. Simple Core Areas within the Flathead Lake Core Area - acres and percentages of bull trout-occupied drainages in the Stillwater and Whitefish drainages by management area (MA).

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5 a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the FLCA
Upper Stillwater Lake	0	0	0	0	1759 (100)	0	0	1759
Upper Whitefish Lake	0	0	0	0	3866 (79)	1054 (21)	0	4920
Whitefish Lake	0	0	0	0	541 (14)	3278 (86)	0	3819

Hungry Horse Reservoir Core Area

NFS lands designated management area 6 (15 percent) occur mainly along Hungry Horse Reservoir and its tributaries (Table II-11). Activities in these areas may include scheduled timber harvest, recreation, prescribed fire, access management and restoration activities. These actions may result in increased sediment delivery, substrate embeddedness, and other direct or indirect effects from project-level activities. Of the local populations with management area 6 lands, the largest percentage occurs in Quintonkon Creek and Wheeler Creek (48 and 44 percent respectively). However, effects to bull trout that could result from forest management activities would be minimized through implementation of RMZ standards and guidelines. Restoration activities in these watersheds may also result in additional short-term adverse effects related to sediment or in-stream activities, but it is likely that these actions will result in long-term improvements in habitat conditions. Management areas 6a and 6b are designated lower within the watersheds and primarily below bull trout spawning habitat. This reduces the likelihood of sediment generated from management activities to affect bull trout spawning and egg/larval survival. Headwaters tend to be protected by management allocation areas that will have less forest management.

An additional 10 percent of the action area in within the Hungry Horse Reservoir Core Area is allocated to management area 5 (Table II-11). A wide range of uses are allowed in management area 5; however, management area 5 lands would generally be relatively large and free of roads, providing a variety of motorized and non-motorized recreation opportunities. Trails would be

the primary improvements constructed and maintained for recreation users, and roads would be restricted due Revised Plan standards that require road densities within the NCDE primary conservation area to be maintained at baseline conditions (see grizzly bear chapter of this document for further details).

Further, the majority (67 percent) of the Hungry Horse Reservoir Core Area is allocated to existing wilderness, management area 1a (Table II-11). Management area 1 is a wilderness designation and has the greatest restriction on all uses. The allocation of 77 percent of this core area to management areas 1 and 5 would limit the likelihood of adverse effects on bull trout in these areas.

Even though the majority of bull trout spawning occurs within the Bob Marshall Wilderness, there are known outfitter camps along bull trout spawning reaches particularly along Big Salmon, Little Salmon and Youngs Creeks, where disturbance may and does occur from stream crossings and outfitter camp activity such as getting water that may temporarily move bull trout off redds. Few adverse effects other than trail and outfitter use are anticipated for the wilderness local populations because they are allocated to management area 1 where few allowable uses would occur.

Wounded Buck Creek and Sullivan Creek have been identified as the highest priorities for storm-proofing within the Revised Forest Plan's Conservation Watershed Network. This designation would result in an overall reduction of potential culvert failure but would result in short term increases in sediment as culverts are removed or upgraded. Additionally, the Spotted Bear River would receive additional protection due to being recommended as a Wild and Scenic River under the Revised Forest Plan. This designation provides additional protection to riparian and aquatic ecosystem function by implementing a ¼-mile corridor on either side of the river that limits management activities.

Table II-11. Hungry Horse Reservoir Core Area—acres and percentages of bull trout-occupied drainages in the action area by management area (MA).

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the HHRCA
Danaher Creek	72,053 (100)	0	0	0	0	0	0	72,053
Youngs Creek	77,732 (100)	0	0	0	0	0	0	77,732
Gordon Creek[1]	42,315 (100)	0	0	0	0	0	0	42,315
White River	56,718 (100)	0	0	0	0	0	0	56,718
Little Salmon Creek	36,485 (100)	0	0	0	0	0	0	36,485

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Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the HHRCA
Big Salmon Creek[2]	49,741 (100)	0	0	0	0	0	0	49,741
Bunker Creek	20,235 (62)	15	0	0	9,754 (30)	2,841 (9)	0	32,830
Sullivan Creek	0	0	0	0	23,412 (76)	7,502 (24)	0	30,914
Quintonkon Creek	0	0	0	0	9,274 (51)	8,498 (48)	187 (1)	17,959
Wheeler Creek	1,014 (6)	0	0	0	8,965 (49)	8,021 (44)	113 (< 1)	18,113
Wounded Buck Creek	1,198 (11)	0	0	0	4,990 (44)	4,933 (34)	142 (1)	11,263
Spotted Bear River	93,047 (81)	5,273 (5)	0	0	7,912 (7)	8,194 (7)	0	114,426
Total acres (%) in core area	450,538 (67)	52,886 (8)	0	0	64,307 (10)	104,296 (15)	442 (< 1)	672,027

[1] also covers Doctor Lake
[2] also covers Big Salmon Lake

Swan Lake Core Area

The majority of the Swan Lake Core Area is allocated to management areas 1a and 1b (48 percent), and general forest management areas 6b and 6c (34 percent) (Table II-12). NFS lands designated management area 6 (34 percent) across this core area will be foreseeably affected by scheduled timber harvest, recreation, prescribed fire, and access management. Effects to bull trout from these activities are anticipated, primarily through increased sediment delivery, increased substrate embeddedness, and other direct or indirect effects from project-level activities. The local populations with the largest percentage of management area 6 lands in the Swan Lake Core Area are Jim Creek (63 percent), Cold Creek (54 percent), and Piper Creek (49 percent. It should also be noted that 51 percent of FNF lands within the Holland Creek Core Area are designated as management area 6. As discussed previously in this opinion, the Holland Creek Core Area is a simple core area that occurs wholly within the Swan Lake Core Area watershed. As such, we include discussion of the Holland Lake Core Area in the Swan Lake Core Area sections. As described above, we anticipate that adverse effects to bull trout would be reduced in this management area 6 lands through implementation of RMZ standards and guidelines. Restoration in these watersheds may result in additional short-term adverse effects related to sediment or in-stream activities. However, these activities will likely result in long-term improvements in habitat conditions.

An additional 14 percent of the action area in the Swan Lake Core Area is allocated to management area 5 (Table II-12). Lost Creek has the largest allocation of management area 5 at

76 percent, followed by Soup Creek at 56 percent. A wide range of uses are allowed in management area 5; however, management area 5 lands would generally be relatively large areas without roads, providing a variety of motorized and non-motorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would be restricted due to additional Revised Forest Plan direction implemented as part of the NCDE grizzly bear Conservation Strategy (see grizzly bear chapter of this document for further details). Management area 1 is a wilderness designation and has the greatest restriction on all uses. Approximately 48 percent of the Swan Lake Core Area is designated as management area 1. As a result, over 60 percent of the Swan Lake Core Area is either management area 1 or 5. We anticipate that this would limit the likelihood of adverse effects on bull trout in these areas given the restricted nature of activities allowed on these lands.

Streams that drain from the west along the Mission Mountains (i.e., Elk, Jim, Cold and Piper Creeks) have their headwaters protected within the Mission Mountain Wilderness. Additionally, Lion Creek's headwaters are protected within lands designated as management area 1b, recommended wilderness. Potential impacts from management activities would be less in these local populations due to the headwaters being protected by wilderness. However, impacts to Goat, Squeezer, Soup, and Woodward Creeks might be greater due to a higher percentage in general forest management areas 6b and 6c (Table II-12). Lost Creek has a large percentage of lands allocated to management area 5 (76 percent), which allows some timber harvest but is not scheduled. In addition, road construction would be largely limited within bull trout watersheds because they are in the primary conservation area for grizzly bears (see grizzly bear chapter of this document for a details description).

Goat Creek and Lion Creek are identified as the highest priorities for storm-proofing within Revised Forest Plan's Conservation Watershed Network. This designation would result in an overall reduction of potential culvert failure but would result in short-term increases in sediment as culverts are removed or upgraded. Elk Creek, Lion Creek, and the headwaters of the Swan River above Lindbergh Lake would receive additional protection due to being recommended as wild and scenic rivers. These designations would further limit the amount of activity that may impact riparian or aquatic systems by providing a ¼-mile corridor within which management activity is limited.

Table II-12. Swan Lake Core Area - acres and percentages of bull trout-occupied drainages in the action area by management area (MA).

Population / drainage name (HUC)	MA1 acres (percent)	MA2 acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5 acres (percent)	MA6 acres (percent)	MA7 acres (percent)	Total acres of drainage in the SLCA
Elk Creek	12,645 (78)	2,447 (15)	0	0	421 (3)	774 (5)	0	16,287
Cold Creek	9,179 (44)	3 (< 1)	0	0	394 (2)	11,110 (54)	0	20,683
Jim Creek	3,884 (33)	0	0	0	483 (4)	7,271 (63)	0	11,638
Piper Creek	4,998 (45)	0	0	0	622 (6)	5,394 (49)	0	11,014

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Population / drainage name (HUC)	MA1 acres (percent)	MA2 acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5 acres (percent)	MA6 acres (percent)	MA7 acres (percent)	Total acres of drainage in the SLCA
Lion Creek	11,283 (55)	3,314 (16)	0	0	770 (4)	5,111 (25)	0	20,478
Goat Creek	9,036 (68)	0	0	0	927 (7)	3,416 (26)	0	13,379
Woodward Creek	0	0	33 (1)	0	888 (23)	3,011 (77)	0	3,932
Soup Creek	0	0	0	0	1,363 (56)	1,050 (44)	0	2,413
Lost Creek	47 (< 1)	55 (< 1)	0	0	11,956 (76)	3,582 (23)	0	15,640
Lindbergh Lake	17,385 (71)	837 (3)	4 (< 1)	0	1,821 (7)	4,533 (18)	0	24,580
Holland Lake	4,383 (36)	0	0	0	1,028 (8)	6,253 (51)	590 (5)	12,254
Total acres (%) in core area	72,840 (48)	6,656 (4)	0	0	20,673 (14)	51,505 (34)	0	151,674

3. Effects to Critical Habitat

The Revised Forest Plan provides direction under which future management decisions are made. Because it is a programmatic decision that authorizes no specific action, no direct effects on critical habitat will occur from the proposed action. Any direct effects would occur later, during individual project implementation, when site-specific decisions are made. All project level activities will undergo their own environmental analyses and Section 7 consultation. An analysis for the anticipated effect of management activities on the primary constituent elements (PCEs) for bull trout is given followed by expected impacts each core area.

Effects from Forest Management Activities

Vegetation Management

Vegetation management may have temporary impacts on PCE 1 (water quality), PCE 4 (instream habitat) and PCE 6 (substrate characteristics) when harvest activities generate increases in sediment. The Revised Forest Plan contains standards and guidelines that will minimize many effects of vegetation management by providing direction within the RMZs. These standards and guidelines will ensure that in some areas vegetation management is prohibited unless required for aquatic resource benefits. As a result, riparian vegetation will be allowed develop under natural processes. Thus, vegetation management is not expected to impact PCE 2 (migration habitat), PCE 3 (food availability), and PCE 8 (water quantity). In addition, we do not anticipate vegetation management to affect PCEs 5 (water temperature), 7 (stream flow), and 9 (non-native species) are not affected.

Fuels Management

Fuel management through the use of prescribed fire and hand thinning is expected to have little direct effect on bull trout PCEs. Fuel management may reduce the potential for severe and intense wildfires. High-intensity fire can change infiltration characteristics of the soil and change hydrologic characteristics in watersheds when they occur over large areas, resulting in increased erosion. Wildfire suppression has the potential to affect PCE 1 by application of fire retardant, although current standards require avoidance of waterways, and the Revised Forest Plan continues these protections. The requirement for the use of minimum impact suppression techniques in riparian areas ensures protection of critical habitat during wildfire suppression. In general, we anticipate that adherence to these practices will reduce potential impacts to water temperature (PCE 5) by maintaining riparian vegetation during the course of fuels management activities.

Access Management and Recreation

Access management and recreation affect bull trout critical habitat primarily through the delivery of sediment. This impact affects PCEs 1, 2, 3, 4 and 6 (see Table A3-2 in Appendix 3. In some cases, stream crossings that may also present a barrier to migration, affecting PCE 7. Where road fill impinges directly on the stream or where soils become compacted in wetland and riparian areas from dispersed camping, effects to PCE 6 may occur. Forest-wide desired conditions, objectives, standards, and guidelines in the Revised Forest Plan that emphasize road decommissioning, regular road maintenance, removal of barriers at stream crossings, and motor vehicle use designations designed to move OHV use away from riparian areas will reduce but not eliminate effects to bull trout critical habitat. While we anticipate that these activities will be beneficial to bull trout critical habitat in the long-term, some of these activities may result in short-term adverse effects to bull trout critical habitat.

Livestock Grazing

Livestock grazing may affect bull trout critical habitat due to trampling or trailing along streambanks and grazing or trampling of riparian vegetation. These impacts may reduce the function of PCEs 1-4 and 8 by increasing bank instability, creating erosion, increasing sediment. Reduction of riparian vegetation through consumption or physical impacts from trampling can also affect the function of PCEs 1, 2 and 5 (see crosswalk Table A3-2 in Appendix 3) by removing overhanging vegetation, which provides shade to reduce temperatures and nutrients and habitat to support an abundant food base. Grazing occurs primarily along roads and in transitory range where previous timber harvest has created an open understory with herbaceous vegetation, so direct impacts to streams are less likely. Avoidance of timber harvest in riparian areas was instituted via forest plan amendment in 1995 and will continue with direction in the Revised Forest Plan, thus allowing for increased canopy cover along streams. Piper Creek is the only designated critical habitat with an active grazing allotment, and it has 5 cow-calf pairs.

Watershed Improvement

As discussed previously, in many cases watershed improvement/restoration activities result in a short-term negative effect due to a pulse of increased sediment. This impact would affect PCEs 1, 2, 3, 4 and 6 (see crosswalk Table A3-2 in Appendix 3). However, these activities have the potential to result in long-term positive impacts to PCEs 1 through 8, depending on the specifics

of the project. As with all project-level decisions, separate consultation looking at design and site-specific impacts would occur prior to any project implementation.

Effects to Core Areas

The potential impact from the Revised Forest Plan to designated bull trout critical habitat in each core area is displayed in Table II-13 as the percentage of critical habitat drainages within each core area allocated to different management areas on FNF lands. With the exception of the Holland Lake and Whitefish Lake Core Area, no drainage on FNF lands that impacts designated critical habitat contains more than 21 percent of management area 6 lands. Actions on Management Area 6 (General Forest) lands will likely have the greatest effect on critical habitat since the management options available are much greater than other designations (e.g., wilderness, backcountry). Forest management activities have little potential to affect critical habitat in large lakes and reservoirs, where regulation of water level and fisheries management are the predominant effects.

Table II-13. The percentage of bull trout core areas on FNF lands by management area designation. Some core areas are not discussed here if NFS lands are less than 10 percent (see section D.3. *Species and Critical Habitat Affected*). Adopted from USFS 2017.

Core Area	1 (a&b)	2 (a&b)	3	4	5 (a-c)	6 (a-c)	7
Flathead Lake	63	2	0	0	16	19	0
Frozen Lake	69	0	0	0	31	0	0
Upper Stillwater Lake	0	0	0	0	100	0	0
Upper Whitefish Lake	0	0	0	0	79	21	0
Whitefish Lake	0	0	0	0	14	86	0
Hungry Horse Reservoir	67	8	0	0	10	15	< 1
Doctor Lake	100	0	0	0	0	0	0
Big Salmon Lake	100	0	0	0	0	0	0
Swan Lake	48	4	0	0	14	34	0
Lindbergh Lake	71	3	< 1	0	7	18	0
Holland Lake	36	0	0	0	8	51	5

Flathead Lake Core Area

Critical habitat has been designated in Trail, Whale, Red Meadow, Coal, Big, Bear, Morrison, and Granite Creeks as well as in the mainstem North Fork and Middle Fork Flathead Rivers. Limited adverse effects may occur at the project level, particularly associated with restoration activities such as culvert removals, upgrades, and other road-related work. Effects from other management activities would be limited through application of Revised Forest Plan direction and other measures (e.g., retained decisions, BMPs, Forest Service Handbook and Manual direction, other legal and regulatory requirements) as described previously. There should be incremental corresponding improvements in the indicator of sediment over the long term of the plan, with

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short-term effects from road and culvert work that affects PCEs 2, 3, and 6. Over the life of the plan, improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7, through implementation of the bull trout conservation strategy (USFS 2013) and the Revised Forest Plans Conservation Watershed Network. Substantial changes in PCEs 6, 8, and 9 are not expected in the Flathead Lake Core Area.

Hungry Horse Reservoir Core Area

Critical habitat has been designated for each of the local populations (Danaher, Youngs, Gordon, White River, Little Salmon, Big Salmon, Bunker, Sullivan, Quintonkon, Wheeler, and Wounded Buck) as well as the mainstem South Fork Flathead River and Spotted Bear River. Doctor Lake and Big Salmon Lake are also designated as critical habitat. Limited adverse effects may occur at the project level, particularly associated with restoration activities such as culvert removals, upgrades and other road related work. Effects from other management activities would be limited through application of Revised Forest Plan direction and other measures (e.g., retained decisions, BMPs, handbook and manual direction, other legal and regulatory requirements) as described previously. There should be incremental corresponding improvements for the indicator of sediment over the long term of the plan with short term effects from the road and culvert work which affects PCEs 2, 3, and 6. Over the life of the plan, minor improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7, given that passive restoration has been identified as a conservation strategy in many of the watersheds within this core area (Table II-67). Substantial changes in PCEs 6, 8, and 9 are not expected in the Hungry Horse Reservoir Core Area since much of the upper watershed is in the Bob Marshall Wilderness, and Hungry Horse Reservoir has not been invaded by lake trout.

Swan Lake Core Area

Critical habitat has been designated for each of the local populations in the Swan Lake Core Area as well as the mainstem Swan River. Limited adverse effects may occur at the project level, particularly associated with restoration activities such as culvert removals, upgrades, and other road-related work. Effects from other management activities would be limited through application of the revised forest plan direction and other measures (e.g., retained decisions, BMPs, Forest Service Handbook and Manual direction, other legal and regulatory requirements), as described previously. There should be incremental corresponding improvements in sediment over the lifetime of the Revised Forest Plan due to active restoration being identified as the preferred conservation strategy in the Cold Creek, Jim Creek and Lindbergh Lake watersheds. This improvement will impact PCEs 1, 2, 3, 4 and 6 (see crosswalk Table A3-2 in Appendix 3). Short-term effects from road and culvert work that affects PCEs 2, 3, and 6 is also anticipated in the Swan Lake Core Area. Over the life of the plan, minor improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7, through natural processes. Given the uncertain future of lake trout suppression in Swan Lake, which is largely out of the USFS control, we cannot make any assessment about potential impacts on PCE 9 (non-native species).

H. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future

Federal actions are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

For the purpose of this consultation, cumulative effects are primarily the effects attributable to state and private landowners with adjacent lands or inholdings on the FNF, or to the actions of state and local governments when no other federal nexus (e.g., permit, funding) is present. The largest non-federal land owners are the State of Montana and Weyerhaeuser Co. Both of these entities manage their lands under existing habitat conservation plans (HCP) completed and approved under section 10 of the Endangered Species Act and consulted on through section 7, and hence are not considered in the cumulative effects analysis.

Numerous smaller private landowners within the boundaries of the FNF implement activities such as timber harvest, road building and maintenance, livestock grazing, water diversion, residential development, and agriculture. Future private activities will continue and, presumably increase. As population density rises, demand for residential and commercial development is also likely to grow. Such increased use and demand would increase the importance of quality habitat on NFS lands as strongholds for bull trout persistence and recovery.

Non-native fish species are identified as the primary threat to both the Flathead Lake and Swan Lake Core Area in the Columbia Headwaters RUIP (USFWS 2015b). The extent to which non-native fish populations grow in both size and distribution is largely under the control of state natural resource agencies. As such, the proliferation of non-native fish species in the action area will continue to threaten bull trout populations in the Flathead Lake and Swan Lake Core Areas until a solution to this threat can be agreed upon and implemented.

Angler harvest and poaching has been identified as one reason for bull trout decline (USFWS 2015b). It is likely that recreational fishing, especially in known spawning streams in the fall, will increase as the human population in western Montana increases. Misidentification of bull trout has been a concern because of the similarity of appearance with brook trout. Although harvest of bull trout in the majority of the action area is illegal, incidental catch likely occurs (legal harvest in Hungry Horse Reservoir and portion of S. Fork Flathead River). The fate of released bull trout is unknown, but some level of hooking mortality is likely due to the associated injuries and the stress of handling fish (Long 1997). Unintentional and illegal harvest could have a direct effect on the bull trout in the action area. The extent of the effect is dependent on the amount of increased recreational fishing pressure, which is a function of the increased number of people fishing each season. Illegal poaching is difficult to quantify, but generally increases in likelihood as the human population in the vicinity grows (Ross 1997). This may increase as the human population grows, but we anticipate that closed roads and limited public access will keep this low.

Global climate change and the related warming of our climate have been well documented. Evidence of global climate change/warming includes widespread increases in average air and ocean temperatures, accelerated melting of glaciers, and rising sea level. Given the increasing certainty that climate change is occurring and is accelerating (IPCC 2007, Battin et al. 2007), we can no longer assume that climate conditions in the future will resemble those in the past. Potential increases in water temperature due to climate change are likely to occur in the future.

The impact of increased water temperature on bull trout is difficult to predict, but we anticipate that higher temperatures will reduce the distribution of bull trout within the action area as some streams become unsuitable. Further, we anticipate that increased water temperature will also affect bull trout by creating more favorable conditions for non-native fish species such as brook trout and potentially brown trout.

The cumulative effects within the action area are reflected in bull trout population numbers and life history forms and the habitat conditions described herein. All core areas are at risk of the continued increase of non-native fish species and fisheries management; and concern for the viability and effects to bull trout populations are well documented (USFWS 2015). Activities occurring on private lands at the same time that the proposed federal activities may exert cumulative adverse effects on bull trout. However, some non-federal activities will likely improve conditions for bull trout over the long-term and will work in conjunction with federal actions toward recovery of bull trout in some instances. Since the proposed action is programmatic in nature, it does not in itself mandate or approve future implementation of activities on the FNF. Therefore, any future actions would undergo separate analysis and consultation related to the effects to listed species and/or critical habitat. Any site-specific information of future activities that will occur on no-federal land that may contribute to cumulative effects would be considered at that time.

I. CONCLUSION

1. Jeopardy Determination

After reviewing the current status of bull trout, the environmental baseline (including effects of federal actions covered by previous consultations) for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the Flathead National Forest's Revised Forest Plan, as proposed, is not likely to jeopardize the continued existence of bull trout. This conclusion is based on the magnitude of the project effects to reproduction, distribution, and abundance in relation to the listed population. Implementing regulations for section 7 (50 CFR 402) defines "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." Our conclusion is based on, but not limited to, the information presented in the 2017 biological assessment (USFS 2017), correspondence during this consultation process, information in our files, and informal discussions between the Service and the FNF.

Jeopardy determinations for bull trout are made at the scale of the listed entity, which is the coterminous United States population (64 FR 58910). This follows the April 20, 2006, analytical framework guidance described in the Service's memorandum to Ecological Services Project Leaders in Idaho, Oregon and Washington from the Assistant Regional Director – Ecological Services, Region 1 (USFWS 2006). The guidance indicates that a biological opinion should concisely discuss all the effects and take into account how those effects are likely to influence the survival and recovery functions of the affected [then] interim recovery unit(s), which should

be the basis for determining if the proposed action is "likely to appreciably reduce both survival and recovery of the coterminous United States population of bull trout in the wild."

As detailed earlier in this BO (see Section D.1 and Table II-3), the approach to the jeopardy analysis in relation to the proposed action follows a hierarchical relationship between units of analysis (i.e., geographical subdivisions) that characterize effects at the lowest unit or scale of analysis (the local population) toward the highest unit or scale of analysis (the Columbia Headwaters Recovery Unit). The hierarchical relationship between units of analysis (local population, core areas) is used to determine whether the proposed action is likely to jeopardize the survival and recovery of bull trout. As mentioned previously, if the adverse effects of the proposed action do not rise to the level where it appreciably reduces both survival and recovery of the species at a lower scale, (such as the local population or core area) then the proposed action could not jeopardize bull trout in the coterminous United States (i.e., range wide). Therefore, the determination is appropriately a no-jeopardy finding. However, if a proposed action causes adverse effects that are determined to appreciably reduce both survival and recovery of the species at a lower scale of analysis (i.e., local population or core area), then further analysis is warranted at the next higher scale.

The proposed action represents a programmatic decision that authorizes no specific action, and therefore, would have no direct effects on listed species or their habitats. The Revised Forest Plan provides the direction under which future management decisions would be made. Any direct or indirect effects would occur later, during individual project implementation when site-specific decisions are made based on Revised Forest Plan direction. All project level activities may be subject to consultation, as appropriate, under the Endangered Species Act prior to implementation.

Minimization of the effects of land management activities on bull trout and their habitats is controlled through the management direction provided for in the Revised Forest Plan. Baseline conditions are expected to improve where active watershed restoration is implemented in combination with conservation of those watersheds currently in proper functioning condition. Adverse effects are expected to occur in all four core areas as a result of forest management activities that would be reasonably expected to be implemented over the life of the Revised Forest Plan. Effects to bull trout and their habitat would primarily be attributable to short-term sediment generation through management activities authorized by the plan. The level of effects is not expected to result in discernible negative impacts to core area populations.

As a result, the Service concludes that implementation of the proposed action is not likely to appreciably reduce the reproduction, numbers, or distribution of bull trout at the scale of any of the affected core areas, and by extension in the Flathead Lake Geographic Region and the Columbia Headwaters Recovery Unit. Therefore, the Service concludes that implementation of the Revised Forest Plan will not appreciably reduce both the survival and recovery and would not jeopardize bull trout at the range-wide scale of the listed entity, the coterminous population of the United States.

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2. Adverse Modification Determination

After reviewing the current status of the four Critical Habitat Subunits in the action area (Flathead Lake North Fork Flathead River, Flathead Lake Middle Fork Flathead River, Flathead Lake South Fork Flathead River, and Swan River and Lakes) and their relationships to the bull trout core area, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, the Service concludes that while these effects will temporarily lower the function of spawning and rearing habitat in the action area due to some level of unavoidable sediment loading, these effects are unlikely to significantly change the functional capacity of the Critical Habitat Subunits described above. On that basis, it is the Service's biological opinion that implementation Flathead National Forest's Revised Forest Plan, as proposed, is not likely to destroy or adversely modify bull trout critical habitat.

Pursuant to current national policy and the statutory provisions of the Act, destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR 402.02).

The approach to the adverse modification analysis in relation to the proposed action follows a hierarchical relationship between units of analysis (discussed in detail in Section D.2 and Table II-4 above). The hierarchical relationship between units of analysis (e.g., stream segment, critical habitat subunit) is used to determine whether the proposed action is likely to adversely modify designated bull trout critical habitat. Should the adverse effects of the proposed action not rise to the level where it appreciably diminishes the value of critical habitat at a lower scale, such as the individual stream segment or subunit, the proposed action could not adversely modify bull trout critical habitat at larger scales such as the critical habitat unit or the coterminous United States (i.e., range wide). Therefore, the determination will result in a no adverse modification finding.

The proposed action represents a programmatic decision that authorizes no specific action, and therefore, would have no direct effects on critical habitat. The Revised Forest Plan provides the direction under which future management decisions are made. Any direct or indirect effects would occur later, during individual project implementation when site-specific decisions are made based on Revised Forest Plan direction. Projects must be consistent with forest-wide standards and guides in the Revised Forest Plan, which are designed to minimize impacts to critical habitat by placing limits on activities that may occur in riparian areas and on the timing of such activities. Other standards and guides require that habitat values be maintained or improved in the long term. Such measures in combination with the small percentages of critical habitat that may potentially see future impacts are not expected to reduce the conservation value within the critical habitat units as a whole, and, therefore, are not expected to adversely modify critical habitat on a range-wide basis. Active restoration in priority bull trout watersheds would be expected to contribute to the conservation value of critical habitat over the long term. All project level activities may be subject to consultation, as appropriate, under the Act prior to implementation. As a result, the Service concludes that implementation of the proposed action is

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not likely to significantly change the functional capacity of the Critical Habitat Subunits described above.

J. INCIDENTAL TAKE STATEMENT

Section 9 of the Act, and Federal regulations pursuant to section 4(d) of the Act, prohibit the take of endangered and threatened species, respectively without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

This biological opinion identifies management direction that allows for future activities that may adversely affect bull trout and designated bull trout critical habitat, including vegetation management, road construction, use, and maintenance, unplanned and prescribed fires, grazing, recreation, and mining. The proposed action reduces the potential for incidental take to occur as a result of these actions. The mere potential for future take from these actions is not a legitimate basis for providing an exemption for take. Subsequent consultation, as appropriate, on the specific actions developed pursuant to the Revised Forest Plan will serve as the basis for determining if an exemption from the section 9 take prohibitions is warranted. If so, the Service will provide Reasonable and Prudent Measures and Terms and Conditions, as appropriate, to minimize the impacts of the take on bull trout in accordance with 50 CFR 402.14(i).

K. REPORTING REQUIREMENTS

In order to monitor the impacts of incidental take, the Federal agency or any applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [(50 CFR 402.14 (i)(3)]. This BO does not contain an explicit incidental take statement. However, the Forest, in this Revision, proposes a culvert monitoring plan that affects some former projects. The Service hereby revises the reporting requirements on those and future affected projects in the following manner.

The Service agrees that the Culvert Monitoring Plan Version 1.0 will replace the culvert monitoring requirements contained in the Terms and Conditions issued in the following past biological opinions:

- Amendment 19 Revised Implementation (November, 2010)

- Robert Wedge Post-Fire Project (November, 2004)
- West Side Reservoir Post-Fire Project (November, 2002)
- Moose Post-Fire Project (November, 2002)
- Spotted Beetle Project (March, 2002)

The specific Term and Condition in each biological opinion is presented in the Culvert Monitoring Plan (Table 1). From this date forward, the Service will consider the Terms and Conditions presented in Table 1 of the plan as being amended such that adherence to the Culvert Monitoring Plan Version 1.0 (and any subsequent version agreed to by the Service) will function in lieu of existing culvert monitoring requirements. We believe a more comprehensive, Forest-wide culvert monitoring and remediation effort will native fish and wildlife species. The Service's approval of the Culvert Monitoring Plan and amendment of existing Terms and Conditions are based on the following:

- Current monitoring requirements are spread throughout the Forest in a handful of bull trout watersheds. The Culvert Monitoring Plan will monitor culvert conditions in ALL bull trout watersheds across the Forest.

- The Culvert Monitoring Plan includes remedial actions that shall be taken by the Forest if a failing culvert is found. Remedial actions will be developed in coordination with the Service.

- The Culvert Monitoring Plan includes an adaptive management strategy. This strategy will optimize the monitoring effort by allowing changes to be made based on past years' data, changes in watershed conditions, or major climatic events (e.g., floods, fire). The adaptive management process will be carried out in coordination with the Service

- Annual reporting requirements are included in the Culvert Monitoring Plan. These requirements include an annual meeting between the Service and the Forest, and will ensure an annual assessment of the effectiveness of implementation.

- As part of the adaptive management strategy, the Culvert Monitoring Plan indicates that if at any time implementation cannot be effectively achieved, the Forest will revert back to the original Term and Condition monitoring requirements (as presented in Table 1. of the Culvert Monitoring Plan Version 1.0).

L. CONSERVATION RECOMENDATIONS

Sections 7(a)(1) of the Act directs federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information. The recommendations provided here relate only to the

proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibilities.

During the course of this consultation, the Service noted several elements that will contribute to the conservation of endangered, threatened, proposed, and candidate species. These elements were proposed by the USFS as part of FNF's Revised Forest Plan. These elements are: the Revised Forest Plan will implement the Aquatic Riparian Conservation Strategy (ARCS). The goal of the ARCS is to maintain or restore watershed conditions. Implementation of the Revised Forest Plan will also include the establishment of a Conservation Watershed Network (CWN). This process seeks watersheds identified as native fish strongholds with appropriately functioning aquatic habitats. CWN watersheds are 10 to 12th code hydrological unit codes (HUCs) intended to protect stronghold populations of native salmonids and complement restoration efforts. Through Revised Forest Plan direction, CWN watersheds will maintain high quality habitat and functionally intact ecosystems that are contributing to and enhancing conservation and recovery of bull trout. The ongoing efforts by the Forest Service to cooperate with other federal, state, local, and tribal agencies and private landowners in the action area are important in supporting coordinated bull trout conservation efforts.

This biological opinion identifies the following conservation recommendations that, in addition to the proposed action and other ongoing conservation actions, will support recovery of listed species. As discussed above, these conservation recommendations are discretionary agency activities meant to minimize or avoid adverse effects to listed species. The conservations recommendations are:

1. Section 2672.2 of the Forest Service Manual states: "The Forest Service must manage habitats at levels that accomplish the recovery of federally listed species so that protective measures under the Act are no longer necessary." The Bull Trout Conservation Strategy (USFWS 2013) was intended, in part, to "help direct resources to the most important opportunities, where FS management has the potential to increase habitat quality and connectivity." The Bull Trout Conservation Strategy should be considered for management opportunities to improve habitat conditions that are conducive to the recovery of bull trout.

2. When planning future projects at the watershed scale, consider actions designed to improve the functional condition of habitat baseline conditions (e.g., FUR to FAR) for bull trout.

3. Work cooperatively with other state and federal agencies to address the potential impacts of non-native fish species (e.g., lake trout) in the Swan Lake and Flathead Lake core areas. Consider actions that include suppression and removal of non-native fish species.

4. Consider implementation of recovery actions identified in the Service's Bull Trout Recovery Plan and the associated Columbia River Headwaters Recovery Unit Implementation Plan (USFWS 2015, 2015b).

In addition to management direction that will contribute to the recovery of bull trout, direction relative other listed species (i.e., grizzly bear, Canada lynx, water howelia) is also contained in the FNF's Revised Forest Plan. These elements are documented in the biological assessment (USFS 2017) or species-specific chapters of this biological opinion. Upon review the Service concludes that the FNF's Revised Forest Plan demonstrated a commitment to conservation of threatened and endangered species, and will continue to contribute to the recovery of these species.

Upon review of Forest Plan components that will be carried forward, and components that are being proposed, we conclude that the features of the FNF's Revised Forest Plan can be considered elements of a program for the conservation of endangered species and threatened species, as described in section 7(a)(1) of the Act. Further, we conclude that this proposed action demonstrates the USFS's commitment to conservation of threatened and endangered species on NFS lands in the action area.

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M. REINITIATION NOTICE

This concludes formal consultation for bull trout and bull trout critical habitat on the effects of the revised Land and Resource Management Plan for the Flathead National Forest. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

(1) the amount or extent of incidental take is exceeded;

(2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion;

(3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or

(4) a new species is listed or critical habitat designated that may be affected by the action.

In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. The Service retains the discretion to determine whether the conditions listed in (1) through (4) have been met and reinitiation of formal consultation in required.

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CHAPTER III. BIOLOGICAL OPINION ON GRIZZLY BEARS

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A. CONTEXT OF THE PROPOSED ACTION FOR GRIZZLY BEAR

This section describes the relationship of the action area to grizzly bear habitat and then focuses on the elements of the Revised Forest Plan that may affect grizzly bears. This section also describes the guidelines and standards intended to provide security for grizzly bears, conservation of grizzly bear habitat, and specific measures proposed to avoid, reduce or minimize potential adverse effects of forest management activities on bears at the project level.

This biological opinion will consider the effects of implementing the proposed Revised Forest Plan framework as well as the effects of implementing proposed standards and guidelines at the project level. Note that this biological opinion does not provide an analysis of effects for specific actions. Future actions undertaken by the FNF will undergo detailed analysis and further public comment as part of the site-specific NEPA process, and will undergo consultation under section 7 of the ESA as appropriate. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect grizzly bears as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion.

1. Action Area

As discussed in Chapter I of this biological opinion, the action area for the proposed action in the entirety of the FNF. The Grizzly Bear Recovery Plan (Recovery Plan) prompted the identification of six grizzly bear recovery zones, defined as areas within which the criteria for achievement of recovery would be measured (USFWS 1993). The FNF lies within the Northern Continental Divide Ecosystem (NCDE) (Figure 10). The remaining recovery zones are discussed in *Status of the Species* Section.

2. Description of the Proposed Action

As described in Chapter I, Revised Forest Plan direction is organized by suitability, desired conditions, objectives, guidelines, and standards. The Revised Plan Forest-wide direction describes the framework under which lands will be managed for 15 years or so on the FNF. Components of the FNF's Revised Forest Plan are presented in Appendix 4 of this biological opinion, or in Appendix D of the biological assessment (USFS 2017).

Relationship of the Proposed Action to On-Going Grizzly Bear Conservation Efforts

In 2013, the Service announced the availability of a draft NCDE Grizzly Bear Conservation Strategy for public review and comment (USFWS 2013a). When finalized, the Conservation Strategy will become the post-delisting management strategy for the NCDE grizzly bear population and its habitat. The NCDE Grizzly Bear Conservation Strategy contains habitat-related management direction that pertains to the portions of the Flathead, Helena-Lewis and Clark, Kootenai, and Lolo National Forests that are located within the NCDE. It should be noted that the Helena National Forest and Lewis and Clark National Forest have recently been

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administratively combined but still have separate forest plans in place, each of which are being amended.

Habitat conditions and management on NFS lands within the NCDE (including the FNF) have contributed to the increased population size and improved status of the grizzly bear across the NCDE. Supporting a healthy, recovered grizzly bear population in the NCDE will depend on continued, effective management of the grizzly bear habitat. As part of the proposed action the FNF will incorporate the desired conditions, standards, guidelines, and monitoring items in the Revised Forest Plan that are relevant to management of NFS lands and that will contribute to the recovery of the NCDE population of grizzly bears.

The NCDE Conservation Strategy uses an approach that provides differential protections in areas depending on their relative importance to grizzly bears (USFWS 2013a). Under the NCDE Conservation Strategy, the following management zones and areas are designated:

- Primary Conservation Area (PCA): The PCA is the same area as the NCDE Recovery Zone, and will be managed as a source area where the objective is continual occupancy by grizzly bears. Habitat conditions in the PCA will be maintained in a manner that is compatible with a stable to increasing grizzly bear population.

- Management Zone 1 (zone 1): The objective in zone 1 is continual occupancy by grizzly bears, but at lower densities than inside the PCA. Protections in zone 1 will focus on managing motorized routes and implementing food/attractant storage orders.

- Demographic Connectivity Areas (DCA): Within zone 1, two DCAs will be established (Salish and Ninemile). These areas will be established to allow the NCDE to serve as a "source" population to other ecosystems (i.e., Cabinet-Yaak and Bitterroot). Protections in the DCAs will support female occupancy and dispersal by managing miles of motorized routes, maintaining current roadless areas, and implementing food/attractant storage orders.

- Management Zone 2 (zone 2): National Forest System (NFS) lands in zone 2 will be managed to provide the opportunity for grizzly bear dispersal, particularly males, to other ecosystems. The protections in zone 2 will center on grizzly bear-human conflict prevention and response. As with the PCA, zone 1 and the DCAs, a food/attractant storage order would be implemented on NFS lands within zone 2.

- Management Zone 3 (zone 3): Zone 3 is primarily comprised of areas that do not contain suitable habitat for long-term survival and/or occupancy of grizzly bears. Management in zone 3 will focus on grizzly bear-human conflict response.

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Key Forest Plan Components Related to Grizzly Bear

Key management direction for grizzly bear habitat consistent with what is being developed in the draft NCDE Conservation Strategy will be incorporated into forest plan components (i.e., desired conditions, standards, guidelines, monitoring) of the Revised Forest Plan. A detailed list of the desired conditions, standards, guidelines, and monitoring items is presented in Appendix 3. The effects of these components will be discussed further in this BO. Following is a summary of features of the proposed action:

- Within the PCA, there will be no net increase in open motorized route density (OMRD) or total motorized route density (TMRD), and no net decrease in secure core. Temporary changes could occur (see below), but baseline levels would be maintained in each grizzly bear subunit. The definition of "baseline" for the Revised Forest Plan is consistent with the definition in the NCDE Grizzly Bear Conservation Strategy (see glossary and standard FW-STD-IFS-02 for details).

- In the DCA, habitat protections would focus on limiting miles or density of motorized roads/routes open to the public during the non-denning season (see GA-SM-STD-01 for details).

- Temporary increases in open and total motorized route densities and temporary decreases in secure core would be allowed for projects (see "project" definition in the glossary). However, temporary deviations from baseline conditions will not exceed a five percent increase for OMRD, a three percent increase for TMRD, and a two percent decrease for security core. Temporary deviations will be calculated using a ten-year running average for each bear management subunit (procedures for this calculation are presented in Appendix 2; see FW-STD-IFS-03 for details).

- Restricted roads would not be opened for temporary use by the public during the non-denning within secure core habitat (see FW-STD-IFS-04 for details). Within the PCA, administrative use of restricted roads would be limited (see FW-STD-IFS-01 for details).

- High use non-motorized trails would no longer be considered when calculating secure core habitat. This methodology is being proposed in an effort to remain consistent with the NCDE Grizzly Bear Draft Conservation Strategy.

- Within modeled grizzly bear denning habitat in the PCA, there would be no net increase in the percentage of area or miles of routes designated for over-snow vehicle use on NFS lands during the den emergence time period (see FW-STD-REC-05 for details).

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- Special orders for storage of food/wildlife attractants would be in place across NFS lands in the PCA and zone 1, including the Salish DCA (see FW-STD-WL-02 for details).

- Within the PCA, developed recreation sites designed and managed for overnight use (e.g., campgrounds, cabin rentals, huts, guest lodges, recreation residences) during the non-denning season would be limited to one increase above the baseline in number or capacity per decade per bear management unit (see FW-STD-REC-01 for details).

- Vegetation management would be designed to consider grizzly bear habitat and to reduce the risk of grizzly bear-human conflicts within the PCA (see FW-GDL-TE&V-01 through 05 for details).

- Livestock allotments in the PCA would have requirements for no net increase in the number of cattle and sheep allotments and no net increase in sheep animal unit months (AUMs). Livestock allotments would be managed to limit the risk of grizzly bear-human conflicts in the primary conservation area and zone 1 (see FW-STD-GR-01 through 06 for details).

- Mineral and energy development would be managed with consideration of grizzly bear habitat and to reduce the risk of grizzly bear-human conflicts in the primary conservation area and zone 1. New leases for leasable minerals (e.g., oil and gas) in the PCA would be required to have a no surface occupancy stipulation (see FW-STD-E&M-01 through 09 and FW-GDL-E&M-01 through 06 for details).

- Forest plan monitoring items would be added (see MON-NCDE-01 through 08).

B. STATUS OF THE SPECIES

1. ESA Listing History

The Service listed the grizzly bear as a threatened species in the contiguous United States in 1975 (40 FR 31734-31736, July 28, 1975). The Service identified the following as factors establishing the need to list: (1) present or threatened destruction, modification, or curtailment of habitat or range; (2) overutilization for commercial, sporting, scientific, or educational purposes; and (3) other manmade factors affecting its continued existence. The two primary challenges in grizzly bear conservation are the reduction of human-caused mortality and the conservation of remaining habitat (USFWS 1993).

The Service subsequently developed the Grizzly Bear Recovery Plan (Recovery Plan) in 1982, which was later revised in 1993 (USFWS 1993). The 1993 revised Recovery Plan delineated grizzly bear recovery zones in 6 mountainous ecosystems in the U.S. The Recovery Plan details recovery objectives and strategies for the grizzly bear recovery zones in the ecosystems where

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grizzly bear populations still persist. These recovery zones are: the Northern Continental Divide Ecosystem (NCDE), Greater Yellowstone Ecosystem (GYE), Cabinet-Yaak Ecosystem (CYE) and the Selkirk (SE) Ecosystem. The Recovery Plan also includes recovery strategies for the North Cascades Ecosystem (NCE) in Washington, where only a very few grizzly bears are believed to remain, and for the Bitterroot Ecosystem (BE) of Idaho and Montana, where suitable habitat remains, but no grizzly bear occupancy has been documented for more than 50 years.

Since the original listing of the grizzly bear, the Service has completed four, 5-year status reviews (46 FR 14652, February 27, 1981; 52 FR 25523, July 7, 1987; 56 FR 56882, November 6, 1991; and September 6, 2011). The Service has undertaken a number of other actions to review the status of individual grizzly bear populations. Between 1986 and 2007, the Service received and reviewed 10 petitions requesting a change in status for individual grizzly bear populations (51 FR 16363, May 2, 1986; 55 FR 32103, August 7, 1990; 56 FR 33892, July 24, 1991; 57 FR 14372, April 20, 1992; 58 FR 8250, February 12, 1993; 58 FR 38552, July 19, 1993; 58 FR 43856, August 18, 1993; 58 FR 43857, August 18, 1993; 59 FR 46611, September 9, 1994; 64 FR 26725, May 17, 1999; 72 FR 14866, March 29, 2007; 72 FR 14866, March 29, 2007). Through this process, we determined the CYE, SE, and NCE warrant endangered status. These uplistings remained warranted but precluded by higher priority listing actions until 2014 (63 FR 30453, June 4, 1998; 64 FR 57534, October 25, 1999; 66 FR 54808, October 30, 2001; 67 FR 40657, June 13, 2002; 69 FR 24876, May 4, 2004; 70 FR 24870, May 11, 2005; 71 FR 53756, September 12, 2006; 72 FR 69034, December 6, 2007; 73 FR 75176, December 10, 2008; 74 FR 57804, November 9, 2009; 75 FR 69222, November 10, 2010; 76 FR 66370 October 26, 2011; 78 FR 70104 November 22, 2013). As of 2014, the NCE remains warranted but precluded while the CYE and SE populations were no longer warranted (79 FR 72450 December 5, 2014). However, the determinations for the CYE and SE were recently vacated. The Service previously determined that grizzly bears in the CYE warranted a change to endangered status, but were precluded from uplisting. However, for several years this population's status has been improving and the Service determined in 2014 that the CYE population no longer warranted endangered status. This determination was recently vacated on August 22, 2017 and the matter is currently remanded to the Service for further consideration. The regulatory environment for grizzly bears had not changed between the time the bear was considered warranted for endangered status but precluded, no longer warranted endangered, and now a matter remanded to the Service. In other words, no management controls were relaxed in 2014.

In 2007, the Service determined that the GYE supported a grizzly bear population with sufficient numbers and distribution of reproductive individuals so as to provide a high likelihood that the species will continue to exist and be well distributed throughout its range for the foreseeable future. Therefore, based on the best scientific and commercial information available, the Service delisted the Yellowstone grizzly bear DPS, effective April 30, 2007. However, on September 21, 2009, a court order vacated the final rule designating the Yellowstone DPS and removing the Yellowstone grizzly bear DPS from the list of threatened species and remanded the rule back to the Service. In accordance with the court order, in March of 2010, the Yellowstone grizzly population was once again listed as a threatened population under the Endangered Species Act (75 FR 14496, March 26, 2010).

The best available scientific and commercial data continue to indicate that the GYE population of grizzly bears has recovered and no longer meets the definition of an endangered or threatened species under the Act. Therefore, on March 11, 2016, the Service proposed to identify the GYE grizzly bear population as a distinct population segment (DPS) and to remove the DPS from the list of endangered and threatened wildlife (81 FR 13173). On June 30, 2017, the Service published a final rule removing the GYE grizzly bears from the list of endangered and threatened wildlife (82 FR 30502). The final rule became effective on July 31, 2017.

2. Species Description, Life History, and Population Dynamics

Species information for the grizzly bear is presented in detail in the updated 1993 Grizzly Bear Recovery Plan (USFWS 1993), below is a summary of this information:

Grizzly bears are large and long-lived mammals. Male grizzly bears are usually larger than females (400-600 lbs for males and 250-350 lbs for females), and individuals in the wild typically live between 15 and 25 years (Blanchard 1987). Grizzly bears are omnivorous, opportunistic feeders that have large caloric requirements. This is particularly true in later summer and fall when bears need to build fat reserves that will be utilized during the denning period. Grizzly bears are generally solitary animals, with the exception of the mating season when male and female bears tolerate one another, and a female with cubs. Grizzly bears do not defend territories, but instead have home ranges they share with other grizzly bears, although social systems influence movements and interactions among resident bears. Home range sizes for adult female grizzlies vary from 50 to 150 square miles; an adult male can have a home range size as large as 600 square miles (Servheen 1983).

Grizzly bears in the contiguous United States spend 5 to 6 months in their dens, typically beginning in October or November (Craighead and Craighead 1972). During this period, they do not eat, drink, urinate, or defecate. Over the course of the denning season, grizzly bears hibernate and may lose 30 percent of body weight. All of this weight is stored as fat, which is acquired during the 2 to 4 months prior to entering dens. During the pre-denning period, bears increase their food intake dramatically and may gain as much as 3.64 pounds per day (Craighead and Mitchell 1982).

Mating occurs from May through July, and cubs are born inside the den in late January or early February. Cubs remain with their mother for 2 to 3 years (Schwartz et al. 2003). The age at which females produce their first litter varies from 3 to 8 years, with litter size varying from one to four cubs. Grizzly bears have one of the lowest reproductive rates among terrestrial mammals. Grizzly bear females cease breeding successfully some time in their mid to late 20s (Ibid.).

3. Habitat Requirements

Grizzly bears are opportunistic omnivores and will eat berries, grasses, leaves, insects, roots, carrion, small mammals, fish, fungi, nuts, and ungulates. Grizzly bears are selective in their seasonal use of various kinds of forage and, therefore, move across the landscape as they follow

the growth and abundance of preferred forage items (Mace et al. 1996; McLellan et al. 1999; Kasworm et al. 2010).

Grizzly bears are habitat generalists. Basic habitat requirements include the availability of food and water, security (from humans and other bears), and den sites (Mace et al. 1996; Mace et al. 1999; Linnell et al. 2000) (Table III-1). While biologists agree that preferred habitats of grizzly bears include early seral forests, the proximity of hiding cover is also an important variable that has been shown to influence the use of foraging habitat. Given equal foraging opportunities, under cover and in the open, bears prefer to feed in areas with cover.

As mentioned, grizzly bears will typically move across the landscape in search of their preferred forage items. As a result, the productivity of grizzly bear populations is likely more strongly influenced by the availability of high quality food resources than by density-dependent regulating factors (IGBC 1987). It has also been observed that grizzly bears of all ages will congregate readily at plentiful food sources and form a social hierarchy unique to that grouping of bears (Hornocker 1962, USFWS 1993).

Table III-1. Grizzly bear key habitat requirements (USFWS 2011).

Habitat Requirement	Key Habitats
Spring foraging[1]	Low-elevation mesic vegetation
Summer, autumn foraging[1]	Moderate- to high-elevation mesic vegetation
Security cover and isolation from humans[2,3]	Cover provided by vegetation and topographic breaks; absence or low density of roads and trails with motorized use.
Denning habitat[4]	Remote, high-elevation areas with slopes greater than 30 degrees; friable, deep soils; and snow accumulations

[1] Mace et al. (1996); Mace et al. (1999); McLellan and Hovey (2001); Nielsen et al. (2002); Waller and Mace (1997).
[2] Archibald et al. (1987); Kasworm and Manley (1990); Mace et al. (1996); Mace et al. (1999); Mattson et al. (1987); McLellan and Shackleton (1988, 1989); Wielgus et al. (2002).
[3] Mace and Waller (1997); White et al. (1999); Graves et al. (2003).
[4] Pearson (1975); Servheen (1981); Zager and Jonkel (1983); Podruzny et al. (2002).

With the exception of a few forest vegetation types, such as horsetail associations, the majority of vegetative food items preferred by grizzly bears occur in early seral communities where forest cover is absent or relatively sparse (Servheen 1983). Foraging areas that are consistently described in the literature as favored by bears include avalanche chutes (Mace et al. 1996; Waller and Mace 1997; Ramcharita 2000; McLellan and Hovey 2001), fire-mediated shrub fields (McLellan and Hovey 2001), and riparian areas (Servheen 1983; McLellan and Hovey 2001; Kasworm et al. 2010). Avalanche chutes may be used at any time of year, but seem to attract bears particularly in the spring. These areas are typically moist (due to deep snows that melt later than in other areas), and they contain both valuable forage species and sufficient vegetation that provides visual screening. Fire-mediated shrub fields often contain soft-mast producing shrub species (e.g., berries), an important food source for foraging bears in mid-summer and early fall. Riparian areas are primarily used in spring and early summer when habitats at higher elevations are still covered with snow or plant growth is otherwise delayed. Riparian areas

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provide a variety of key forbs and grasses, and a complex tree and shrub structure offering hiding cover. When bears emerge from their dens in the spring, their fat stores have been severely depleted. At this point, foraging to rebuild energy reserves is their primary focus. It is important that bears have adequate spring foraging opportunities close to their dens, especially when cubs have been born, to build up fat stores quickly.

Food habits not only vary between seasons but also between the recovery zones. Radio collared grizzly bears in the Cabinet Mountains and Yaak River (in the CYE) made greatest annual use of closed timber, timbered shrub fields, mixed shrub snow chutes, mixed shrub/cutting units, alder shrub fields, huckleberry shrub fields, and graminoid and beargrass side-hill parks (Kasworm et al. 2010). In the GYE, grizzly bears have been documented of feed on more than 260 species of plants and animals (Gunther et al. 1991a; Gunther et al. 2014). Due to the challenge of monitoring such a diverse diet, four food sources with relatively high energetic values are monitored because of the relative ease in measuring their abundance. Ungulates (primarily elk and bison) serve as an important food source in early spring (winter killed) before most vegetation is available, early summer (during the calving period), and throughout the year from usurped wolf kills (Green et al. 1997; Mattson 1997; Ballard et al. 2003; Fortin et al. 2013; Gunther et al. 2014). Although the availability of cutthroat trout has declined since the early 2000s, spawning cutthroat trout (*Oncorhynchus clarki*) are a source of nutrition for grizzly bears in the Yellowstone population in the early summer when available (Mattson et al. 1991a; Felicetti et al. 2004; Fortin et al. 2013). These grizzly bears will then feed on army cutworm moths (*Euxoa auxiliaris*) during the late summer and fall as they try to acquire sufficient fat levels for winter hibernation (Mattson et al. 1991b; French et al. 1994). Further, in some years, whitebark pine (*Pinus albicaulis*) seeds may serve as an important fall food due to its high-fat, energy-rich content (USFWS 2011).

In the NCDE grizzly bears eat roots/corms/bulbs and other vegetation in the early summer months before berries become available (Aune and Kasworm 1989; McLellan and Hovey 1995). Grizzly bears on the eastern front of the Northern Rockies and in Glacier National Park also feed on concentrations of lady bird beetles and army cutworm moths (Mattson et al. 1991b). Once berries become available, NCDE grizzly bears consume a wide variety of available species. McLellan and Hovey (1995) analyzed scat samples and determined that the amount and species of berries varies annually based on their availability. During late summer to fall, grizzly bears in the NCDE continue to eat berries but also consume more meat and roots/bulbs/corms (Aune and Kasworm 1989; McLellan and Hovey 1995). Late summer to fall is also the time when grizzlies make use of whitebark pine nuts when and where they are available (Aune and Kasworm 1989).

In addition to foraging habitat, a degree of isolation from humans and human-associated activities are necessary habitat components for grizzly bears (Mattson et al. 1987; McLellan and Shackleton 1988, 1989; Mace et al. 1996, 1999). Human activities can result in direct mortality of bears, as well as indirect negative effects by displacing bears to less suitable habitats (McLellan et al. 1999; Wakkinen and Kasworm 2004). The most effective way to minimize the risk of adverse interactions between humans and bears is to provide spatial separation between areas of human activity and areas of bear activity. In areas where such separation is not possible,

providing large areas of secure habitat that include seasonal habitats may reduce the potential for contact and minimize risk of disturbance and illegal mortality (Mace and Waller 1998).

Managing public motorized access to grizzly bear habitat is one of the most common and effective ways to maintain a level of separation between grizzly bears and humans. This separation provides a number of benefits: (1) minimizes human interaction and reduces potential grizzly bear mortality risk; (2) minimizes displacement from important habitat where energetic requirements can be met with limited disturbance from humans; and (3) minimizes habituation to humans (Mattson et al. 1987; McLellan and Shackleton 1988; McLellan 1989; Mace and Manley 1993; Mace et al. 1996; Wakkinen and Kasworm 1997). Secure habitat for grizzly bears (referred to as security core or secure core areas) is specifically defined by the Interagency Grizzly Bear Committee (IGBC) as areas that are at least 0.31 miles from any open or gated road, motorized trail, or non-motorized high intensity route during the core period (IGBC 1998). Such lands should also encompass areas of seasonal importance for grizzly bears throughout the year.

While security cover allows grizzly bears to avoid contact with humans, the cover is sometimes necessary for bears to avoid contact with other bears. Strict territoriality among grizzly bears is not known, and intraspecific defense behavior generally tends to be limited to defense of limited food concentrations, defense of young, and surprise encounters (USFWS 1993). Adult male bears are known to kill juveniles, and adults also occasionally kill other adults. Females with cubs require spatial separation from aggressive males. This is particularly true in spring, when cubs-of-the-year are most prone to attack. Data are insufficient to fully assess the effects of predation on younger bears by adult bears (USFWS 1993), particularly when considering potential indirect effects of various human activities that may displace a subadult bear into the home range of an aggressive adult bear. Females with cubs often select rugged and isolated habitats for this reason (Mace and Waller 1997; Russell et al. 1979). Shrub and tree cover, as well as topographic landscape features, are commonly used as security from humans or other bears (McLellan and Hovey 2001; Wielgus et al. 2002), and dispersing subadult bears may be forced to choose poor home ranges that may be equally dangerous to their survival (USFWS 1993).

Another key habitat requirement for grizzly bears is the presence of suitable denning habitat. Den site characteristics are variable, but several researchers have described dens located at high elevations in remote areas with slopes greater than 30 degrees, soils that are deep, and aspects where snow accumulates (Craighead and Craighead 1972; Linnel et al. 2000; Mace and Waller 1997; Podruzny et al. 2002). Sloped sites are often selected because they facilitate easier digging and are generally stabilized by trees, boulders, or root systems of herbaceous vegetation. In addition to excavating dens, grizzly bears den in natural caves and hollows under the roots of trees. While individual den sites are rarely reported to be used for more than one winter, numerous researchers have observed that dens rarely occur singly, but are concentrated in areas that apparently possess appropriate environmental conditions (Craighead and Craighead 1972).

4. Habitat Fragmentation

Habitat linkage and connectivity are important components of grizzly bear habitat (Servheen et al. 2001; USFWS 1993). As a result, habitat fragmentation is particularly relevant to the survival and recovery of grizzly bears. Grizzly bears require extensive home ranges due to their large size and high metabolic demands. Large expanses of unfragmented habitat are important for feeding, breeding, sheltering, traveling, and other essential behavioral patterns. Historically, as human settlements and developments along roads increased in grizzly bear habitat, grizzly bear habitat (and eventually populations) became fragmented. Fragmentation continues today, as grizzly bears attempting to move within, or even between, recovery zones often encounter high traffic roads (e.g., highways, interstates), concentrated human development, and/or altered vegetation that does not provide foods, cover, or security. These conditions can continue to contribute to fragmented grizzly bear habitat and populations, and may even lead to direct mortality if bears conflict with humans. Maintaining suitable linkage (areas providing safe passage across/through less than optimal environments) and connectivity (contiguous preferred habitat or cover) between small, isolated grizzly bear populations can benefit grizzly bears in several ways, including (1) allowing immigrant grizzly bears to bolster a resident population in an area that has been affected by catastrophic events or negative environmental conditions, and (2) preserving genetic diversity by reducing negative effects from inbreeding. Task 37 in the Grizzly Bear Recovery Plan (USFWS 1993) called for the evaluation of linkage potential between grizzly bear recovery zones.

5. Dispersal, Movement and Genetic Health

Grizzly bears live at relatively low population densities and are vulnerable to excessive human-caused mortality. As a result, fragmentation of historically contiguous populations into isolated "remnant" populations is a management reality on the current ecological landscape (Forman and Alexander 1996; Proctor et al. 2012; Servheen et al. 2001). However, the extinction risk of isolated populations is reduced through minimal levels of connectivity (Soulé 1987). At greatest risk of extinction are small isolated populations with less than 100 individuals. Such populations are more susceptible to extinction through demographic processes such as human-caused mortality, natural mortality, and lower population growth rates as well as environmental processes such as poor food years, climate change, and habitat loss. While the CYE and SE grizzly bear populations contain less than 100 individuals each, they are not isolated from Canadian populations. Small populations benefit greatly from both demographic rescue (i.e., the immigration of female bears) and to a lesser degree genetic rescue (i.e., immigration of male bears). Although reconnection of these somewhat isolated populations is challenging (Forman and Alexander 1996; Lindenmayer and Fischer 2006), metapopulation theory directs that connectivity is the best long-term conservation practice to increase the resiliency, redundancy, representation, and overall probability of persistence of remaining grizzly bear populations in the lower 48 States (Boyce 2000).

Proctor et al. (2012) compiled and analyzed all known genetic and movement data for grizzly bears in 10 different study areas. They assessed the current state of genetic fragmentation within and between these study areas and used genetic assignment testing and movement data from radio-collared individuals to compile what is known about current levels of male and female

movement. Samples from coastal British Columbia and the Selkirk Mountains south of Canadian Highways 3 and 3A (i.e., the SE) have unique genetic material that is dissimilar to other grizzly bear populations in southern Canada and the northern U.S. In the Selkirk Mountains this difference is most likely due to genetic drift acting on a small isolated population over several generations because of anthropogenic pressures (Proctor et al. 2012).

Although there are differences in heterozygosity values among study areas and recovery zones, there have been no detectable consequences on grizzly bear morphology, physiology, ecology, or biology related to these differences in genetic diversity. This is evidenced by normal litter size, little evidence of disease, an equal sex ratio, and physical characteristics such as body size and weight (Schwartz et al. 2006, 2006a; Kasworm et al. 2008; USFWS 2011). Proctor et al. (2012) determined that these genetic differences are not the result of natural selection in varying environments or indicative of historical conditions. Instead, they are artifacts of human pressures (Ibid.). Grizzly bears face high mortality risk when moving between secure blocks of habitat. This mortality risk and very low population sizes resulting from past range contraction and mortality have resulted in genetic fragmentation. Each of these fragmented populations may possess genetic material missing from other populations. Maintenance of this genetic material is important to the long-term ability of this region's grizzly bears to respond to environmental changes.

Because grizzly bears have low reproductive rates, long generational periods (8-10 years), and are slow to disperse across landscapes, there can be a lag time between population fragmentation and the subsequent genetic change (Proctor et al. 2004). The genetic data collected by Proctor et al. (2012) reflect fragmentation occurring on the landscape in the recent past (i.e., last 30-60 years). The researchers also examined grizzly bear movements between ecosystems that displayed varying levels of genetic separation. Movement data were collected from 1985-2007 and represent a more recent picture of fragmentation than genetic data. In general, males move more frequently and over longer distances than females. This result is expected based on what is known about female home range size and the dispersal process. Females typically establish smaller home ranges than males, and new female home ranges also overlap with their mother's (Servheen 1983). As a result, females generally disperse over much shorter distances than male grizzly bears (McLellan and Hovey 2001; Proctor et al. 2004). The majority of migrants that moved from one study area to another were males, but small number of females were also observed moving between genetically fragmented populations (Proctor et al. 2012). This is consistent with finding in western Montana and Wyoming. The earliest detections of grizzly bears from the NCDE found in the intervening area between the NCDE and the GYE were male, and males make up most of the known occurrences in this region (Mace and Roberts 2012).

Connectivity must be examined in a genetic (requires males only) and demographic (requires females) framework. While dispersing males can enhance genetic diversity, in-turn reducing genetic fragmentation (Miller and Waits 2003; Proctor et al. 2012), female dispersal into small populations is necessary to enhance growth rate (Proctor et al. 2012). This concept is relevant to grizzly bear recovery in the NCE, SE, and CYE recovery zones, all of which contain small populations that are demographically and genetically isolated to varying degrees.

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Increasing genetic and demographic fragmentation across Canada Highway 3 has been documented (Proctor et al. 2012). This fragmentation could lead to a loss of connectivity between some U.S. populations and Canadian grizzly bears. Canada Highway 3 is at least a partial barrier to population connectivity by minimizing female crossings (Ibid.). Maintaining and increasing movements by females (i.e., demographic rescue) from larger populations (e.g. Canada or the NCDE) into the small populations (NCE, SE, and CYE) is critical to the long-term conservation of these populations. Recovery could be accomplished via natural movements or translocating animals.

Another aspect of connectivity Proctor et al. (2012) examined was known habitat use by grizzly bears in intervening habitats between Service-identified recovery zones. This habitat use is relevant to understanding how and where grizzly bears in different ecosystems may be linked in the near future. The researchers found 4 males and 1 female using habitat between the Selkirk and Purcell Mountains in Canada, although there was no evidence indicating any migration between these 2 mountain ranges. Mace and Roberts (2012) documented the distribution of grizzly bears in and adjacent to the NCDE recovery zone based on a compilation of telemetry data, mortality data, and DNA detections. The study found that a small number of both male and female grizzly bears are occupying habitat a substantial distance from the recovery zone boundary, including areas to the south, east and west of the NCDE recovery zone. One female grizzly bear with a cub was found to be regularly using habitat between the NCDE and CYE. Telemetry data on this female indicate that she and her offspring spent most of their summer in the Salish Mountains less than 2 miles east of the edge of the CYE while denning within the boundaries of the NCDE recovery zone (Kasworm et al. 2010). The detection of grizzly bears outside the NCDE recovery zone has been increasing in recent years (Costello et al. 2016). Kasworm et al. (2012) have documented multiple grizzly bears, including females with cubs, in the Tobacco BORZ (Bears Outside Recovery Zone), an area situated between the CYE and NCDE.

6. Range-Wide Status

When grizzly bears in the lower 48 States were listed under the ESA in 1975, the vast reduction in range, increase in trail and road construction, increase in recreation, livestock use of NFS lands, unsustainable human-caused mortality, lack of data regarding populations, and isolation were identified as factors affecting their conservation status (40 FR 31734, July 28, 1975). To date, all of these threats have been addressed to varying degrees in different areas.

New information regarding grizzly bear biology, current status, and threats has become available over the years since listing. This research and information has been valuable in addressing the impacts and management of roads, trails, recreation, and livestock management. It has also indicated the need for public information and assistance programs, and attractant storage protocols to limit human-caused mortality of grizzly bears.

Although there are six grizzly bear recovery zones, five are occupied; the BE does not have a grizzly bear population at this time. We have recent population data for the GYE, NCDE, CYE, and SE. The current range and distribution of grizzly bears in the lower 48 States is not a static

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measure as dispersal is occurring, and the specific distribution has not been quantified systematically across all ecosystems. Grizzly bears now occur both within the formally designated recovery zones and in habitat adjacent to the NCDE, GYE, SE and CYE (Wittinger 2002; USFS 2009; Mace and Roberts 2011, 2012).

Following is a summary of the status of grizzly bears for the five recovery zones not included in the action area, followed by a more detailed discussion for the recovery zone that is included in the action area (NCDE).

North Cascade Ecosystem

The North Cascade Ecosystem (NCE) recovery zone lies in north central Washington and is 9,694 square miles in area. Grizzly bears were historically abundant in the NCE, but numbers have declined substantially in recent decades. Sullivan (1983) compiled 233 reports of grizzly bears in the North Cascades and adjacent British Columbia from the mid-1800s through 1983. The last grizzly bear killed in the North Cascades was in Fisher Creek in 1967 (Sullivan 1983), and the last verified sighting occurred in the Glacier Peak Wilderness during 1996 (North Cascades Grizzly Bear Recovery Team 2004). A grizzly bear habitat evaluation of the North Cascades was conducted from 1986 to 1991 (Almack et al. 1993; Gaines et al. 1994). The evaluation and a Technical Committee Review Team (Servheen et al. 1991) concluded that the ecosystem contained sufficient habitat to maintain and recover a grizzly bear population.

Currently, it is estimated that the NCE supports less than 20 grizzly bears (Almack et al. 1993). The nearest population of grizzly bears is immediately north in Canada with an estimated 25 individuals but populations to the east and west of the Cascades in Canada are considered extirpated (North Cascades Grizzly Bear Recovery Team 2004). The distribution of grizzly bears within the NCE is unknown due to a lack of data (USFWS 2011), and very few credible sightings and reports exist. A recent confirmed sighting in the U.S. occurred in September 2010, and there have been credible reports in the British Columbia portion of this ecosystem (*Ibid.*).

The National Park Service and the Service are working in cooperation with the U.S. Forest Service, and the Washington State Department of Fish and Wildlife in the development of an EIS process for restoring Grizzly Bears to the North Cascades Ecosystem (NCE). That EIS was released to the public for review on January 12, 2017.

Selkirk Ecosystem

The Selkirk Ecosystem (SE) recovery zone lies within northwestern Idaho, northeastern Washington, and southeastern British Columbia. It encompasses 2,201 square miles and is unique in that it is split between Canada (47 percent) and the U.S. (53 percent). The 1993 Recovery Plan defined a portion of the SE within Canada so that it was at least 2,000 square miles in size. This size would promote the Recovery Plan's minimum population goal of 90 grizzly bears in the SE (USFWS 1993). In Canada, land ownership is roughly 65 percent Crown (i.e., public) land and 35 percent private. In the U.S. portion of the SE, land ownership is approximately 80 percent Federal, 15 percent State, and 5 percent private lands. Within the SE, 3 percent (39,976 acres) is designated Wilderness Area. The habitat is contiguous across the

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border and radio-collared bears are known to move back and forth across the border. Therefore, the grizzly bears north and south of the border are considered one population (USFWS 1993).

The SE grizzly bear population has yet to reach recovery criteria presented in the Recovery Plan (USFWS 1993) for females with cubs. In 2004, Wakkinen and Kasworm (2004) estimated that the SE grizzly bear population was increasing at a rate of 1.8 percent annually. More recently, Proctor et al. (2012) compiled data from multiple sources and conducted DNA-based population surveys to estimate a population size of 83 grizzly bears in the SE. The most recent data indicate that population status is below recovery goals in the SE for number of unduplicated females but meets the criteria for distribution of females with young in bear management subunits (Kasworm et al. 2016a). The human-caused mortality levels for total bears and female bears were in excess of calculated limit during 2010-2015 (Ibid.). After known mortality was subtracted, a minimum of 30 grizzly bears were identified in the SE during 2013-2015 based on captures, genetic information, mortality, and sightings of unique individuals (Kasworm et al. 2016a). The recovery plan established a goal of zero human-caused grizzly bear mortality for the SE. This goal was not met.

Bitterroot Ecosystem

The Bitterroot Ecosystem (BE) recovery zone is located in east central Idaho and western Montana, and encompasses 5,785 square miles. Though suitable habitat remains, grizzly bears have been extirpated from the BE. At this time the BE is not considered to be occupied by a population of grizzly bears (USFWS 2011). The Service released a final environmental impact statement (EIS) and decision notice addressing the impacts of reintroducing grizzly bears into the Bitterroot Ecosystem in east central Idaho (USFWS 2000).

Cabinet-Yaak Ecosystem

The Cabinet-Yaak Ecosystem (CYE) recovery zone is 2,609 square miles in size and is located primarily in northwestern Montana with small portions in northern Idaho. The location of the CYE relative to the SE and NCDE (east and west, respectively) makes it essential to long-term survival and recovery of grizzly bears throughout a significant portion of its range in the U.S. Land ownership in the CYE is approximately 90 percent Federal, 5 percent State, and 5 percent private lands. The Kootenai National Forest manages approximately 72 percent of lands within the CYE recovery zone, with the Idaho Panhandle and Lolo National Forests administering the remaining Federal lands within the recovery zone. Approximately 5.6 percent (94,272 acres) of the CYE recovery zone is designated Wilderness. Major private land owners in the recovery zone include Weyerhauser and Stimson Timber Companies. Individual landowners live on various-sized acreage along the major rivers. The relative distribution of grizzly bears across this ownership pattern is unknown, but is believed to be proportionate to land ownership (i.e., approximately 90 percent of the grizzly bear population lives on the 90 percent of public land within this recovery zone). In Canada, the portion of British Columbia directly north of the CYE recovery zone is largely public with the exception of the Moyie and Kootenay River valleys.

The CYE is often described in terms of having two portions. The Cabinet Mountains portion forms the southern half of the CYE and is topographically diverse with steep mountain ranges

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(up to 8,700 feet) and definable seasonal habitats. The Yaak portion has gentler topography, lower elevations (up to 7,700 feet), and seasonal habitats are not as clearly definable. More research and telemetry work has occurred in the Yaak than the Cabinet Mountains.

After known mortality was subtracted, a minimum of 41 grizzly bears were identified in the Cabinet-Yaak recovery zone during 2013-2015 based on captures, genetic information, mortality, and sightings of unique individuals (Kasworm et al. 2016a). Grizzly bears also occur to the north of the U.S.-Canada border, and interchanges of radio-collared bears across the border have been documented (USFWS 1993). Kasworm et al. (2016) also concluded that there is a 61 percent probability that the CYE grizzly bear population is increasing, and the rate of that increase was estimated at 1.1 percent from 1983 to 2015.

Kasworm et al. (2017, In Prep) provide additional evidence of an improving baseline. The text, table and figure presented below are provided as presented in Kasworm et al. 2017:

> "The estimated finite rate of increase (λ) for 1983–2016 using Booter software with the unpaired litter size and birth interval data option was 1.016 (95% C.I. 0.936–1.085, Table 15). Finite rate of change in the population was an annual 1.6% for the period (Caughley 1977). Subadult female survival and adult female survival accounted for most of the uncertainty in λ, with reproductive rate, yearling survival, cub survival, and age at first parturition contributing much smaller amounts. The sample sizes available to calculate population trend are small and small sample sizes yield wide confidence intervals around any calculated estimate of trend (i.e., λ). The probability that the population was stable or increasing was 66%.
>
> Sample size concerns limited calculation of point estimates of cumulative annual rate of change until 1998 (Fig. 9). Finite rates of increase calculated for the period 1983–1998 (λ = 1.067, finite change = 6.5% annual) suggested an increasing population. Survival rates for adult and subadult females were 0.948 and 0.901 respectively, at that time. Adult and subadult female survival rates declined to 0.926 and 0.740 respectively in 2006 at the lowest point in the cumulative lambda calculations (λ = 0.926, finite change = -7.7% annual decline) (Fig. 10). Human-caused mortality has accounted for much of this decline in survival rates and population trend. During 2016, adult female survival and subadult female survival had increased to 0.954 and 0.827 respectively and resulted in an improving population trend estimate since 2006. Improving survival by reducing human-caused mortality is crucial for recovery of this population (Proctor et al 2004)."

Table 15. Booter unpaired method estimated annual survival rates, age at first parturition, reproductive rates, and population trend of native grizzly bears in the Cabinet–Yaak recovery zone, 1983–2015.

Parameter	Sample size	Estimate (95% CI)	SE	Variance (%)[a]
Adult female survival[b] (S_a)	16 / 43.3[c]	0.954 (0.884–1.0)	0.032	23.5
Subadult female survival[b] (S_s)	18 / 22.4[c]	0.827 (0.655–0.961)	0.081	62.7
Yearling survival[b] (S_y)	33 / 16.2[c]	0.884 (0.726–1.0)	0.076	2.4
Cub survival[b] (S_c)[d]	38/38	0.632 (0.474–0.790)	0.079	5.2
Age first parturition (a)	11	6.5 (6.1–6.8)	0.200	0.7
Maximum age (w)	Fixed	27		
Unpaired Reproductive rate (m)[e]	13/20/21[f]	0.378 (0.302–0.492)	0.048	5.4
Unpaired Lambda (λ)	5000 bootstrap runs	1.016 (0.936–1.085)	0.039	

[a] Percent of lambda explained by each parameter

[b]Booter survival calculation which may differ from Kaplan-Meier estimates in Table 13.
[c]individuals / bear-years
[d]Cub survival based on counts of individuals alive and dead
[e]Number of female cubs produced/year/adult female. Sex ratio assumed to be 1:1.
[f]Sample size for individual reproductive adult females / sample size for birth interval / sample size for litter size from Table 15.

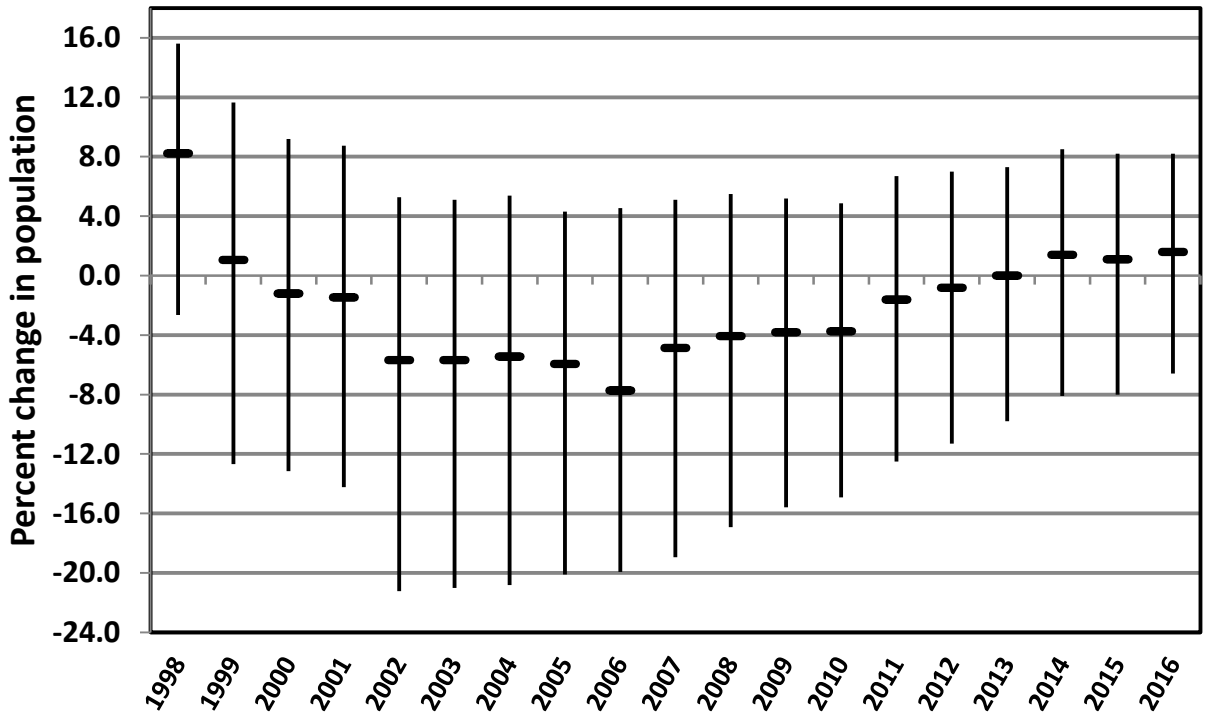


Figure 10. Point estimate and 95% confidence intervals for cumulative annual calculation of population rate of change for native grizzly bears in the Cabinet-Yaak recovery area, 1983–2016. Each entry represents the annual rate of change from 1983 to that date.

"Population Estimate

During 2012 the USGS used mark-recapture techniques to estimate the CYGBRZ (generally the CYE) grizzly bear population at 48-50 (Kendall et al. 2016). This was the best recovery area wide population estimate. Using the midpoint of this starting estimate, the calculated rate of increase (1.6%), and the numbers and fates of individuals in the augmentation program (five additions but two mortalities = net gain of three) we estimate the 2016 population at approximately 55 individuals." (Kasworm et al. 2017, In Prep)

The Service determined multiple times – most recently in 1999, that grizzly bears in the CYE warranted a change to endangered status, but were precluded from uplisting (see ESA Listing History, above). However, for several years, this population's status has been improving and the Service determined in 2014 that the CYE population no longer warranted endangered status. This determination was recently vacated by the Court on August 22, 2017 and the matter is currently remanded to the Service for further consideration. The population trend has now

changed from 'declining' to 'increasing.' The USFS has established regulatory mechanisms for motorized access management and attractant storage and researchers have documented some movement between the Cabinet-Yaak and other populations in Canada. These improvements have reduced the threats to the CYE grizzly bear population, but motorized access management has not been fully implemented and more progress is expected (USFS 2015; USFWS 2013).

Greater Yellowstone Ecosystem

The 9,209 square mile Greater Yellowstone Ecosystem (GYE) recovery zone includes portions of Wyoming, Montana, and Idaho; portions of five National Forests (Beaverhead-Deerlodge, Bridger-Teton, Custer-Gallatin, Shoshone, and Targhee NFs); Yellowstone and Grand Teton National Parks; John D. Rockefeller Memorial Parkway; portions of adjacent private and state lands; and lands managed by the Bureau of Land Management. Grizzly bears also frequently occur in and use areas outside of the defined GYE recovery zone.

Population recovery criteria are measured within the 19,279 square mile demographic monitoring area, which includes the recovery zone and all suitable habitat within the GYE. A large proportion of the GYE grizzly bear population occurs within the recovery zone, but grizzly bears also inhabit large areas outside the recovery zone and some areas outside of the demographic monitoring area. Yellowstone and Grand Teton National Parks make up 39.4 percent of the GYE recovery zone. Private holdings and other ownership make up 2.1 percent of the recovery zone and the remaining 58.5 percent occurs on NFS land. National Park Service and NFS lands support roughly 89 percent of the currently known distribution of the grizzly bears in the GYE recovery zone.

Three demographic criteria found in the 1993 Grizzly Bear Recovery Plan (USFWS 1993) have been reevaluated and updated. The second criterion pertaining to the distribution of females with offspring remains unchanged, while the first and third criteria pertaining to the minimum allowable number of females with cubs of the year and sustainable mortality limits have been revised and updated to reflect current methods based on the best available science (USFWS 2017). The current demographic recovery criteria appended to the 1993 Recovery Plan are:

- Demographic Recovery Criterion 1 – Maintain a minimum of population size of 500 grizzly bears and at least 48 females with cubs-of-the-year in the GYE demographic monitoring area, as indicated by methods established in published, peer-reviewed scientific literature and calculated by the Interagency Grizzly Bear Study Team. If the estimate of total population size drops below 500 in any year or below 48 females with cubs-of-the-year in 3 consecutive years, then this criterion will not be met;

- Demographic Recovery Criterion 2 – Sixteen of 18 bear management units (BMUs) within the recovery zone must be occupied by females with young, with no two adjacent bear management units unoccupied, during a 6-year sum of observations. This criterion is important as it ensures that reproductive females occupy the majority of the recovery zone and are not concentrated in one portion of the ecosystem. If less than 16 of 18 bear

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management units are occupied by females with young for 3 successive 6-year sums of observations this criterion will not be met;

- Demographic Recovery Criterion 3 – Maintain the population within the DMA around the 2002–2014 model-averaged Chao2 population estimate (average = 674; 95% CI = 600–747; 90% CI = 612–735) by maintaining annual mortality limits for independent females, independent males, and dependent young as per table 2. These adjustable mortality rates were calculated as those necessary to manage the population to the model-averaged Chao2 population estimate of 674 bears which occurred during the time period that the population had a relatively flat population trajectory. If mortality limits are exceeded for any sex/age class for three consecutive years and any annual population estimate falls below 612 (the lower bound of the 90% confidence interval), the IGBST will produce a Biology and Monitoring Review to inform the appropriate management response. If any annual population estimate falls below 600 (the lower bound of the 95% confidence interval), this criterion will not be met and there will be no discretionary mortality, except as necessary for human safety.

The first and third criteria were changed because the Service no longer considers the 1993 recovery plan criteria, as supplemented in 2007, the best scientific method available. The Chao2 estimator is now used to calculate the total number of independent females from unique observations of females with cubs-of-the-year. This then allows calculation of total population size instead of the minimum population size as used in the 1993 method. Additionally, unknown and unreported mortalities can now be calculated, which allows more conservative mortality management based on annually updated information rather than the estimate of unknown and unreported mortality as used in the 1993 recovery plan. Data on the reproductive performance of GYE grizzly bears, survival rates of cub and yearling grizzly bears, the trajectory of the GYE grizzly bear population under alternate survival rates, and the impacts of spatial and environmental heterogeneity on the GYE grizzly bear demographics has been improved and updated.

Using the 2017 revised recovery criteria, it was determined that independent male and dependent young mortalities were under the limits in 2015 (Haroldson and Frey 2016). Independent female mortality exceeded the threshold for 2015. The independent female, independent male, and dependent young mortalities were all under the limits in 2013 and 2014 (Haroldson and Frey 2014, 2015). The criterion states that independent female, independent male, and dependent young mortality cannot be exceeded in 3 consecutive years. Because the threshold for independent female mortality was not exceeded in 2014 and the thresholds for independent male and dependent young mortality were met in each of the last three years the revised demographic recovery criteria are met for independent females, dependent young, and independent males.

The GYE grizzly bear population has increased from estimates as low as 136 individuals when listed in 1975 to approximately 717 animals as of 2015 (Haroldson et al. 2016). This population had been increasing since the mid-1990s and was increasing at 4 to 7 percent per year (USFWS 2007, 2007a). A slowing of population growth began in the early 2000s, primarily due to a decline in survival of dependent-aged bears (van Manen et al. 2016). The population for the

recent period has a relatively flat population trajectory (van Manen, in litt.). According to van Manen et al. (2016) this slowing of population growth may be the result of an increase in grizzly bear density (rather than a decline in food resources); possibly indicating the population is near or at carrying capacity. The range of this population also has increased dramatically as evidenced by the increase in occupied habitat since the 1970s. GYE grizzly bears continue to increase their range and distribution annually and grizzly bears in the GYE area now occupy habitats they have been absent from for decades.

In 2007, the Service determined that the GYE supported a grizzly bear population with sufficient numbers and distribution of reproductive individuals so as to provide a high likelihood that the species will continue to exist and be well distributed throughout its range for the foreseeable future. Therefore, based on the best scientific and commercial information available, the Service delisted the Yellowstone grizzly bear DPS, effective April 30, 2007. However, on September 21, 2009, a court order vacated the final rule designating the Yellowstone DPS and removing the Yellowstone grizzly bear DPS from the list of threatened species and remanded the rule back to the Service. In accordance with the court order, in March of 2010, the Yellowstone grizzly population was once again listed as a threatened population under the Endangered Species Act (75 FR 14496, March 26, 2010).

The best available scientific and commercial data continue to indicate that the GYE population of grizzly bears has recovered and no longer meets the definition of an endangered or threatened species under the Act. Therefore, on March 11, 2016, the Service proposed to identify the Greater Yellowstone Ecosystem (GYE) grizzly bear population as a DPS and to remove it from the list of endangered and threatened wildlife (81 FR 13173). The Service has determined that the GYE DPS has increased in size since being listed as threatened and has more than doubled its occupied range. The threats to the population are sufficiently minimized. The threats to the population are sufficiently minimized, And members of the Yellowstone Ecosystem Subcommittee of the IGBC signed and finalized the 2016 Conservation Strategy for the GYE on December 16, 2016 (USFWS 2016). On June 30, 2017, the Service published a final rule removing the GYE grizzly bears from the list of endangered and threatened wildlife (82 FR 30502). The final rule became effective on July 31, 2017.

Northern Continental Divide Ecosystem

The Northern Continental Divide Ecosystem (NCDE) recovery zone is in north central Montana (8,926 square miles), and is approximately 45 miles from the BE and 15 miles from the CYE. Of the 8,926 square miles within the NCDE recovery zone, approximately 84 percent is on public lands administered by state or federal agencies. The remaining lands are comprised of Tribal, local government, and private ownership. Federally managed land is primarily divided among Glacier National Park and the five National Forests previously discussed in this document. Thirty-two percent (2,805 square miles) of all lands inside the NCDE recovery zone are designated Wilderness Areas.

Recently, a draft Grizzly Bear Conservation Strategy was prepared for the NCDE (USFWS 2013a). Five federal agencies (the Service, USFS, National Park Service, U.S. Bureau of Land

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Management, and U.S. Geological Survey), two Montana State agencies (Montana Fish, Wildlife and Parks and Montana Department of Natural Resources and Conservation), and two tribal entities (the Blackfeet National and Confederated Salish Kootenai) participated in development of the NCDE Grizzly Bear Conservation Strategy. A draft was published in 2013, and the above mentioned agencies will be signatories to an agreement to implement the final conservation strategy. The expectation is that the signatories will incorporate the set of habitat standards and guidelines relevant to their jurisdiction into their respective management plans in a manner that is consistent with the agency's requirements. Under the draft NCDE Conservation Strategy, all federal agencies would manage lands within the PCA so that (1) there would be no net decrease in secure core from the baseline and no net increase in open and total motorized route densities from the baseline (with specific allowances for temporary changes); (2) the number and capacity of developed recreation sites would be limited; (3) there would be no net increase in the number of livestock allotments and no net increase in the number of sheep animal unit months from the baseline; (4) vegetation management would be conducted in a way that considers grizzly bear habitat needs; and (5) mineral and energy development would be designed to avoid, minimize, or mitigate adverse impact to grizzly bears. Many of these aspects of the NCDE Conservation Strategy have been discussed above, and will continue to be discussed throughout this document.

The Service is currently evaluating habitat-based recovery criteria for the NCDE. On May 11, 2016, a notice was published in the Federal Register informing scientists and other interested parties that they would have the opportunity to submit oral or written comments on habitat-based recovery criteria for the NCDE grizzly bear population. On July 7, 2016, the Service conducted a workshop to hear oral presentations and also accepted written comments during July 2016. If it is determined that habitat-based recovery criteria are needed for the NCDE population, such criteria may be appended to the Recovery Plan. The draft NCDE Conservation Strategy includes measurable criteria for motorized access and secure habitat, developed recreation sites, and livestock allotments. The Conservation Strategy also addresses minerals management and vegetation management measures to maintain or enhance connectivity between grizzly bear ecosystems, and requires proper storage of food and attractants. The Revised Forest Plan as proposed will serve to incorporate elements consistent with the Conservation Strategy, if necessary the Revised Forest Plan can be revised or amended once the NCDE Conservation Strategy is finalized.

NCDE Population Size and Trend

Current estimates indicate that the NCDE grizzly bear population is growing and has experiences significant population growth over the last four decades. The population size and trend are measured within the 16,640 square mile area comprised of the recovery zone and Zone 1, as defined in the draft NCDE Grizzly Bear Conservation Strategy (USFWS 2013c). In 2004, a DNA-based mark-recapture study was conducted in a 7.8-million-acre area occupied grizzly bears in and around the NCDE recovery zone. Extrapolating from the 563 individuals detected, the overall grizzly bear population in the NCDE was calculated to be 765 grizzly bears, including all sex and age classes (Kendall et al. 2009). Between 2004 and 2009, Mace et al. (2012) radio-collared and monitored 83 female grizzly bears in the NCDE and calculated that the population was increasing at a rate of 3.06 percent per year (95 percent confidence interval = 0.928-1.102).

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Further, data from this study indicated that more than 1,000 grizzly bears resided in and adjacent to the NCDE recovery zone and Zone 1 in 2012.

More recently, Costello et al. (2016) calculated a slightly lower population growth rate of 2.3 percent for grizzly bears in the NCDE. However, this lower growth rate was thought to be the result of more through analytical techniques instead of a decline in the population. The authors stated: "we do not believe the observed difference in the two estimates is a result of actual population change. Our current models included a covariate for trend, and no negative trend was observed in any of the vital rates. Rather, we believe that the differences between Mace et al. (2012) and this report can be attributed to: (1) an increase in sample sizes for estimation of all vital rates; (2) better representation of conflict females in the estimation of vital rates; and (3) subtle but significant differences in methods of analysis."

To maintain a healthy grizzly bear population in the NCDE, it is necessary to have a balance between reproduction and mortality (USFWS 2013b). Grizzly bear mortality and survival in the NCDE affects population growth and is influenced by age, sex, reproductive status, and home range location (e.g., proximity to human developments). The average age of first reproduction in the NCDE is 5.4 years, but can vary from 3-8 years of age (Mace et al. 2012). Mean litter size in the NCDE is about two cubs, can range between one to four cubs (Mace and Waller 1997a; Schwartz et al. 2003). Cubs are born in the den in late January or early February and remain with the female for 1.5 to 2.5 years, making the average time between litters in the NCDE 3.0 years (Mace and Waller 1997; Schwartz et al. 2003).

Teisberg et al. (2015) assessed grizzly bear population health and body condition, finding that adult females across all ecoregions of the NCDE enter dens at mean fat levels above those thought to be critical for cub production. They stated that there is no evidence to conclude that the widely varying food resources across the NCDE are inadequate to meet the needs of reproductively active adult females. As opportunistic omnivores, grizzly bears in all regions of the NCDE exploit diverse combinations of food items to arrive at productive body conditions (Teisberg et al. 2015). Costello et al. (2016) documented a survival rate for adult females (the most important group affecting population trend) of 94.7 percent with a 95 percent confidence interval of 91.9 to 97.2 percent (Costello et al. 2016).

Grizzly bear mortalities can be attributed to variety of causes and fluctuate from year to year. Human-caused mortality is the most significant factor influencing grizzly bear survival in the NCDE. Costello et al. (2016) analyzed human-caused mortality of independent-aged (i.e., greater than 2 years old) grizzly bears from 2004–2014, and found that human-caused death accounted for 71 percent of all grizzly bear mortality in the NCDE. They also determined that the leading cause of human-cause mortality was management removals, followed by poaching/malicious kills, and defense of life. However, when accounting for the fact that non-management removal deaths often go unreported, Costello et al. (2016) estimated that poaching/malicious kills likely accounted for the highest proportion of total independent bear mortality (27 percent), followed by management removals (16 percent), illegal defense of property (11 percent), and natural causes (9 percent).

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The majority of management removals result from conflicts at sites associated with frequent or permanent human presence (USFWS 2013a). Unsecured grizzly bear attractants on private lands such as chicken coops, garbage, human foods, pet/livestock foods, bird food, chicken coops, livestock carcasses, wildlife carcasses, barbeque grills, compost piles, orchard fruits, or vegetable gardens are usually the source of these conflicts. Walters and Holling (1990) stated that managing human-caused mortality, monitoring both population and habitat parameters (e.g., road access), and responding when necessary with adaptive management are the best ways to ensure a healthy grizzly population

In each grizzly bear recovery zone, the Recovery Plan established minimum population goals that ensure a population of grizzly bears that is; (1) adequately distributed throughout the zone, (2) reproducing, and (3) can sustain existing levels of human-caused mortality (USFWS 1993). The Recovery Plan identified a minimum NCDE-wide grizzly bear population of 391 bears. The most recent population estimates indicate that this number is exceeded by a large margin, and the NCDE population is continuing to grow.

NCDE Population Distribution

In addition to increases in population size, grizzly bear distribution throughout the NCDE has also increased over the last few decades. To facilitate the assessment of grizzly bear population recovery objectives, the NCDE grizzly bear recovery zone was subdivided into smaller units called Bear Management Units (BMUs). Twenty-three BMUs were delineated in the NCDE (see Figure 1-4 in Appendix 1).

Costello et al. (2016) evaluated occupancy of the 23 BMUs in the NCDE by females with offspring during 2004–2014. Using a 6-year running average, as set forth in the recovery plan (USFWS 1993), they documented full occupancy of the recovery zone/PCA starting in 2009.

The NCDE recovery zone includes approximately 5.7 million acres of land. Using verified grizzly bear locations to create a current distribution map for the NCDE, Costello et al. (2016) estimated that bears currently occupy an area of roughly 13.6 million acres, more than double the size of the recovery zone or about 21,312 square miles, more than double the size of the recovery zone (8,926 square miles). This current distribution of grizzly bears encompasses the entire NCDE recovery zone/PCA, nearly all of zone 1, including 100 percent of the Salish demographic connectivity area and 63 percent of the Ninemile demographic connectivity area, and part of zones 2 and 3 (Costello et al. 2016). Both males and females are becoming increasingly common along streams and in shrubby draws to the east of the recovery zone boundary along the Rocky Mountain Front. Three female grizzly bear dens have been documented in short-grass prairie habitat along the eastern front of the Rocky Mountains (Mace and Roberts 2014).

Based on its large population size, increasing trend, and genetic diversity, the NCDE appears to be capable of serving as a source population for other grizzly bear populations in the contiguous United States (USFWS 2013a). Demographic connectivity may be especially important to support the small grizzly bear population in the CYE, which might not otherwise be viable over

the long term. The NCDE population also has the potential to be a source population for recolonization of the BE.

Status of Habitat in the NCDE

Grizzly bears use a wide variety of habitats. The varying climate, topography, and vegetative conditions throughout the NCDE result in a mosaic of habitats and foods for grizzly bears to consume during different seasons. During spring and early summer, grizzly bears in the NCDE eat primarily roots, corms, bulbs, and other vegetation (Aune 1994; McLellan and Hovey 1995). Later in the summer, grizzly bears in the NCDE consume a wide variety of berries as they become available (McLellan and Hovey 1995). Summer foraging items also include concentrations of lady bird beetles and army cutworm moths on rocky talus slopes (Aune and Kasworm1989; Mattson et al. 1991; Servheen 1983). During late summer to fall, grizzly bears in the NCDE continue to eat berries but also consume more meat, herbaceous vegetation, and roots (Aune and Kasworm 1989; Mace et al. 1994; McLellan and Hovey 1995).

In the past, grizzly bears were known to feed extensively on whitebark pine nuts in the late summer to fall, particularly in the Whitefish Range and on the Rocky Mountain Front (Aune and Kasworm 1989; Kendall and Arno 1990). However, high infection rates and mortality of whitebark pine caused by white pine blister rust (Kendall and Keane 2001) have dramatically reduced or eliminated this food source. The NCDE grizzly bear population has continued to increase despite the loss of this food source, indicating that ample alternate food sources remain available to grizzly bears in the NCDE.

As described in the Recovery Plan, grizzly bears are an omnivorous and opportunistic species, with utilized food sources varying annually, seasonally, and even day to day (USFWS 1993). The abundance and distribution of food resources, availability of habitat components such as cover and denning sites, the levels and types of human activities, grizzly bear social dynamics, learned behavior of individual grizzly bears, and annual weather are important variables influencing the accessibility of foods for bears. Because of the complexity and interactions of these variables, there is no known way to deductively calculate the carrying capacity for grizzly bears across a landscape (USFWS 1993). A mosaic of vegetation providing forage and cover is desirable, but the complexity described above makes it difficult to quantify a desired landscape composition.

The NCDE contains large areas of congressionally-designated wilderness, totaling more than 1.6 million acres within the recovery zone/PCA. The Wilderness Act of 1964 precludes road construction, motorized and mechanized uses, permanent human habitation, new livestock allotments, new mining claims, new oil and gas leases, or other developments that would impair the wilderness character of wilderness areas, except for those specifically allowed by the enabling legislation (e.g., Schafer airstrip). Wilderness areas provide a high degree of security for grizzly bears. The NCDE also contains sizable amounts of inventoried roadless areas. These roadless areas, as well as certain other lands that have little or no permanent human presence or road development, are well distributed throughout the NCDE and contribute to secure habitat for grizzly bears.

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The Nature Conservancy mapped landscape permeability for the Pacific Northwest (McRae et al. 2016) including western Montana, by classifying areas as having high, moderate or low landscape permeability. Resistance to movement was modeled by considering features such as land use, roads and rail lines, energy infrastructure, and housing development. Overall, the network of federal lands in northwestern Montana was estimated to provide a moderate to high degree of landscape permeability for wildlife, including grizzly bears. The USFS has been cooperating for many years with federal and state agencies and private organizations to improve habitat connectivity and mitigate the impacts of highways, train tracks, and other developments that impede movement by wildlife, including specific efforts for grizzly bears.

Grizzly bears utilize denning habitat in the winter to hibernate. On the west side of the NCDE, 52 separate females monitored during 1987-88 to 2012-13 denning seasons entered their dens between the first week of October and the fourth week of November, with most occurring the fourth week of October (Mace and Roberts 2014). In the spring, 72 females emerged from their dens between the third week of March and the fourth week of May, with most occurring during the second week of April (Mace and Roberts 2014). On the east side of the NCDE (i.e., Rocky Mountain Front), grizzly bears entered dens between October 10 and December 5, with a median date of November 7, and emerged in the spring between March 10 and May 13, with a median date of April 7 (Aune 1994; Mace et al. 1994).

Both males and females have a tendency to use the same general area to hibernate year after year, but the same den is rarely reused by an individual (Linnell et al. 2000). The average elevation of 252 grizzly bear dens in the NCDE ranged from 6,427 to 6,906 feet (USFS 2017). An estimated 47 percent (1,647,836 acres) of NFS land in the PCA provides potential denning habitat; therefore, the availability of denning habitat is not likely to be a limiting factor for grizzly bears in the NCDE (USFWS 2013a).

7. Factors Affecting the grizzly bear in the NCDE

In this section, we present the primary factors affecting the NCDE grizzly bear population Below, we summarize the status of human-caused habitat loss, habitat fragmentation and mortality, as well as habitat conservation within the NCDE.

Food and Attractant Storage

Improperly stored food and attractants remains a significant threat to NCDE grizzly bears. Improperly storing these attractants can result in the habituation of grizzly bears to human presence and/or conditioning grizzly bears to seek out human foods and attractants. Food-conditioned grizzly bears can learn to enter unsecured garbage containers, sheds, and other buildings in search of a food. The accessibility of attractants often leads to the mortality of a food-conditioned grizzly bear by management agencies or, in more dire circumstances, by private citizens defending their life or property. Grizzly bear are particularly susceptible to anthropogenic food sources during years of poor natural food production such as a berry crop failure. Measures that make attractants such as food, garbage, and livestock carcasses inaccessible through proper storage or disposal are very effective in reducing grizzly bear-human conflicts and the potential for injuries or mortalities.

In the Swan Mountains, the majority of grizzly bear-human conflicts and bear deaths were reported to have occurred on private lands in rural roaded areas (Mace et al. 1996). These conflicts often involved bears that were food-conditioned or habituated to human presence. Nearly 60 percent of management removals resulted from conflicts caused by unsecured food, garbage, pet and livestock foods, carcasses, orchard fruits, vegetable gardens, etc., that attracted bears into the proximity of humans.

On NFS lands, efforts to keep human food, garbage, and other attractants unavailable to bears are ongoing. This is primarily done through the issuance of food storage orders aimed at preventing grizzly bear–human conflicts. The first food storage order was issued in 1998 and included the entire Bob Marshall Wilderness Complex. Subsequent orders have been implemented on a number of National Forests, and have periodically been supplemented or updated as more needs arise. One notable update has been an increase in the spatial extent of food storage orders in recent years as the NCDE grizzly bear population expands outside the original NCDE recovery zone (i.e., PCA). A forest-wide food/wildlife attractant storage special order was issued by the Lolo National Forest in 2011. The Kootenai National Forest also implemented a forest-wide food storage and sanitation special order in 2011 that covered lands within both the NCDE and Cabinet-Yaak recovery zones (USFS 2011a). The Helena and Lewis and Clark National Forests have also issued food/attractant storage orders in 2005 and 2010 respectively, and special orders in effect on the Flathead National Forest were updated in 2010 and 2011 (USFS 2010, 2011).

Other federal agencies also use their authorities to provide for proper storage of food and attractants. Within Glacier National Park, the National Park Service has implemented food storage regulations (pursuant to 36 CFR 2.10 (d)) prohibiting anyone from leaving food unattended or stored improperly where it could attract or otherwise be available to wildlife. The Service administers the National Bison Range complex. National Wildlife Refuges within this complex are day-use only with no overnight camping allowed, and users are expected to pack out their trash as there are no garbage receptacles available anywhere on the refuges. On BLM lands occupied by grizzly bears, food storage guidelines are incorporated into their contracts.

Motorized Routes

A large body of research exists demonstrating that the presence of roads and associated human activities has detrimental impacts to grizzly bears. These impacts are largely due to increase potential for conflict, and displacement from important habitats resulting in lowered survival rates during the non-denning season.

Secure habitat is important to the survival and reproductive success of grizzly bears, especially adult females (Mattson et al. 1987; IGBC 1994). Grizzly bear habitat security is primarily achieved by managing motorized access, which results in four favorable outcomes for grizzly bears:

1. minimizes human interaction and reduces potential grizzly bear mortality risk;

2. minimizes displacement from important habitats;

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3. minimizes habituation to humans; and

4. provides habitat where energetic requirements can be met with limited disturbance from humans.

Research has demonstrated that roads and associated human activities impact grizzly bears by displacing them from important habitats and lowering their survival rates during the non-denning season (Mace and Waller 1996; Mattson et al. 1987; McLellan and Shackleton 1989; Waller and Mace 1997). Mace and Manley (1993) also showed that grizzly bears adjusted their habitat use patterns in response to both total and open road densities, as well as the traffic levels on roads. In response, the Interagency Grizzly Bear Committee appointed an Access Task Force to develop guidelines for the management of motorized routes in grizzly bear habitat. The guidelines were originally published in 1994 and updated in 1998, and they recommended three parameters to include as components of access management: OMRD, TMRD, and security core habitat. In effect, these recommendations endorsed the basic premise of managing open and total route densities and security core during the non-denning season as an effective strategy to support recovery of grizzly bears (IGBC 1998).

Research findings from the Swan Mountain Range of the Flathead National Forest have been used to evaluate the effects of motorized route density on grizzly bears in the NCDE since 1995. Mace et al. (1996) converted a linear road map to a total road density map using a 1 km^2 (0.39 mi^2) moving window analysis and reported the following relationships to road density:

1. Road density was lower within the composite of the multiannual home ranges of 14 adult and subadult female grizzly bears (0.6 km/km^2 or 0.95 mi/mi^2) than was road density outside the composite home range (1.1 km/km^2 or 1.7 mi/mi^2);

2. As total road density increased, probability of selection by grizzly bears declined;

3. 56 percent of the composite female home range was un-roaded compared to 30 percent outside the composite home range;

4. Within seasonal ranges, grizzly bears were more likely to use areas with higher road densities during spring than during other seasons;

5. Selection for habitats within a 0.3 mi buffer around roads decreased as traffic volume increased.

Recent research conducted on grizzly bears in Alberta, British Columbia assessed the impact of linear road density on grizzly bears. This differs from the moving windows analysis endorsed by the IGBC described previously. Boulanger and Stenhouse (2014) found strong spatial gradients in grizzly bear population trends based upon road density. Further, the authors identified threshold values for road densities associated with desired grizzly bear population outcomes. A summary of the threshold values is presented in Table III-2 below.

The road density thresholds derived by Boulanger and Stenhouse (2014) further illustrate the effects that motorized routes, and access management by extension, can have on grizzly bears in the action area. This new research is being applied in the proposed action to prescribe open linear road density limits within zone 1 of the action area, which includes the Salish and Ninemile demographic connectivity areas (DCAs, and zone 1of the action area).

Table III-2. Grizzly bear population objectives and associated road density thresholds derived by Boulanger and Stenhouse (2014). The right-hand column presents how these thresholds were used in developing the proposed action.

Objective described in the Alberta study	Reported density km/km2	Converted to English units	Where used to assess effects of the Revised Forest Plan
Grizzly bear presence – Distribution of collared bears shows most bears occurred within road densities of 1.5 km/km^2 or less (p. 10)	1.5 km/km^2	2.4 mi/mi^2	Used to evaluate the ability to provide for bear movement on the FNF (zone 1). Density calculation included roads open for motorized use in the non-denning season on NFS lands.
Occupancy by females – Adult females occupied habitat with road densities of 1.25 km/km^2 or less. If lower survival rate of females with dependent young is considered, the threshold of road density that can be tolerated is reduced (p. 15)	1.25 km/km^2	2.0 mi/mi^2	Used to evaluate the ability of the Salish demographic connectivity area to support female occupancy. Density calculation included both roads and trails open for motorized use in the non-denning season on NFS lands.
Grizzly bear mortality risk- Most grizzly bear mortalities occurred at road densities greater than 1.0 km/km^2, except for adult males where mortalities occurred across all road densities (p.10)	1.0 km/km^2	1.6 mi/mi^2	Used to evaluate grizzly bear mortality risk in the Salish demographic connectivity areas. Density calculation included both roads and trails open for public motorized use in the non-denning season on NFS lands.
Alberta core conservation area – Allows for survival rates of females with dependent offspring high enough to ensure an increasing population (p. 18)	0.75 km/km^2	1.2 mi/mi^2	N/A [moving window analysis method is used in the primary conservation area]

Over-Snow Vehicles

The effects of winter activities (e.g., snowmobiling) on denning grizzly bears are not well studied, but there is no evidence to indicate that current levels of snowmobile use are inhibiting the recovery of the grizzly bear population in the NCDE. As described in the BA, an assessment of 252 known grizzly bear dens in the NCDE was conducted in 2014. These dens were assessed with respect to areas open to over-snow use or closed to over-snow use, and no apparent avoidance by grizzly bears of areas open to over-snow use was found. In a review of the limited information available on black, brown (grizzly), and polar bears, Linnell and others (2000) reported that bears readily den within 0.6–1.2 mi of human activity (roads, habitations, industrial activity) and appear to be undisturbed by most activity that occurs further than 0.6 miles from the den site. Further, litter abandonment by female grizzly bears due to snowmobiling activity has not been documented in the lower 48 states (Hegg et al. 2010), nor have adverse effects on bears from snowmobiles been substantiated (Mace and Waller 1997a).

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As discussed in the Service's 2008 biological opinion on Amendment 24 to the Flathead National Forest (USFWS 2008), den abandonment has been documented in association with industrial activity and direct approach (Reynolds et al. 1986; Harding and Nagy 1980; Jonkel 1980; Craighead and Craighead 1972). Harding and Nagy (1980) found that one grizzly bear abandoned its den after having the den driven over by a seismic vehicle. Other events with seemingly similar levels of disturbance have not led to den abandonment (Jonkel 1980; Reynolds et al. 1986; Mace and Waller 1997; Linnell et al. 2000). We are not aware of any primary-source reports in the literature of grizzly bear den abandonment directly attributed to snowmobile activity (USFWS 2008). Nor has other substantive adverse effects on bears from snowmobile use been substantiated (see discussion in USFWS 2008). Mace and Waller (1997) reported no abandonment of dens by grizzly bear even though snowmobiles were often seen within 2 km of den sites. Likewise, the Interagency Grizzly Bear Study Team has intensively researched grizzly bear ecology in the GYE from the 1970's to present, but this research has never documented den abandonment attributed to snowmobiles.

In our 2008 biological opinion (USFWS 2008), we concluded that disturbance from snowmobiles may be most consequential shortly before or after den emergence of a female with cubs. Females and their cubs remain in the den site area for several weeks after emergence from dens (Haroldsen et al. 2002; Mace and Waller 1997). Females with cubs have high energetic needs, and cubs have limited mobility for several weeks after leaving the den. Disturbance levels that cause a female to prematurely leave the den in spring, or move from the den area, could ultimately impair the fitness of the female. Further, if the cubs attempt to follow, they will likely experience decreased fitness as well, as the family group may be pushed to less suitable habitat. To date, we are unaware of any documentation of snowmobile-related impacts on post-den emergent females with cubs, although detection of such events may go unreported. However, the Service's 2008 conclusion remains the same: "In the judgment of the Service, snowmobile-related impacts on post-den emergence females with cubs are more likely to impart serious consequences than any potential impacts to denning grizzly bears."

As described previously, Mace and Roberts (2014) reported that 72 females on the west side of the Continental Divide emerged in the spring between the third week of March and the fourth week of May, with most occurring during the second week of April. Peak den emergence in early April was also found on east side of the Continental Divide, in the Swan Mountains and Mission and Rattlesnake Mountains (Aune and Kasworm 1989; Mace and Waller 1997a; Servheen and Klaver 1983). Given the average den emergence period throughout the NCDE, there is potential for late-season (after March 31) over-snow vehicle use to affect grizzly bears.

Non-Motorized Trails

Several studies have investigated the behavioral response of bears to non-motorized trails (Jope 1985; Kasworm and Manley 1990; Mace and Waller 1996; MacHutchon 2014). These studies vary considerably in study design, trail use levels, grizzly bear sample sizes, and conclusions as to the impacts of non-motorized trails on bears. In Glacier National Park, bears more than 500 feet away from trails generally did not respond to hikers by fleeing (Jope 1985), and in 45 percent of all cases bears showed no movement in response to hikers. Hiker group size did not significantly affect initial bear behavior, and the relationship between group size and subsequent

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behavior was similarly weak. The higher presence of bear bells among larger groups may have influenced bear response.

McLellan and Shackleton (1989) reported that bears showed a stronger response to people on foot than in motor vehicles in "low human-use" areas. However, less than half of bears showed any response (walked or ran away) to stimulus greater than 250 feet away. McLellan and Shackleton also reported that grizzlies fled further in response to unexpected off-trail foot travel than to motorized use. Similarly, Mace and Waller (1996) reported that bear response to off-trail hikers was greater than that observed for other types of disturbances. Kasworm and Manley (1990) reported that grizzly bears used habitats within 100 meters (328 feet) of trails less than expected but used habitats 100-1,000 meters (3,281 feet) from trails in proportion to their availability.

Grizzly bear response to human disturbance may also differ between seasons or habitats. Jope (1985) noted that grizzly bears were more likely to respond to hikers through flight or charges in spring and early summer than later in the year, possibly due to habituation once human use became more common during the summer season. Kasworm and Manley (1990) found that bears used habitat within 100 meters of trails less than expected in spring and fall. Conversely, Mace and Waller (1996) found that distance to trails and/or lakes with campsites were significant variables only in summer and autumn.

Non-motorized recreation uses (hiking, horseback riding, mountain biking) also affect the risk of grizzly-bear human conflicts (Herrero and Higgins 1999). These conflicts can pose risks to human safety, as well as safety to grizzly bears. Herrero (1985) was one of the first researchers to report on the causes of bear attacks and how to avoid them. Based upon his study of bear attacks in Canadian national parks, Herrero reported that 68 out of 135 grizzly bear incidents in which the party's activity prior to the bear attack was known, hiking was the most common activity. Herrero reported that 75 percent of encounters he classified as "sudden" were known to involve bear mothers, with females and cubs of the year being most dangerous. Sudden encounters are the most likely situation to result in a grizzly bear-inflicted injury (S. Herrero, 1985). Attacks by bears on humans in North America are disproportionately more frequent in national parks, most being the result of sudden encounters between hikers and grizzly bears that react defensively to protect young or a food source (Herrero 1985; MacHutchon 2014). Fortin and others (2016) reported that most defensive attacks result from surprise encounters involving humans hiking off-trail, in the backcountry, and in areas of natural food abundance for grizzly bears.

Quinn and Chernoff (2010) conducted a literature review of the ecological effects of mountain bikes. A database of 33 grizzly bear-bicyclist encounters or confrontations within western North America revealed that in 95 percent (20 of 21) of encounters where the distance apart was estimated, the bear was 165 feet or less away. Schmor (1999) interviewed 41 mountain bikers in the Calgary region who cycled in the Rocky Mountains and concluded that the speed and relative silence of mountain bikes, especially when combined with environmental factors (e.g., dense vegetation, hilly terrain, running water), likely contributed to mountain bikers approaching bears closer than 50 meters (164 feet) before being detected by the bear. These factors make it less

likely that an encounter can be avoided. MacHutchon (2014) stated that an alert mountain biker making sufficient noise and traveling at slow speed (e.g., uphill) would be no more likely to have a sudden encounter with a bear than would a hiker.

In 1998, the Interagency Grizzly Bear Committee assigned a task force to create standard definitions and procedures for managing motorized access in grizzly bear recovery zones. At that time, the task force recommended that the impacts of "high intensity use" non-motorized trails be considered in calculations of "core" habitat (i.e., security core) in the grizzly bear recovery area (IGBC 1998). When this recommendation was made there were no data or literature available to determine what defined a "high intensity use" trail or how high-use trails may relate to grizzly bear population parameters. The task force recommended that trails receiving greater than 20 parties per week during the non-denning season be considered "high intensity use" and that an influence zone would be used that was the same as motorized routes (i.e., 500 meter buffer). Figure 1-5 (in Appendix 1) shows the distribution of trails modeled as "high use" trails in the NCDE, the majority of which are located in Glacier National Park.

Because of the subjective method of establishing the threshold value of 20 parties per week, the lack of available data to quantify high-use non-motorized levels, and the lack of published research demonstrating increased grizzly bear mortality risk or population-level impacts associated with high use non-motorized trails, the NCDE conservation strategy team recommended removing consideration of high use non-motorized trails to define core habitat (USFWS 2013a). This new methodology for calculating security core habitat is one component of the proposed action, and will be discussed in more detail below.

Developed Recreation Sites

Developed recreation sites are sites or facilities on federal lands with features that are intended to accommodate public use and recreation. Examples include campgrounds, trailheads, rental cabins, fire lookouts, summer homes, and visitor centers. Developed recreation sites can affect grizzly bears through temporary or permanent habitat loss and displacement. However, the primary concern related to developed recreation sites is that of grizzly bear-human conflicts caused by unsecured bear attractants, habituation, and food conditioning (Knight et al. 1988). Developed recreation sites that support overnight use are considered to have a higher potential for grizzly bear-human conflict (USFWS 2013a). Grizzly bear-human conflicts have occurred at developed recreation sites on NFS lands, although efforts such as food storage orders, bear-resistant containers, and public education have been implemented to help reduce the risk of these instances in the future. The majority of grizzly bears removed or relocated by management agencies in the NCDE had been involved in conflicts related to unsecured attractants, such as garbage, pet/livestock feed, and human food. Although the majority of these grizzly bear mortalities associated with human conflict occur on private lands, developed recreation sites on public lands in the NCDE area remain a concern.

Livestock Management

When the grizzly bear was listed in 1975, the Service identified "livestock use of surrounding national forests" as detrimental to grizzly bears "unless management measures favoring the species are enacted" (40 FR, p. 31734). The primary concern with livestock operations is that

they may lead to direct mortality of bears due to control actions resulting from depredation or learned use of bear attractants such as livestock carcasses and feed. Other potential effects include displacement due to livestock-related activity and competition for preferred forage

Predation on smaller animals such as domestic sheep and goats, calves, or chickens have been widely documented (Anderson et al. 2002; Knight and Judd 1983). Grizzly bears frequently coexist with larger livestock such as adult cattle without incident. However, predation on cattle does occur. When these incidents occur, management agencies may try to relocate bears, but often have to remove them from the population. Because of the increased likelihood of grizzly bears conflicts with sheep, the 1986 Interagency Grizzly Bear Guidelines emphasized the desirability of phasing out sheep allotments.

Approximately 7 percent of all human-caused grizzly bear mortalities in the NCDE between 1998 and 2011 were due to management removal actions associated with livestock depredations. In the NCDE, most livestock depredations by grizzly bears occur on sheep but also on young cattle. The majority of these livestock-related grizzly bear mortalities occur east of the Continental Divide, either on private lands or on the Blackfeet Indian Reservation along the Rocky Mountain Front.

There are also permitted grazing operations on NFS land for horses and mules in the NCDE. These are typically associated with outfitter and guide operations, or Forest Service administrative use. There is no evidence of conflicts with bears due to depredation, attractants, or forage competition related to horse and mule grazing permits. Honeybees are classified as livestock in Montana (MCA 15-24-921) and hives present a strong attractant to some grizzly bears. On-going efforts to keep grizzly bears away from honeybee operations (e.g., electric fences) have proven effective at minimizing conflict although these conflicts still occur.

Vegetation Management

Grizzly bears in the NCDE occupy a variety of habitat types but generally prefer to forage in areas with hiding cover nearby, particularly when feeding in the daylight hours (Aune and Kasworm 1989; Mace and Waller 1997a). To further illustrate this point, Waller (1992) reported that grizzly bears avoided recently harvested tree stands, as well as stands less than 30–40 years old where newly growing vegetation did not yet provide hiding cover. Nielson et al. (2004) suggested that forest design and silvicultural planning consider strategies such as increased perimeter-to-area ratio and low-impact site preparation to maximize grizzly bear food abundance, while minimizing human access (Nielsen et al. 2004).

Vegetation management (e.g., timber harvest, thinning, fire suppression) on NFS lands may alter the amount and composition of cover and forage in grizzly bear habitat. Some types of vegetation management may actually serve to increase grizzly bear forage through improved growth of grasses, forbs, and berry-producing shrubs (Zager et al. 1983). However, the roads and human activity associated with these activities can negatively affect grizzly bears by disturbing or temporarily displacing bears while operations are on-going. Further, human activity in grizzly bear habitat results in greater chances of a conflict (Zager et al. 1983).

Mineral and Energy Development

Mineral development refers to surface and underground extraction of leasable materials (e.g., oil, coal, hardrock mining), which is regulated by permits on NFS lands. Currently there are no plans to operate any commercial mines on NFS lands within the PCA, except for the Cotter Mine on the Helena National Forest. The production of oil and natural gas is conducted through a leasing process. As of 2012, there were 247 oil and gas leases inside the PCA (including public and private lands). At that time, nine leaseholders had submitted applications for permit to drill to the Bureau of Land Management, one of which was located on private lands. Within zone 1, there have been eleven applications for permit to drill submitted, only three of which are on NFS lands. The applications for permit to drill include surface use plans of operation, which require site-specific evaluation and analysis in compliance with National Environmental Policy Act.

Mineral and energy development may affect grizzly bears by reducing and fragmenting habitat. However, the increased human activity associated with these developments is a greater threat. Increased human presence can result in conflicts with grizzly bears. As with other factors affecting grizzly bears (e.g., developed recreation), situations where more humans and bears co-exist often lead to conflict due to habituation, improper storage of attractants, or even vehicle strikes.

Habitat Fragmentation

Linkage zones are rather recent concepts in broad management direction for grizzly bears and other large-ranging species (Servheen and Sandstrom 1993). Linkage zones, or zones of habitat connectivity within or between populations of animals, foster the genetic and demographic health of the species and a number of efforts to identify and conserve linkage areas are underway.

The NCDE recovery zone/PCA, at 8,926 square miles, encompasses multiple National Forests, Glacier National Park, and is contiguous with grizzly bear habitat in Canada, including Banff National Park. Large blocks of continuous wilderness or core areas occur, providing high levels of connectivity. Road densities on multiple use lands outside of core areas are being managed at levels based on grizzly bear research to reduce potential conflicts. A mix of federal, state, private lands, and highways occur along the North and Middle Forks of the Flathead River and along the Swan River. These areas typically have higher road densities, human settlements and other associated activity. Such factors represent risks for grizzly bears attempting to reside in or move through the area. However, no evidence exists that suggests a substantial lack of connectivity for grizzly bears across these valley bottoms. Grizzly bears are living in these areas and females are raising young; observations are documented each year.

Climate Change

Over the past 50 years the average temperature in the U.S. has risen more than 2 degrees Fahrenheit. Precipitation has increased an average of five percent, extreme weather events (e.g., drought, floods, extreme heat) have become more frequent and intense, and sea level has risen along most of the U.S. coast (Karl et al. 2009). Additionally, cold-season storm tracks are shifting northward and Arctic sea ice is declining.

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Ecosystem processes are affected by climate and by the concentration of carbon dioxide in the atmosphere (Janetos et al. 2008). Biodiversity within ecosystems is itself an important resource that maintains the ability of these systems to function. Many factors affect biodiversity including: climatic conditions, influences of competitors, predators, parasites, and diseases disturbances such as fire; and other physical factors. A rapidly changing climate, in conjunction with other stressors, is exerting major influences on natural environments and biodiversity, and these influences are generally expected to continue into the future.

Climate trends will be important to NCDE grizzly bears with respect to how these trends affect denning behavior, foraging habitat availability, and fire-regimes. Earlier snowpack melt off may shorten the denning season and make food available later in the fall and earlier in the spring. Spring and fall encounters between grizzly bears and people may therefore increase, escalating the mortality risk to bears during these times. An additional effect of climate change could be changes in the availability of and distribution of foraging areas due to increasing temperatures and seasonal changes in precipitation. The extent and rate to which plant species and communities would be affected is difficult to predict. Changes in vegetative distributions may also influence other mammal distributions, including prey species like ungulates.

Grizzly bears are habitat generalists and opportunistic omnivores, able to find resources in a wide variety of habitat conditions. It is difficult to predict how this large, wide-ranging species would respond to environmental changes associated with climate change. At this time, the scope and scale of such changes are unknown, and the effects (positive or negative) on grizzly bears would likely be variable across the landscape. If climate change affects the status of the NCDE grizzly bear population such that we have new information relevant to our effect analysis below, reinitiation of the consultation may be necessary.

C. ENVIRONMENTAL BASELINE

This section assesses the effects of past and ongoing human and natural factors that have led to the current status of the species, its habitat and ecosystem in the action area. Environmental baseline is defined as "…the past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process." (50 CFR 402.02)

The proposed action will provide the framework under which NFS lands administered by the FNF will be managed to support the continued recovery of the NCDE grizzly bear population. This BO considers the effects of implementation of the Revised Forest Plan, as well as the effects of the Revised Forest Plan specific to the conservation of grizzly bears and grizzly bear habitat. This section provides current information on grizzly bear population and habitat dynamics in the action area.

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1. Action Area

The action area is the FNF. This has been discussed previously in Chapter 1 of this biological opinion, as well as in Section A.1 of this chapter.

2. Status of the Species on the Flathead National Forest

Grizzly bear habitat on the FNF comprises 37 percent of the NCDE grizzly bear recovery zone/PCA (USFWS 2013a). This habitat is distributed across six geographic areas of the FNF (see Figure 1). Table III-3 displays the approximate acreage in each geographic area on the Flathead National Forest within grizzly habitat management zones, totaling about 2.4 million acres. On the FNF, a total of about 1.6 million acres inside the primary conservation area is currently designated as wilderness, inventoried roadless areas (IRAs), or other backcountry management areas that contribute to high levels of habitat security for grizzly bears (Figure 14).

Table III-3. Grizzly bear management zones within geographic areas (GAs) on the Flathead National Forest.

Grizzly Habitat Classification	North Fork Flathead River GA	Middle Fork Flathead River GA	South Fork Flathead River GA	Hungry Horse GA	Salish Mountains GA	Swan Valley GA	Total Forest
Primary Conservation Area	319,998	370,156	789,074	286,229	6,781	364,297	2,136,534 (90%)
Zone 1: Salish Demographic Connectivity Area	0	0	0	0	95,840	0	95,840 (4%)
Zone 1 outside DCA	43	0	0	5	135,516	143	135,702 (6%)

Grizzly bear habitat on the FNF includes a variety of coniferous forests, deciduous forests, wetland and riparian areas, and grass/forb/shrub patches found in areas such as meadows, avalanche chutes, burned areas, and logged areas. The natural range of grizzly bear habitat variation has been affected by ecological processes in the past (e.g., fire, floods, avalanches, insects, and disease) and will continue to be affected by these processes in the future. Grizzly bears and their habitat are also affected by a variety of human activities, which are described further below.

Motorized Route Density and Security Core Inside the PCA/Recovery Zone

The moving window analysis method has been used to evaluate the effects of motorized route density on grizzly bears across the NCDE since 1995. The Interagency Grizzly Bear Committee (IGBC) established definitions and procedures for analyzing the effects of motorized use, delineating analysis areas that were equivalent to the average size of a female grizzly bear home range. In the NCDE, these are called bear management unit (BMU) subunits. The FNF's 12 bear management units in the recovery zone/primary conservation area have been further subdivided into 73 subunits (Figure 11). The IGBC recommended criteria for open and total road densities, as well as core habitat within a grizzly bear subunit, to support conservation and recovery of grizzly bears (IGBC 1998).

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The existing FNF Forest Plan allows motorized use based upon Amendment 19 (A19), adopted in the 1995 Record of Decision (USFS 1995; USFWS 1995). In 54 BMU subunits where A19 applied, standards for grizzly bear specified that there would be no net increase in total motorized route density (TMRD) greater than 2 miles per square mile, no net increase in open motorized route density (OMRD) greater than 1 mile per square mile, and no net decrease in the amount of security core area. Additionally, A19 provided management objectives for 40 BMU subunits with greater than 75 percent NFS lands. In these subunits (40 out of 54 where A19 applied), A19 established management direction to reduce impacts of forest management activities on grizzly bears (especially females) by adopting the following for subunits where the USFS managed more than 75 percent of the acres in a subunit (calculations are done using a moving window analysis (USFS 1995):

- OMRD exceeding one mile per square mile is limited to less than or equal to 19 percent of a subunit;
- TMRD exceeding two miles per square mile is limited to less than or equal to 19 percent of a subunit; and
- Core habitat of 68 percent or greater within a subunit.

In 1995 there were many more miles of open and total roads than there are currently. At that time 16 of the Forest's subunits with greater than 75 percent NFS lands met or exceeded 68 percent security core habitat. From 1995 to 2015 another 11 subunits met or exceeded 68 percent security core, and four subunits met amended standards for security core. Further, a total of about 731 miles of roads have been decommissioned (USFS 2017). This effort has almost doubled the number of subunits exceeding (i.e., more favorable for grizzly bears) the standard for security core. Between 1995 and 2016, habitat conditions for grizzly bears on the FNF have become even more favorable. This has increased the availability of secure grizzly bear habitat and connectivity, benefitting the grizzly bear population.

On-the-ground conditions for grizzly bears continue to improve, but the reporting required under A19 has changed. The number of subunits with > 75 percent NFS lands has now changed because the FNF acquired more than 45,000 acres of former Plum Creek Timber Company lands through the Legacy Project and other land acquisitions (see Figures 25 and 26). The Nature Conservancy (TNC) and the Trust for Public Land agreed to purchase lands from Plum Creek Timber Company (PCTC) and then sell or donate these lands to Federal, State, and private owners. This land transfer is known as the Legacy Project. The majority of these lands have come under Federal (USFS) or State (DNRC) management, and any lands that were sold to private owners have safeguards (e.g., conservation agreements) attached to them so that the integrity of wildlife habitat is maintained. The Legacy Project transfer of lands to the Flathead NF was completed by 2016.

At the time A19 was adopted, 14 subunits had less than 75 percent NFS lands (USFS 1995). These 14 subunits were not required to meet the standards for OMRD, TMRD and security core

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presented above. Instead, these subunits were managed for "no net increase" in OMRD or TMRD and "no net loss" of security core.

As a result of the Legacy Project acquisitions and a district court decision related to the Glacier Loon and Buck Holland subunits, the FNF is now reporting conditions in relation to A19 motorized access objectives for 47 rather than 40 subunits where NFS lands are greater or equal to 75 percent of the subunit (USFWS 2016). The seven subunits with Legacy Project acquired lands are: Buck Holland, Cold Jim, Glacier Loon, Hemlock Elk, Lion Creek, Meadow Smith, and Piper Creek. In these subunits, roads on acquired lands are now classified as NFS roads, effectively increasing the miles of roads managed by the Flathead National Forest. Because these lands are still relatively new NFS lands, the FNF does not have complete knowledge of all roads on the acquired lands. Currently, FNF staff are working to complete field road logs in an effort to obtain to complete information such as the type and location of closure devices.

The status of all grizzly bear subunits on the FNF is summarized below and presented in Table III-4 (note: OMRD,TMRD, and core percentages presented in Table III-4 reflect signed decision that already undergone consultation) :

- 48 subunits with > 75 percent NFS lands meet or are less than 19 percent OMRD.
- 47 subunits with > 75 percent NFS lands meet or are less than 19 percent TMRD.
- 44 subunits with > 75 percent NFS lands meet or are greater than 68 percent Core.

Table III-4. Status of bear management unit (BMU) subunits on the FNF. Some subunits have had amended A19 objectives (shown here in red). Values in parentheses indicate subunit conditions once projects have been fully implemented. These projects have signed decisions and have undergone consultation, but on-the-ground implementation is still on-going. Shaded subunits have less than 75 percent NSF lands.

Subunit Name	OMRD Percentage	TMRD Percentage	Security Core Percentage
Albino Pendant	0	0	88
Big Salmon Holbrook	0	0	87
Black Bear Mud	0	0	84
Brushy Park	0	0	85
Buck Holland	24	41	45
Burnt Bartlett	0	0	92
Hungry Creek	0	0	88
Little Salmon Creek	0	0	98
Meadow Smith	20 (18)	54 (53)	42
White River	0	0	74
Big Bill Shelf	11	6	80
Bunker Creek	5	3	92
Goat Creek	23	59	39
Gorge Creek	0	0	90
Harrison Mid	1	0	95
Jungle Addition	19	19	68
Lion Creek	18	47	41

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Subunit Name	OMRD Percentage	TMRD Percentage	Security Core Percentage
South Fork Lost Soup	25	47	37
Spotted Bear Mountain	19	18	68
Pentagon	0	0	94
Silvertip Wall	0	0	97
Strawberry Creek	0	0	100
Trilobite Peak	0	0	100
Coram Lake Five	30	46	14
Doris Lost Johnny	57	20	36
Emery Firefighter	19	20 (19)	58 (68)
Peters Ridge	52	25	34
Riverside Paint	18	16	71
Wounded Buck Clayton	28	30	65
Dickey Java	9	0	81
Moccasin Crystal	8	1	81
Stanton Paola	8	3	81
Canyon McGinnis	18	31	50
Cedar Teakettle	35	36	24
Lower Big Creek	18	19	71
Werner Creek	29	20	63
Beaver Creek	6	26 (25)	66
Cold Jim	18	57 (54)	43 (44)
Crane Mountain	28	53	25
Glacier Loon	22	41	48
Hemlock Elk	6	30	64
Piper Creek	19	45	55
Porcupine Woodward	27	74	15
Lazy Creek	68	62	10
Stryker	37	33	50
Upper Whitefish	34	57	54
Ball Branch	8	12	84
Jewel Basin Graves	20	19	68
Kah Soldier	19	19	68
Logan Dry Park	30	36	51
Lower Twin	9	2	92
Noisy Red Owl	20	13	59
Swan Lake	40	23	45
Twin Creek	0	0	100
Wheeler Quintonkon	25	19	68
Flotilla Capitol	0	0	99
Long Dirtyface	0	0	100
Plume Mtn Lodgepole	0	0	97
Skyland Challenge	20	17	65
Tranquil Geifer	0	2	85
Coal & South Coal	15	19	73
Frozen Lake	10	4	86
Hay Creek	25	16	55
Ketchikan	14	3	73
Lower Whale	36	17	50
Red Meadow Moose	25	17	68
State Coal Cyclone	29	25	58

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Subunit Name	OMRD Percentage	TMRD Percentage	Security Core Percentage
Upper Trail	14	4	88
Upper Whale Shorty	12	11	86
Basin Trident	0	0	85
Gordon Creek	0	0	82
Jumbo Foolhen	0	0	89
Youngs Creek	0	0	92

Ten of the 73 subunits on the FNF are comprised of less than 75 percent NFS lands (indicated by shading in Table III-4). Of these subunits, 10 are managed under a strategy of "no net increase" in road densities (i.e., OMRD and TMRD) and "no net decrease" in security core. The remaining three do not have the same strategy because the FNF administers a very small percentage of lands within the subunit. In the biological opinion on the effects of the revised implementation schedule for A 19 (USFWS 2014), the Service concluded, "In summary, the existing access management conditions are good to very good for grizzly bears in the NCDE, with a few site specific exceptions. It is our opinion that motorized access is managed across the NCDE at levels that are evidently conducive to grizzly bear population growth and conserve grizzly bear habitat."

The existing Forest Plan (via A19) aka the current condition, also addresses administrative use of closed routes in the grizzly bear recovery zone (i.e., PCA) by describing allowable levels of administrative use. The direction states that outside of security core areas, motorized administrative use is acceptable at low intensity levels as defined by either (1) existing cumulative effects analysis models (which defined low-intensity levels as one to six vehicles/week) or (2) minor activities that do not exceed 30 days duration. Administrative use of reclaimed roads may not occur during the non-denning season other than over-snow vehicle use, which can occur during the period of time when public over-snow vehicle use is allowed.

Swan Valley Grizzly Bear Subunits

The Swan Valley provides habitat for grizzly bears as well as habitat connectivity from the Mission Mountains to the Swan Mountain Range. The Swan Valley Grizzly Bear Conservation Agreement (SVGBCA) is a collaborative document that has guided management of multiple-use lands managed by the Forest Service, Montana Department of Natural Resources and Conservation (DNRC), and lands formerly owned and managed by Plum Creek Timber Company. The purpose of the agreement is to "establish an ecosystem-based management plan throughout the Conservation Area which allows affected Parties to realize economic and recreational benefits of their ownership while helping conserve the bear and other species." Under the agreement, motorized access and timber harvest in 11 Swan Valley grizzly bear subunits were cooperatively managed.

The SVGBCA set an active/inactive rotation schedule for grizzly bear subunits in the Swan Valley. This rotation schedule designates select subunits to be "active" during the non-denning period (defined in the agreement as April 1-November 15). Under the schedule, 4 subunits can be active for 3 years while the other 7 subunits are inactive for a minimum of 3 years. Within an "active" subunit, unlimited commercial use (major forest management activities such as road

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construction and timber harvest) may occur during the non-denning season, but there are some activity restrictions in spring habitat from April 1-June 15. This provision of the agreement limits disturbance to grizzly bears during the spring when habitat availability is limited by snowpack that remains at higher elevations.

Within an "inactive" subunit, salvage harvest may occur between June 16 and August 31 but is restricted to two consecutive weeks with no more than 30 days in aggregate. Post and pole collection is also allowed in inactive subunits if the activity is less than two weeks in duration. Concentrating commercial activities in active subunits and limiting the scope and timing of activities in the inactive subunits is designed to reduce the risk of disturbance to grizzly bears from human activities in subunits where multiple landowners could be engaging in land management activities.

The SVGBCA also provides guidelines to maintain visual screening along open forest roads and maintain hiding cover throughout the subunit area. SVGBCA guidelines include providing 40 percent cover within each subunit. Retention of vegetative screening and hiding cover are intended to reduce potential effects from noise and human activity on open forest. During the two decades from 1996-2015, Plum Creek Timber Company, in conjunction with the "fiber agreement" with the Nature Conservancy (TNC) that was enacted during the Legacy land transfer, harvested a large portion of its lands in the agreement area. The "fiber agreement" between Plum Creek Timber Company and the Nature Conservancy has now ended, and Plum Creek Timber Company has now been acquired by Weyerhaeuser. Table III-5 displays the acres of harvest in the 11 Swan Valley grizzly bear subunits managed under the SVGBCA.

Table III-5. Acres of timber harvest from 1996 to 2015 in Swan Valley grizzly bear subunits by landowner[1]

Swan Valley Grizzly Bear BMU Subunit	Timber Harvest DNRC 1996-2005 (acres)	Timber Harvest DNRC 2006-2015 (acres)	Timber Harvest PCTC/TNC1996-2005 (acres)	Timber Harvest PCTC/TNC2006-2015 (acres)	Timber Harvest USFS 1996-2005 (acres)	Timber Harvest USFS 2006-2015 (acres)	Total Timber Harvest 1996-2015 (acres)
Goat Creek	1,345	501	4,369	0	0	10	6,215
Lion Creek	778		1,249	524	0	796	3,347
Piper Creek		120	2,620	2,141	16	19	4,786
Porcupine Woodward	485	2,000	3,690	0	0	0	6,175
South Fork Lost Soup	1,587	3,097	66	0	0	0	4,750
Meadow Smith			518	2,631	256	2,262	5,667
Buck Holland			110	984	450	2,247	3,791
Cold Jim			1,045	4,459	149	0	5,653
Hemlock Elk			1,007	1,843	252	523	3,625

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Swan Valley Grizzly Bear BMU Subunit	Timber Harvest DNRC 1996-2005 (acres)	Timber Harvest DNRC 2006-2015 (acres)	Timber Harvest PCTC/TNC1996-2005 (acres)	Timber Harvest PCTC/TNC2006-2015 (acres)	Timber Harvest USFS 1996-2005 (acres)	Timber Harvest USFS 2006-2015 (acres)	Total Timber Harvest 1996-2015 (acres)
Glacier Loon			1,543	376	717	104	2,740
Beaver Creek			1,044	546	303	5	1,898

[1] PCTC/TNC = Plum Creek Timber Company/The Nature Conservancy;

DNRC = Department of Natural Resources and Conservation.

The DNRC data has the following qualifiers:

- Harvested acres were sorted by sale date, not actual harvest date. Harvest date unknown.
- Does not include Plum Creek lands acquired in the Swan through the Legacy Project. This data is not known.
- No major timber sales occurred in the DNRC Swan River State Forest between 1996 and 2002.
- Does not include most small-volume timber permits or small-scale thinning/salvage projects.

Conditions in the Swan Valley have changed since A19 and the SVGBCA were adopted. The acquisition of former Plum Creek Timber Company lands by state and federal agencies totals approximately 66,000 acres checkered throughout the 230,000-acre Swan River watershed (Figures 25 and 26). This acquisition limits permanent human development and fragmentation of private lands in the Swan Valley and helps to maintain or improve habitat quality for grizzly bears and other wildlife species. Land acquisition is also expected to reduce the risk of grizzly bear food conditioning and habituation associated with private land development. Acquisition of the Legacy Project lands has reduced the need for coordination of timber harvest activities because Plum Creek Timber Company and The Nature Conservancy are no longer managing lands in 11 grizzly bear subunits.

The NCDE grizzly bear population is stable to increasing and expanding in distribution, even with a high level of timber harvest activity and road use by the multiple land managers in the intermingled ownership in the Swan Valley from 1995 to 2015. Because there are many acres of young forest that will not be suitable for additional harvest for many decades, and because PCTC/TNC no longer manage lands in the eleven subunits shown in Table III-5, the level of harvest and harvest-related activities (including road use) is likely to be much lower in the near future. Cover is becoming established in the areas that were harvested in the past.

The only remaining parties to the SVGBCA are the USFS and the DNRC. The DNRC manages blocks of lands in four grizzly bear subunits: Goat Creek, Lion Creek, Porcupine Woodward, and South Fork Lost Soup. This totals about 55,900 out of 124,362 acres in these subunits, or about 45 percent. In these four subunits, about 32,090 acres, or about 51 percent of lands managed by the FNF are in IRAs. Other private lands in these subunits total less than 2 percent of the subunit acreage. Table III-6 displays OMRD, TMRD, and security core for these four shared subunits. Because the DNRC manages very little land in the Piper Creek grizzly bear subunit it is not included in the table. Further, DNRC manages land in the Lion Creek subunit but it is still greater than 75 percent NFS lands so it is not included in Table III-6.

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Table III-6. Open motorized route density (OMRD), total motorized route density (TMRD), and security core habitat for subunits shared by USFS and DNRC with less than 75% NFS lands.

Subunit Name	OMRD %	TMRD %	Security Core %
Goat Creek	23	59	39
Porcupine Woodward	27	73	15
South Fork Lost Soup	25	47	37

Ruby (2014) studied grizzly bear habitat use along Montana Highway 83 in the Swan Valley and found that grizzly bears exhibited little negative selection for high open road densities within the Swan Valley study area. Ruby (2014) used location data from 24 grizzly bears instrumented with GPS collars using the Swan Valley of the Forest from 2000 to 2011 to characterize grizzly bear movement and habitat-use patterns. Use of GPS collars enabled grizzly bears to be tracked on a 24-hour basis. Ruby found that grizzly bears use high-quality habitats around human development and are not completely displaced. Rather, bears adopted movement patterns in close proximity to open roads and homes so that they were active during night time-periods when human activity was lowest. Although human activity associated with human site development in the rural landscape of the Swan Valley did not affect habitat selection, Ruby (2014) noted that it can result in human encounters resulting in grizzly bear mortality or management-related removals from the population. Where resources are not limiting, grizzly bear movement patterns that avoid periods of human activity may be an important strategy for limiting mortality risk to grizzly bears. Even though road density parameters in the Swan Valley do not meet 19 percent OMRD, 19 percent TMRD, and 68 percent security core, based on location data from Ruby (2014), grizzly bears continue to use Swan Valley habitats.

Motorized Route Density and Security Core Outside the PCA/Recovery Zone

Outside the recovery zone/primary conservation area, the 1986 forest plan identified geographic units and a range of public open road densities for each (see alternative A discussion) (USFS 2016). Table III-7 shows the linear density of roads open to public motorized use (during all or a portion of the non-denning season) within the portions of zone 1 under management authority of the Flathead National Forest. This level of motorized access has supported expansion of the grizzly bear population, including females, into zone 1, including the Salish demographic connectivity area (Figure B-5) (USFWS 2012a). In all geographic units, linear densities of roads open to public motorized use are at levels that support occupancy and survival of both males and females (Boulanger and Stenhouse 2014) and are below the upper thresholds established by the 1986 forest plan.

Table III-7. Density of roads open to the public motorized use outside the grizzly bear recovery zone/PCA by geographic unit of the FNF.

Geographic Unit[1]	Density of roads open to public motorized vehicle use (avg. linear mile/mile[2] of NFS lands)
Swan Lake Ranger District	
Island Geographic Unit	1.7
Tally Lake Ranger District	
Olney-Martin Creek Geographic Unit	1.6

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Geographic Unit[1]	Density of roads open to public motorized vehicle use (avg. linear mile/mile[2] of NFS lands)
Upper Good Creek Geographic Unit	1.3
Sylvia Lake Geographic Unit	1.0
Star Meadow-Logan Creek Geographic Unit	1.5
Tally Lake-Round Meadow Geographic Unit	1.8
Mountain Meadow-Rhodes Draw Geographic Unit	1.6
Upper Griffin Geographic Unit	0.9
Ashley Lake Geographic Unit	1.9

Motorized Over-Snow Use During the Den Emergence Period

As discussed in Section C.3 above, motorized over-snow vehicle can have adverse effects on grizzly bears during the crucial den emergence period. The existing Forest Plan allows motorized over-snow use based upon Amendment 24 (A24), adopted in the Winter Motorized Recreation Plan Record of Decision in 2006 (USFS 2006). A24 was implemented to provide management direction regarding over-snow motorized use on the FNF by establishing a Winter Motorized Recreation Management Plan that clarified where, when, and under what conditions over-snow vehicles were allowable on the FNF. A24 identified areas suitable and not suitable to motorized over-snow vehicle use, including four "late-season areas" within the recovery zone/PCA. The four designated "late-season areas" are: Canyon Creek groomed route corridor (open until April 15); Six Mile (open until April 30); Skyland Challenge (open until May 15); and Lost Johnny (open until May 31).

Table III-8 presents current areas and routes open to motorized over-snow vehicle use in the recovery zone/PCA according to season (i.e., denning season and den emergence time period). Note that miles and acres displayed in this table reflect the implementation of A24. During the denning season, about 22 percent of the recovery zone/PCA on the FNF is suitable for motorized over-snow vehicle use. During the non-denning season, which includes the time period when grizzly bears may be emerging from their dens, motorized over-snow vehicle use is suitable on approximately two percent of the acreage within the FNF's portion of the recovery zone/PCA (see Figures 19 and 20). The USFS and MTFWP have monitored motorized over-snow use as well as known den locations and bears emerging from their dens and reported this information to the USFWS. The agencies have not detected any conflicts due to over-snow use on the Flathead National Forest (USFS 2017).

Table III-8. Miles/acres suitable for motorized over-snow vehicle use within the primary conservation area (PCA)

Area	Motorized Over-Snow Vehicle Routes Open Dec. 1 to March 31[1]	Motorized Over-Snow Vehicle Areas Open Dec. 1 to March 31[1]	Motorized Over-Snow Vehicle Routes Open April 1 to Nov. 30)[2]	Motorized Over-Snow Vehicle Acres Open April 1 to Nov. 30)[2]
PCA	872 miles	516,134 acres	661 miles	59,017 acres

[1] This includes all routes and areas open during this time period.

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[2] This includes all routes and areas open during this time period.

Non-Motorized Trails Inside the PCA

The FNF has about 2,041 miles NFS trails in the PCA, and about 275 miles of this total are considered to be "high use" using the IGBC criteria. Figure 16 shows the distribution of trails modeled as "high use" in the NCDE. As this data shows, the majority of trails that have been modeled as "high use" are in Glacier National Park.

Strategies recommended to reduce the risk of sudden encounters between grizzly bears and people include (1) visitor education regarding safe practices in bear country (e.g., expect to meet bears, look ahead, slow down, make lots of noise), (2) managing recreation to occur more predictably in space and time, and (3) designing or locating recreation trails to increase the distance at which bears can detect people and to avoid habitats with concentrated bear food resources (Fortin et al., 2016; J. Herrero and Herrero, 2000; Quinn and Chernoff, 2010).

Although a variety of methods can be used to reduce the risk of grizzly bear-human conflicts due to non-motorized uses, Herrero and Herrero (2000) emphasized that none of them can entirely remove the risk of hiking or mountain biking in grizzly bear habitat. When grizzly bear-human conflicts do occur in the NCDE (whether associated with non-motorized trail use, off-trail backcountry use, developed recreation sites, or private or other agency lands), MTFWP, in cooperation with land management agencies and the USFWS, monitors the conflict situation and determines the appropriate conflict response based on established Interagency Grizzly Bear Guidelines. No population-level effects of non-motorized trails have been demonstrated, and there are relatively few "high intensity use" trails on NFS lands. Because of the lack of studies demonstrating population-level impacts associated with non-motorized trails, the subjective method of establishing the threshold value of 20 parties per week and their influence zone, and the lack of available objective data to quantify non-motorized use levels, the NCDE conservation strategy team recommended removing consideration of high-intensity use non-motorized trails to define core habitat effectiveness (USFWS 2013).

Developed Recreation Sites

On the FNF, there are 63 campgrounds, 63 recreation residences, and 20 lookouts/cabins/lodges designed for overnight use on NFS lands in the PCA (see Tables III-9 and III-10 for the number of sites their respective capacities). The FNF also has one developed resort on NFS lands in the PCA, the Whitefish Mountain Resort, as well as an unknown number of dispersed recreation sites. The FNF has consulted with Service on the effects of various resort expansion projects since 1989 (USFS-USFWS 2016; USFWS 1989, 1995a, 2007b, 2011d, 2012b, 2013d, 2015). The FNF also has one developed ski resort that operates during the grizzly bear denning season - Blacktail Mountain. This resort is in zone 1 outside the Salish DCA. Currently, food storage orders are implemented at these resorts and have been effective in reducing the risk of grizzly-bear human conflicts at these sites.

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Table III-9. Number of developed recreation sites designed for overnight use in the primary conservation area on the Flathead National Forest

Area	Number of Developed campgrounds	Number of cabins, lodges, lookouts with overnight use	Recreation Residences
PCA	63	20	63

Table III-10. Capacity of developed recreation sites designed for overnight use in the primary conservation area on the Flathead National Forest

Area	Capacity of Developed campgrounds	Capacity of cabins, lodges, lookouts with overnight use	Capacity Recreation Residences
PCA	552	48	63

Livestock Allotments

No sheep grazing and very limited cattle grazing occurs on the FNF. The Forest currently has seven active cattle allotments—four in the Salish geographic area outside the recovery zone/PCA and three in the Swan Valley geographic area inside the recovery zone/PCA (see Figures 4 and 21). Current allotment acreage represents approximately 3 percent of NFS lands, consisting of about 81,500 acres. Authorized grazing on the FNF has declined over the last several decades. Current animal unit months authorized for grazing totals about 1,078. Because livestock grazing has been declining, the risk of conflicts on the FNF has also declined.

There have been no known livestock-related grizzly bear mortalities on the FNF. According to the draft GBCS, "Indirect impacts on grizzly bears due to attractants associated with livestock can be effectively minimized with requirements to securely store and/or promptly remove attractants associated with livestock operations (e.g., livestock carcasses, livestock feed, etc.)" (USFWS 2013a). Livestock carcasses are promptly removed and livestock feed is properly stored on FNF lands, as required by the attractant storage orders that are in place (USFS 2011).

In addition to cattle, there are permitted grazing operations for horses and mules on FNF lands. These are primarily associated with outfitter and guide operations, or Forest Service administrative use. The food storage order addresses attractants associated with horses or mules, and there is no evidence of conflicts with bears due to depredation, attractants, or forage competition related to horse and mule grazing permits. Honeybees, classified as livestock in Montana (MCA 15-24-921), can be attractants to some grizzly bears. However, there are no permitted honeybee operations on the FNF.

Vegetation Management

Commercial timber harvest has affected a total of approximately 17 percent of the NFS lands on the FNF. In total, about 46 percent (304,750 acres) of the suitable land base on the FNF has been affected by commercial timber harvest since the 1940s. Though some harvest records date back to 1918, it wasn't until the early 1940s that harvesting on NFS lands became more prevalent and accurate record-keeping began. Table III-11 presents the approximate forest-wide acres and trend of timber harvest from 1960 through 2012 (USFS 2017). Table III-12 displays the

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approximate acres harvested for each of the six geographic areas on the FNF from 1960-2012. The majority of the Salish geographic area, where the highest amount of timber harvest has occurred, is outside of the grizzly bear recovery zone/PCA.

The Interagency Grizzly Bear Guidelines addressed vegetation management activities, and these guidelines were incorporated into the existing Forest Plan for timber management in grizzly bear management situations 1 and 2. These adopted guidelines have guided vegetation management on the FNF for the last 30 years. The draft GBCS (USFWS 2013a) includes many similar strategies for vegetation management that are designed to increase grizzly bear foods, limit the impacts of road use associated with projects, and protect seasonally important habitats.

Table III-11. Acres of NFS lands affected by commercial harvest activity by decade.

Decade of Harvest	Intermediate Harvest[1] (acres)	Regeneration Harvest[2] (acres)	Total Acres
< 1950	854	4,721	5,575
1950-1959	6,567	21,626	28,193
1960-1969	15,943	63,162	79,105
1970-1979	32,530	67,729	100,259
1980-1989	19,538	64,296	83,834
1990-1999	10,318	33,107	43,425
2000-2012	28,176	25,679	53,855
Total	113,927	280,320	394,247

[1] Intermediate harvest = removal of portion of the trees in a stand (e.g., commercial thin, overstory removal cut, salvage cut)

[2] Regeneration harvest = removal of nearly all the trees in the stand (e.g., clearcut, seedtree cut, shelterwood cut)

Table III-12. Approximate acres and percent of NFS lands affected by commercial harvest activity by geographic area (GA) 1960-2012

GA	Total NFS lands in GA (acres)	Sum of Harvest Acres (percent)
Hungry Horse	286,234	67,943 (24%)
South Fork	789,074	14,287 (2%)
Middle Fork	370,156	7,367 (2%)
North Fork	320,044	82,219 (26%)
Salish Mountains	262,859	122,016 (46%)
Swan Valley	364,440	100,415 (28%)
Total	2,392,807	394,247 (16%)

Mineral and Energy Development

The three systems that govern federal mineral and energy resources from NFS lands include the mining, salable and leasing laws and regulations. The mineral or energy resources falling within each system are known as locatable, salable, and leasable. The Forest Service has management authority over the surface resource impacts resulting from locatable mineral activity and has full

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discretionary authority over disposal of salable mineral material. For leasable commodities on NFS lands, the BLM issues all leases with Forest Service consent. Locatable mineral development refers to surface and underground hardrock mining of metallic minerals and nonmetallic minerals. Salable minerals include materials such as common varieties of sand, stone, and gravel. Leasable mineral development includes the production of materials such as oil and natural gas.

Locatable Minerals

Currently, there are no authorized locatable mineral activities such as exploration or development operations for locatable minerals within the boundaries of the FNF. Based on the results of a query of the BLM mining claim database, one active mining claim (MMC195448) is located within the planning area (USFS 2017). The Mary Dee II lode claim is located in the Hungry Horse geographic area. The FNF has low potential for locatable minerals as displayed in Figure 5.

Saleable Minerals

The FNF's use of mineral material, such as gravel, riprap, and crushed aggregate includes maintenance and/or new construction of roads, recreation sites, and trailheads. Other uses include Forest contract work (i.e., timber sales), culvert replacement, and repair of damage caused by fire, floods, and landslides. The mineral material utilized by the Forest is primarily derived from Forest Service pits and quarries located on the FNF. The type, volume, and source location of in-service mineral material varies year by year according to need. In addition, free use permits (FUPs) can be issued to state or federal agencies, municipalities, county road districts, nonprofit associations, or individuals (36 CFR 228.57). For example, the Forest has issued free-use permits to Flathead County for maintenance and improvement of the North Fork Road.

Leasable Minerals

The production of oil and natural gas is conducted through a leasing process. Existing FNF Forest Plan standards and guidelines provide guidance for authorizations and stipulations that are determined at the project level. At this time, there is no leasable mineral exploration or development on the Forest. The BLM suspended the oil and gas leases in 1985 after the Conner v. Burford district court decision (Conner v. Burford, 605 F.Supp. 107 [D.Mont.1985]) (Figure B-36). The court found the environmental "effects analysis" supporting lease issuance on the FNF to be inadequate, and specified that no activity could take place on the leases until an environmental impact statement (EIS) was completed. The 9th Circuit Court of Appeals upheld the district court decision to require an EIS prior to any post-leasing activities in a January 13, 1988, decision, as amended July 1, 1988.

The Forest has low potential for locatable minerals and low to high potential for leasable minerals. However, most NFS lands on the FNF are withdrawn from mineral entry (Figure 5). The type of lands withdrawn from mineral entry and leasing on the FNF include:

- administrative sites such as campgrounds;

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- Forest lands within the boundaries of a ski area permit;
- the Bob Marshall, Great Bear, and Mission Mountains Wilderness Areas;
- sections of the North, South and Middle Forks of the Flathead River;
- portions of the Forest withdrawn from mineral development by the North Fork Watershed Protection Act of 2013.

Withdrawal of these large areas reduces the risk of grizzly bear habitat loss, disturbance, displacement, and mortality. All withdrawals are subject to valid existing rights. The USFS does not have the discretion to deny the exercise of an outstanding mineral right. However, the developer does not have unrestricted rights, as the developer's rights are limited to use only as much of the surface as is reasonably necessary to explore, develop, and transport materials. The developer must provide an operating plan to the FNF, and the FNF has some ability to manage surface resources.

D. EFFECTS OF THE ACTION

Effects of the action are "…the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline." [50 CFR §402.02] These effects are considered along with the predicted cumulative effects to determine the overall effects to the species for purposes of preparing a BO on the proposed action. Direct effects are defined as those that result from the proposed action and directly or immediately impact the species or its habitat. Indirect effects are those that are caused by, or will result from, the proposed action and are later in time, but still reasonably certain to occur.

This section considers the effects to grizzly bears from implementation of the FNF's Revised Forest Plan, which includes incorporating habitat-related direction from the draft Northern Continental Divide Ecosystem (NCDE) Grizzly Bear Conservation Strategy (USFWS 2013a). Effects to grizzly bears are discussed in a general fashion, followed by an action area-specific break-down.

This biological opinion does not provide an analysis for effects of specific actions. Rather, analysis is a broad-scale examination of the types of activities that can be conducted the Revised Forest Plan that could potentially occur in grizzly bear habitat and result in effects on grizzly bears. Because of the broad-scale analysis, the FNF will remain responsible for project-specific section 7 consultation on all future projects that may affect the grizzly bear or its habitat, even if those projects are consistent with the Revised Forest Plan.

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1. General Effects

Access Management

The IGBC Taskforce provided standardized definitions for roads and standardized methods to measure road densities and define analysis areas as a result of grizzly bear research information on open and total road densities and grizzly bear core areas (IGBC 1994, 1998). The Service considers the management of roads one of the most important variables in grizzly bear habitat conservation. This section provides a general discussion of direct and indirect effects of motorized access management on grizzly bears and on the environmental baseline as affected by road densities.

Research has confirmed adverse impacts of roads on grizzly bears (Mace et al. 1996, Mace et al. 1999). Negative impacts associated with roads and excessive road densities influences grizzly bear population and habitat use patterns in numerous, widespread areas. These impacts are summarized in the following section, and some can be found in detail in The Grizzly Bear Compendium (IGBC 1987). Impacts reported in this document including:

- Direct mortality from vehicle strikes and illegal harvest (i.e., misidentification, poaching);
- Indirect mortality resulting from habituation to humans;
- Avoidance/displacement of grizzly bears away from roads and road activity; and
- Core habitat modification and/or fragmentation due to roads and road construction (including vegetative and topographic disturbances).

<u>Grizzly Bear Mortality</u>

Mortality is the most serious consequence of roads in grizzly bear habitat. Mortalities can occur from illegal shooting, collisions with vehicles, or indirectly through habituation to human presence (resulting in management removal or other lethal outcome). The specific relationship between roads and the mortality risk to grizzly bears is difficult to quantify, but the level of human use is one of several factors influencing the mortality risk associated with any road. Forest roads facilitate human access into grizzly bear habitat, which directly or indirectly increases the risk of mortality to grizzly bears. Historically, increasing road networks on the landscape resulted in grizzly bears becoming increasingly vulnerable to illegal and legal harvest in Montana (Mace et al. 1987) and in the Yellowstone region (Mattson et al. 1992). In southeastern British Columbia, McLellan and Shackleton (1988) reported roads increased access for legal hunters and poachers, the major source of adult grizzly mortality. McLellan (1989b) reported that 7 of 13 successful legal hunters interviewed had been on a road when they harvested their grizzly bear, and McLellan and Mace (1985) found that a disproportionate number of mortalities occurred near roads. In the Yellowstone ecosystem, Mattson and Knight (1991) reported that areas influenced by secondary roads and major developments were most lethal to grizzly bears. Aune and Kasworm (1989) reported 63 percent of known, human-caused grizzly bear deaths on the eastern front of the Rocky Mountains occurred within 1 kilometer (0.6

miles) of a road, including 10 of 11 known female grizzly bear deaths. In Montana, Dood et al. (1986) reported that 48 percent of all known, non-hunting mortalities during the period of 1967 through 1986 occurred within 1 mile of roads. Grizzly bears were also killed by vehicle collision, the most direct form of road-related mortality (Greer 1985, Knight et al. 1981, Palmisciano 1986).

The presence of roads alone does not necessarily result in direct mortality of grizzly bears, but the proximity of the roads to human population centers, and dispersed recreation in habitat around roads, can pose considerable risks to grizzly bears. Social values and attitudes also contribute to the level of mortality risk to grizzly bears. Incidental or accidental human-caused grizzly bear mortality, combined with a few individuals intent on illegally shooting grizzly bears, can collectively result in detrimental effects to grizzly bear populations. Access management can be instrumental to reducing mortality risk to grizzly bears by managing the present and anticipated future road use-levels resulting from the increasing human population in western Montana.

Displacement

Some grizzly bears, particularly sub-adults, may readily habituate to humans and consequently suffer increased mortality risk. However, many grizzly bears under-use or avoid otherwise preferred habitats that are frequented by humans. This represents a modification of normal grizzly bear behavior that results in detrimental effects. Negative association with roads arises from the fear of vehicles, vehicle noise, and other human-related activities around roads. These associations can also stem from human scent along roads, and hunting and shooting along or from roads. Grizzly bears that experience these negative consequences learn to avoid the disturbance generated by roads and may not choose to use these habitats even long after road closures.

All factors contributing to direct links between roads and displacement from habitat have not been quantified. As with mortality risk, the level of road-use by people is likely an important factor in assessing the potential displacement caused by any road. However, research indicates that grizzly bears consistently were displaced from roads and habitat surrounding roads, often despite relatively low levels of human use (Mattson et al. 1987, McLellan and Shackleton 1988, Aune and Kasworm 1989, Kasworm and Manley 1990, Mace and Manley 1993, Mace et al. 1996).

Avoidance behavior is often strongest in adult grizzly bears, with males selecting for high quality habitats and absence of humans (Gibeau et al. 2002). Males that were found using high quality habitat near roads, did so during the night where hiding cover was available (Ibid.). In contrast, adult females were more likely to avoid humans and roads all together, rather than seek out the highest quality habitats (Gibeau et al. 2002). Mueller et al. (2004) reported all age and sex classes used habitats closer to high-use roads and development when humans were least active. Not surprisingly, they also found that bears showed a considerably greater avoidance of high-use roads and development during periods of high human activity. The study also found that, regardless of the time of day, sub-adult bears were found closer to high-use roads than adult

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bears. This trend was also documented by Gibeau et al. (2002), who demonstrated that sub-adult grizzly bears were almost always closer to human activity than adults.

In Montana, Aune and Stivers (1982) reported that grizzly bears avoided roads and adjacent corridors even when the area contained preferred habitat for breeding, feeding, shelter and reproduction. McLellan and Shackleton (1988) found that grizzly bears used areas near roads less than expected in southeastern British Columbia, and estimated that 8.7 percent of the total area was rendered incompatible for grizzly bear use because of roads. Mace and Manley (1993) reported use of habitat by all sex and age classes of grizzly bears was less than expected where total road densities exceeded two miles per square mile. They also found that adult grizzly bears used habitats less than expected when open motorized access density exceeded one mile per square mile. Further, female grizzly bears in the study area tended to use habitat more than 0.5 mile from roads or trails greater than expected.

Mace et al. (1996) and other researchers have used 500 meters as the zone of influence around roads. Waller and Servheen (2005) also documented avoidance of areas within 500 meters of US-2 in Montana. Benn and Herrero (2002) set zones of influence of 500 meters and 200 meters around roads and trails, respectively. They reported that all 95 human-caused grizzly bear mortalities with accurate or reasonable locations that occurred in Banff and Yoho National Parks between 1971 and 1998 occurred within these zones of influence along roads and trails or around human settlements.

Conversely, grizzly bears can become conditioned to human activity and in some instances show a high level of tolerance especially if the location and nature of human use are predictable (Mattson 1993). In Glacier National Park, Jope (1985) suggested grizzly bears in parks habituate to high human use and showed less displacement, even in open habitats. Yonge (2001) found that grizzly bears near Cooke City, Montana, were willing to consistently forage in very close proximity to high levels of human use if cover was sufficient and energetically efficient feeding opportunities were present. In Montana's Swan Valley, Ruby (2014) used location data from 24 collared grizzly bears to show nocturnal use of highly roaded habitat.

Both Mattson (1993) and Yonge (2001) postulated that areas with higher levels of human activity might have a positive effect for bears by serving as a kind of refugia for weaker population cohorts (subadults and females with cubs) seeking to avoid intra-specific competition (i.e., conflict with adult males). However, Mattson qualified this observation by adding that the beneficial effects vary as to whether hunting is allowed, and how closely the human population is regulated. Further, food conditioned grizzly bears were much more likely to be killed by humans.

Core Habitat Fragmentation

The IGBC Taskforce (IGBC 1994) recognized the importance of secure areas to grizzly bears. The Taskforce defined "core areas" as those areas with no motorized access (during the non-denning period) or heavily used foot/livestock trails, providing some level of secure habitat for grizzly bears. Motorized use, such as snowmobiling, or that associated with timber harvest, could occur within core areas during the denning (winter) period. The Taskforce recommended

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the establishment of core areas in all subunits, the size of core area should depend on ecosystem-specific habitat conditions, and that a core area remain intact on the landscape for at least 10 years.

Mace and Manley (1993) reported adult females used habitat further than 0.5 mile from roads or trails more than expected. They also found that 21 percent of the composite home range had no trails or roads and 46 percent was unroaded (greater than 0.5 mile from a road). Substantive blocks of unroaded habitat were components of all adult female home ranges. Of the adult female locations within unroaded polygons, 83 percent occurred within 7 polygons that exceeded 2,260 acres in size. Based on grizzly bear habitat use data from the GYE, Mattson (1993) recommended that micro scale security areas in that region be an absolute minimum of 6 kilometers (3.6 miles) in diameter or 28 square kilometers (10 square miles) and should be secure for a minimum period of 5, or preferably 10, years.

These large blocks of secure "core" habitat are vital to grizzly bears, providing areas that are free from human influence. Grizzly bear security core habitat allows bears to exist under natural, free-ranging conditions. In most grizzly bear ecosystems in the lower U.S. roads are the primary threat to large blocks of grizzly bear security core habitat by facilitating human presence, or by fragmenting large swaths of habitat into smaller blocks.

Attractants and Habituation to Humans

Continued exposure to human activity without negative consequence can result in habituation, which is a loss of a grizzly bear's natural wariness of humans. Habituated grizzly bears may safely adjust to noise and activity and can demonstrate a high degree of tolerance. Tolerance is especially likely if the location and nature of human use are predictable, and do not result in overtly negative impacts for grizzly bears (Mattson 1993).

Improperly stored food, garbage, livestock or pet foods can lure grizzly bears to areas near people and pose a significant risk of habituating bears to human presence and/or conditioning grizzly bears to seek out anthropogenic foods and attractants. Food conditioned grizzly bears may enter unsecured garbage receptacles, sheds and other buildings in search of a reward. Accessibility to human related attractants and conditioning to those rewards can lead to management removal of grizzly bears and additionally, mortality of grizzly bears by people defending their life and property.

Grizzly bears are particularly susceptible to anthropogenic foods and attractants during years of poor natural production. Information and education programs, and food storage orders are particularly important during years of poor natural food production, and in seasons of high nutritional and energy needs for bears. MTFWP has stated that perhaps the greatest advancement in the management of problem bears has been the development of bear management specialist positions (USFWS 2011). The combination of shortened response time to reports of grizzly bear conflicts, preventative actions to remove attractants, the deterrent effects of local law enforcement, and perhaps most important, building community involvement in the management and conservation of grizzly bears, has been invaluable. These efforts assist in

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dealing with nuisance bears, preventing habituation of bears, and fostering local public support of grizzly bear conservation (MTFWP 2005, Wenum 2011).

Recreation

Effects during the Non-Denning Season

Several studies have investigated the behavioral response of bears to non-motorized trails. These studies vary considerably in study design, trail use levels, grizzly bear sample sizes, and conclusions as to the impacts of non-motorized trails on bears. In Glacier National Park, bears more than 500 feet away from trails generally did not respond to hikers by fleeing (Jope 1985), and in 45 percent of all cases bears showed no movement in response to hikers. Hiker group size did not significantly affect initial bear behavior, and the relationship between group size and subsequent behavior was similarly weak. The higher presence of bear bells among larger groups may have influenced bear response.

McLellan and Shackleton (1989) reported that bears showed a stronger response to people on foot than in motor vehicles in "low human-use" areas. However, less than half of bears showed any response (walked or ran away) to stimulus greater than 250 feet away. McLellan and Shackleton also reported that grizzlies fled further in response to unexpected off-trail foot travel than to motorized use. Similarly, Mace and Waller (1996) reported that bear response to off-trail hikers was greater than that observed for other types of disturbances.

White and others (1999) documented grizzly bear displacement from feeding sites in Glacier National Park in response to hikers. Kasworm and Manley (1990) reported that grizzly bears used habitats within 100 meters (328 feet) of trails less than expected but used habitats 100-1,000 meters (3,281 feet) from trails in proportion to their availability.

Grizzly bear response to human disturbance may differ between seasons or habitats. Jope (1985) noted that grizzly bears were more likely to respond to hikers through flight or charges in spring and early summer than later in the year, possibly due to habituation once human use became more common during the summer season. Kasworm and Manley (1990) found that bears used habitat within 400 feet of trails less than expected in spring and fall. Conversely, Mace and Waller (1996) found that distance to trails and/or lakes with campsites were significant variables only in summer and autumn.

Non-motorized recreation uses (hiking, horseback riding, mountain biking) also affect the risk of grizzly-bear human conflicts (Herrero and Higgins 1999). These conflicts can pose risks to human safety, as well as, safety to grizzly bears. Herrero (1985) was one of the first researchers to report on the causes of bear attacks and how to avoid them. Based upon his study of bear attacks in Canadian national parks, Herrero reported that 68 out of 135 grizzly bear incidents in which the party's activity prior to the bear attack was known, hiking was the most common activity. Herrero reported that 75 percent of encounters he classified as "sudden" were known to involve bear mothers, with females and cubs of the year being most dangerous. Sudden encounters are the most likely situation to result in a grizzly bear-inflicted injury (Herrero 1985).

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Attacks by bears on humans in North America are disproportionately more frequent in national parks, most being the result of sudden encounters between hikers and grizzly bears that react defensively to protect young or a food source (MacHutchon 2014). Fortin and others (2016) reported that most defensive attacks result from surprise encounters involving humans hiking off-trail, in the backcountry, and in areas of natural food abundance for grizzly bears. Various studies have analyzed the contribution of human behavior in bear attacks and concluded that activities where people may be moving quickly and/or quietly enough to surprise a bear before the bear detects them is an important factor. This can include activities such as mountain biking (if cyclists are traveling quietly at high speed) or hiking while hunting (if an individual is moving quietly through the forest or is in close proximity to an animal carcass).

Quinn and Chernoff (2010) conducted a literature review of the ecological effects of mountain bikes. A database of 33 grizzly bear-bicyclist encounters or confrontations within western North America revealed that in 95 percent (20 of 21) of encounters where the distance apart was estimated, the bear was 165 feet or less away. Schmor (1999) interviewed 41 mountain bikers in the Calgary region who cycled in the Rocky Mountains and concluded that the speed and relative silence of mountain bikes, especially when combined with environmental factors (e.g., dense vegetation, hilly terrain, running water), likely contributed to mountain bikers approaching bears closer than 50 meters (164 feet) before being detected by the bear. These factors make it less likely that an encounter can be avoided. MacHutchon (2014) stated that an alert mountain biker making sufficient noise and traveling at slow speed (e.g., uphill) would be no more likely to have a sudden encounter with a bear than would a hiker.

In Glacier National Park, conflicts and grizzly bear mortalities are rare and are related almost exclusively to campgrounds and other developed human-use areas (White et al. 1999). In the Swan Mountains, Mace and Waller (1996) reported there were no historic or recent records of grizzly bear-human conflict in their study area. The authors suggested that avoidance by bears of heavily used human trails may increase grizzly bear survival.

Effects during the Denning Season

The effects of winter recreation activities on denning grizzly bears are not well studied, but there is no evidence to indicate that current levels of non-motorized or motorized over-snow vehicle use are inhibiting the recovery of the grizzly bear population in the NCDE (Mace, pers. comm). In the fall of 2000, the science and resource management staff of the Biological Resources Management Division of the National Park Service and the Rocky Mountains Cooperative Ecosystem Studies Unit at the University of Montana organized an expert workshop to summarize the state-of-science on monitoring the effects of snowmobiles on wildlife in national parks and surrounding lands. Graves and Reams (2001) edited the output of this expert workshop for protocols to monitor snowmobile effects on wildlife. The participating scientists and biologists developed a flow-chart depicting possible impacts and prioritized research to address these impacts. They prioritized the need to develop techniques that would demonstrate and measure actual impacts on bear individuals and populations in the field, and addressed physiological/behavioral responses, mortality and displacement from habitat.

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The group concluded that the evidence was inadequate to predict impacts on grizzly bears, but the possible effects were identified: den abandonment, loss of young, increased energetic costs while bears were in dens or displaced away from suitable habitat if outside dens, death, and learned displacement from suitable habitat resulting from exposure to disturbance (Graves and Reams 2001). Several issues to monitor were identified, including the effect of presence on emerging animals and the effect of noise on hibernating bears. Impacts to emergent bears were identified as a higher concern than impacts to denning bears.

Some indications of bear species responses to human disturbance are available from the distances of dens from centers of human activity. The fact that some bear dens were documented within 1 kilometer (0.6 mile) of human activity centers (Linnell et al. 2000) indicates that bears do not totally avoid denning habitat based on its proximity to human disturbance. Caution should be used when making inferences with this information, however. Just because some bears were found denning close to human activities does not mean that all bears can or will do so. Likewise, such data usually do not include the long-term productivity or survival of the study animals. Linnell et al. (2000) summarized distances of bear dens to various centers of human activity as documented by nine studies of brown and black of bears; distances ranged from 0.1 to 6.5 km (~109 yards to 4 miles) and did not account for differences in altitude or other factors such as den characteristics, snow depth or activity levels. Harding and Nagy (1980) noted successful grizzly bear dens from 1.6 to 6.4 km (~1 to 4 miles) from active mining camps, although no dens were found within 1 km (~0.6 mile) of active drilling and staging camps. Although Schoen et al. (1987) noted that brown bears in Alaska gradually, from year-to-year, located their annual dens away from an area of increasing mining activity, the short distances to disturbance sources reported for the European brown bear dens were reportedly in proximity to long-established sources (Linnell et al. 2000), which suggests that some bears may become habituated to disturbance sources.

The draft NCDE Grizzly Bear Conservation Strategy (USFWS 2013a) indicates that the available data about the potential for grizzly bear disturbance or den abandonment from nearby snowmobile use is extrapolated from studies examining the impacts of other human activities and is identified as “anecdotal” in nature, with sample sizes so small they cannot be legitimately applied to assess population level impacts. There are no reports of den abandonment by grizzlies in the lower 48 states due to snowmobiling activity.

Effects during the Den-Emergence Period

The effects of winter recreation are likely most consequential shortly before or after den emergence of a female with cubs. Most emerging bears move immediately to a known, reliable spring food source, such as a big game winter range (Reinhart and Tyers 1999). Females with cubs have high energetic needs, and cubs have limited mobility for several weeks after leaving the den, therefore they remain in the den site area for several weeks after emergence from dens (Haroldson et al. 2002; Mace and Waller 1997). Researchers involved in the Delphi assessment of snowmobile impacts (Graves and Reams eds. 2001) indicated higher concerns with emergent females with cubs as they are likely the most sensitive to disturbance (Haroldson et al. 2002).

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Disturbance levels that cause a female to prematurely leave the den in spring or move from the den area could impair the fitness of the female and safety of the cubs. If cubs attempt to follow their mother, they would likely experience decreased fitness and the family group may be pushed to less suitable habitat. A disturbance would have to be severe for a sow to abandon her cubs (Linnell et al. 2000). In the judgment of the Service, winter recreation-related impacts on post-den emergence females with cubs are more likely to impart serious consequences than any potential impacts to denning grizzly bears.

Vegetation Management

Vegetation management may impact grizzly bears in the short-term by displacing grizzly bears from important food sources and/or displacing grizzly bears to less secure habitat, if treatment units are located within or near key habitat types. Long-term effects to grizzly bears may result from vegetation alteration, impacting both grizzly bear cover and forage. A decrease in the amount of cover may result in different effects on grizzly bears and their habitat. If cover is limiting in the project area, either by the amount or distribution, timber harvesting would likely result in negative impacts (Ruediger and Mealy 1978). Reduced cover may increase the visibility of grizzly bears, which may potentially increase their vulnerability to illegal human-caused mortality and/or contribute to displacement from preferred habitats. However, if cover is not limited in a project area, timber harvesting may have either no effect or a positive effect in those situations where food abundance or distribution is improved. By removing or reducing overstory vegetation through harvesting, slashing and/or burning, sunlight reaches the forest floor or clearing and grizzly bear food production may be increased (Ruediger and Mealey 1978). This includes foods such as berries and succulent forbs.

In a study on use of harvested stands, Waller (1992) found that use of these stands increased during the berry season, due to some harvested stands having high berry production. If food production or distribution is improved but human activity is not controlled after the completion of harvest activities, negative impacts on grizzly bears may occur due to an increase in the potential for conflicts between humans and grizzly bears (Ruediger and Mealey 1978). Waller (1992) found that of the harvested stands that he studied, those with the highest grizzly bear use had limited access for people due to closed gates and/or over-grown roads. Grizzly bears within his study area that used harvested stands were found at higher elevations and spent little time in lower elevation stands where harvest was most common. Waller attributed this to human use of those lower, more accessible harvested stands. Waller also found that grizzly bears avoided stands where the vegetation had not recovered enough to provide security cover and preferred to use stands that were 30 to 40 years post-harvest.

Zager (1980) found that differences of shrub responses depended on the type of treatment that occurred post-harvest. Among the key shrub grizzly bear foods on clearcut sites where slash was bulldozer-piled before burning, Zager found a consistent decline in canopy coverage when compared to old burns. This is likely due to the extreme heat created by burning slash piles which may kill rhizomes and root crowns and bulldozer use which may also destroy rhizomes and root crowns. In those areas where slash was either broadcast burned or not treated, key grizzly bear shrub foods were generally found throughout the sites, except on skid roads and

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other severely disturbed areas. On relatively mesic sites, globe huckleberry, mountain-ash and serviceberry generally increased in cover.

Timber harvest activities that would occur during the grizzly bear denning season are not likely to impact grizzly bears. Snow is an excellent sound barrier (Blix and Lentfer 1992) and impacts to denning bears would likely be less in deep snow situations than in shallow snow conditions. It is likely that hibernating bears exposed to meaningless noise, with no negative consequences to the bear, habituate to this type of disturbance (Knight and Gutzweiler 1995).

Helicopters may also be used in vegetation management projects, and in general reduce impacts to grizzly bears where they reduce or eliminate the need for new roads. Helicopter use may elicit a response in grizzly bears. Effects may range from a simple awareness of the helicopter, short-term disturbance or flight response or displacement from an area. In timbered habitats, McLellan and Shackleton (1989) found that an overt avoidance or displacement response required high intensity helicopter activity, such as carrying equipment within 200 meters of a grizzly bear. Helicopter use that is short in duration and low in frequency, would not likely result in significant affects to grizzly bears.

Extended use with multiple passes could interfere with the normal behavior patterns of grizzly bears. However, when considering long-term habitat effects, helicopter use does not use or require roads and may not pose the same chronic displacement effects or mortality risks that roads-based operations do. Helicopter use is a temporary event, whereas roads are typically chronic features on the landscape that facilitate access for people into bear habitat long after a project is complete. Consequently, while short-term helicopter activities may impact grizzly bears, they do not impart the same chronic habitat effects as roads. If repeated, low altitude flights continue into multiple seasons, the effects upon grizzly bear behavior (i.e., avoidance and more than just temporary displacement) may become more substantial.

The effects to grizzly bears of repeated, low altitude flight paths that follow open roads may be partially offset by the existing under-use of habitat in the immediate vicinity of the roads due to the “avoidance” by grizzly bears of habitat in close proximity to open roads. In many cases, the effects of helicopter logging that occurs in roaded habitat would have insignificant effects to grizzly bears as long as all roaded areas and roadless habitat effectiveness provide adequate secure habitat for grizzly bears. However, helicopter logging in areas that are not highly roaded could result in adverse effects to grizzly bears adapted to the use of more secure habitat. Thus, the effects of helicopter use on grizzly bears can vary significantly; effects will be determined through an analysis of site-specific activities and conditions in the area.

2. Effects Specific to the Proposed Action

This section considers the effects to individual NCDE grizzly bears and their habitat as guided by components of the Revised Forest Plan (i.e., desired conditions, objectives, standards, and guidelines applied forestwide, to management areas and/or to geographic areas). This analysis addresses how the specific components targeted for grizzly bear (Appendix 3 of this document,

or Appendix D of the biological assessment), as well as key plan components not targeted for the grizzly bear, have the potential to affect individual grizzly bears.

The Revised Forest Plan does not prescribe site-specific actions, so this document does not provide an analysis of site-specific projects. Because this is a broad-scale analysis of actions that could potentially result in effects on the grizzly bear and its habitat, the FNF will remain responsible for future project-specific section 7 consultation as appropriate.

Under the existing Forest Plan, the Interagency Grizzly Bear Guidelines (1986) are applied to the portion of the FNF located within the NCDE recovery zone. About 99 percent of the acres within the recovery zone on the FNF are management situation 1 or 2, which gives the most stringent protection to grizzly bear habitat. The remaining acres are in management situation 3, which gives more consideration to human uses and development (USFS 2017).

Under the Revised Forest Plan, the recovery zone would become the PCA. This totals about 90 percent of the total FNF area. Areas that were previously outside the recovery zone/PCA would be designated as zone 1 (totaling about 10 percent of the total Forest area). Zone 1 includes the Salish demographic connectivity area (see Figures 10-12).

With implementation of the proposed action, specific reference to the Interagency Grizzly Bear Guidelines, including the delineation of management situations, would no longer be part of the revised forest plan. However, much of the existing forest plan management direction that is based on the Interagency Grizzly Bear Guidelines would be retained, as shown in Appendix D of the biological assessment (USFS 2017) and Appendix 3 of this biological opinion. Similarly, previous amendments to the forest plan (e.g., amendments 19 and 24) would no longer be part of the Revised Forest Plan. However, these past actions have created the current environmental baseline that would be maintained over the long-term. These include the attractant storage orders, standards for "no net change" to the baseline (see NCDE glossary in appendix D) for open and total motorized access density and secure core habitat, temporary changes in access conditions for projects, linear road density in zone 1, motorized over-snow use, and administrative use of restricted roads.

The Revised Forest Plan will also contain additional desired conditions, standards, guidelines, and monitoring items pertaining to developed recreation, livestock grazing, vegetation management, and minerals development. In summary, the Revised Forest Plan would provide management direction aimed at maintaining conditions that contribute to supporting recovery of the NCDE grizzly bear population, and providing connectivity with other grizzly bear recovery zones (e.g., CYE). Effects of the proposed action are described in detail in the following sections. The proposed Revised Forest Plan elements pertaining to grizzly bear were developed to be consistent with the draft NCDE Grizzly Bear Conservation Strategy (USFWS 2013a).

Management Area Designation

As described in chapter one of this biological opinion, the Revised Forest Plan includes designation of all lands administered by the FNF into certain management areas (MAs). This provides a management framework under which allowable uses may occur for the life the plan

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(15 years). Since these designations were discussed previously, we will not provide further details related to each MA in this section.

Under the Revised Forest Plan, the majority of lands within the PCA (about 66 percent) are in non-motorized MA designations (MA1a, MA1b, MA5a, as well as some of MA2a, MA2b, and MA3b)(Table III-13). These areas will continue to provide an interconnected network of habitat with high levels of security. There would be no commercial timber harvest in wilderness or recommended wilderness. Timber management opportunities are also expected to continue to be limited within inventoried roadless areas that are outside of recommended wilderness (in management areas such as MA5) due to the high cost of harvesting timber where there are no roads. These areas will continue to provide high levels of habitat diversity, primarily provided by wildland or prescribed fire.

Table III-13. Distribution of Revised Forest Plan management areas for the grizzly bear management zones. Note: Percentages are displayed as the percent of the individual management zone in a particular management area.

Management Area	Primary Conservation Area	Zone 1, Salish DCA	Zone 1, Outside DCA
1a Designated wilderness	50%		< 1%
1b Recommended wilderness	9%		
2a Designated wild and scenic rivers	1%		
2b Eligible wild and scenic rivers	1%	< 1%	1%
3a Administrative areas	< 1%		< 1%
3b Special areas	< 1%	< 1%	< 1%
4a Research natural areas	< 1%	6%	
4b Experimental and demonstration forests	< 1%	5%	
5a Backcountry nonmotorized year-round	7%		
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	2%		
5c Backcountry: motorized over-snow vehicle use	5%		< 1%
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	< 1%		
6a General forest low	6%	1%	3%
6b General forest medium	13%	21%	1%
6c General forest high	4%	65%	83%
7 Focused recreation areas	2%	1%	12%

In zone 1, the majority of lands (87 percent) are in general forest Management area 6 (Table III-13). These areas would have high levels of successional stage and habitat diversity, primarily provided by timber harvest, fuels reduction, pre-commercial, and commercial thinning. In order to place more emphasis on demographic connectivity, a continuous area of MA6b is designated

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in the Salish DCA along the north and west boundary of the Tally Lake Ranger District, contiguous with an unroaded research natural area (MA3b). In zone 1, forestwide and geographic area standards would apply that would reduce indirect effects of timber harvest, as described above. Timber harvest, salvage harvest, fuels reduction, and precommercial thinning would be subject to forest-wide desired conditions, standards and guidelines which would reduce effects of grizzly bears, regardless of management area designation. These plan components will be discussed further below.

Non-Motorized Trails Inside the PCA/Recovery Zone

As part of the proposed action, the definition of secure core used in the draft NCDE grizzly bear conservation strategy (USFWS 2013a) will be incorporated into the Revised Forest Plan. This new definition does not include a deduction from secure core percentages for high use non-motorized trails. The lack of demonstrable effects and the difficulty in determining what constitutes a "high use" non-motorized trails led to the decision by the grizzly bear conservation strategy team to eliminate this from the definition of secure core. This change in methodology will result in a calculated change in core habitat in 28 subunits on the FNF. Table III-14 displays these 28 subunits along with the existing security core percentage, and the secure core percentage that will be part of the proposed action. These secure core percentages will be considered baseline conditions.

Table III-14. Comparison of existing conditions for security core versus secure core under the proposed action. Note: Only subunit that have a change in percentage due to the new methods are presented here.

Subunit Name	Security Core Percentage	Secure Core Percentage
Albino Pendant	88	100
Big Salmon Holbrook	87	100
Black Bear Mud	84	100
Brushy Park	85	100
Buck Holland	40	49
Burnt Bartlett	92	100
Hungry Creek	88	100
Little Salmon Creek	98	100
White River	74	100
Big Bill Shelf	80	87
Gorge Creek	90	100
Harrison Mid	95	99
Lion Creek	41	51
Pentagon	94	100
Silvertip Wall	97	100
Wounded Buck Clayton	65	66
Dickey Java	81	85
Stanton Paola	81	83
Glacier Loon	48	52
Jewel Basin Graves	68	75

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Subunit Name	Security Core Percentage	Secure Core Percentage
Swan Lake	45	46
Flotilla Capitol	99	100
Plume Mtn Lodgepole	97	100
Tranquil Geifer	85	90
Basin Trident	85	100
Gordon Creek	82	100
Jumbo Foolhen	89	100
Youngs Creek	92	100

The number of subunits that do or do not provide at least 68 percent secure core habitat does not change as a result of the proposed change in secure core calculation. As shown in Figure 16, many of the high-use non-motorized trails in the NCDE are in Glacier National Park or in designated wilderness areas. This change in methodology does not constitute a change in effects to grizzly bears. Rather, this is a reflection of altered analytical techniques. When assessing temporary decreases in secure core (as allowed under the Revised Forest Plan) each subunit will undergo the same process when calculating pre-project secure core percentages. Therefore, any changes in secure core conditions resulting from the omission of high use non-motorized trails will also be reflected in baseline percentages.

Motorized Route Density and Secure Core Inside the PCA

Desired condition NCDE-DC-IFS-01 would establish the intent to manage open motorized route density, total motorized route density, and secure core in a manner that contributes to sustaining the recovery of the NCDE grizzly bear population. Three key standards and two key guidelines would implement this desired condition.

Forest-wide standard FW-STD-IFS-02 would maintain on-the-ground conditions that have contributed to the growth and expansion of the NCDE grizzly bear population. FW-STD-IFS-02 states, “In each bear management subunit within the NCDE primary conservation area, there shall be no net decrease to the baseline (see glossary) for secure core and no net increase to the baseline for open motorized route density or total motorized route density on National Forest System lands during the non-denning season (see NCDE glossary in appendix D).” This standard has an associated monitoring component (MON-NCDE-01) that requires the Forest Service to monitor OMRD, TMRD, and security core in each bear management subunit and to compare those conditions to the baseline. The results of this monitoring are to be reported biennially.

As discussed in the Section A.2 *Description of the Proposed Action* newly implemented Forest Plan direction considers “baseline” as a subunit’s access condition as of December 31, 2011, or as modified by changes evaluated through separate section 7 consultation with the Service and other conditions listed in Standard FW-STD-IFS-02. These baseline conditions are presented below in Table III-15. Conditions are similar to what was presented in Table III-4 in Section C.2 (*Environmental Baseline*), except that core habitat is calculated and presented using the methods associated with the proposed action. This method was discussed in detail above, and is

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consistent with the draft NCDE Grizzly Bear Conservation Strategy (USFWS 2013a). Further, management situation 3 (MS-3) lands are also not considered in Table III-15 because management situations are no longer designated under the Revised Forest Plan. These changes in methodology change percentages in some subunits, but these changes are not reflecting a change in on-the-ground conditions.

Management direction would apply to NFS lands in all 73 subunits. Thus, it is likely that existing conditions would generally be maintained, with no requirement for future reductions of OMRD, TMRD, or increases in secure core. We expect that conditions in 32 subunits on the FNF will continue to contribute adverse effects to individual grizzly bears since route densities are greater than those known to adversely affect grizzly bears (19% for OMRD and TMRD), or the percentage of secure core is less than the threshold also known to adversely affect grizzly bears (at least 68%). We expect these adverse effects to continue, but these conditions are consistent with conditions in the action area during a time when the NCDE grizzly bear population was known to be increasing in size and expanding in distribution (Costello et al. 2016, Kendall et al. 2009, Mace et al. 2012). Therefore, we do not expect the management direction presented above to preclude recovery of the NCDE grizzly bear population.

Table III-15. Status of bear management unit (BMU) subunits on the FNF. Shaded subunits have less than 75 percent NSF lands. These conditions will be considered "baseline" for the purposes of implementing Revised Forest Plan Standards FW-STD-IFS-02 and FW-STD-IFS-03.

Subunit Name	OMRD Percentage	TMRD Percentage	Secure Core Percentage
Albino Pendant	0	0	100
Big Salmon Holbrook	0	0	100
Black Bear Mud	0	0	100
Brushy Park	0	0	100
Buck Holland	24	41	49
Burnt Bartlett	0	0	100
Hungry Creek	0	0	100
Little Salmon Creek	0	0	100
Meadow Smith	18	53	42
White River	0	0	100
Big Bill Shelf	11	6	87
Bunker Creek	5	3	92
Goat Creek	23	59	39
Gorge Creek	0	0	100
Harrison Mid	1	0	99
Jungle Addition	19	19	68
Lion Creek	18	47	51
South Fork Lost Soup	25	47	37
Spotted Bear Mountain	19	18	68
Pentagon	0	0	100
Silvertip Wall	0	0	100
Strawberry Creek	0	0	100
Trilobite Peak	0	0	100
Coram Lake Five	30	46	14
Doris Lost Johnny	57	20	36

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Subunit Name	OMRD Percentage	TMRD Percentage	Secure Core Percentage
Emery Firefighter	19	19	68
Peters Ridge	52	25	34
Riverside Paint	18	16	71
Wounded Buck Clayton	28	30	66
Dickey Java	9	0	85
Moccasin Crystal	8	1	81
Stanton Paola	8	3	83
Canyon McGinnis	18	31	50
Cedar Teakettle	35	36	24
Lower Big Creek	18	19	71
Werner Creek	29	20	63
Beaver Creek	6	25	66
Cold Jim	18	54	44
Crane Mountain	28	53	25
Glacier Loon	22	41	52
Hemlock Elk	6	30	64
Piper Creek	19	45	55
Porcupine Woodward	27	74	15
Lazy Creek	68	62	10
Stryker	37	33	50
Upper Whitefish	34	57	54
Ball Branch	8	12	84
Jewel Basin Graves	20	19	75
Kah Soldier	19	19	68
Logan Dry Park	30	36	51
Lower Twin	9	2	92
Noisy Red Owl	20	13	59
Swan Lake	40	23	46
Twin Creek	0	0	100
Wheeler Quintonkon	25	19	68
Flotilla Capitol	0	0	100
Long Dirtyface	0	0	100
Plume Mtn Lodgepole	0	0	100
Skyland Challenge	20	17	65
Tranquil Geifer	0	2	90
Coal & South Coal	15	19	73
Frozen Lake	10	4	86
Hay Creek	25	16	55
Ketchikan	14	3	73
Lower Whale	36	17	50
Red Meadow Moose	25	17	68
State Coal Cyclone	29	25	58
Upper Trail	14	4	88
Upper Whale Shorty	12	11	86
Basin Trident	0	0	100
Gordon Creek	0	0	100
Jumbo Foolhen	0	0	100
Youngs Creek	0	0	100

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The proposed action will also include a standard that will allow temporary changes in OMRD, TMRD, and secure core during project activities (IFW-STD-IFS-03). Changes to OMRD, TMRD, or secure core are considered temporary because they can only occur while a project is being implemented, and the proposed action also contains direction that does not allow a net increase in OMRD or TMRD in any subunit, and does not allow a net decrease in secure core in any subunit. Further, changes in OMRD, TMRD or secure core are considered temporary because project cannot exceed five years of on-the-ground implementation (discussed further below). The standard will allow projects to temporarily increase OMRD by five percent, temporarily increase TMRD by three percent, and temporarily decrease secure core by two percent. Changes in motorized access conditions will be measured using a ten year running average, and will be compared against the baseline (see Appendix 2 for this procedure and a hypothetical example). These allowances are based on analyses and ESA section 7 consultations on six timber harvest and road management projects affecting 18 bear management subunits on the Flathead and Lolo National Forests (USFWS 2013a). These projects occurred between 2003 and 2010, a period during which the NCDE grizzly bear population is known to have been increasing in size and distribution (Costello et al. 2016, Kendall et al. 2009, Mace et al. 2012). Therefore, the duration of these projects and the associated increases in OMRD and TMRD, and decreases in secure core are believed to be compatible with an increasing grizzly bear population in the NCDE. During the life of these six federal projects, the OMRD temporarily increased an average of 5.4 percent, the TMRD temporarily increased an average of 2.9 percent, and the secure core temporarily decreased by 2 percent.

Temporary increases in OMRD or TMRD, or temporary decreases in secure core, resulting from project implementation will likely result in adverse effects to individual grizzly bears. These effects will occur in subunits that are below, or relatively close to, the research benchmarks described in detail above. In these subunits, temporary project changes in OMRD or TMRD could result in densities going above 19 percent. Likewise, in these subunits temporary project changes could result in secure core percent dropping below 68 percent. In total, temporary changes in TMRD, OMRD and secure core allowed under the Revised Forest Plan may result in adverse effects to individual grizzly bears in up to 39 of the 73 subunits on the FNF. However, we do not expect that these adverse effects to individual grizzly bears will preclude recovery of the NCDE grizzly bear population. This conclusion is based on the fact that the extent of temporary changes allowed under the Revised Forest Plan is consistent with temporary changes made within subunits during a time when the NCDE grizzly bear population was known to not only be stable, but also expanding in distribution and increasing in size.

The Revised Forest Plan will also provide direction that each project will be planned so that it does not exceed five years of on-the-ground implementation (with certain exceptions, see details in FW-GDL-IFS-01). Further, guideline FW-GDL-IFS-02 ensures that pre-project access conditions (i.e., OMRD, TMRD, secure core) would be restored within one year of project completion. While projects meeting these guidelines may result in some adverse effects to grizzly bears as a result of displacement from preferred habitat, they would provide limits on the amount and duration of the disturbance so that bears are not permanently displaced by human activities.

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Although the Revised Forest Plan would allow temporary changes in habitat security due to projects, including some activities in secure core, there would be no temporary decreases in secure core due to vegetation management projects throughout most of the PCA. The FNF has nearly 1.7 million acres of security core habitat, only about 12 percent of which is likely to have temporary changes in access conditions. This is because the vast majority of this habitat occurs in wilderness or inventoried roadless areas. Changes in access conditions will not occur in these areas because road construction is not allowed. As a result, high levels of habitat security would continue to be maintained. In addition, with the proposed action, some of the inventoried roadless areas would be added as recommended wilderness where timber harvest would not be allowed (see discussion in management area section below). The temporary changes to OMRD, TMRD, or security core will be monitored by the Forest Service for its projects (see MON-NCDE-05 in Appendix 4).

The proposed action also addresses administrative use of roads within the PCA. Standard FW-STD-IFS-01 states, "Within the NCDE primary conservation area, motorized use of roads with public restrictions shall be permitted for administrative use (see glossary), as long as it does not exceed either 6 trips (3 round trips) per week or one 30-day unlimited use period during the non-denning season (see glossary and full text of the standard in Appendix 4). During the time period that the NCDE grizzly bear population was growing and expanding in distribution, administrative use was allowed on gated roads. Under the Revised Forest Plan FW-STD-IFS-01 would allow administrative use on gated roads and also on roads in secure core habitat (e.g., road rehabilitation work that cannot be done during the denning period). Mace et al. (1996) found that grizzly bears in the Swan Valley selected areas near roads traveled by fewer than 10 vehicles per day. The six trips per week as allowed under administrative use is below this level, so we expect disturbance to grizzly bears to be minor. Unlimited use for one 30-day time period could disturb bears or cause avoidance in the affected area if it exceeded 10 vehicles per day, but this level of administrative use would be restricted to a short period of time to minimize effects to individual grizzly bears.

The Revised Forest Plan also addresses temporary use of closed roads by the public. Standard FW-STD-IFS-04 states, "within the NCDE primary conservation area, a restricted road may be temporarily opened for public motorized use to allow authorized uses (such as firewood gathering), provided the period of use does not exceed 30 consecutive days during one non-denning season and occurs outside of spring and fall bear hunting seasons. However, temporary public use of a restricted road shall not be authorized in secure core (see glossary)." This standard would allow temporary use of restricted roads for motorized use by the public for purposes such as firewood gathering as long as it was not in secure core. There would be some increase in disturbance to grizzly bears in areas outside of secure core, but the risk is minimized by limiting the duration and season when this could occur. Further, gated roads on the FNF have been temporarily opened for periods of up to 30 days to allow firewood gathering during the time period when the NCDE grizzly bear population was increasing in size and distribution, with no apparent population-level effects.

Although the Revised Forest does not contain grizzly bear standards that would require road closures, the Revised Forest Plan will contain an objective to decommission, or place into

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intermittent stored service, 30-60 miles of road over the life of the plan (about 15 years). This target of this objective is improved aquatic/riparian ecosystem function, but these road closured will likely benefit grizzly bears by further decreasing road densities and improving riparian habitats that provide cover and forage opportunities.

It should be noted that the existing Forest Plan, OMRD and TMRD are calculated based on MS-1 and MS-2 lands and do not include MS-3 lands. However, because management situations will not be retained in the Revised Forest Plan, roads and route densities for MS-3 areas will be included in OMRD and TMRD calculations. This will result in minor changes in the percentages in some subunits, but these changes are a result of differing methodology rather than on-the-ground changes in road densities.

Overall, the set of Revised Forest Plan components discussed above is intended to limit OMRD and TMRD and to maintain sufficient habitat security in the PCA. Proposed maintenance of baseline conditions and temporary changes are largely consistent with "on-the-ground" conditions for grizzly bears during a period (i.e., 2004-present) when the NCDE grizzly bear population was known to be increasing in both population size and distribution. Where differences occur, they would be limited to a small portion of grizzly bear habitat. As a result, we expect that the components of the proposed action described above may result in adverse effects to individual grizzly bears. However, we also expect to maintain recovery of the NCDE grizzly bear population. Over the long term, the proposed action would maintain baseline levels of OMRD, TMRD, and secure core in the primary conservation area during the non-denning season that would support continued recovery of the NCDE grizzly bear population.

Motorized Route Density and Security Core Inside the Salish DCA and Zone 1

As discussed above, areas on the FNF outside the PCA are designated as zone 1. Within zone 1, certain lands will be designated as the Salish DCA (see Figure 10). The goal in zone 1 is to maintain grizzly bear occupancy but at a lower density than in the PCA. This goal is consistent with what is being developed in the NCDE draft Conservation Strategy (USFWS 2013a). Zone 1 is not intended to provide core habitat for the NCDE grizzly bear population. Instead, desired conditions for zone 1 emphasize connectivity and limiting the density of roads open to motorized public use. Within the portion of zone 1 defined as the Salish DCA, the goal is to provide for female grizzly bear occupancy and facilitate genetic interchange with the CYE. These goals are also consistent with those of the NCDE draft Conservation Strategy (USFWS 2013a). Under the Revised Forest Plan these goals are supported by the following desired conditions:

- GA-SM-DC-03: Within the Flathead National Forest portion of NCDE zone 1 (including the Salish demographic connectivity area), roads provide for public and administrative access to National Forest System lands. Grizzly bear habitat in zone 1 contributes to sustaining recovery of the grizzly bear population in the NCDE. The demographic connectivity area provides habitat that can be used by female grizzly bears and allows for bear movement between grizzly bear ecosystems.

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- GA-SM-DC-04: In areas between the primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. *See also FW-DC-LSU-01*. NFS lands in the Swift Creek-Stillwater connectivity area (see Forest Plan figure B-30) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges.

Given the differing grizzly bear management objectives for Zone 1 and the Salish DCA, a different method for analyzing the effects of motorized use during the non-denning season was used. The analysis of effects on bears relied on recent work by Boulanger and Stenhouse (2014), who studied 142 grizzly bears monitored in Alberta from 1999-2012. They modeled grizzly bear sex and age class survival as it related to linear road density. A summary of the modeled threshold values, and how they were used in the analysis of effects for Zone 1, is shown in Table III-14 below.

Base on the findings of Boulanger and Stenhouse (2014), open road densities less than or equal to 2.4 linear mi/mi^2 appeared to be a threshold for grizzly bear occupancy, and an open road density less than or equal to 2.0 mi/mi^2 appeared to be a threshold for female grizzly bear occupancy in their Alberta study area (Table III-16). If both roads and motorized trails are included, the Salish DCA has an open linear motorized route density of 1.5 mi/mi^2 (Table III-17). In the portion of zone 1 outside the Salish DCA, the density of motorized routes open to public use is 1.9 mi/mi^2 (Table III-17). While some areas of the Salish DCA and remainder of zone 1 may have linear road densities that are high enough to adversely affect individual grizzly bear, we expect that they will still support occupancy of female grizzly bears because densities are less than the values described by Boulanger and Stenhouse (2014) (see Table III-16). Thus, we conclude that existing road densities in the Salish DCA and remainder of zone 1 are consistent with the goals of the NCDE draft Conservation Strategy. Further, the route density calculation should be considered conservative (i.e., more protective for bears) since the analysis of Boulanger and Stenhouse (2014) did not include motorized trails.

Table III-16. Linear road density analysis for zone 1 and the Salish DCA

Objective described in the Alberta study (Boulanger & Stenhouse, 2014)	Reported density km/km^2	Converted to mi/mi^2	Where applied in the analysis
Grizzly bear presence – Distribution of collared bears shows most bears occurred in areas with road densities of 1.5 km/km^2 or less (p. 10)	1.5 km/km^2	2.4 mi/mi^2	Used to evaluate the ability to support occupancy and movement by grizzly bears of any age, sex, or reproductive status in zone 1.
Occupancy by females – Modeling results suggested that the threshold of road density depended heavily on assumptions. Adult females occupied habitat with road densities of 2.0 mi/mi^2 or less, unless higher mortality of females with dependent young is assumed.	1.25 km/km^2	2.0 mi/mi^2	Used to evaluate the ability of the Salish demographic connectivity area to support occupancy and movement by female grizzly bears. The Salish demographic connectivity is not intended to provide core habitat.

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Objective described in the Alberta study (Boulanger & Stenhouse, 2014)	Reported density km/km^2	Converted to mi/mi^2	Where applied in the analysis
For core habitat, which has a goal of occupancy by females with dependent young, the threshold road density recommended is reduced to 1.2 mi/mi^2 (p. 15)			Density calculation included both roads and trails open for public motorized use in the non-denning season.

Table III-17. Public open motorized access for all roads/trails on NFS lands (includes highways and county/city and private roads/trails) from the 2015 calendar year roads/trails dataset.

NCDE Management Zone	Open Roads (miles)	Motorized Trails (miles)	Total Miles	NFS Square Miles	Miles/Mile^2 Public Open Motorized Roads only	Miles/Mile^2 Public Open Motorized Roads and Trails
Zone 1, Salish DCA	217	14	231	150	1.4	1.5
Zone 1, outside DCA	338	64	402	212	1.6	1.9

The Revised Forest Plan includes standard GA-SM-STD-01. This standard will require the FNF to maintain baseline levels for the linear density of motorized routes open to public use during the non-denning season within the Salish DCA over the long-term (as indicated in Table III-17 above). The standard also states that in the portion of zone 1 outside the Salish DCA, baseline levels for the linear density of roads open to public use during the non-denning season would be maintained over the long-term, but the density of motorized trails could increase. We expect these adverse effects to continue since the Revised Forest Plan contains direction (standard GA-SM-STD-01) that will maintain these conditions. However, while we recognize that motorized routes in the Salish DCA and zone 1 may be adversely affecting individual grizzly bears, these densities remain low enough to support occupancy be females. Additionally, these conditions were present on the landscape while the NCDE grizzly bear population has continued to increase in size and distribution (Costello et al. 2016, Kendall et al. 2009, Mace et al. 2012). As a result, we do not expect these adverse effects to preclude recovery of the NCDE grizzly bear population.

Motorized Over-snow Use During the Den Emergence Period

The Revised Forest Plan contains standard FW-STD-REC-05, which states, “Within grizzly bear denning habitat modeled by MTFWP in the NCDE primary conservation area, there shall be no net increase in percentage of area or miles of routes designated for motorized over-snow vehicle use on NFS lands during the den emergence time period (see glossary)”. The standard would provide additional assurance that potential impacts to bears, particularly females with cubs, would not increase over time. The proposed action does not include restrictions in motorized over-snow use during the den emergence period outside of the PCA, but most of this area is currently open.

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We discussed the potential for late-season over snow vehicle use to adversely affect grizzly bears (primarily females with cubs) in Sections B.7 and C.2. Areas on the FNF open to motorized over-snow vehicle use during the den emergence time period occur on about 3 percent of modeled grizzly bear denning habitat within the PCA on the FNF. In addition, there are 19 miles of routes open to motorized over-snow use in modeled denning habitat during the den emergence period (i.e., open after March 31st). In these areas motorized over-snow vehicle use can potentially overlap temporally and spatially with females with cubs of the year that have recently emerged from the den. This would result in late-season over-snow vehicle use having an adverse effect on individual grizzly bears within the PCA. However, we do not expect these potential adverse effects to have an effect on the NCDE grizzly bear population. This is because the spatial overlap of denning habitat and area suitable for late-season over-snow use occurs on only three percent of modeled denning habitat on the FNF. Further, the currently existing spatial overlap cannot increase in the future due to standard FW-STD-REC-05 in the Revised Forest Plan, and this current level of spatial overlap is what was occurring on the FNF during a time period when the NCDE grizzly bear population was known the be increasing in size and distribution (Costello et al. 2016, Kendall et al. 2009, Mace et al. 2012).

Developed Recreation Sites

As presented above, there are two developed resorts on the FNF (Big Mountain and Blacktail). Standard FW-STD-REC-04 of the Revised Forest Plan would require that new or reauthorized ski area permits include mitigation measures to reduce the risk of grizzly bear-human conflicts, and this would continue to decrease the potential for detrimental effects to the NCDE grizzly bear population. Further, guideline GA-SM-MA7-Big Mtn-GDL-01 states, "To reduce grizzly bear-human conflicts the Whitefish Mountain Resort during the non-denning season, existing mitigation measures for grizzly bears regarding food/garbage handling, odor control, and grizzly bear education at the summit house should be retained." These plan components would benefit the grizzly bear by limiting the risk of grizzly-bear human conflicts resulting from the resorts. Blacktail Ski Area is outside the PCA, but within zone 1. This ski area is not currently operated during the non-denning season, but forestwide standard FW-STD-REC-04 would apply to this area as well.

Developed recreation sites are of concern because frequent or prolonged human occupancy may result in increased bear attractants, increasing the risk of grizzly bear-human conflicts or grizzly bear mortality. The proposed action includes standard FW-STD-WL-01 which states that within the NCDE PCA and zone 1 (including the Salish DCA), food/wildlife attractant storage special order(s) shall apply to all NFS lands. Food storage orders are currently in effect across the FNF and are very effective in reducing grizzly bear-human conflicts on NFS lands. The orders are updated over time as new information and new technologies become available, but would continue to be guided by the Interagency Grizzly Bear Committee or a similar group of experts.

The draft NCDE Conservation Strategy stated that the main concern with developed recreation sites has to do with overnight use. As a result, the proposed action will include two desired conditions and one standard to address developed recreation sites designed and managed for overnight use. Within the PCA, the number, capacity, and improvements of developed recreation sites will provide for user comfort and safety while minimizing the risk of grizzly

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bear–human conflicts on NFS lands (FW-DC-REC-01). Increases in the number and capacity of developed recreation sites on NFS lands that are designed and managed for overnight use during the non-denning season will be at levels that contribute to sustaining the recovery of the grizzly bear population in the NCDE (FW-DC-REC-02). Standard NCDE-STD-REC-01 would set a limit of one increase above baseline conditions in the number or the overnight capacity of developed recreation sites designed and managed for overnight use per bear management unit per decade on NFS lands in the PCA (see NCDE-STD-REC-01 in Appendix 3). Guideline FW-GDL-REC-01 states that if these increases occur, the project should include measures to reduce the risk of grizzly bear-human conflict. Further, guideline FW-GDL-REC-06 states that new developed recreations sites should not be located within the inner riparian management zone (with certain exceptions). This plan component will provide some indirect benefit to grizzly bears my maintaining key riparian habitats that provide cover and forage. This set of plan components is consistent with what has occurred on the FNF through consultation during the time period when the NCDE grizzly bear population was stable to increasing and expanding in distribution (Costello et al. 2016).

These proposed plan components may increase the likelihood of grizzly bear conflicts with humans. However, the proposed components were developed to be consistent with what has occurred on the FNF while the NCDE grizzly bear population was stable to increasing. Although there may be an increased risk of grizzly bear-human conflicts as a result of some increase in developed recreation sites with overnight use in the future, the risk of mortality to grizzly bears would be limited under the proposed action through the measures stated above. Implementation and monitoring of food storage orders, public education, and increases in the availability of bear-resistant food storage devices will also help to reduce the number of grizzly bear-human conflicts on the FNF.

An increase in developed recreation during the non-denning season may represent adverse effects to individual grizzly bears. However, the effects of such increases are difficult to consider at this time. While the proposed action will limit the volume and rate of increase (1 site per BMU per decade), new developed recreation sites may occur in a variety of manners. For example, the effects of installing a new developed recreation site near valuable grizzly bear habitat (e.g., riparian areas, meadows) will likely be much different than the effect of increasing the capacity of an already heavily used campground.

Future increases in developed recreation sites available for use during the non-denning season will undergo a separate section 7 consultation, as appropriate. Give the difficulty in forecasting details associated with these increase, we have determined that it would be more appropriate to assess potential adverse effects to grizzly bears during project-specific consultation or other environmental review, rather than at the programmatic level.

Livestock Allotments

In Section C.2 we discussed current livestock allotments on the FNF. Cattle grazing is a relatively minor use of NFS lands on the FNF, and there are no sheep grazing allotments. Existing cattle grazing allotments have been compatible with an NCDE grizzly bear population that is stable to increasing and expanding in distribution (Costello et al. 2016). Based on the lack

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of history of conflicts, the risk of grizzly bear mortality associated with livestock grazing is low. Desired conditions for grazing support continued recovery of the grizzly bear.

A number of Revised Forest Plan components address livestock allotments on the FNF heading into the future. Guideline FW-DC-GR-01 indicates that within the PCA, the number of, capacity of, and improvements on grazing allotments support ecologically sustainable grazing, and temporary grazing permits are used for effective management of noxious weeds, while minimizing the risk of human-bear conflicts on National Forest System lands.

Although the FNF has not had conflicts between cattle and grizzly bears, the proposed action, includes the following standards which would result in reduced risk of future conflicts. FW-STD-GR-01 states, "Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), new or reauthorized grazing permits and annual operating plans shall incorporate requirements to reduce the risk of grizzly bear–human conflicts (e.g., food/wildlife attractant storage special order). New or reauthorized permits shall include a clause providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflicts." The Revised Forest Plan will also contain a standard (FW-STD-GR-03) that requires permits for livestock within the PCA and zone 1 (including the Salish DCA), permits for livestock grazing shall include a provision that requires reporting livestock carcasses within 24 hours of discovery. The standard also requires proper disposal of the carcass, and ensures that bone yards shall not be established on National Forest System lands.

Further, standard FW-STD-GR-04 of the Revised Forest Plan states that there shall be no net increase above baseline conditions (as described in the glossary of Appendix D in the BA) in the number of active sheep grazing allotments within the PCA, zone 1 and the Salish DCA. Standard FW-STD-GR-05 of the Revised Forest Plan states that there shall be no net increase above baseline conditions (as described in the glossary of Appendix D in the BA) in the number of active cattle grazing allotments within the PCA, zone 1 and the Salish DCA. As previously mentioned, the FNF does not have any sheep allotments and very few cattle allotments, but this will ensure that no increase occurs in the future. The Revised Forest Plan will also include standard FW-STD-GR-06. This standard states, "Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), temporary permits for grazing by small livestock for purposes such as controlling invasive exotic weeds or reducing fire risk, or for trailing of small livestock across NFS lands, shall not result in an increase in bear/small livestock conflicts." The Revised Forest Plan components discussed here, along with the expectation that current use levels would be maintained, reduce the likelihood of grazing allotments resulting in conflicts with grizzly bears.

We do not anticipate that implementation of the Revised Forest Plan will result in habituation of grizzly bears leading to conflicts because relatively few acres are subject to livestock grazing, current use levels are expected to be maintained and not substantially increase, the Revised Forest Plan includes measures to address potential habituation risks to bears from livestock grazing, and there is no history of grizzly bear management actions on the FNF. Further, Revised Forest Plan states that sheep and cattle grazing allotments within the PCA cannot

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increase beyond baseline conditions. This will ensure that grazing allotments occurring on the FNF in future remain consistent with what was occurring on the landscape during a time period when the NCDE grizzly bear population was known the be increasing in size and distribution (Costello et al. 2016, Kendall et al. 2009, Mace et al. 2012). Hence, we do not consider this type of land use, at its current or anticipated levels, to result in adverse effects to individual grizzly bears.

Vegetation Management

Grizzly bears are habitat generalists that can adapt to a variety of changing vegetative conditions (see Section C.3 above). The proposed action provides for grizzly bear habitat diversity, considering the modeled effects of climate change that are anticipated to occur over the next 50 years. Because the grizzly bear uses a wide variety of habitats across the Forest, a specific model was not developed for this species. Rather, the discussion below is a summary of all modeled vegetation changes on the Forest. Grizzly bear habitat and its use by grizzly bears would vary across time and space due to natural processes (e.g., succession, wildfires, insects/disease) and vegetation management activities (e.g., timber harvest, fire, planting, precommercial thinning). On the heavily forested Flathead National Forest, changes in successional stages and other vegetation characteristics are indicative of bear foods, cover, and connectivity. Changes in vegetation would be monitored at a forestwide and ecosystem-wide scale, and vegetation management activities would also continue to be assessed through project-specific analyses as conditions change.

The Revised Forest Plan will contain direction pertaining to vegetation management in grizzly bear habitat. The proposed direction is similar to the Interagency Grizzly Bear Guidelines (IGBC, 1986) in encouraging a mosaic of successional stages; placing spatial and temporal restrictions on logging activities; designing projects to maintain or improve grizzly bear habitat; and retaining cover as needed along grass/forb/shrub openings, riparian wildlife habitat, or wetlands. Inside the PCA, desired conditions for the grizzly bear include:

- FW-DC-TE&V-01. Within the NCDE primary conservation area, the amount, type and distribution of vegetation provides for the ecological, social, and economic sustainability of NFS lands while also providing habitat components that contribute to sustaining the recovery of the grizzly bear population in the NCDE. See also FW-DC-WL-02.

- FW-DC-TE&V-02. Within the NCDE primary conservation area, there is a mosaic of successional stages to provide for grizzly bear habitat needs over the long term.

Inside the PCA, the following guidelines, similar to the IGBC guidelines, would apply:

- FW-GDL-TE&V-01. Within the NCDE primary conservation area, measures to reduce the risk of disturbance to the grizzly bear population should be incorporated into vegetation and fuels project design criteria, which vary on a site-specific basis (e.g., some activities should be restricted in spring habitat during the spring time period; areas with low levels of human activity should be provided adjacent to areas with high levels of disturbance). Note:

Management activities such as precommercial thinning, burning, weed spraying, and implementation of road best management practices may need to be completed during the spring time period in order to meet resource objectives (especially if needed to prevent resource damage), in which case other measures should be used to reduce the risk of disturbance (e.g., limiting the duration of the activity or limiting use of closed roads).

- FW-GDL-TE&V-02. Within the NCDE primary conservation area, vegetation management activities should be designed to avoid detrimental effects on the grizzly bear population and to include one or more measures to protect, maintain, increase, and/or improve grizzly habitat quantity or quality (e.g., promoting growth of berry-producing shrubs, forbs, or grasses known to be bear foods) in areas where it would not increase the risk of grizzly bear–human conflicts.

- FW-GDL-TE&V-03. Within the NCDE primary conservation area, measures to retain cover (where present) along a portion of grass/forb/shrub openings, riparian wildlife habitat, or wetlands should be incorporated in project design criteria (this varies on a site-specific basis).

- FW-GDL-TE&V-04. Within the NCDE primary conservation area, vegetation management projects (including timber sales and other non-commercial vegetation management contracts) should include a clause providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation.

- FW-GDL-TE&V-05. To reduce the risk of grizzly-bear human conflicts within the NCDE primary conservation area, vegetation management activities designed to enhance grizzly habitat (e.g., increased huckleberry production) should not occur in or next to campgrounds, administrative facilities, or other developed recreation sites that operate during the non-denning season.

These guidelines would benefit grizzly bears because they promote a mosaic of successional stages; restrict logging activities in time and space as needed; design projects to maintain or improve grizzly bear habitat quality or quantity where it would not increase the risk of grizzly bear-human conflicts; and retain cover as needed along grass, forb, and shrub openings.

In addition to grizzly bear-specific vegetation guidelines for the PCA, other standards and forest-wide plan components would benefit the grizzly bear. FW-DC-TE&V-11 states that the forest groundcover consists of a variety of grass, forb, and shrub species, including berry-producing species that provide forage for grizzly bears and other wildlife species (e.g., huckleberries, serviceberries, mountain ash, and buffaloberry. This desired condition may be met in wildfire areas, prescribed burn areas, or areas managed to produce timber.

Canada lynx management standards VEGS1, VEGS2, VEGS5, and VEGS6 in the Northern Rockies Lynx Management Direction are being carried forward into the Revised Forest Plan (with one FNF-specific exception), and apply across about 1.8 million acres of the FNF. These standards would limit vegetation treatments in each lynx analysis unit (LAU) on the FNF as well as in three adjacent LAUs (a complete description of these standards can be found in the Canada lynx chapter of this biological opinion). Because there is a great deal of overlap in the Forest's LAUs and grizzly bear subunits, these limitations on vegetation management would also provide cover for grizzly bears. Forest-wide, riparian management zones (RMZs) total about 427,320 acres and are not suitable for timber production, although timber harvest may occur under specific conditions, so key wetland and riparian habitats used by grizzly bears would be managed to continue to support their needs (a complete description of RMZs can be found in the bull trout chapter of this biological opinion).

The vegetation management components in the Revised Forest Plan would continue to provide diverse cover and foraging conditions for grizzly bears. The new components would also continue to reduce the potential for disturbance to grizzly bears through the timing of timber sale activities. Vegetation management activities may present short-term effects to individual grizzly bears due to disturbance from increased activities or temporary habitat changes. However, we do not anticipate that these effects will be adverse to grizzly bears.

Mineral and Energy Development

The Flathead National Forest currently has no leasable or locatable mineral activity, and there is a very low risk of effects due to mineral activities. Standards FW-STD-E&M-01 through 08 in the Revised Forest Plan will reduce the risk that any future developments would have adverse effects on grizzly bears. The Revised Forest Plan will require that new or reauthorized permits, leases, or plans of operation in the PCA and zone 1 include a provision for modification or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation (FW-STD-E&M-02). Additionally, the Revised Forest Plan will include standards that would require the following: measures for mitigation of mineral development impacts (FW-STD-E&M -03); proper storage and handling of wildlife attractants (FW-STD-E&M -04); mitigation measures or stipulations such as timing restrictions for ground-disturbing activities in spring habitat and seismic activity in denning habitat (FW-STD-E&M-05); mitigation measures if needed regarding motorized access, such as management of motorized traffic, helicopter use, noise reduction (FW-STD-E&M -06); and worker safety training for employees living and working in grizzly bear habitat (FW-STD-E&M -07).

In addition to the measures described above, the Revised Forest Plan will include NCDE-STD-MIN-08. This standard would require that new leases for minerals and/or energy development in the PCA include a no surface occupancy stipulation. With a no surface occupancy stipulation, access to oil and gas deposits would require horizontal drilling from outside the boundaries of the no surface occupancy areas. This prevents the loss of grizzly bear habitat through displacement and limits the potential for habituation and conflict with humans. In addition to this standard, the proposed action includes a monitoring component (MON-NCDE-04) that pertains to mineral and energy leases in the PCA and zone 1 (including DCAs). If there is

potential for adverse effects to grizzly bears and/or their habitat, MON-NCDE-04 requires the development of a monitoring plan that will be implemented for the life of the mineral activity. Specifically, the monitoring plan must document how effects to bears will be monitored, and identify appropriate mitigation measures and funding sources for those measures. As a result, we anticipate that effects of the proposed action associated with mineral and energy development on grizzly bears will be insignificant.

Food/Attractant Storage

As previously described, habituation and food conditioning of grizzly bears is a serious concern in all grizzly bear populations. Food storage orders substantially reduce the potential for adverse effects to bears as a result of food conditioning and habituation. The measures in food storage order help to reduce the potential for or eliminate human-grizzly bear conflicts and the potential for adverse effects to grizzly bears. The Revised Forest Plan includes standard FW-STD-WL-02 that requires a Food/Wildlife Storage Special Order be applied to all NFS lands within the PCA and zone 1 (including the Salish DCA). Based on the lack of conflicts and management removals associated with food/attractant storage, adverse effects to individual grizzly bears related to food storage issues on the FNF are not expected.

Actions Specific to Geographic Areas (GAs)

Swan Valley

In Section C.2 we described the history of land ownership in the Swan Valley geographic area, and discussed how it has changed substantially since the existing Forest Plan and the Swan Valley Grizzly Bear Conservation Agreement were adopted. As a result, the FNF now proposes to manage all subunits with the same forest-wide direction, superseding the previous agreement. Nevertheless, the FNF has stated its intention to continue to coordinate with others to support continued recovery of threatened and endangered species. As stated in desired condition FW-DC-P&C 03, "Recovery of threatened and endangered species is accomplished through cooperation with the U.S. Fish and Wildlife Service (including section 7 consultation, as required), state agencies, other federal agencies, tribes, counties, interested groups, and interested private landowners."

In addition to forest-wide plan components, additional plan components in the Revised Forest Plan would provide benefits for grizzly bears in the Swan Valley. The Revised Forest Plan will include the following components pertaining to the Swan Valley:

- GA-SV-DC-09: The portion of the Seeley Clearwater connectivity area from Condon south to the boundary of the Swan Valley geographic area and from the south end of Swan Lake to Lost and Porcupine Creeks (see figure B-30 in Revised Forest Plan) provides habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, and wolverine) moving between the Swan and Mission Mountain Ranges.

- GA-SV-OBJ-04: Decommission or place into intermittent stored service 10 to 30 miles of roads. Priorities are roads causing resource damage in priority

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watersheds, roads on acquired lands in the Swan Valley that are not needed for fire protection or other resource management, and/or roads within desired non-motorized recreation opportunity spectrum settings and/or roads within bull trout watersheds.

As explained above, most of the Legacy Project land acreage was regenerated prior to being acquired by the Forest and would not be large enough to be merchantable for decades. As a result, the level of timber harvest and associated road use that occurred on these lands over the last decade would not be expected to occur in the near future. Some road access would continue to be needed for activities such as restoration work, access to other ownerships, or fire protection but the high density of roads in the former Plum Creek Timber Company sections would be reduced. The FNF has made an estimate of the range of miles of road that could be decommissioned or placed into intermittent stored service, but specific roads would be assessed during site-specific project planning.

While there would continue to be adverse effects to individual grizzly bears from high road densities, these plan components would benefit grizzly bears in the Swan Valley by continuing to emphasize connectivity in management of the linkage zone south of Condon and improving habitat security on lands acquired through the Legacy Project.

Salish Mountains

The Salish Mountains geographic area has specific grizzly bear management direction that applies to zone 1, including the Salish SDC (see section on zone 1 above). Additional Salish Mountains-specific components in the Revised Forest Plan would provide benefits for grizzly bears in the Salish Mountains:

- GA-SM-DC-04: In areas between the primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. NFS lands in the Swift Creek-Stillwater connectivity area provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges.

- GA-SM-GDL-01: In order to provide elk habitat security, access management actions should not result in a decrease in total acres of NFS lands within the geographic area that are at least 250 contiguous acres and at least one half mile from roads open to wheeled motorized use by the public. If vegetation management occurs in elk security habitat, a mosaic of cover and forage should be provided, in consideration of the site-specific topography and vegetation types. Roads may be temporarily opened, after consultation with a forest wildlife specialist, for up to 30 days during July and August to allow for activities such as firewood gathering.

These plan components would benefit grizzly bears in the Salish Mountains by emphasizing linkage of habitat in the Salish DCA and providing elk habitat security in zone 1, which would indirectly benefit the grizzly bear population.

3. Species' Response to the Proposed Action

As discussed in Section D.2 (*Effects Specific to the Proposed Action*), the proposed action will implement forest plan components that will be beneficial to the NCDE grizzly bear population. However, the proposed action will also maintain conditions in certain circumstances that are adversely affecting individual grizzly bears. The proposed action also includes forest plan components that will result in additional, temporary adverse effects to grizzly bears beyond those resulting from existing conditions. The overwhelming majority of adverse effects from forest management arise from roads and associated high road densities and motorized access resulting in disturbance and displacement of grizzly bears. Additional adverse effects may result from premature displacement or disturbance of a female grizzly bear with cubs by snowmobile activities during the den emergence period. As characterized in the effects analysis above, there is a low likelihood of effect on three percent of the denning habitat on the FNF. Further, the risk of effect would be limited to the period of time from female and cub den emergence (2nd week of April) through spring snow melt (these dates would vary year to year). While the proposed action will result in adverse effects to individual grizzly bears, the proposed action will ensure the about 63 percent of the FNF remains in a management area designation that would continue to provide high levels of habitat security, and limit or prevent motorized access in the future (e.g., designated and recommended wilderness, non-motorized backcountry).

Regarding the Interagency Grizzly Bear Guidelines: The proposed action would no longer specifically reference the Interagency Grizzly Bear Guidelines, including the delineation of management situations. However, much of the existing forest plan management direction that is based on the Interagency Grizzly Bear Guidelines would be retained (see discussion in Section D.2).

The NCDE grizzly bear population is robust and growing. The most recent population data indicate that the NCDE population is greater than 1,000 grizzly bears and is growing at a rate of more than two percent annually (Costello et al. 2016). As discussed throughout this document, a draft NCDE Grizzly Bear Conservation Strategy has been created by an interagency team consisting of representatives from the U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, U.S. Geological Service, Montana Department of Fish, Wildlife and Parks, Montana Department of Natural Resources and Conservation, Bureau of Land Management, the Confederated Salish and Kootenai Tribes, and the Blackfeet Nation. Members of this team are considered the leading experts on grizzly bears in the NCDE. The draft strategy was developed by combining grizzly bear knowledge and expertise with the best available scientific research relative to grizzly bear conservation and management.

The proposed action will implement a Revised Forest Plan that contains direction related to grizzly bears with standards and application rules consistent to that developed for the draft NCDE Grizzly Bear Conservation Strategy. This will lead to management approaches on the

FNF that will contribute to a stable and expanding population of grizzly bears, as evidenced by the population status and trend under these conditions to date. Thus, the proposed action is expected to maintain high levels of grizzly bear survival within the action area.

The expectation of the NCDE Conservation Strategy is that the signatories will incorporate plan components consistent with each agency's respective requirements. Adopting direction consistent with what is being drafted in the NCDE Conservation Strategy would limit motorized access, developed recreation sites, late-season motorized over-snow use, livestock grazing allotments and mineral/energy development within the NCDE PCA on NFS lands. Some of these parameters would not exceed the 2011 baseline levels as described in the draft NCDE conservation strategy. Others will follow a trend similar to what was happening during the time when the NCDE grizzly bear population was growing and expanding its distribution across the landscape (i.e., 2004 to 2011). While these conditions may present a low level of adverse effects to NCDE grizzly bears, evidence suggests that management of NFS lands in accordance with the proposed Revised Forest Plan will support a sustainable and increasing NCDE grizzly bear population.

E. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Future activities will occur on non-federal land within the action area. Such activities could include residential and recreational development and use, timber harvest, fuel reduction around private developments, livestock grazing, and other actions. However, at this time, specific future actions being considered or proposed on non-federal land that could have cumulative effects with the proposed action are not known. To some degree, motorized routes, developed sites, and livestock grazing on private lands (where known) were incorporated into the 2011 baseline figures for grizzly bear habitat measures in the draft NCDE conservation strategy. However, future motorized route construction and use, increases in developed sites, and changes in livestock management on private land do not count against the habitat standards imposed.

While future non-federal actions are difficult to anticipate, these effects may be limited due to the large extent of federally-administered land in the NCDE recovery zone/PCA. The action area (i.e., lands administered by the FNF) contains approximately 2.1 million acres within the PCA. An additional 2.3 million acres is administered by other federal agencies not associated with this biological opinion (i.e., other National Forests, Glacier National Park). In total, approximately78 percent of the NCDE recovery zone/PCA is administered by a federal entity. As such, actions on these areas would be subject to separate section 7 analysis. The remaining acres occur on other land ownerships including state (four percent), tribal (seven percent) and private lands (nine percent). Note that one percent of the recovery zone/PCA is comprised of large water bodies (i.e., Flathead Lake).

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While some activities on non-federal land may contribute to cumulative effects at the project level at some point in the future, the large extent of the PCA under NFS and large blocks of wilderness within which human access is restricted by regulation and topography would serve to reduce the impacts of larger residential human populations on grizzly bears. While federal land management cannot entirely compensate for impacts on private land, management would continue to provide high quality habitat for grizzly bears on lands within the NCDE administered by federal agencies.

Since the proposed action is programmatic in nature (i.e. provides direction for future actions that may be authorized, funded, and/or carried out by the Forest) it does not in itself mandate or approve future implementation of activities on the FNF. Therefore, any future projects proposed and designed to implement the Revised Forest Plan would undergo separate consultation related to the effects of listed species. Any site-specific information on future activities that will occur on non-federal land that might contribute to cumulative effects would be considered at that time.

F. CONCLUSION

After reviewing the current status of the grizzly bear, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is the Service's biological opinion that the effects of the proposed FNF Revised Forest Plan are not likely to jeopardize the continued existence of the grizzly bear. No critical habitat has been designated for this species therefore none will be affected. Regulations implementing section 7 of the Act define "jeopardize the continued existence of" as: "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Our conclusion that implementation of the proposed FNF Revised Forest Plan would not jeopardize the continued existence of grizzly bears is based on the literature and information referenced in this document, the information in the biological assessment prepared for the Revised Forest Plan (USFS 2017), meetings and discussions with USFS, discussions with grizzly bear experts, and information in our files. The *Effects of the Action* section analyzed and summarized key factors in detail.

The Service's section 7 handbook explains that adverse effects on individuals of a species generally do not result in jeopardy determinations unless that loss when added to the environmental baseline, is likely to result in an appreciable reduction of the likelihood of both survival and recovery of a listed species in the wild by reducing the reproducing, numbers, or distribution of that species. In our analysis for grizzly bears, we first conduct such an analysis relevant to the NCDE grizzly bear population, and then determine the impact of the proposed action on the species.

Implementation of the proposed action may result in adverse effects to individual grizzly bears over the life of the Revised Forest Plan (15 years), particularly as a result maintaining conditions on the landscape that are adversely affecting grizzly bears and new access management direction including temporary reductions in secure core habitat, and increases in open and total motorized route densities. These effects are likely to be greatest in grizzly bear subunits that do not meet

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recommended open and total route densities and/or secure core percentages. Although the proposed action provides direction that allows temporary changes in access conditions in a subunit, the extent of such projects would be limited by management area allocations discussed in Section D.2. Additionally, future projects that will result in these changes will still be subject to project level analysis. The process will ensure that a site-specific analysis of effects will occur if a project is proposed within the PCA.

Based on the best available scientific information reviewed in this consultation, adverse effects on individual grizzly bears as a result of the proposed action will not negatively impact the recovery of the NCDE grizzly bear population. Further, we expect that direction in the Revised Forest Plan will result in conditions that support grizzly bear use of NFS lands in the NCDE. It is our opinion that the proposed action would not appreciably reduce the likelihood of both the survival and recovery of the NCDE grizzly bears. Below we summarize key factors related to the effects of the proposed action on grizzly bears as detailed and analyzed in this biological opinion. Key points of our rationale for this non-jeopardy conclusion include the following factors:

Factors related to the proposed action:

- The Revised Forest Plan would replace existing direction related to grizzly bears and incorporate direction consistent with draft NCDE Grizzly Bear Conservation Strategy. This direction was developed by an interagency team of grizzly bear experts using the best available scientific data.

- Because the draft NCDE Grizzly Bear Conservation Strategy was created to provide direction which will maintain a recovered NCDE population, we anticipate that incorporating consistent direction into the Revised Forest Plan will contribute to high levels of grizzly bear survival within the action area.

- Under the proposed action, existing Forest Plan language will be superseded by new elements that will retain similar on-the-ground management direction, in the form of newly designated standards and guidelines. This update will ensure that desired conditions, standards and guidelines applicable to the PCA are consistent among all National Forests that manage lands within the NCDE.

- The majority (41 of 73) of the bear management subunits on the FNF currently meet the research thresholds for OMRD (< 19 percent with > 1 mi/mi2), TMRD (< 19 percent with > 2 mi/mi2), and security core (> 68 percent), providing excellent quality and availability of habitat for grizzly bears, including females with cubs. Further, 20 of these subunits are entirely within designated wilderness.

- Thirty two subunits do not meet one or more of the research thresholds presented above. The proposed action would incorporate direction to

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maintain baseline levels in these subunits, which would allow adverse effects to individual bears to continue. While some adverse effects to individual grizzly bears will continue to occur, they are not expected to have an effect on the survival and recovery of the NCDE population since these conditions were on the landscape during a time when the NCDE grizzly bear population was increasing in size and distribution.

- The Revised Forest Plan will require projects to results in no net increase above baseline conditions in OMRD or TMRD in each bear management subunit within the PCA (as specified in FW-STD-IFS-02). The best available science indicates that baseline conditions (see glossary for baseline definition) provided adequate habitat conditions inside the NCDE recovery zone/PCA to support a stable to increasing grizzly bear population.

- The Revised Forest Plan will require projects to result in no net decrease below baseline conditions in percent secure core in each bear management subunit within the PCA (as specified in FW-STD-IFS-02). Temporary decreases in secure core during the non-denning season may occur to facilitate other multiple uses and desired conditions, but the extent would be limited.

- In each subunit, the Revised Forest Plan would require projects to result in no more than a five percent temporary increase in OMRD, a three percent temporary increase in TMRD, and a two percent temporary decrease in secure core. These temporary changes would be calculated using a 10-year running average for each grizzly bear subunit (as specified in FW-STD-IFS-03). Allowable deviations to access condition within the PCA are consistent with project-level section 7 consultations done elsewhere in the NCDE. These projects resulted in temporary changes to motorized route densities and security core in 18 grizzly bear subunits, but all occurred during a period of time when the NCDE grizzly bear population was growing (2004 to 2011).

- The Revised Forest Plan would allow no more than one increase in the number or capacity of developed recreation sites that are designed and managed for overnight use (e.g., campgrounds, cabin rentals, huts, guest lodges, recreation residences) during the non-denning season per BMU per decade. Impacts to grizzly bears from these increases would be mitigated by the conditions specified in FW-STD-REC-01 and FW-GDL-REC-01. This rate of increase is consistent with increases during a time period (2004 to 2011) when the NCDE grizzly bear population was increasing in numbers and distribution.

- The Revised Forest Plan requires no net increase above the baseline in cattle or sheep grazing allotments on NFS lands within the PCA (as specified in FW-STD-GR-04 & 05.

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- The Revised Forest Plan requires no net increase above the baseline in the percentage of area, or miles of routes, open to motorized over-snow use in denning habitat during the den-emergence period within the PCA (as specified in FW-STD-REC-05).

- The Revised Forest Plan requires that any new mineral and/or energy leases on NFS lands within the PCA include a no surface occupancy stipulation (as specified in FW-STD-E&M-08.

- Eight monitoring components are included in the Revised Forest Plan. These require biennial reporting of habitat conditions within the action area (see MON-NCDE-01 through MON-NCDE-08 in Appendix 4).

- The effect on grizzly bears from many of the Revised Forest Plan components is expected to be neutral to insignificant and/or discountable. Much of the direction related to grizzly bears is procedural and/or duplicative and in general the removal of this direction would have minor, insignificant effects on grizzly bears relative to habitat management procedures currently in place. In addition, some direction consists of changes in methods, terminology, or clarifications of the direction that are expected to have little to no effect on the design or implementation of projects on the ground, and thus would have little to no effects to grizzly bears.

- The proposed action will maintain habitat connectivity within the FNF, and linkage areas for movement of grizzly bears between recovery zones. This will be accomplished through desired conditions, guidelines and standards that will provide large, remote areas with low levels of human disturbance that contribute to movement in migratory corridors within and between ecosystems, as well as female occupancy in zone 1 (both inside and outside the Salish DCA). This will facilitate genetic exchange between ecosystems, as well demographic exchange by allowing the NCDE to serve as a "source" population for smaller ecosystems (CYE). Connectivity among ecosystems will support a more robust grizzly bear population in the lower U.S. as a whole.

- Finally, the FNF's Revised Forest Plan is a framework programmatic action. This proposed action does not authorize, fund, or carry out an action but provides direction for future actions that may be authorized, funded, or carried out by the USFS. Therefore, any action subsequently authorized, funded, or carried out under the Revised Forest Plan, will be addressed in subsequent section 7 consultations, as appropriate.

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Factors related to the NCDE grizzly bear population:

- In 1993, the Grizzly Bear Recovery Plan articulated the conservation needs for the recovery of grizzly bears. The plan stated that recovery zones include areas large enough and of sufficient habitat quality to support recovered grizzly bear populations, and that although grizzly bears are expected to reside in areas outside the recovery zones, only habitat within the recovery zone is needed for management primarily for grizzly bears.

- The Recovery Plan strategy has been successful and resulted in growth of the NCDE grizzly bear population since listing. Mace et al. (2012) estimated that the NCDE population has surpassed 1,000 individuals, and the most recent data from Costello et al. (2016) indicate that the population is continuing to grow at a rate of 2.3 percent annually. Based on the best available information, the Service concludes that the status of the NCDE grizzly bear population is robust.

- In addition to increased population size and a positive growth rate, the NCDE grizzly bear population has greatly expanded its distribution on the landscape. Costello et al. (2016) used verified grizzly bear locations to create a current distribution map for the NCDE. This map estimated that grizzly bears occupy an area of about 13.6 million acres, more than double the size of the recovery zone/PCA (5.7 million acres). These data serve to reinforce the Service's conclusion that the NCDE grizzly bear population is robust.

- Efforts to keep human food, garbage, and other attractants unavailable to grizzly bears will remain intact. Forest-wide food/wildlife attractant storage orders are in place across the whole FNF.

- Other federal agencies have also used their authorities to provide for proper storage of food and attractants in an effort to reduce grizzly bear conflicts with humans. Within Glacier National Park, food storage regulations (pursuant to 36 CFR 2.10 (d)) prohibit anyone from leaving food unattended or stored improperly where it could attract or otherwise be available to wildlife. The National Bison Range complex (administered by the Service) is day-use only, with no overnight camping allowed. Users are expected to pack out their trash; there are no garbage receptacles available anywhere on the refuges. On BLM lands within the NCDE recovery zone, food storage guidelines are incorporated into their contracts. The BLM also incorporates food storage guidelines into contracts in areas that are outside the recovery zone but in areas known to be occupied by grizzly bears

- Montana Fish, Wildlife and Parks' bear specialist program is expected to continue to work with the public to reduce risks to grizzly bears on private and

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public lands, both inside and outside the boundaries of the recovery zone. In cooperation with other agencies, this program has made notable strides toward an informed public and reduced the availability of attractants to grizzly bears on private and public lands.

- The NCDE encompasses approximately 5.7 million acres (8,926 square miles), of which more than 3.4 million acres (61 percent of the total) are managed by the USFS and nearly 1 million acres (17 percent of the total) are managed by Glacier National Park. Further, nearly 68 percent of all lands within the NCDE PCA are considered "protected." These lands include congressionally designated Wilderness Areas, and other designations that do not allow roads and/or motorized use (e.g., Inventoried Roadless Areas). These areas contain the highest quality grizzly bear habitat and will continue to contribute significantly to reducing the number of human bear encounters and increasing security for grizzly bears.

Recovery zones were established to identify areas necessary for the recovery of a species and are defined as the area in each grizzly bear ecosystem within which the population and habitat criteria for recovery are measured. The NCDE recovery zone/PCA has been managed to provide and conserve grizzly bear habitat, and best available scientific information indicates this been successful. As anticipated in the Recovery Plan, the NCDE grizzly bear population has responded to these conditions, and has stabilized and increased. In addition, the NCDE grizzly bears have been expanding beyond the PCA and will likely continue to expand into the future. In response, the proposed action provides land management direction to areas outside the original recovery zone/PCA (e.g., DCAs, zone 1) that will facilitate grizzly bear occupancy, especially females with cubs.

The proposed action may result in adverse effects on some individual grizzly bears using the action area now and into the future. However, considering the large size of the NCDE recovery zone, favorable land management direction within the recovery zone/PCA, and the robust status of this grizzly bear population, adverse effects on grizzly bears as a result of implementing the Revised Forest Plan would not have negative effects on the status of the NCDE grizzly bear population. Therefore, we conclude that the proposed action is not reasonably expected to reduce appreciably the likelihood of both the survival and recovery of NCDE grizzly bears.

G. INCIDENTAL TAKE STATEMENT

Section 9 of the Act, and Federal regulations pursuant to section 4(d) of the Act, prohibit the take of endangered and threatened species, respectively without special exemption. "Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined by the Service as an intentional or negligent act or omission that creates the likelihood of injury to

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listed wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. “Incidental take” is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with this Incidental Take Statement.

The measures in an incidental take statement are non-discretionary and must be undertaken by the action agency so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The action agency has a continuing duty to regulate the activity that is covered by this incidental take statement. If the action agency (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the action agency must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

1. Amount or Extent of Take Anticipated

This biological opinion considered the effects to grizzly bears from implementation of the Revised Forest Plan direction as guided by the Revised Forest Plan components (e.g., management area allocation, suitability, desired condition, standards, and guidelines). It includes specific components for the conservation of grizzly bears and grizzly bear habitat, but does not authorize specific actions. Our analysis of the Revised Forest Plan is a broad-scale examination of the types of projects and activities conducted under the Revised Forest Plan that could potentially occur in grizzly bear habitat and result in effects on grizzly bears. The Revised Forest Plan contains sufficient specificity to determine that the extent of adverse effects does not rise to levels that are likely to jeopardize the NCDE grizzly bear population.

In this biological opinion, we documented how the proposed action reduces the potential for adverse effects and incidental take to occur as a result of Forest management. However, the potential remains for specific projects and activities to result in adverse effects and incidental take of grizzly bears. The mere potential for future take from these actions is not a legitimate basis for providing an exemption for take. The FNF is responsible for section 7 consultation on all future projects (conducted under the Revised Forest Plan) that may affect the grizzly bear or its habitat, even if those projects are consistent with Revised Forest Plan. Subsequent consultation, as appropriate, on the specific actions developed pursuant to the Revised Forest Plan will serve as the basis for enumerating the incidental take and determining if an exemption from the section 9 take prohibitions is warranted. If so, the Service will provide Reasonable and Prudent Measures and Terms and Conditions, as appropriate, to minimize the impacts of the taking on the grizzly bear in accordance with 50 CFR 402.14(i).

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Two exceptions to this approach are related to the effects of motorized access route densities and over-snow motorized use on grizzly bears. For motorized route densities, the science is clear that above certain densities, bears suffer adverse effects that can lead to significant impairment of the ability to feed, breed, or shelter. The FNF has examined, monitored and reported motorized access route densities in all grizzly bear subunits of the PCA. In the Salish DCA the FNF examined, monitored and reported the linear density of roads and motorized trails open to public use during the non-denning season. In the remainder of zone 1 the FNF has examined, monitored and reported the linear density of roads open to the public during the non-denning season. Hence, we are able to ascertain the level of adverse effects and provide surrogate measures of incidental take of grizzly bears related to road densities in both the PCA and zone 1 (including the Salish DCA).

For over-snow motorized use the FNF analyzed and reported the amount of modeled denning habitat that was impacted by late season over-snow vehicle use. The best available science and information suggests that recently emerged females with cubs could be vulnerable to adverse disturbance effects of snowmobile use near den sites during the den emergence period. The FNF provided both acres of modeled denning habitat and an estimate of late season motorized over-snow vehicle use in denning habitat. Thus, we are able to ascertain the level of adverse effects and provide surrogate measures of incidental take of grizzly bears related to snowmobile use during the den emergence time period.

It should be noted that this biological opinion also considered the effects of increased developed recreation sites on grizzly bears. The Revised Forest Plan will allow one increase in the number or the overnight capacity of developed recreation sites designed and managed for overnight use per bear management unit per decade on NFS lands in the PCA (as specified in FW-STD-REC-01). While we maintain that increases have the potential to adversely affect grizzly bears (primarily through increased risk of conflict with humans), we also discussed how the details in site development and effects to bears can vary. Since this proposed action does not authorize any particular projects, future actions that will affect grizzly bears will be subject to additional section 7 consultation with the Service while the grizzly bear remains listed. We have determined that if increased developed recreation opportunities on any of the FNF were to result in adverse effects to grizzly bears, project-specific consultation (as required) would be the appropriate time to exempt any such take. As a result, incidental take associated with increased developed recreation will not be discussed further in this incidental take statement.

The amount or extent of incidental take resulting from access management and motorized over-snow vehicle use is examined below:

Access Management

As described in the accompanying biological opinion, the effect of roads with high use upon grizzly bear behavior and habitat use has been well documented in the scientific literature. We anticipate that incidental take of grizzly bears is likely to occur in the form of harassment of adult female grizzly bears in highly roaded areas (through displacement caused by road-related disturbance in areas of high open road densities). We also anticipate harm of adult female bears

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(through significant habitat modification or degradation caused by high open or total road densities). Both harassment and harm can cause actual injury to female grizzly bears by significantly disrupting normal behavioral patterns, including breeding, feeding, or sheltering.

The take we anticipate would be caused by displacement (i.e. significant underuse) of female grizzly bears from key habitat areas in highly roaded areas, which may result in decreased fitness that impairs a female's inherent reproductive potential. In other words, some adult female grizzly bears wary of humans and human-generated disturbance may fail to breed at their potential frequency or they would fail to complete gestation due to decreased fitness. We do not expect all adult female grizzly bears affected by displacement or by alteration of habitat caused by the proposed action to suffer impairment of breeding, feeding and/or sheltering. We do not anticipate incidental take of male and subadult grizzly bears, which are independent and thus more mobile and do not have the physiological or nutritional requirements of pregnant or lactating females.

Currently, the Service is unaware of scientific or commercial information that could be used to quantify the exact level of incidental take of female grizzly bears as a result of such impacts to or degradation of their habitat, or displacement. Reduced reproductive success of females as a result of displacement effects could include grizzly bear cub injury or mortality, but it is more likely to occur through failure to breed or complete gestation. The amount of take is difficult to quantify for the following reasons:

1. The amount of take would depend on the number of adult female grizzly bears impacted by high road densities. We lack specific information on the precise number of adult female grizzly bears that use the action area, but due to the amount of habitat meeting acceptable habitat parameters, we reasonably assume very few adult females would be affected.

2. Individual grizzly bears would react differently to the disturbance. Not all adult female bears that are exposed to disturbances from roaded areas would be adversely impacted to the point of take.

3. Individual female grizzly bears that initially may be sensitive to disturbances may over time become accustomed to the routine disturbances generated by routine forest road use. Therefore, determining the precise amount of take, as defined by impaired reproductive potential, is difficult.

Therefore, as detailed in this biological opinion, the Service anticipates some low level of incidental take of female grizzly bears would occur in the form of harm or harassment from the displacement effects of road densities. The amount of take would be also difficult to detect for the following reasons:

1. Grizzly bears are not easily detected or observed in the wild.

2. Reproductive rates of individual female grizzly bears vary naturally due to environmental and physiological causes.

3. A reduction in "normal" reproductive success of an individual female is not easily discernible in the wild.

4. The reasons a grizzly bear fails to breed and/or failure to complete gestation are not discernible in the wild.

In instances where incidental take is difficult to quantify or detect, the Service uses surrogate measures of take. Here, we use the research benchmark levels of OMRD, TMRD, and secure core as our surrogate measure of incidental take. These benchmarks were discussed in detail in this biological opinion. Where individual subunit road densities are higher than benchmark levels of OMRD or TMRD, or where core is less, we conservatively anticipate some level of impaired habitat use, resulting in impaired breeding or feeding for some adult female grizzly bears. Based on the best available research and information, we anticipate that some level of incidental take of female grizzly bears will occur within individual subunits as long as: (1) OMRD exceeds one mile per square mile in more than 19 percent of a subunit; (2) TMRD exceeds two miles per square mile in more than 19 percent of a subunit, and/or (3) secure core area makes up less than 68 percent of a subunit.

There are 32 subunits on the FNF that do not meet one or more of the research benchmarks described above (see Table III-15 in Section C.2). Seven subunits meet the research benchmarks, but are close enough that temporary changes to access conditions (as allowed under the proposed action and specified in FW-STD-IFS-03) may result in incidental take of grizzly bears (see Table III-15 in Section C.2). This will occur when temporary changes to access condition cause OMRD or TMRD to increase above the research benchmarks, or when secure core decreases below the research benchmark. Changes are calculated using a 10-year running average as described above and in Appendix 3 of this biological opinion, or Appendix D or the biological assessment. While changes in road density and/or secure core will be temporary, adverse effects and incidental take will occur while these changes are implemented on the ground. Within those subunits achieving the research benchmarks, incidental take of grizzly bears is unlikely to occur. Project resulting in changes to OMRD, TMRD, or secure core beyond those permitted by the Revised Forest Plan and analyzed in this biological opinion will result in levels of take that exceed the amount of incidental take we anticipate here, and reinitiation or project-specific consultation would be required.

Additionally, we use spatial and temporal surrogates for incidental take that will occur in grizzly bear subunits within the PCA. The proposed action indicates that on-the-ground implementation of each project will not exceed five years within any one subunit. Therefore, we use a maximum of five years of on-the-ground project work (as specified in FW-GDL-IFS-01) as a surrogate for take. Further, we assume that on-the-ground project implementation on NFS lands will not concurrently impact OMRD, TMRD, or secure core in more than three adjacent grizzly bear subunits on the FNF. This will provide grizzly bears within a project subunit the opportunity to move away from activities into undisturbed subunits. If on-the-ground implementation of a

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project exceeds five years, or if a project concurrently impacts OMRD, TMRD, or secure core in more than three adjacent subunits, the level of take exempted under this biological opinion would be exceeded and reinitiation or project-specific consultation would be required (as appropriate).

In the zone 1 (including the Salish DCA), we anticipate some level of incidental take of female grizzly bears. We base our opinion on the fact that linear densities of road s and motorized trails open to the public during the non-denning season. Thus, we anticipate that road and motorized trail densities in these areas are likely causing incidental take of grizzly bears and this will continue. This is a conservative conclusion since grizzly bears moving into these areas did so under prevailing conditions, it is also possible that incidental take is not occurring for every female. Grizzly bears are known to tolerate a range of conditions; some apparently adjust to high levels of human activity without apparent consequence. Further, because few grizzly bears occupy this area, intraspecific competition is probably not significant. Those grizzly bears using zone 1 and the Salish DCA likely have options related to home range selection and use. Similar to the incidental take likely occurring within subunits inside the PCA, we anticipate a low level of incidental take of female grizzly bears in the form of harassment, and /or harm through significant habitat modification or degradation as a result of high road densities and associated disturbance, which causes actual injury to grizzly bears by significantly disrupting normal behavioral patterns, to the extent that a female's normal reproductive potential is impaired.

In the Salish DCA, we use the linear density of roads and motorized trails open to the public during the non-denning season (as specified in GA-SM-STD-01) as a surrogate measure of take (see Table III-17 in Section D.2). In the remainder of zone 1 (i.e., outside the Salish DCA), we use we use the linear density of roads open to the public during the non-denning season (as specified in GA-SM-STD-01) as the surrogate measure of take (also see Table III-17 in Section D.2). In the Salish DCA and zone 1, permanent increases in linear densities beyond the levels shown in Table III-17 of this biological opinion will result in levels of take that exceed the amount of incidental take we anticipate here, and reinitiation or project-level consultation would be required.

Motorized Over-Snow Vehicle Use During Den Emergence

In Sections C.2 (*Environmental Baseline*) and D.2 (*Effects of the Action*), we discuss the potential impacts of motorized over-snow vehicles on grizzly bears as they emerge from their dens. We anticipate the proposed action to result in incidental take where late season (after March 31) motorized over-snow vehicle uses overlaps with grizzly bear denning habitat. The incidental take is expected to be in the form of harassment to individual female grizzly bears and/or cubs caused by premature displacement from the den site area, resulting in reduced fitness of females and cubs. We expect the amount and extent of take would be very low. Late season motorized over-snow use would affect very few individual females with cubs over the life of the plan, as adult females with cubs occur at very low numbers compared to the amount of denning habitat available. As spring season ends, the amount of motorized over-snow use decreases. Finally, an individual female would not likely be affected for more than one denning season. Grizzly bears typically do not reuse den sites. Thus, if a female grizzly bear suffers significant

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disturbance at or near her den site, it is probable that she would locate a new site to den in the future and would have options for denning elsewhere.

The difficulty in detecting or quantifying this incidental take is the same as presented above, and just as above we are using a surrogate measure of incidental take. We use the following two surrogates for take: (1)The amount of potential denning habitat within the PCA currently overlapped by known late-season motorized over-snow vehicle use (three percent); and (2) The miles of routes within the PCA open to late-season motorized over snow vehicles (19 miles). If late season motorized over-snow vehicle use (i.e., after March 31) occurs on more than three percent of modeled denning habitat within the PCA on the FNF, or more than 19 miles of routes are open to late season motorized over snow vehicles in modeled denning habitat, then the amount of take we anticipated in this biological opinion would be exceeded, and reinitiation or project-specific consultation would be required.

2. Effects of Take

In the accompanying biological opinion, the Service determined that the level of anticipated take is not likely to result in jeopardy to grizzly bear within the NCDE recovery zone. The best scientific information indicates a robust NCDE grizzly bear population of more than 1,000 individuals. Further, the latest trend data show that the population is growing at a rate of 2.3 percent annually and now occupies an area of roughly 13.6 million acres, more than twice the size of the original NCDE recovery zone (5.7 million acres). Impacts on the grizzly bear population, including anticipated levels of incidental take as a result of the proposed action will not appreciably reduce survival or the recovery of the species. We anticipate no mortality of adult or subadult grizzly bears, but rather some low level of effect on the normal reproductive potential of a relatively low number of adult female bears inhabiting the FNF. Critical habitat has not been designated for the grizzly bear, therefore none would be affected.

3. Reasonable and Prudent Measures

Biological opinions provide reasonable and prudent measures that are expected to reduce the amount of incidental take. Reasonable and prudent measures are those measures necessary and appropriate to minimize incidental take resulting from proposed actions. Reasonable and prudent measures are nondiscretionary and must be implemented by the agency in order for the exemption in section 7(o)(2) to apply.

1. Minimize or reduce the potential for mortality and displacement of grizzly bears due to the proposed action.

4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions that implement the reasonable and prudent measure described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary:

To implement the reasonable and prudent measure:

1. The Forest Service shall comply with standards FW-STD-IFS-01 , FW-STD-IFS-02, FW-STD-IFS-03, FW-STD-IFS-04 and FW-STD-REC-05 in the Flathead Forest Plan.

2. The Forest Service shall comply with guideline FW-GDL-IFS-01 and FW-GDL-IFS-02 in the Flathead Forest Plan. If projects will be unable to comply with the above guidelines, the Forest Service shall contact the Service immediately to determine further consultation needs.

3. Concurrent, temporary increases in OMRD or TMRD, or concurrent temporary decreases in secure core for new projects (*as described in the glossary in Appendix 3*) on NFS lands shall not occur in more than 3 adjacent bear management subunits on the FNF.

4. The Forest Service shall continue to implement food/attractant storage and handling programs in the action area. This includes ensuring all Forest Service employees and contractors adhere to appropriate protocols, and providing educational material to the public on measures to avoid conflicts and/or food conditioning of grizzly bears.

5. **Reporting Requirements**

To remain in compliance with the terms and conditions, and to demonstrate that the USFS is adequately reducing the potential for and minimizing the effect of any incidental take of grizzly bears, the USFS shall adhere to the reporting requirements stipulated in the "Monitoring" components of the proposed action. Specifically, these components are presented as MON-NCDE-01 through MON-NCDE-08 in Appendix 4 of this biological opinion, and in Appendix D of the biological assessment (pages 318-319). The stipulated biennial monitoring reports shall be provided to the Service's Ecological Services Office in Helena, Montana.

If a human-caused grizzly bear mortality is discovered on NFS lands, the Service's Grizzly Bear Recovery Office in Missoula, Montana shall be notified within 24-hours. Reporting human-caused grizzly bear mortalities on NFS lands may be done by MTFWP, but the USFS remains responsible for ensuring that the Service has received all appropriate information.

H. CONSERVATION RECOMMENDATIONS

Sections 7(a)(1) of the Act directs federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement

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recovery plans or to develop information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibilities.

During the course of this consultation, the Service noted several elements of the FNF's Revised Forest Plan that will contribute to the conservation of endangered, threatened, proposed, and candidate species. The Revised Forest Plan will provide habitat conditions on the FNF that supported a stable to increasing population of grizzly bears in the NCDE. The Revised Forest Plan will be beneficial to grizzly bears by requiring food/attractant storage order(s) on NFS lands, limiting motorized access, limiting new developed recreation sites, limiting new grazing allotments, and requiring a "no surface occupancy" stipulation for new oil and gas leases in the recovery zone/primary conservation area. These and other plan components for minerals, recreation, livestock grazing, lands, and vegetation management activities will ensure that grizzly bear habitat needs are provided for in future site-specific projects. Additional plan components for zone 1 will be beneficial to the NCDE grizzly bear population by supporting grizzly bear occupancy in areas beyond the original recovery zone/PCA. The ongoing efforts by the Forest Service to cooperate with other federal, state, local, and tribal agencies and private landowners in the NCDE also are important in supporting coordinated grizzly bear conservation efforts.

This biological opinion identifies the following conservation recommendations that, in addition to the proposed action and other ongoing conservation actions, will support recovery of listed species. As discussed above, these conservation recommendations are discretionary agency activities meant to minimize or avoid adverse effects to listed species. The conservations recommendations are:

1. Maintain and/or install grizzly bear informational signs at major access points that provide the public with the following information: potential grizzly bear presence; proper sanitation/food storage techniques; and distinguishing characteristics between grizzly bears and black bears.

2. Participate in ongoing interagency efforts to identify, map, and manage linkage areas that may be important in providing landscape connectivity within and between grizzly bear ecosystems, across all land ownerships for grizzly bears.

3. Plan recreational development, and recreational/operation uses in a manner that facilitates grizzly bear movement and maintains habitat effectiveness.

4. Plan and manage developments on NFS lands in a manner that allows for grizzly bear use of key habitats in the PCA and zone 1.

5. In cooperation with other agencies, identify areas where grizzly bears concentrate during specific time periods to take advantage of concentrated and/or diverse food sources. Where grizzly bear use is known or likely to occur and where practicable, plan activities in a fashion that minimizes displacement of grizzly bears.

6. The USFS continues to plan recreational development, and manage recreational and operational uses to provide for grizzly bear and Canada lynx movement, and to maintain effectiveness of these species' habitats.

7. The USFS continues to identify and prioritize roads for rehabilitation or seasonal restrictions within watersheds with relatively high road densities so as to improve habitat quality and/or security for grizzly bears, Canada lynx, and bull trout, as well as other listed and non-listed fish and wildlife species.

In addition to management direction that will contribute to the recovery of grizzly bears, direction relative other listed species (i.e., bull trout, Canada lynx, water howelia) is also contained in the FNF's Revised Forest Plan. These elements are documented in the biological assessment (USFS 2017) or species-specific chapters of this biological opinion. Upon review the Service concludes that the FNF's Revised Forest Plan demonstrated a commitment to conservation of threatened and endangered species, and will continue to contribute to the recovery of these species.

Upon review of Forest Plan components that will be carried forward, and components that are being proposed, we conclude that the features of the FNF's Revised Forest Plan can be considered elements of a program for the conservation of endangered species and threatened species, as described in section 7(a)(1) of the Act. Further, we conclude that this proposed action demonstrates the USFS's commitment to conservation of threatened and endangered species on NFS lands in the action area.

I. REINITIATION NOTICE

This concludes consultation on the effects of the FNF's Revised Forest Plan on grizzly bears. As provided in 50 C.F.R. § 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (3) a new species is listed or critical habitat designated that may be affected by the action.

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CHAPTER IV. BIOLOGICAL OPINION FOR CANADA LYNX AND CANADA LYNX CRITICAL HABITAT

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A. CONTEXT OF THE PROPOSED ACTION FOR CANADA LYNX

The proposed action is described in detail in Chapter I of this biological opinion. This chapter identifies and describes the relationship of the action area to Canada lynx habitat, explains the relationship of the proposed action to existing management, and then describes elements of the Revised Forest Plan that provide for the conservation of Canada lynx and Canada lynx critical habitat. Further, this chapter describes the components of the Revised Forest Plan intended to conserve Canada lynx and lynx habitat, and specific measures proposed to avoid, reduce, or minimize potential adverse effects of forest management activities at the project level.

This biological opinion will consider the effects of implementation of the proposed framework of the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

1. Description of the Proposed Action

As discussed in Chapter I of this biological opinion, the action area for the proposed action is the entirety of the FNF. The action area lies within the Northern Rocky Mountain/Cascade region of the contiguous United States distinct population segment (DPS) of Canada lynx. Lynx habitat within the Northern Rocky Mountain/Cascade Geographic Area was delineated into lynx analysis units (LAUs) for analysis and management purposes. A LAU is intended to provide the fundamental unit for evaluating and monitoring the effects of management activities on lynx. Lynx analysis units do not depict actual lynx home ranges but are approximately the size of a female's home range (25-50 mi^2 or 16,000-32,000 acres), contain at least 10 mi^2 (6,400 acres) of primary vegetation capable of supporting lynx, and encompass year-round foraging and denning habitat components (ILBT 2013).

LAUs were delineated for the Flathead National Forest (FNF) in accordance with the guidance provided in the Lynx Conservation Assessment and Strategy and the Northern Rockies Lynx Management Direction and have not been changed since they were originally delineated (Figure 27). The area covered by the lynx analysis units on the FNF is the primary area used for analysis under the Endangered Species Act. The area selected is large enough to include the effects of activities on adjoining non-federal lands but not so large so as to obscure effects on a biologically meaningful unit.

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Within the FNF there are 109 LAUs that are either wholly or partially on NFS lands. Of these LAUs approximately 1,795,000 acres are mapped as lynx habitat (i.e., boreal forest habitat types) and approximately 598,000 acres are mapped as non-lynx habitat (i.e., low elevation, scree slopes, cliff faces, lakes, and dry habitat types) (Figure 27). Because resident lynx may make exploratory or breeding movements into new areas, though typically returning to their original home range, and males in particular may travel long distances during these episodes, the action area is considered to be the entire FNF.

Relationship of Proposed Action to Existing Management

In 2007, the FNF amended the existing Forest Plan with the Northern Rockies Lynx Management Direction amendment (NRLMD) (USFS 2007). In addition to the FNF's Forest Plan, the NRLMD amended existing plans for17 other National Forests. The Service prepared a biological opinion on the effects of the amendment on lynx and determined that the NRLMD was not likely to jeopardize lynx (USFWS 2007). Thus, the existing FNF Forest Plan manages lynx habitat under the direction in the NRLMD. This direction applies to projects and activities in lynx habitat, and it is used along with the biological opinion during section 7 consultation to help evaluate and document the effects of individual proposed projects on lynx. The NRLMD applies to all areas designated by the Forest Service as "lynx habitat" within LAUs on NFS lands within the 18 National Forests, including the FNF.

At the time the NRLMD was prepared and the biological opinion was completed (2007), critical habitat had not been designated for lynx on NFS lands. Critical habitat was designated in 2009 (February 25, 2009, 71 FR 8616) and later revised in 2014 (September 12, 2014, 79 FR 54782). Since that time, the NRLMD has been applied to lynx critical habitat on the FNF.

The NRLMD includes standards and guidelines intended to "incorporate management direction in land management plans that conserves and promotes recovery of Canada lynx, by reducing or eliminating adverse effects from land management activities on National Forest System lands…" (USFS 2007). As analyzed in our 2007 biological opinion, the NRLMD is intended to avoid or reduce the potential for projects proposed under Forest Plans to adversely affect lynx through a suite of objectives, standards, and guidelines that promote and conserve the habitat conditions needed to produce adequate snowshoe hare (lynx primary prey) densities to sustain lynx home ranges, and thus sustain lynx populations. The biological opinion concluded that the programmatic objectives and project-level standards, and guidelines in the amended Forest Plans provide comprehensive conservation direction adequate to reduce adverse effects to lynx from forest management on NFS lands and do not result in jeopardy to the lynx DPS. Because critical habitat for lynx was not designated on NFS lands in 2007, the opinion did not address the effects of Forest Plan direction, as amended by the NRLMD, on lynx critical habitat. However, the USFS initiated consultation with the Service on the NRLMD and lynx critical habitat, and a biological opinion was rendered on October 18, 2017 (USFWS 2017a).

This biological opinion re-examines the effects of implementation of the NRLMD under the Revised Forest Plan in light of the most recent science available for lynx. This biological opinion will also address the effects of the Revised Plan, including the NRLMD as carried forward in the plan, on lynx critical habitat in the action area.

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Proposed Action Description

As described in Chapter I of this biological opinion, the Revised Forest Plan direction is organized by desired conditions, objectives, standards and guidelines (see Appendices in BA and this biological opinion). The Revised Forest Plan will provide the FNF with forest-wide direction for the next 15 years, and it describes the framework under which lands will be managed.

The Revised Forest Plan designated all lands managed by the FNF as a certain management area (MA). Management area plan components and delineation provides the on-the-ground framework guiding which allowable uses may occur. Table IV-1 summarizes approximate acres and the percentage of management areas in lynx habitat. The following section characterizes the MAs in Canada lynx habitat and discusses the effects of the resulting management direction on the species. A more detailed description of the MA designations can be found in Chapter I of this biological opinion, or in the biological assessment (USFS 2017).

Management direction from the NRLMD will be retained in the Revised Forest Plan forest plan through standard FW-STD-WL-04. As such, the Revised Forest Plan will carry forward the objectives, standards, and guidelines that were developed to conserve lynx. The use of the terms "goals," "standards," and "guidelines" in the NRLMD is consistent with the definitions of these terms found the Revised Forest Plan (USFS 2017). The definition of "objectives" in the NRLMD is consistent with the definition of "desired conditions" in the Revised Forest Plan. As a result, the Revised Forest Plan defines the NRLMD "objectives" as "desired conditions." The NRLMD plan components are being incorporated by reference throughout the Revised Forest Plan (e.g., in the terrestrial ecosystems and vegetation, wildlife species, recreation, and infrastructure sections).

Forest-specific modifications to VEG S6 (to add an exception category aimed at protecting mature rust-resistant whitebark pine trees) and HU G11 (for areas identified as suitable for over-snow motorized recreational vehicle use) are being proposed as part of the Revised Forest Plan. These modifications will be addressed in more detail further in this biological opinion

Table IV-1. Canada lynx habitat and designated critical habitat in each Forest management area (MA).

Management Area (MA)	Canada Lynx Habitat Acres	Percentage of Potential Lynx Habitat	Canada Lynx Critical Habitat Acres	Percentage of Critical Habitat Acres
1a Designated wilderness	771,082	43	1,069,992	49
1b Recommended wilderness	155,820	9	189,705	9
2a Designated wild and scenic rivers	4,294	< 1	5,349	< 1
2b Eligible wild and scenic rivers	13,364	1	14,392	1

Management Area (MA)	Canada Lynx Habitat Acres	Percentage of Potential Lynx Habitat	Canada Lynx Critical Habitat Acres	Percentage of Critical Habitat Acres
3b Special areas	1,001	< 1	1,165	< 1
4a Research natural areas	4,673	< 1	5,544	< 1
4b Experimental and demonstration forests	8,782	< 1	9,357	< 1
5a Backcountry nonmotorized year-round	122,511	7	144,301	7
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	45,047	3	49,491	2
5c Backcountry: motorized over-snow vehicle use	95,822	5	109,973	5
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	8,583	< 1	9,668	< 1
6a General forest low	106,027	6	112,128	5
6b General forest medium	255,311	14	271,341	12
6c General forest high	166,672	9	166,542	8
7 Focused recreation areas	36,578	2	32,963	2
Total	**1,795,567**		**2,191,912**	

B. STATUS OF THE SPECIES & CRITICAL HABITAT

1. ESA Listing History

On March 24, 2000 the Service listed the contiguous United States DPS of the Canada lynx as threatened in fourteen States (65 FR 16052). Subsequently, the Service published a final rule designating critical habitat in November, 2006 (71 FR 66006); however, no federal lands (including NFS lands) were included in the 2006 final rule. In February of 2009, the Service published a final rule (74 FR 8616) that revised the 2006 designation and included designation of Canada lynx critical habitat on federal lands.

In September of 2014, the Service published a final rule (79 FR 54782) that again revised the previous (2009) designation of critical habitat and the distinct population boundary for the contiguous United States DPS for Canada lynx (USFWS 2014). The 2014 revised rule includes all or portions of ten National Forests that appended the NRLMD to their land management plans in 2007. The ten National Forests addressed in this assessment and included in the 2014 revised critical habitat designation are the Idaho Panhandle, Kootenai, Flathead, Lolo, Helena, Lewis & Clark, Gallatin, and Custer in Forest Service Region 1, the Shoshone in Forest Service Region 2, and the Bridger Teton in Forest Service Region 4. It should be noted that since 2014 the Helena and Lewis & Clark National Forests have been administratively combined into the Helena-Lewis & Clark National Forest, and the Custer and Gallatin National Forests have been combined into the Custer-Gallatin National Forest.

2. Species Description, Life History and Population Dynamics

The Canada lynx (lynx) is a medium-sized cat with long legs; large, well-furred paws; long tufts on the ears; and a short, black-tipped tail (McCord and Cardoza 1982). The winter pelage of the lynx is dense and has a grizzled appearance with grayish-brown mixed with buff or pale brown fur on the back, and grayish-white or buff-white fur on the belly, legs, and feet. Summer pelage of the lynx is more reddish to gray-brown (Quinn and Parker 1987). Adult males average 22 pounds in and 33.5 inches in length (head to tail), while females average 19 pounds and 32 inches (Quinn and Parker 1987). The lynx's long legs and large feet make it highly adapted for hunting in deep snow. The life expectancy for lynx is not very well known, but the oldest documented lynx was a 16 year old male in Montana (Kolbe and Squires 2006).

Lynx occur in mesic coniferous forests that have cold winters with deep, fluffy snow, and provide a prey base of snowshoe hare (Ruggiero et al. 2000). These forests are generally described as boreal forests that provide optimal habitat for snowshoe hares. In North America, the distribution of lynx is nearly coincident with that of snowshoe hares (Bittner and Rongstad 1982, McCord and Cardoza 1982). Lynx survivorship, productivity, and population dynamics are closely related to snowshoe hare density in all parts of its range. In the extensive boreal forests of Canada, snowshoe hare densities reach peak densities of roughly four to six hares per hectare (or 1.6 to 2.4 per acre) and decline to about 0.1 to 1 per hectare (0.04 to 0.4 per acre) during cyclic lows (Hodges 2000a). Ruggiero et al. (2000) found that a minimum density of snowshoe hares greater than 1.2 hares per acre distributed across a large landscape is necessary to support survival of lynx kittens, as well as recruitment and maintenance of a lynx population.

As mentioned above, snowshoe hares are the primary prey of lynx, comprising 35 to 97 percent of the diet throughout their range (Quinn and Parker 1987, Koehler and Aubry 1994). Other prey items can include various species of squirrels, porcupine, beavers, voles, and even ungulates (Saunders 1963, van Zyll de Jong 1966, Nellis et al. 1972, Brand et al. 1976, Koehler 1990, Staples 1995). During the cycle when hares become scarce, the proportion and importance of other prey species, especially red squirrel, increases in the diet (Brand et al. 1976, Apps 2000, Mowat et al. 2000). However, a diet of red squirrels alone might not be adequate to ensure lynx reproduction and survival of kittens (Koehler 1990). Most research has focused on the winter diet. Summer diets are poorly understood throughout the range of lynx. In their review of the literature, Mowat et al. (2000) reported that summer diets have less snowshoe hare and more alternate prey species, possibly because of a greater availability of other species.

In Canada and Alaska, lynx populations undergo extreme fluctuations in response to the cycling of snowshoe hare, enlarging or dispersing from their home ranges and ceasing the recruitment of young into the population after hare populations decline (Mowat et al. 2000). In the contiguous United States, the degree to which the lynx population fluctuations are influenced by local snowshoe hare population dynamics is unclear. Lynx in the lower U.S. are on the periphery of the species' range in North America, and are naturally limited by the low availability of snowshoe hares, as suggested by large home range size and high kitten mortality. These characteristics appear to be similar to those exhibited by lynx populations in Canada and Alaska during the low phase of the hare population cycle (Aubry et al. 2000). This is likely due to the inherently patchy distribution of lynx and hare habitat in the contiguous United States and correspondingly lower densities of hares.

Individual lynx maintain large home ranges, generally ranging between 12 to 83 square miles (Aubry et al. 2000, Squires et al. 2004, Vashon et al. 2005). The size of lynx home ranges varies depending on abundance of prey, the animal's gender and age, season, and the density of lynx populations (Koehler 1990, Poole 1994, Mowat et al. 2000). When densities of snowshoe hares decline, for example, lynx enlarge their home ranges to obtain sufficient amounts of food to survive and reproduce. Research supports the hypothesis that lynx home ranges at the southern extent of the species' range are generally large compared to those in the core of their range in Canada (Koehler and Aubry 1994, Squires and Laurion 2000).

Lynx are highly mobile and have a propensity to disperse long distances, particularly when prey becomes scarce (Mowat et al. 2000). Lynx also make long distance exploratory movements outside their home ranges (Aubry et al. 2000, Squires et al. 2001, Moen et al. 2010). Aubry et al. (2000) defined exploratory movements as long-distance movements beyond identified home range boundaries, in which the animal returned to its original home range. In Minnesota, exploratory movements were greatest for males during the breeding season in March (Burdett et al. 2007). In Montana, Wyoming, and southern British Columbia, exploratory movements during the summer months by resident lynx have been documented in numerous studies (Apps 2000, Squires and Laurion 2000, Squires and Oakleaf 2005). Distances of these exploratory movements in Montana ranged from 9 to 25 miles, and lasted anywhere between one week to several months (Squires and Laurion 2000).

Breeding typically occurs through March and April (Quinn and Parker 1987), and kittens are usually born between April and June depending on the region (Slough and Mowat 1996). In Montana, the average litter size in the Seeley Lake study area was 2.3 kittens and 3.2 kittens in the Purcell Mountains (Squires et al. 2006). The male lynx does not help with rearing young (Eisenberg 1986) and den use typically ends between late June and late July (Olson et al. 2011). In northwestern Montana, females stayed at natal dens an average of 21 days, and the time spent at subsequent dens decreased with time since parturition (ibid.). The natural fluctuation in hare populations appears to greatly impact lynx breeding and kitten survival. In northern study areas during the low phase of the hare cycle, few if any live kittens are born, and few yearling females conceive (Poole 1994, Slough and Mowat 1996).

3. Habitat Requirements

The primary factor driving lynx behavior and distribution is the distribution of snowshoe hare, their primary prey. Snowshoe hares prefer boreal forest stands that have a dense horizontal understory to provide food, cover, and security from predators. Snowshoe hares feed on conifers, deciduous trees, and shrubs, and density is correlated to understory (horizontal) cover between approximately 3 to 10 feet above the ground or snow level (Hodges 2000b). Habitats most heavily used by snowshoe hares are stands with shrubs, stands that are densely stocked with trees, and stands at ages where branches have more lateral cover at a height used by hares (Hodges 2000b). Generally, earlier successional forest stages support a greater density of horizontal understory and more abundant snowshoe hares (Wolfe et al. 1982, Koehler 1990, Homyack et al. 2007). Mature, multistoried stands in boreal forests also have adequate dense understory to support abundant snowshoe hares (Griffin 2004, Squires et al. 2006).

Lynx are associated primarily with upper elevation coniferous forests dominated by mixtures of the following vegetation types: Douglas-fir, spruce-fir, fir-hemlock, and on drier sites, lodgepole pine (Aubry et al. 2000). In extreme northern Idaho, northeastern Washington, and northwestern Montana, cedar-hemlock habitat types may also be considered primary vegetation. Secondary vegetation interspersed within subalpine forests may also contribute to lynx habitat. Dry forest types (e.g. ponderosa pine) do not provide lynx habitat.

In the United States, lynx inhabit conifer and conifer-hardwood habitats that support their primary prey, snowshoe hares. Both timber harvest and natural disturbance processes (e.g., fire, insect infestations, catastrophic wind events) can provide foraging habitat for lynx when resulting understory stem densities and structure provide the forage and cover needs of snowshoe hare (Parker et al. 1983, Bailey et al. 1986, Koehler 1990, Agee 2000). These characteristics also include a dense, multi-layered understory that maximizes cover and browse at both ground level and at varying snow depths throughout the winter in order to provide cover and food for snowshoe hares. Despite the variety of habitats and settings, good snowshoe hare habitat typically has a common feature – dense, horizontal vegetative cover 1 to 3 meters (3 to 10 feet) above the ground or snow level (Hodges 2000b). Multi-story boreal forests usually provide this structure, as well as high levels of cover preferred by lynx.

Cover is important to lynx when hunting (Brand et al. 1976). Lynx have been observed (via snow tracking) to avoid large openings during daily movements within the home range, seeming to prefer to move through continuous forest, using the highest terrain available such as ridges and saddles (Koehler 1990, Staples 1995). Kesterson (1988) and Staples (1995) reported that lynx hunted along the edges of mature stands within a burned forest matrix, and Major (1989) found that lynx hunted along the edge of dense riparian willow stands. In Montana, lynx preferentially foraged in spruce-fir forests with high horizontal cover, abundant hares, and large diameter (greater than 11 inches dbh) trees during the winter (Squires et al. 2006). Lynx tended to avoid sparse, open forest and forest stands dominated by small-diameter trees during the winter.

Lynx use a variety of types of large woody debris, such as downed logs, root wads, and windfalls, to provide denning sites with security and thermal cover for kittens (McCord and Cardoza 1982, Koehler and Brittell 1990, Squires et al. 2006, Squires et. al. 2008). During the

first few months of life, kittens are left alone at these sites when the female lynx hunts. Downed logs and overhead cover provide protection of kittens from predators, such as owls, hawks, and other carnivores during this period. The age of the forest stand does not seem as important for denning habitat as the amount of horizontal structure available (Mowat et al. 2000, USFWS 2007). This cover provides hiding cover and shelter for kittens. Den sites may be located within older regenerating stands (>20 years since disturbance) or in mature conifer or mixed conifer-deciduous (typically spruce/fir or spruce/birch) forests. In Montana, lynx selected den sites with higher horizontal cover than elsewhere in the animal's home range (Squires et al. 2006, Squires et al. 2008).

Denning habitat in or near foraging habitat is likely to be most functional and selected by females. The hunting range of females is restricted at the time of parturition, and their need to feed kittens requires an abundance of prey. Lynx, like other felids, frequently move their kittens until they are old enough to hunt with their mother. Multiple nursery sites are used that provide kittens with overhead cover and protection from predators and the elements. Downed logs and overhead cover throughout the home range provides security when lynx kittens are old enough to travel (Koehler 1990).

4. Range-Wide Status

Because of the limitations and uncertainty in the historical records of lynx occurrence in the contiguous United States, it is difficult to compare the current distribution and status of resident lynx populations in the DPS with what may have been the historical condition. However, research and surveys over the last 2 decades have significantly improved our understanding of the current distribution, habitats, and the status of resident populations compared to what was known when the DPS was listed in 2000. For example, although we knew there were some resident lynx in Maine (Unit 1), we lacked information on the quality and distribution of lynx and hare habitats and the potential number of lynx. We now know this unit currently has large areas of high-quality habitat created by the regeneration of areas of extensive clear-cutting in the 1970s and 1980s in response to a large spruce budworm outbreak, that there are probably more lynx in Maine now than was likely under historical natural disturbance regimes and habitat distributions, and that currently this unit probably supports the largest resident lynx population in the DPS. Similarly, when the DPS was listed, we were uncertain whether Minnesota (Unit 2) supported a resident population. We now know that a persistent population occupies the northeastern corner of the state. Research also suggests that lynx and habitats in the western United States (Units 3, 4, 5, and 6) are naturally less abundant and more patchily-distributed than was thought at the time of listing, and several areas thought to have historically supported small resident populations currently do not (the Greater Yellowstone Area [Unit 5], the Garnet Mountains in western Montana [Unit 3], and the Kettle Mountains of northeastern Washington). We also know that recent extensive wildfires in north-central Washington (Unit 4) have substantially reduced (probably temporarily) the amount of high-quality lynx habitat and likely caused a decline in lynx numbers there. Finally, as a result of the release of 218 Canadian and Alaskan lynx from 1999-2006 and the subsequent survival and reproduction of some of these lynx and some of their offspring, resident lynx currently occupy parts of western Colorado (Unit 6), although the current number of lynx there is uncertain. Table IV-2 below summarizes each of the six geographic units within the contiguous United States DPS.

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Table IV-2. Lynx Geographic Units in the Contiguous United States DPS.

Unit No.	Name	Size (km^2)
Unit 1	Northern Maine	28,909
Unit 2	Northeastern Minnesota	21,101
Unit 3	Northwestern Montana/Northeastern Idaho	26,997
Unit 4	North-central Washington	5,176
Unit 5	Greater Yellowstone Area	23,687
Unit 6	Western Colorado	25,294

The following summarizes the status of the lynx DPS in the contiguous United States by geographic unit:

Unit 1 – Northern Maine

This geographic unit encompasses the northern hardwood and spruce-fir (Acadian) forest in roughly the northern half of Maine. Resident lynx in this unit represent the southern periphery of a larger and highly resilient population (Harrison 2017) that also occupies southern Quebec (where trapping is legal) and northern New Brunswick (where lynx are a provincially-endangered species and harvest is prohibited). Although the actual number of resident lynx in this unit is unknown, the Maine Department of Inland Fisheries and Wildlife believes this unit currently may be capable of supporting 750-1,000 lynx based on estimates of habitat distribution and lynx home range sizes (Vashon et al. 2012), which would make it the largest population in the DPS. This is many more resident lynx than likely occurred historically and many more than were suspected to occur in this unit when the DPS was listed, and it is the result of extensive clearcutting and herbicide application to salvage spruce-fir and encourage softwood regeneration following a severe spruce budworm outbreak in the 1970s and 1980s (Hoving et al. 2004, Vashon et al. 2008, Simons 2009). Those past treatments have created the current extensive distribution of young, regenerating softwood stands that provide optimal hare foraging habitat. Lynx responded to these conditions with high survival and reproduction, small home ranges, and the highest densities documented in the DPS. Historically, under a more natural disturbance regime, Maine typically had a greater proportion of mature forest and, therefore a patchier distribution of high-quality habitat that likely supported a smaller lynx population that may have been more dependent on immigration from Canada. State forestry regulations passed in 1989 caused landowners to shift to various forms of partial harvesting that have resulted in lower landscape hare densities across much of the unit. Hare populations do not seem to cycle in this region, but hare density estimates from 2008-2015 declined by over 50 percent compared to estimates from 2001-2006. Reproduction and adult survival declined in the low-hare environment after 2006, although kitten survival remained high.

Unlike other DPS units, lynx habitat in northern Maine occurs nearly entirely on private, industrial forest lands, most of which lack long-term commitments to lynx management. The majority of private lands in this unit are now owned by investment companies seeking to

diversify income from their investments, which could result in forest practices less likely to maintain or conserve hare and lynx habitat. Other potential stressors to lynx in this unit include incidental trapping, road mortality, large-scale wind energy development, residential and resort development, and parcelization of forestlands from rapid turnover in investment company landowners. Another spruce budworm outbreak may be imminent, and forestry response by investment landowners is uncertain. Climate change is a concern because average annual snowfall and duration are currently at the minimum thresholds believed necessary to give lynx a competitive advantage over bobcats and other mesocarnivores. Although lynx regularly occur outside this unit in southeastern and southwestern Maine, and small numbers of reproducing lynx have also been documented recently in northern New Hampshire and northern Vermont, the ability of some of these peripheral areas to support persistent breeding populations is questionable. However, recent telemetry data in Maine suggest that resident lynx are expanding both east and south of the Northern Maine Geographic Unit, with home range maintenance and reproduction documented in both areas, which previously were considered outside the area capable of supporting resident lynx (Vashon 2017, pers. comm.).

Unit 2 – Northeastern Minnesota

This geographic unit contains a mix of upland conifer and hardwood interspersed with lowland conifer, alder (Alnus spp.) or willow (Salix spp.) shrub swamps, and black spruce (Picea mariana) or tamarack (Larix laricina) bogs. Despite uncertainty when the DPS was listed, it has become apparent that a reproducing resident population of roughly 50 to 200 lynx exists in northeastern Minnesota. This unit is directly connected to lynx habitats and populations in Canada, and lynx in this unit likely represent the southern extent of a larger cross-border population, most of which occurs in Ontario, where trapping of lynx is legal. Lynx in Minnesota select regenerating forest dominated by conifer with extensive forest edge; lynx beds (resting and hunting) and kill sites are associated with regenerating and mixed forest (Burdett 2008). Hare densities in parts of northeastern Minnesota appear to be sufficient to support a viable lynx population and are highest in regenerating forests (McCann and Moen 2011). The Superior National Forest continues to manage lynx habitats in accordance with its 2004 Forest Plan, which includes measures to minimize several risk factors and promote lynx conservation on the forest. Management of lynx habitat on State and private lands is voluntary and lacks long-term commitments to lynx management. Factors affecting current conditions in this unit primarily include forestry management, roads, and incidental trapping; other factors that could potentially impact resident lynx in this unit include mining development, snow compaction related to winter recreation, competition with bobcats, and lynx-bobcat hybridization. Since 2000, 45 lynx mortalities have been documented in Minnesota from unknown causes (16), incidental trapping (11), vehicle collisions (9 on roads and 2 on railroads), and illegal shooting (7). Six lynx radio-collared in Minnesota died after traveling north into Ontario, 4 from legal trapping/hunting, and 2 from unknown causes; some of these mortalities occurred years after the lynx was last located in Minnesota, indicating survival of Minnesota lynx in Ontario for extended periods is possible.

Unit 3 – Northwestern Montana/Northeastern Idaho

The historical and current sizes of the resident lynx population in this unit are unknown, but it is thought currently to be capable of supporting 200-300 lynx home ranges. Habitats capable of supporting resident lynx in this unit are naturally patchier and less-broadly distributed (Squires et al. 2006, 2013), and lynx therefore naturally rarer, than was thought when the DPS was listed

(ILBT 2013, Lynx SSA Team 2016). Minor genetic differences suggest 3 subpopulations in the northwest (Purcell Mountains), central (Seeley Lake), and southern (Garnet Mountains) parts of the unit. No lynx were detected in the Garnet Range from 2011 to 2015, prompting concerns about the potential loss of the small resident population (perhaps 7-10 lynx) documented there in the mid-1980s and again recently from 2002 to 2010. However, whether this absence indicates the extirpation of a previously persistent resident population or the temporary loss of an historically ephemeral population is uncertain. A single lynx was verified in the Garnet Range in February 2016, indicating that natural recolonization of the area is possible; however, subsequent surveys have failed to detect that lynx or other lynx, and there currently remains no evidence of lynx residency in this mountain range (Lieberg 2017, pers. comm.). Most (about 90 percent) of this unit is managed to conserve and restore lynx and hare habitats, including on federal, state, tribal, and some private lands. Past timber harvest and associated management (e.g., thinning, road construction, fire suppression) appear to have had localized impacts but not to have diminished the unit's ability to support resident lynx, with habitats in the Garnet Range being a possible exception. The size, frequency, and intensity of wildfires in this unit have increased over the past several decades, likely in response to climate warming, but population-level impacts to lynx have not been documented. Whether (and if so to what extent) other climate-mediated factors have influenced the current condition of lynx populations or habitats in this unit are also unknown. Regulations prohibit lynx trapping and require measures to reduce the likelihood of trapping lynx incidentally when legally trapping other species. Hare densities have not been estimated broadly throughout the unit but appear to be low or marginal even in what is considered the highest-quality habitat, suggesting that even small decreases in habitat quality/hare densities could influence its continued ability to support resident lynx. The role of past and recent immigration in maintaining the demographic and genetic health of current lynx populations in this unit is unknown, but peaks in cyclic lynx numbers in Canada have declined, especially when compared to the unprecedented irruptions of the early 1960s and 1970s, and there is no evidence of significant immigration into this unit since then.

Unit 4 – North-central Washington

This geographic unit encompasses extensive boreal forest vegetation types and is directly connected to lynx habitats and populations in British Columbia. It represents about 58 percent of the Okanogan Lynx Mangagement Zone (LMZ). Historical and current resident lynx numbers in northern Washington are unknown, but recent habitat and home range analyses for the larger Okanogan LMZ (summarized in Lewis 2016) suggest that this geographic unit may have been capable of supporting about 50 lynx prior to extensive wildfires over the past 2-3 decades (85-90 lynx in the entire LMZ). Those fires affected over a third of the LMZ, led to increased home range size, and may have reduced the carrying capacity of this unit to perhaps 30 lynx currently (50-55 in the entire LMZ). Additional extensive wildfire activity in the northern part of this unit in 2017 may result in further reduction of carrying capacity. The recent increases in wildfire frequency, size, and intensity in lynx habitat in this unit may have been influenced by climate change (Westerling et al. 2006). Burned habitats are expected to regenerate back into suitable lynx habitat, but this may take 10-40 years. However, additional wildfire activity in this unit before previously burned areas recover could substantially reduce the viability of the lynx population in this geographic unit (see section 5.2.4). Because of these habitat impacts and remaining stressors to lynx, the Washington Department of Fish and Wildlife recently submitted, and the State Fish and Wildlife Commission adopted, a proposal to uplist lynx from threatened to

endangered within the State. Hare densities in Washington are generally at the low end of the range thought necessary to support lynx persistence. The Okanogan-Wenatchee and Colville National Forests, which administer more than 90 percent of lynx habitat in Washington, continue to manage in accordance with the LCAS. Additionally, the Washington Department of Natural Resources, which manages approximately 4 percent of lynx habitat in Washington, developed a Lynx Habitat Management Plan in 1996, which was updated in 2006 and is also largely based on the LCAS. The Kettle Range to the east of this unit was suspected to have supported a small (likely fewer than 20 individuals) resident population until about 30 years ago when over-trapping compounded by habitat changes may have resulted in its extirpation (Stinson 2001, Koehler et al. 2008). Potential impediments to lynx movement between the Kettle Range and the Cascades and British Columbia may make natural recolonization of the Kettle Range unlikely.

Unit 5 – Greater Yellowstone Area

There are no reliable estimates of current or historical lynx numbers in this unit but, given its naturally-fragmented potential habitat, generally low hare densities, and the paucity of verified records, it appears unlikely this unit ever supported a large resident population, and it is possible that this unit historically supported resident lynx only ephemerally. No lynx have been verified in this unit since 2010, but whether this indicates the extirpation of a small but previously persistent resident population or the temporary loss of an historically ephemeral population is uncertain. Over 97 percent of this unit consists of Federal lands that are currently managed to conserve and restore lynx and hare habitats. Past timber harvest and associated management (thinning, road construction, fire suppression) appear to have had localized impacts but not to have diminished the unit's ability to support resident lynx. The size and intensity of wildfires have increased over the past several decades, predominantly in the northern half of the unit (including the large fires of 1988 in Yellowstone National Park) and likely in response to climate warming, but impacts to lynx are uncertain. Whether (and if so to what extent) other climate-mediated factors have influenced the current condition of lynx populations or habitats in this unit are also unknown. Snow conditions currently appear to be adequate, with most of this geographic unit modeled to have a 95 percent probability of providing snow cover conditions supportive of lynx presence (Gonzalez et al. 2007). Hare densities were very low in most of Yellowstone National Park but high in parts of the Bridger-Teton National Forest in the southern half of the unit. The role of past and recent immigration in maintaining the demographic and genetic health of lynx populations in this unit is unknown. This unit lacks direct connectivity to other lynx populations, and there is only anecdotal evidence that irruptions of lynx from Canada resulted historically in immigration into this unit. At least 9 lynx released in Colorado dispersed northward into this unit and some temporarily occupied home ranges in areas used previously by native resident lynx, but there is no evidence of long-term occupancy or reproduction by these lynx.

Unit 6 – Western Colorado

The current and historical numbers of resident lynx numbers in this unit are unknown, but Colorado Parks and Wildlife lynx biologists believe it currently could support 100-250 lynx as a result of the 1999-2006 release of 218 lynx from Canada and Alaska. Released lynx had high survival but the proportion of females producing kittens and kitten survival were low. This unit is not directly connected to lynx populations in Canada, and it does not appear to have received immigrant lynx during the historicaly large irruptions of the early 1960s and early 1970s. Since

1996, 2 unprecedentledly large bark beetle epidemics have affected about 16,200 km^2 (6,255 mi^2) of spruce-fir and lodgepole pine forests in Colorado, including much of the lynx habitat in this unit. Additionally, the 2013 West Fork Complex fire impacted more than 400 km^2 (154 mi^2) of lynx habitat in the San Juan Mountains. Beetle outbreaks do not appear to have negatively impacted hares, and hare numbers may increase in affected areas as succession progresses; however, they have negatively impacted red squirrels, an important alternate prey species for lynx in this unit. Areas affected by beetles that contained multi-story stand conditions likely continue to provide habitat to support snowshoe hares and lynx. Areas affected by fire may require 20 years or more, and in some areas considerably longer, to recover to a point where the stands will again support snowshoe hares. Large-scale monitoring efforts in the San Juans documented continued lynx occupancy during 2010-11, 2014-15, and 2015-2016, and it is reasonably likely that lynx continue to occur in all national forests within the State of Colorado. Snowshoe hare habitat is naturally patchily-distributed in this geographic unit, which limits hare abundance. Because the majority (90 percent) of potential lynx habitat in Colorado is under federal land management, actions occurring on other ownerships are unlikely to result in significant impacts to lynx habitat within this unit. The USFS manages over 85 percent of the lynx habitat in this unit, providing conservation through the Southern Rockies Lynx Amendment. However, regulatory mechanisms for the conservation of lynx are lacking on approximately 3,159 km^2 (1,220 mi^2; over 12 percent) of this unit, including lynx habitats on some BLM and some non-Federal lands.

5. Status of Lynx Designated Critical Habitat

The Service published a revised designation of critical habitat for the contiguous United States distinct population segment of the Canada lynx on September 12, 2014, which became effective on October 14, 2014 (79 FR 54782). In total, approximately 38,955 square miles have been designated within five units in the states of Maine, Minnesota, Montana, Wyoming, Idaho, and Washington (see Table IV-3).

Table IV-3. Critical habitat units designated for lynx (79 FR 54782).

Critical Habitat Units	Area Designated (mi^2)	Land Ownership
Unit 1: Maine	10,123	Private, State, Federal
Unit 2: Minnesota	8,069	Federal, State, Private
Unit 3: Northern Rocky Mountains (MT and ID)	9,783	Federal, Private, State
Unit 4: North Cascades	1,834	Federal, Private
Unit 5: Greater Yellowstone Area (MT and WY)	9,146	Federal, State, Private
TOTAL	**38,955**	

The five units contain the physical and biological features essential to the conservation of the lynx as they are comprised of the primary constituent element and its components laid out in the appropriate quantity and spatial arrangement. The units are discussed below with information taken from the final rule revising designated critical habitat for lynx (79 FR 54782) followed by a discussion on the primary constituent element and its components.

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Critical Habitat Units

Unit 1 is located in northern Maine in portions of Aroostook, Franklin, Penobscot, Piscataquis, and Somerset Counties. This area was occupied by the lynx at the time of listing and is currently occupied by the species. This area is the one area in the northeastern region of the lynx's range within the contiguous United States that currently supports breeding lynx populations and may serve as a source of lynx, or provide connectivity for more peripheral portions of the lynx's range, in the Northeast.

Unit 2 is located in northeastern Minnesota in portions of Cook, Koochiching, Lake, and St. Louis Counties. This area was occupied by the lynx at the time of listing and is currently occupied by the species. Lynx are currently known to be distributed throughout northeastern Minnesota. This area is essential to the conservation of lynx because it is the only area in the Great Lakes region for which there is evidence of recent lynx reproduction. It likely acts as a source or provides connectivity for more peripheral portions of the lynx's range in the region. National Forest land in Unit 2 is managed under Forest Plans that have incorporated management direction similar to the NRLMD, which reduces or eliminates adverse effects on lynx, by reducing adverse effects on habitat important to lynx.

Table IV-4. Square miles of lynx critical habitat per ownership per state in Lynx Critical Habitat Unit 3: Montana and Idaho (79 FR 54782).

	Federal (mi^2)	State (mi^2)	Private(mi^2)
Montana	8,743	156	839
Idaho	45	.04	0

Unit 3 is located in the Northern Rocky Mountains of northwestern Montana, in portions of Flathead, Glacier, Granite, Lake, Lewis and Clark, Lincoln, Missoula, Pondera, Powell, and Teton Counties and in a small portion of northeastern Idaho in Boundary County. This area is approximately 9,783 square miles, was occupied by the lynx at the time of listing, and is currently occupied by the species. Lynx are known to be widely distributed throughout this unit and breeding has been documented in multiple locations. This area is essential to the conservation of lynx because it appears to support the highest density lynx populations in the Rocky Mountain region of the lynx's range. It likely acts as a source for lynx and provides connectivity to other portions of the lynx's range in the Rocky Mountains, particularly the Yellowstone area. Table IV-4 illustrates the preponderance of federal lands designated as critical habitat, which are primarily National Forest system lands, within Unit 3. Timber harvest and management are dominant land uses, and so special management is required depending upon the silvicultural practices conducted. Timber management practices that provide for a dense understory are beneficial to lynx and snowshoe hares. National Forest lands in Unit 3 are managed under the NRLMD (U.S. Forest Service 2007a). The NRLMD includes a suite of management directives that enhance, maintain, and conserve dense understories within this habitat.

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Unit 4 is located in the North Cascade Mountains of north-central Washington in portions of Chelan and Okanogan Counties and includes BLM lands in the Spokane District as well as Loomis State Forest lands. This area was occupied by the lynx at the time of listing and is currently occupied by the species. This unit supports the highest densities of lynx in Washington. This area is essential to the conservation of lynx because it is the only area in the Cascades region of the lynx's range that is known to support breeding lynx populations. National Forest lands in Unit 4 are managed under the 2006 Conservation Agreement (U.S. Forest Service and U.S. Fish and Wildlife Service 2006), which defers any projects that adversely affect lynx until Forest Plans are amended to consider the conservation needs of lynx and lynx habitat.

Unit 5 is located in the Greater Yellowstone Area of southwestern Montana, in portions of Carbon, Gallatin, Park, Stillwater, and Sweetgrass Counties, and in northwestern Wyoming in portions of Fremont, Lincoln, Park, Sublette, and Teton Counties. This area was occupied by the lynx at the time of listing and is currently occupied by the species. The Greater Yellowstone Area is inherently marginal lynx habitat with highly fragmented foraging habitat (snowshoe hare habitat). For this reason, lynx home ranges in this unit are likely to be larger and incorporate large areas of non-foraging matrix habitat. Table IV-5 illustrates the preponderance of federal lands designated as critical habitat, which are primarily National Forest system lands, within Unit 5. National Forest lands in Unit 5 are managed under either the NRLMD (U.S. Forest Service 2007a) or the Southern Rockies Lynx Management Direction (U.S. Forest Service 2008), which provides management direction similar to the NRLMD.

Table IV-5. Square miles of lynx critical habitat per ownership per state in Lynx Critical Habitat Unit 5: Montana and Wyoming (79 FR 54782).

	Federal (mi^2)	State (mi^2)	Private(mi^2)
Montana	2,235	12	140
Wyoming	6,688	10	60

Primary Constituent Element of Critical Habitat

The physical and biological features that are essential to the conservation of lynx were identified within the geographical area occupied by lynx at the time of listing. These physical and biological features are the primary constituent element (PCE) laid out in a specific quantity and spatial arrangement to be essential to the conservation of the species. Based on this and the current knowledge of the life history, biology, and ecology of lynx, the PCE for lynx critical habitat is (79 FR 54811):

1. Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:
2.
    a. Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs

touching the snow surface;

b. Winter conditions that provide and maintain deep, fluffy snow for extended periods of time;

c. Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and

d. Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

Activities that May Affect Critical Habitat

The final rule also described activities that may affect critical habitat and therefore should result in consultation. These activities include, but are not limited to: (79 FR 54827):

1. Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx. These activities could significantly reduce the quality of snowshoe hare habitat such that the landscape's ability to produce adequate densities of snowshoe hares to support persistent lynx populations is at least temporarily diminished.

2. Actions that would cause permanent loss or conversion of the boreal forest on a scale proportionate to the large landscape used by lynx. Such activities could eliminate and fragment lynx and snowshoe hare habitat.

3. Actions that would increase traffic volume and speed on roads that divide lynx critical habitat. These activities could reduce connectivity within the boreal landscape for lynx, and could result in increased mortality of lynx within the critical habitat units.

Further, the rule notes that in matrix habitat, activities that change vegetation structure or condition would not be considered an adverse effect to lynx critical habitat unless those activities would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range, or if they adversely affect adjacent foraging or denning habitat.

6. Factors Affecting the Status of Lynx Rangewide

The final rule listing lynx as a threatened species (65 FR 16052) concluded that the primary factor threatening the lynx DPS was the inadequacy of existing regulatory mechanisms, specifically, the lack of guidance for conservation of lynx in federal land management plans. The USFS manages the vast majority of lynx habitat in the U.S. The Service concluded that the lack of Forest Plan guidance for conservation of lynx, as evidenced by the fact that, at the time of listing, forest plans allowed or directed actions that cumulatively could adversely affect lynx,

was a significant threat to the contiguous United States DPS of lynx. The remanded determination in our clarifications of findings of our final rule (68 FR 40076) affirmed the findings in the final rule.

Based on a review of all past and recent literature, the following are risk factors potentially affecting lynx. These risk factors have varying effects on lynx, depending upon the nature, location, duration and timing of the activity. Some risk factors present more likelihood of risks to lynx, while others are relatively benign in effects. The Service believes vegetation management (including fuels management), wildfire management, habitat loss and fragmentation, and climate change have the greatest potential to influence lynx and snowshoe hares and the population-level. Other risks that may impact lynx but are unlikely to result in population-level effects include incidental trapping, recreation, mineral and energy development, illegal shooting, forest /backcountry roads and trails, and livestock grazing. The discussion of risk factors is largely excerpted from the Revised LCAS prepared by the Interagency Lynx Biological Team (ILBT 2013).

Vegetation Management

Stand structure, composition and arrangement are important elements of habitat for snowshoe hares and lynx. Vegetation management practices can have beneficial, neutral, or adverse effects on lynx and snowshoe hare habitat and populations, and the duration of these effects varies widely. Vegetation management occurs across the range of the lynx and can directly affect important habitats and prey. Management activities uninformed by consideration of negative impacts to the species were identified as being of potential concern to lynx conservation (68 FR 40076).

Throughout the DPS range, hares and lynx are associated with dense regenerating early successional conifer (typically spruce-fir) stand. Historically, the dominant processes that created early successional stages within the range of the lynx were wildlife, forest insect and disease outbreak, and wind/ice events (Kilgore and Heinselman 1990, Heinselman 1996, Veblen et al. 1998, Agee 2000, Seymour et al. 2002, Lorimer and White 2003). In the DPS range, wildlife was the predominant natural disturbance in the West and in the Great Lakes Region, but was less important in the Northeast.

After disturbances, forests generally develop through several stages described by Oliver (1980) as “stand initiation”, “stem exclusion”, “understory reinitiation”, and “old growth”. Stand dynamics, particularly within-stand competition for light, nutrients, and space, determine how forests grow and respond to intentional manipulations and natural disturbances (Oliver and Larson 1996). The frequency and severity of disturbances influence which species will dominate in a stand after the disturbance event. During the stand initiation structural stage (SISS), trees that are established and tall enough to protrude above snow cover may provide winter snowshoe hare and lynx habitat. During the stem exclusion stage, the tree crowns lift and lower branches self-prune, thus growing above the reach of snowshoe hares. As the stand moves into understory reinitiation and old growth structural stages, food and cover may again become available to support snowshoe hares.

Commercial timber management of conifer forests traditionally has been designed to: reduce tree density and promote tree growth (e.g., precommercial thinning), especially in young regenerating forests; improve growth and vigor of mature trees (e.g., commercial thinning, thinning from below); reduce the vulnerability of commercially-valuable trees to insects and disease (e.g., commercial thinning, group selection); and harvest forest products (e.g., regeneration harvest). Timber management practices may mimic natural disturbance processes but management for timber production in not an appropriate ecological substitute. Some practices, such as use of herbicides to suppress hardwood regeneration, do not have a historical analogue. Timber harvest may differ from natural disturbances by:

- Removing most standing biomass from the site, especially larger size classes of trees, and down logs, which alters microsite conditions and nutrient cycling;
- Creating smaller, more dispersed patches and concentrating harvest at lower elevations in mountainous regions and on more nutrient rich soils, resulting in habitat fragmentation:
- Causing soil disturbance and compaction by heavy equipment, which may result in increased water runoff and slower tree growth at the site; or
- Giving a competitive advantage to commercially-valuable tree species and reducing the structural complexity of the forest through the application of harvest, planting, thinning and herbicide treatments.

Where the objective is to provide snowshoe hare habitat by creating additional early successional forest conditions, management considerations include treating areas that are capable of, but not currently providing, dense horizontal cover (e.g., stem exclusion structural stage), designing the appropriate size and shape of treatment units, retaining coarse woody debris, and maintaining high stem densities in regenerated forests (Koehler and Brittell 1990, Homyack et al. 2004, Bull et al. 2005, Fuller and Harrison 2005, Ivan 2011).

Precommercial thinning of young, dense regenerating conifers is generally designed to increase the growth of selected trees by removing competing trees of the same species or shrubs/trees of other species (Homyack et al. 2005, 2007). Reducing the density of sapling-sized conifers in young regenerating forests to increase the growth of certain selected trees promotes more homogeneous patches and reduces the amount and density of horizontal cover, which is needed to sustain snowshoe hares (Griffin and Mills 2004, Ausband and Baty 2005, Griffin and Mills 2007, Ellsworth 2009). Precommercial thinning using traditional methods has been shown to reduce hare numbers by as much as 2 and 3 fold in the first decade after treatment (Griffin and Mills 2007, Homyack et al. 2007) due to reduced densities of sapling and shrub stems and decreased availability of browse. Further, Griffin and Mills (2007) reported that, if their results were representative, the practice of precommercial thinning could significantly reduce snowshoe hares across the range of lynx.

In sub-alpine spruce/fir habitat types precommercially thinned stands are often initially dominated by sun-loving shrub and tree species (e.g., Western larch, lodgepole pine), but are

subsequently "filled in" with shade-loving understory trees (e.g., sub-alpine fir). It has been suggested this could be a technique to extend the time that understory trees and low limbs provide the dense horizontal cover that constitutes snowshoe hare habitat. The duration between time of thinning and regrowth to a height providing winter snowshoe hare habitat would likely vary by tree species, each having different regenerative capacities which could be influenced by a variety of local factors (e.g., topographic relief, moisture, and mineral and organic content of the soil; Baumgartner et al. 1984, Koch 1996). Bull et al. (2005) reported that the slash and coarse woody debris remaining after precommercial thinning provided both forage and cover for snowshoe hares up to a year following treatment. Homyack et al. (2007) found that snowshoe hare densities were reduced following precommercial thinning for 1–11 years post-thinning. They further suggested that after precommercial thinning, the stands did not regain the structural complexity in the understory that would be needed to support snowshoe hare densities to the level that were present pre-treatment. Because of documented adverse effects of precommercial thinning to snowshoe hares and lynx, in 2007 and 2008 the USFS amended Forest Plans to incorporate management that would conserve lynx, including direction that prohibited precommercial thinning in most lynx foraging habitat (USFS 2007, 2008). However, precommercial thinning is not regulated on private forest lands throughout the remainder of the DPS.

If removal of large trees opens the canopy to the extent that the patch functions as an opening, this may discourage use by lynx (Koehler 1990a, von Kienast 2003, Squires et al. 2010). Removal of larger trees from mature multi-story forest stands to reduce competition and increase tree growth or resistance to forest insects may reduce the horizontal cover (e.g., boughs on snow), thus degrading the quality of winter habitat for lynx (Robinson 2006, Koehler et al. 2008, Squires et al. 2010). Similarly, removing understory trees from mature multi-story forest stands reduces the dense horizontal cover selected by snowshoe hares, and thus reduces winter habitat for lynx (Koehler et al. 2008, Squires et al. 2010).

Fuels treatments are commonly designed to remove understory biomass and reduce stem density in forests that are outside their historical range of variability, and to clear fuels adjacent to human developments for safety or to protect investments. These types of projects are becoming more common. In the western United States, projects designed to restore forests to a condition more representative of the historical range of variability are generally targeted to drier, lower-elevation forests affected by fire suppression (Hessburg et al. 2005), which are not lynx habitat. Lynx habitats in higher-elevation spruce-fir forests have been less affected by past fire suppression and are mostly within the historical range of variability (Agee 2000).

Fuels treatments may be needed to protect human communities and capital improvements by reducing the intensity and rate of spread of a fire, affording control actions with a higher probability of success and providing safer conditions for fire fighters. By removing or reducing the understory and ladder fuels to meet those objectives, dense horizontal cover important to snowshoe hares is reduced and habitat value is diminished for hares and lynx.

Prescribed burning is a technique used to reduce tree stem density and reduce fuels. In the Great Lakes area, prescribed burning is used in lynx habitat primarily as a tool to reduce fuels (including from blow-down) and mimic a more natural fire regime in pine forest types. In these

instances there is a short-term (10–30 years) impact on snowshoe hare habitat. In the western United States, prescribed fire for ecosystem restoration is most applicable in the dry ponderosa pine and Douglas-fir forests that are not lynx habitat. Because spruce-fir forests are generally composed of thinner barked trees that are easily killed even with light fire, this technique is not used frequently in most lynx habitat. Biomass removal for energy production targets the removal of dead trees, logging slash and small diameter trees and shrubs. Biomass removal is similar to fuels treatments in reducing cover and habitat for snowshoe hares.

Wildland Fire Management

Fire and other natural disturbance processes historically played an important role in maintaining a mosaic of forest successional stages that provides habitat for both snowshoe hare and lynx (Koehler and Brittell 1990, Poole et al. 1996, Slough and Mowat 1996). The response of snowshoe hare and lynx in their use of habitat after fires follows a somewhat predictable pattern. For the first few years after a burn, there appears to be a negative correlation between lynx use and the amount of area burned (Fox 1978). This short-term effect is likely a response to a reduction of snowshoe hare populations, reduced cover, and possibly also increased competition from coyotes in the now-open habitat (Stephenson 1984, Koehler and Brittell 1990). The mid-term (10–40 years post-fire) effect on vegetation in a burned area is development of small tree and shrub cover sufficient for hare populations to reoccupy the area. The length of time varies depending on tree species, potential vegetation, fire severity, and the presence of re-sprouting broadleaf species. Where broadleaf species are denser, hare re-occupancy occurs more quickly (within 3–12 years). Hare population density again decreases as the conifer tree canopy develops and shades out the understory. Forest gap processes, such as tree blowdown, insect infestations, and outbreaks of disease, follow a similar pattern (Agee 2000).

Across the range of lynx, vegetation dynamics differ somewhat as a result of the natural fire frequency and intensity. For example, lynx habitat in the northeastern boreal forests had very long fire return intervals of up to 500 years (Agee 2000). The Great Lakes boreal forests tended to have shorter fire return intervals of 50–150 years (Heinselman 1996). In much of the Rocky Mountains, the fire regime was more variable in lynx habitat, with both frequent (35–100 years) stand-replacing or mixed severity fires, and infrequent (200+ years) stand-replacement fires (Morgan et al. 2001). The Cascade Mountains were dominated historically by infrequent (70-150 years) stand-replacing fire regimes (Agee 2000). Disturbance interval and fire severity vary by cover type, with xeric pine types such as lodgepole or jack pine typically experiencing more frequent and more severe fires than mixed conifer types and spruce/fir.

Land management agencies began effective fire suppression with the advent of aircraft support approximately 70 years ago. Over time, continued fire suppression altered vegetation mosaics and species composition. In jack pine forests of the Great Lakes region, fire suppression changed stand composition and successional pathways (Agee 2000). In the western United Stated, a shift to uncharacteristically severe and intense wildfires has occurred recently in lower-elevation forests (Quigley et al. 1996, Morgan et al. 2001). However, fire suppression in areas with a history of infrequent fires, as is typical of cool moist forest types such as spruce-fir forests, has probably not had much impact (Schoennagel et al. 2004).

Current federal wildland fire management policy recognizes fire as a natural ecological process essential to the health and resilience of some forest systems, and it attempts to balance the ecological, social, and legal aspects of wildfire (USDA and USDI 2009). However, the prior history of fire response was largely one of active suppression for most of the last century (Zimmerman and Bunnell 2000, USDA and USDI 2003, 68 FR 40092, Calkin et al. 2015) which, combined with other land-use practices, dramatically altered fire regimes in some places and created conditions prone to larger and more severe fires. Westerling et al. (2006) suggested fuel management and ecological restoration practices will likely not reverse current wildfire trends; large increases in the extent or frequency of wildfires in the western United States since 1970 resulted from increased temperatures and earlier spring snowmelt. Particularly in the western United States, ecosystem restoration is primarily focused in the dry and mesic forest types at lower elevations, rather than in lynx habitat, and includes reestablishing frequent, low intensity fire in those systems. Applying ecosystem restoration across a landscape may reduce the risk of uncharacteristic large, stand-replacing fires occurring in the lower-elevation forest types, and thereby help to prevent their spread into adjacent lynx habitat.

After large dead trees fall to the ground, they provide cover and may enhance lynx foraging habitat in the short term and potential denning habitat in the longer term, depending on post-disturbance stand conditions. Standing snags also may provide sufficient vertical structure and cover to allow lynx to traverse long distances (>1 km) across burned habitat (Maletzke 2004).

Similar to vegetation management, wildland fire management may diminish, enhance, or sustain the density and distribution of snowshoe hare prey resources and lynx habitat, depending on the design and implementation of programs and actions.

Habitat Fragmentation

Human-caused alterations of the natural landscape can reduce the total area of habitat, increase the isolation of habitat patches, and impair the ability of wildlife to effectively move between those patches of habitat. Habitat fragmentation may be permanent by converting forest habitat to residential or agricultural purposes, or temporary by creating an opening but allowing trees and shrubs to regrow. Fragmentation of habitat exacerbates the viability risk inherent in a small population and increases its vulnerability to local extirpation. The combination of human-caused and natural disturbances may exacerbate fragmentation effects.

Lynx habitat in the contiguous United States is inherently patchier than in the northern boreal forest, largely due to less dramatic topography and relatively consistent winter snow conditions (Aubry et al. 2000). The pronounced topographic relief in the mountains of the western United States restricts lynx habitat to a relatively narrow elevational band. A variety of anthropogenic activities can result in increased habitat fragmentation at the home range or broader scale. For example, permanent or temporary removal of forest cover, development of highways and associated infrastructure, and intensive minerals or energy development can fragment lynx habitat.

Within their home ranges, lynx strongly select for habitat patches that enhance their foraging opportunities (Fuller and Harrison 2010, Moen et al. 2008, Vashon et al. 2008, Squires et al. 2010). Analysis of winter movements of lynx in Maine indicated that lynx responded to habitat

heterogeneity at a coarse scale within their home ranges, by maximizing their access to snowshoe hare prey (Fuller and Harrison 2010). In Montana, lynx selected homogeneous spruce-fir patches that supported snowshoe hares and avoided recent clear-cuts or other open patches (Squires et al. 2010). Similarly, in Washington, Lewis et al. (2011) reported that landscapes in which hare habitat was more contiguous, or surrounded by a mosaic of similar habitat quality, supported more snowshoe hares than did more fragmented landscapes.

Both lynx and hares are influenced by the spatial arrangement of preferred habitat. In Maine and northern Washington, landscapes where habitat was more contiguous supported more snowshoe hares than landscapes that were more fragmented (Lewis et al. 2011). Several studies (Mowat et al. 2000, von Kienast 2003, Maletzke 2004, Squires and Ruggiero 2007, Squires et al. 2010) have reported that lynx avoid large openings, especially during winter. Mowat et al. (2000) suggested that relatively few snowshoe hares use large openings, and consequently lynx spend little time hunting in these areas. Koehler (1990a) speculated that vegetation management prescriptions that result in distance to cover greater that 100 meters may change lynx movement and use patterns until such time as sufficient reestablishment of forest vegetation occurs.

Fragmentation of the naturally patchy pattern of lynx habitat in the contiguous United States can affect lynx by reducing their prey base and increasing the energetic costs of using habitat within their home ranges. Buskirk et al. (2000) identified direct effects of fragmentation on lynx to include creation of openings that potentially increase access by competing carnivores, increasing the edge between early successional habitat and other habitats, and changes in the structural complexities and amounts of seral forests within the landscape. At some point, landscape-scale fragmentation can make patches of foraging habitat too small and too distant from each other to be effectively accessed by lynx as part of their home range. Maintaining preferred habitat patches for lynx and hares within a mosaic of young to old stands in patterns that are representative of natural ecological processes and disturbance regimes would be conducive to long-term conservation. Vanbianchi et al. (2017) found that in large areas burned by stand-replacing wildfire, retention of unburned patches was important for providing lynx habitat.

Highways typically follow natural features such as rivers, valleys, and mountain passes that may have high value for lynx in providing habitat or connectivity. Various studies have documented lynx crossings of highways. A male lynx in western Wyoming was documented to have successfully crossed several 2-lane highways during exploratory movements (Squires and Oakleaf 2005). In Colorado, lynx successfully and repeatedly crossed major highways, including I-70 (Ivan 2011a, 2011c, 2012). However, in Alberta, Canada, high road densities, human activity, and associated developments appeared to reduce the habitat quality based on decreased occupancy by lynx (Bayne et al. 2008). Apps et al. (2007) found lynx were 13 times less likely to cross the Trans-Canada Highway relative to random expectation, but only 2.2 and 3.1 times less likely to cross Canadian Highway 93 and Highway 1A, respectively, compared to random expectation.

Highways pose a risk of direct mortality to lynx and may inhibit lynx movement between previously connected habitats. If lynx avoid crossing highways, this could lead to a loss of effective habitat within a home range and/or reduced interaction within a local population (Apps et al. 2007). Lynx and other carnivores may avoid using habitat adjacent to highways, or

become intimidated by highway traffic when attempting to cross (Gibeau and Heuer 1996, Forman and Alexander 1998). As the standard of road increases from gravel to 2-lane or 4-lane highways, traffic volumes and the degree of impact are expected to increase. Four lane highways, such as the interstate highway system, commonly include fences, "Jersey barriers", and service roads and may run parallel to railroads or power lines that make successful crossing more difficult, or impossible, for wildlife. Alexander et al. (2005) suggested traffic volumes between 3,000 and 5,000 vehicles per day may be the threshold above which successful crossings by carnivores are impeded.

Recreation

The effects of outdoor recreation on lynx and their habitat remain unclear, but effects likely depend on the type of activity and the context within which it occurs. Construction or expansion of developed areas such as large ski areas and 4- season resorts, as well as smaller recreational sites like nordic ski huts or campgrounds, may directly remove forest cover. Such removal in lynx habitat could decrease prey availability, affect lynx movement within home ranges, or result in a more fragmented landscape.

Few studies have examined how lynx react to human presence. Anecdotal information suggests that lynx are quite tolerant of humans, although given differences in individuals and contexts, a variety of behavioral responses to human presence may be expected (Staples 1995, Mowat et al. 2000). Some wildlife species have been found to be more sensitive to disturbance when bearing and rearing young than in other times of the year. Olson et al. (2011) reported they approached 8 dens of females; half of the females moved their dens within 4 days, while the other half did not move dens for at least 20 days following disturbance. The same study noted that lynx dens were located in more remote areas and unlikely to be disturbed by humans.

More than 50 ski areas exist throughout the range of the lynx in the contiguous United States. Most ski areas are located on north-facing slopes, where ample snow conditions provide for extended ski/snowboard seasons. In the western states, many of these landscapes feature spruce-fir forests. While ski resorts occupy a small proportion of the landscape, spruce-fir forests provide important stable habitat for snowshoe hares and lynx at the southern extent of their range. In winter, alpine and Nordic skiing and snowboarding are the primary uses. Most of these resorts offer year-round recreation, with summer activities typically including hiking and mountain biking.

Ski resort development may fragment the forested landscape. One ski run is often separated from the next only by small inter-trail forest islands. Ski runs often are intermixed with other open areas such as open or gladed bowls, rock outcrops or barren tundra ridges. Ski resorts that are built or expanded in lynx habitat may impact lynx by removing forest cover, reducing the snowshoe hare prey base, and creating or increasing human disturbance in or near linkage areas. There is limited information on lynx behavior and habitat use in and around ski areas. Lynx have been known to incorporate smaller ski resorts within their home ranges, but may not utilize the large resorts.

Most backcountry ski hut sites are primitive in nature. Some facilities may have utilities, summer road access, and on-site storage for grooming equipment and fuel. Use by snowmobile

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clubs and the general public is often focused or concentrated around these sites. Many have developed trail systems that loop around the site or provide access to other remote areas. These facilities are generally located along designated cross-country ski and snowmobile routes. Users compact the snow along the route to/from the huts and in the immediate vicinity. Off-trail travel has the potential to create larger areas of compacted snow. However, this local snow compaction is short term and not likely to change the competitive interactions between lynx and carnivores.

Minerals and Energy Development

Mining and oil and gas exploration and production activities occur primarily within the western units of the DPS although there is increased interest in mining in the Minnesota and Maine units. Lynx habitats may be lost and fragmented as a result of mining, similar to other development: loss of boreal forest; construction of roads, railroads, and transmission lines; and increased human access and disturbance where lynx occur. In the West, for example in the Wyoming Range (Unit 5), extensive oil and coal bed methane development can affect large areas of landscape (e.g., 1 well per 2-4 ha (5-10 ac) and could diminish potential lynx habitat in some areas. Open pit and subsurface mines can affect from tens to thousands of hectares of habitat. To reduce effects of mineral development, land exchanges are sometimes implemented to consolidate private land ownership of the surface above a deposit to be mined. Depending on the lands exchanged, this could retain lynx habitat in public ownership. Surface deposits of minerals and gravel for forest road construction are excavated within some lynx areas and vary from a single truck load to tens of acres. Although mining and oil and gas development can result in loss and fragmentation of lynx habitats, thus far, effects to DPS lynx populations have not been demonstrated.

Forest/Backcountry Roads and Trails

Forest and backcountry roads are typically low-speed (<45 mph), single or double-lane gravel or paved roads. Extensive (>600 km) backtracking studies found that lynx did not avoid gravel forest roads (Squires et al. 2010). Trails are typically narrow routes with a native surface; there is no information to suggest that trails have negative impacts on lynx.

Construction of roads results in a small reduction of lynx habitat by removing forest cover. In some instances, vegetation along less-traveled roads provides good snowshoe hare habitat, and lynx may use the roadbed for travel and foraging (Koehler and Brittell 1990). Similar to McKelvey et al. (2000d), Squires et al. (2010) concluded that forest roads with low vehicular or snowmobile traffic had little effect on lynx seasonal resource-selection patterns in Montana. In Maine, Fuller et al. (2007) documented lynx traveling on roads (unplowed during winter), but determined that roads and their associated edges were selected against within home ranges. Lynx may have exhibited negative selection for road edges because these areas were associated with the lowest density of conifer saplings and hare abundance compared to all other stand types.

Squires et al. (2008) reported that lynx denned farther from all roads compared to random expectation. Lynx occupy dens in early May when many forest roads are still impassable by wheeled vehicles due to persistent snowdrifts and wet, muddy conditions. (ibid.) Snowmobiles no longer used the roads because of intermittent and unpredictable availability of sufficient snow (Squires et al. 2008). They concluded that lynx did not avoid the subset of roads that were open to wheeled vehicle travel (ibid.). Rather, the observed avoidance of roads was more a function

of the correlation of roads and landscape pattern; fewer roads were located in denning habitat and higher road density occurred along forest edges and in managed stands, which lynx avoided (Squires et al. 2008).

Climate Change

In 2000, the Service determined there was no evidence that global warming was a threat to lynx (65 FR 16068-16069). In 2003, we concluded that the information available regarding the potential impact of climate change on lynx was speculative and did not demonstrate a threat to lynx (68 FR 40083, 40098). In the 2005 recovery outline, we acknowledged that continued climate warming was likely to negatively affect the boreal forest ecosystem for which lynx are highly adapted, eventually causing it to recede north and/or to higher, colder elevations, potentially resulting in a substantial future reduction or even elimination of lynx habitats from the contiguous United States (USFWS 2005). In the 2009 and 2014 revised critical habitat designations, the Service acknowledged that new science suggested that climate change may pose a significant risk to the future conservation of the lynx DPS (74 FR 8617, 8621; 79 FR 54811).

Continued climate warming is expected to diminish boreal forest habitats and snow conditions at the southern edge of the range (all of the DPS range) that are, in some places, already patchily-distributed and perhaps only marginally capable of supporting resident lynx. Climate models project reductions in the extent of boreal forest habitats and snow conditions thought necessary to support lynx throughout the DPS, with both features predicted to migrate northward in latitude and to higher elevations (Sturm et al. 2001, Carroll 2007, Danby and Hik 2007, Gonzalez et al. 2007, 2010, McKelvey et al. 2011, ILBT 2013, Koen et al. 2015). This would result in fewer, smaller, and more fragmented and isolated areas capable of supporting resident lynx and therefore smaller and more isolated lynx populations that would be more vulnerable to stochastic environmental and demographic events and genetic drift (Carroll 2007, Johnston et al. 2012, 79 FR 54811. Schwartz 2017). Climate change has also been linked to increases in wildfire and forest insect activities in North America (Joyce et al. 2014, Romero-Lankao); two important components of boreal forest disturbance and, therefore, lynx habitat quality, quantity, and distribution. It also may affect other factors that could influence the future health of lynx populations in the DPS, such as hare/lynx cycles in Canada, disease transmission, and parasites.

7. Implementation of Management Direction on Federally Administered Lands

As previously stated, in the Northern Rockies region of the lynx DPS, the NRLMD (USFS 2007) amended 18 National Forest Plans to address the "lack of guidance for conservation of lynx in federal land management Plans." The NRLMD includes standards and guidelines intended to avoid or reduce the potential for projects proposed under Forest Plans to adversely affect lynx. A suite of standards and guidelines in the NRLMD promote and conserve the habitat conditions needed to produce adequate snowshoe hare (lynx primary prey) densities to sustain lynx home ranges, and thus sustain lynx populations. The NRLMD is intended to address the major threats to lynx and the inadequacy of existing regulatory mechanisms in the Northern Rockies region in order to reduce adverse effects and avoid jeopardy through its implementation.

In support of this biological opinion, we reviewed the latest publications and information providing the best available science on the status and factors influencing lynx and snowshoe hare

populations in the Northern Rocky Mountains region. Based on our updated review of the literature, we conclude that the provisions of the NRLMD continue to address the major risks to lynx on the FNF. This will be further discussed in Section D *Effects of the Action*.

The primary issues addressed in the NRLMD included winter snowshoe hare habitat in multistoried forests, wildland fire risk, and the nature of management direction applied to grazing, mineral development, roads, and over-the-snow recreation. In addition to the vegetation management direction the NRLMD identifies standards and guidelines specific to four other categories of risk factors including: (1) all management practices and activities; (2) livestock management; (3) human use (i.e. special uses, recreation, road, highways, mineral and energy development); and (4) linkage areas. The objectives, standards, and guideline of the NRLMD are discussed in Sections C.2 and C.3 below, and are presented further Appendix 5.

In 2008, USFS similarly completed the Southern Rockies Lynx Amendment (SRLA), which formally amended forest plans covering about 59,000 km^2 (22,780 mi^2), including over 30,000 km^2 (11,583 mi^2) of mapped (potential) lynx habitat on 7 national forests or national forest complexes in western Colorado and southern Wyoming (USFS 2008). Standards and guidelines developed and implemented in accordance with the NRLMD and the SRLA were designed to limit potentially adverse effects and promote beneficial effects of management activities (vegetation management [e.g., timber harvest, precommercial thinning], wildland fire and fuels management, grazing, recreation, road/access management, energy development, etc.) on important lynx habitats including winter snowshoe hare habitat (high-quality lynx foraging habitat), denning habitat, and linkage/connectivity corridors. In a 2008 biological opinion on the SRLA, the Service concluded that vegetation management standards in the SRLA would prohibit treatments that could adversely affect essential components of lynx habitat on 95.5 percent of the mapped (potential) lynx habitat in the SRLA area (USFWS 2008). We discuss the results of the 2007 NRLMD BO (USFWS 2007) later in this document.

8. Analysis of the Species and Critical Habitat Likely to be Affected

Lynx are a wide-ranging species requiring large, interconnected areas of suitable habitat. Habitat connectivity within geographic areas and with Canada may be important for long-term lynx population viability and maintenance of the contiguous United States DPS. Lynx habitat occurs in a relatively patchy distribution across broad areas of the west. Certain areas include expanses of more contiguous and higher quality lynx habitat that appear more important to supporting viable resident lynx populations (e.g. core areas and critical habitat).

A key factor in sustaining lynx populations in the DPS is USFS management of snowshoe hare (their primary prey) habitat. Lynx on FNF lands may be affected by management activities that reduce or degrade essential habitat elements used by lynx for denning, foraging (snowshoe hare habitat and hunting habitat), and recruitment, or that increase habitat fragmentation and lynx mortality. The biological assessment for the Revised Forest Plan (USFS 2017) determined that the proposed action would likely result in adverse effects to individual lynx over the life of the plan. This biological opinion evaluates the effects implementing the Revised Forest Plan within the action area on the lynx population DPS.

Critical habitat has been designated for Canada lynx within the action area, which lies in the critical habitat Unit 3. The conservation role of lynx critical habitat is to support viable core area populations. A key factor in USFS management is providing boreal forest landscapes supporting a mosaic of differing successional forest for the production of snowshoe hare (the lynx primary prey). The biological assessment for the Revised Forest Plan determined that the proposed action would likely result in project-level adverse effects on designated critical habitat for Canada lynx (USFS 2017). This biological opinion evaluates the effects of the Revised Plan within the action area on the conservation role of lynx critical habitat Unit 3.

C. ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The "action area" includes all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action [50 CFR §402.02]. The action area does not necessarily include all areas potentially frequented by far-ranging, or migrant, species (USFWS and NMFS 1998).

As described previously, the action area is the entire FNF (2,392,807 acres). To reiterate, within the 109 LAUs on the FNF, approximately 1,795,000 acres are mapped as lynx habitat (i.e., boreal forest habitat types) and 598,000 acres are mapped as non-lynx habitat (i.e., low elevation lacking deep, fluffy snow, scree slopes, cliff faces, lakes, and dry habitat types). About 2.2 million acres on the FNF are also designated as lynx critical habitat. As discussed earlier in the Section B. *Status of the Species*, resident lynx may make exploratory or breeding movements into new areas, but typically return to their original home range. Males may travel long distances during these episodes. However, lynx habitat supports the densities of snowshoe hares needed to sustain resident lynx and reproduction. Boreal forest is limited in areas outside LAUs, and is much more fragmented in distribution, occurring in smaller patches, than within LAUs. It is unlikely that the amount and distribution of boreal forest patches outside LAUs support the high snowshoe hare densities required by resident lynx.

1. Action Area

The action area is the FNF. This has been discussed previously in Chapter 1 of this biological opinion, as well as in Section A.1 of this chapter.

2. Status of the Species within the Action Area

The lynx recovery outline (USFWS 2005) stratified lynx habitat into three categories: core, secondary, and peripheral. Core areas are places where long-term persistence of lynx and recent evidence of reproduction have been documented. Further, the quality and quantity of habitat in these core areas is available to support both lynx and snowshoe hare life needs. The lynx recovery outline emphasized focusing conservation efforts on core areas to ensure the continued persistence of lynx in the contiguous United States. Six core areas were identified in the

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recovery outline, one of which is in northwestern Montana/northeastern Idaho. The action area (i.e., FNF) is located entirely within the northwestern Montana/northeastern Idaho core area.

Museum records, trapping data, and other information verify the historical occurrence of lynx in western Montana (McKelvey et al. 2000). Squires and others have conducted extensive studies of Canada lynx in northwest Montana and have stated, "Our study area encompassed the occupied range of lynx within the Northern Rockies as estimated from a compilation of lynx distribution data collected from 1998 to 2007. The study area border followed natural topographic and vegetative boundaries to generally encompass all forested regions with recent evidence of lynx presence, including all telemetry locations we documented for resident lynx from 1998 to 2007 (N = 81,523 locations); this study area represented our best estimate of the current distribution of lynx in western Montana" (Squires et al. 2013). The study area delineated encompasses most of the FNF, with the exception of the area west of Kalispell known as "The Island Unit."

Canada lynx are known to be distributed throughout portions of the FNF included in the study area delineated by Squires et al. (2013). From 2010–2015, 15 individual adult or sub-adult lynx were captured and fitted with radio-telemetry collars on the FNF. This confirmed that the North Fork, Middle Fork, and South Fork of the Flathead River watersheds were occupied by lynx (USFS 2017).

Noninvasive sampling techniques have also been used to detect lynx in on the FNF. In the winter of 2012, members of the Southwestern Crown Collaborative (SWCC) Wildlife Working Group began systematic, landscape-scale carnivore monitoring efforts within the Southwestern Crown of the Continent (SW Crown) landscape. The SW Crown spans the area from north of Condon on the Swan Lake Ranger District, through the Seeley Lake Ranger District on the Lolo National Forest, to just east of Lincoln on the Helena-Lewis and Clark National Forest. Surveys combined multi-species snow track surveys, DNA collection from bait stations, and motion-sensor cameras. In order to standardize the approach across the SW Crown, eighty 5 x 5-mile grids were targeted for sampling. Sampling in the SW Crown identified a total of 26 unique lynx across 41 grid cells, including both males and females. All but five of these individuals were new to the Rocky Mountain Research Station genetic database (SWCC 2015).

The FNF also conducted carnivore monitoring from 2013–2016 using the same 5 x 5-mile grid methodology, but in portions that are outside the SW Crown. In this portion, 64 grid cells were surveyed, resulting in 40 detections by either tracks, camera, or genetic verification (USFS 2017). In addition to areas where lynx had previously been trapped, this effort detected lynx in the Salish Mountain Range (tracks and DNA). A female lynx with two kittens were also photographed on the east side of Hungry Horse Reservoir. In summary, lynx have been detected in all geographic areas of the FNF (Curry et al. 2016, SWCC 2015).

Based upon telemetry locations of lynx to date, best estimate of the current distribution of lynx in western Montana is an area about 8.9 million acres in size that ranges from the Purcell Mountains east to Glacier National Park and then south through the Bob Marshall Wilderness Complex to Highway 200 (USFS 2017). The FNF lies in the heart of this area, highlighting its importance to lynx conservation.

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3. Factors Affecting Canada Lynx within the Action Area

The FNF identified past/ongoing actions and key stressors for lynx in its biological assessment (USFS 2017). Additionally, the NRLMD and 2013 LCAS (ILBT 2013) address similar risk factors as those listed in the FNF BA.

As previously stated, the risk factors identified for lynx have varying effects on lynx, depending upon the nature, location, duration, and timing of the activity (USFWS 2007). On NFS lands, some factors present greater likelihood of risks to lynx and others are relatively benign. Many were addressed through implementation of the NRLMD (see Section B.7 above). The status of the risk factors relevant to the action area is summarized below. The combined risk factors are organized and discussed under the following subheadings:

- Vegetation Management
- Wildland Fire Management
- Habitat Fragmentation – including the importance of linkage areas
- Recreation
- Forest/Backcountry Roads and Trails
- Livestock Grazing
- Mineral and Energy Development

Vegetation Management

The primary factors driving lynx populations, behavior, and distribution is the abundance and distribution of their primary prey: snowshoe hare. As discussed in Section B.7 above, stand structure and composition are important elements of habitat for snowshoe hares and lynx. Stem density and snowshoe hare density are directly and positively correlated. Therefore, vegetation management activities that reduce stem densities, overstory vegetative layers, and/or horizontal structure can result in negative effects on both snowshoe hare use of affected stands and therefore lynx.

The vegetation management objectives of the NRLMD (VEG O1, O2, O3 and O4) were designed to improve the quality of lynx habitat by improving conditions for prey:

- VEG O1 - manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx;

- VEG O2 - provide a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hare, and provide winter snowshoe hare habitat in both the SISS and in the mature, multi-story conifer vegetation;

- VEG O3 - conduct fire use activities to restore ecological processes and maintain or improve lynx habitat; and

- VEG O4 - focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover.

These objectives are attained through application of the vegetation management standards: VEG S1, S2, S5 and S6. These standards were created in an effort to ensure that sufficient habitat within each LAU would be available to provide lynx with sufficient snowshoe hare prey and lynx foraging (hunting) habitat conditions. Briefly, the standards state:

- VEG S1 - If more than 30 percent of the lynx habitat in an LAU is currently in a SISS that does not yet provide winter snowshoe hare habitat no additional habitat may be regenerated by vegetation management projects;

- VEG S2 - Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS or BLM lands in an LAU in a ten-year period;

- VEG S5 - Pre-commercial thinning projects that reduce snowshoe hare habitat may occur from the SISS until the stands no longer provide winter snowshoe hare habitat only in limited locations or under limited circumstances; and,

- VEG S6 - Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests may occur only in limited locations or under limited circumstances.

Since 2007, the NRLMD vegetative standards have limited or influenced vegetation management on FNF lynx habitat such that a mosaic of vegetative successional stages required by lynx and its primary prey – the snowshoe hare - are maintained and promoted over time. These key standards maintain the quality of lynx habitat by improving conditions for prey. When applied at the project level, adverse effects on lynx are mostly avoided or minimized. In the NRLMD biological opinion, the Service concluded that this direction would conserve the most important components of lynx habitat: a mosaic of early, mature and late successional staged forests, with high levels of horizontal cover and structure (USFWS 2007).

The NRLMD also included guidelines for vegetation management. Guidelines were intended to be implemented in most cases, whereas a standard is a required action. The NRLMD guidelines would be adhered to except where compelling reasons, such as the protection of other species at risk or public safety, are an issue (USFWS 2007). The vegetation guidelines include:

- VEG G1 - Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available;

- VEG G4 - Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided;

- VEG G5 - Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU; and

- VEG G11 - Denning habitat should be distributed in each LAU.

These standards and guidelines work together to maintain the quality of lynx habitat by improving conditions for prey. When applied at the project level, adverse effects on lynx are mostly avoided, or minimized. In our 2007 NRLMD biological opinion, we concluded that this direction would conserve the most important components of lynx habitat: a mosaic of early, mature and late successional staged forests, with high levels of horizontal cover and structure (USFWS 2007).

Table IV-6 summarizes the current condition of the 109 LAUs on the FNF in regard to VEG S1 and VEG S2. Table IV-6 displays: (a) the percentage of each LAU in a SISS (i.e., snowshoe hare habitat in early successional stages; not to exceed 30 percent); and (b) the percentage of each LAU that has been regenerated by vegetation management in the last 10 years. As shown in Table IV-6, 25 of 109 (23%) LAUs on the FNF have more than 30 percent of lynx habitat modeled as being in an early stand initiation condition. Recent stand-replacing wildfires are the driver in creating substantial acreages on the FNF in a condition where they do not yet provide winter hare and lynx habitat. Although a large percentage of some LAUs coincide with the Wildland Urban Interface (WUI), as shown in Table IV-6, the percentage of lynx habitat affected by regeneration harvest has generally been minor in comparison.

Under NRLMD standard VEG S2, no more than 15 percent of lynx habitat on NFS lands can be regenerated by timber management projects within a LAU in a ten-year period, unless it meets criteria applicable to the WUI. Table IV-6 also displays the condition of LAUs based on forest-wide modeling. On the FNF, only 10 of the 109 LAUs have had more than five percent of the lynx habitat acres regenerated by vegetation management activities over the last ten years. Since the existing Forest Plan was amended to include the NRLMD in 2007, none of the LAUs have had more than 15 percent regenerated by timber harvest.

Table IV-6. Status of lynx habitat and critical habitat on the FNF by LAU, and conditions as they relate to NRLMD standards VEG S1 and VEG S2 (adopted from USFS 2017). Note: LAUs highlighted in grey have had significant regeneration due to recent stand-replacing wildfires.

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	VEG S1- % of lynx habitat on NFS lands in stand initiation stage[a] (due to wildfire + harvest = total)	VEG S2 –% of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	% of lynx habitat in critical habitat in the LAU	% of lynx habitat on NFS lands in WUI
Canyon	96%	23,578	45+3= 48%	0	100	16%
Hay	90%	22,318	0+0=0%	0	100	11%
Lakalaho	100%	21,148	<1+0=<1%	0	100	18%

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	VEG S1- % of lynx habitat on NFS lands in stand initiation stage[a] (due to wildfire + harvest = total)	VEG S2 –% of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	% of lynx habitat in critical habitat in the LAU	% of lynx habitat on NFS lands in WUI
Lower Big	99%	18,543	93+<1=93%	0	100	9%
Lower Coal	53%	13,968	58+0=58%	0	100	17%
Lower Whale	94%	18,341	27+3=30%	<1	100	22%
Moose	82%	11,102	0 +1=1%	<1	100	48%
North Trail	85%	26,722	1+<1=1%	<1	100	25%
Red Meadow	87%	21,956	0=0=0%	0	100	27%
South Trail Tepee	93%	20,236	76+3=79%	<1	100	40%
Teakettle	59%	6,868	1+0=1%	0	100	70%
Upper Big	98%	18,039	24+0=24%	0	100	None
Upper Coal	93%	23,894	7+<1=7%	0	100	None
Upper Trail	100%	15,404	0+0=0%	0	100	None
Upper Whale	100%	21,775	< 1+0=<1%	0	100	None
Bear Creek	96%	21,039	28+<1=28%	<1	100	52%
Challenge Granite	100%	17,419	18+<1=18%	<1	100	None
Clayton Anna	100%	16,183	66+4=70%	0	100	None
Coram Abbot	84%	6,653	0+0=0%	0	100	37%
Dirtyface Spruce	100%	13,023	5+0=5%	0	100	6%
Doris Creek	100%	24,118	24+3=27%	0	100	9%
Emery Creek	100%	12,844	0+1=1%	0	100	2%
Essex Java	99%	14,052	15+<1=15%	<1	100	29%
Felix Logan	100%	17,471	13+0=13%	0	100	None
Graves Forest	100%	21,221	8=0=8%	0	100	< 0.5%
Hungry Horse Creek	100%	11,537	0+0=0%	0	100	None
Lake Five	58%	2,745	0 +0=0%	0	100	99%
Long Cy	100%	21,494	23+0=23%	0	100	none
Moccasin Nyack	92%	13,427	2+<1=2%	<1	100	64%
Murray Canyon	100%	12,625	0+<1=<1%	<1	100	None
Paola Ridge	92%	9,534	<1+2=2%	<1	100	48%
Slippery Bill	100%	12,587	14+<1=14%	<1	100	None

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	VEG S1- % of lynx habitat on NFS lands in stand initiation stage[a] (due to wildfire + harvest = total)	VEG S2 –% of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	% of lynx habitat in critical habitat in the LAU	% of lynx habitat on NFS lands in WUI
South Firefighter	100%	10,726	0+3=3%	3	100	None
Stanton Grant	95%	16,800	0+1=1%	<1	100	51%
Vinegar Moose	100%	21,481	10+0=10%	0	100	4%
West Columbia	87%	7,851	0+0=0%	0	100	86%
Wheeler Creek	100%	15,087	0+0=0%	0	100	14%
Wildcat Mountain	100%	15,831	20+1=21%	0	100	None
Albino Necklace	99%	14,269	13+0=13%	0	100	None
Babcock Creek	100%	11,665	8+0=8%	0	100	None
Bent Whitcomb	100%	21,268	63+1=64%	0	92	4%
Big Prairie Cayuse	100%	11,042	49+0=49%	0	100	None
Big Salmon Lake	97%	22,216	46+0=46%	0	100	None
Black Bear Helen	100%	14,766	79+0=79%	0	100	None
Bunker Creek	100%	23,273	45+<1=45%	<1	100	None
Cox Creek	100%	19,936	4+0=4%	0	100	None
Dolly Varden Creek	100%	24,864	14+0=14%	0	100	None
Dryad Miner	99%	16,882	< 1+0=%	0	100	None
Foolhen Danaher	100%	25,440	10+0=10%	0	100	None
Holbrook Bartlett	100%	29,119	47+0=47%	0	100	None
Hungry Picture	100%	18,561	30+0=30%	0	100	None
Kah Soldier	100%	15,288	9+1+10%	1	100	8%
Little Salmon Creek	100%	27,766	11+0=11%	0	100	None
Lodgepole Creek	100%	21,319	4+0=4%	0	100	None
Lost Jack Mid	100%	13,182	91+0=91%	0	100	None
Lower Gordon Creek	100%	15,795	42+0=42%	0	100	None

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	VEG S1- % of lynx habitat on NFS lands in stand initiation stage[a] (due to wildfire + harvest = total)	VEG S2 –% of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	% of lynx habitat in critical habitat in the LAU	% of lynx habitat on NFS lands in WUI
Lower White River	100%	17,902	38+0=38%	0	100	None
Lower Youngs Creek	100%	18,885	50+0=50%	0	100	None
Mud Lake	100%	10,488	62+0=62%	0	100	None
Pale Clack	100%	13,956	3+0=3%	0	100	None
Peters Crossover	100%	17,925	0+0=0%	0	100	None
Quintonkon Creek	100%	15,888	7<1=7%	0	100	2%
Rapid Basin	100%	29,821	25+0=25%	0	100	None
Shadow Dean	100%	27,399	24+0=24%	0	100	None
Silvertip Creek	100%	12,540	35+0=35%	0	100	None
Spotted Bear Mountain	100%	20,943	53+<1=53%	0	100	1%
Stadium Gorge	100%	25,091	13+0=13%	0	100	None
Stony Jungle	100%	17,700	61+1=62%	<1	100	3%
Strawberry Creek	100%	16,688	27+0=27%	0	100	None
Sullivan Creek	100%	27,743	16+1=17%	0	100	None
Three Sisters Bungalow	100%	27,654	18+0=18%	0	100	None
Trail Bowl	100%	24,727	78+0=78%	0	100	None
Twin Creek	100%	18,890	5+<1=5%	0	96	< 0.5%
Upper Gordon Creek	99%	12,638	5+0=5%	0	100	None
Upper White River	100%	12,521	24+0=24%	0	100	None
Upper Youngs Creek	100%	26,021	59+0=59%	0	100	None
Blacktail	79%	13,680	<1+6=6%	6	0	80%
Haskill Mount	76%	7,885	0+5=5%	2	0	37%
Bond	82%	10,903	0+0=0%	0	100	37%
Buck	68%	9,854	16+0=16%	0	100	61%
Elk	77%	18,879	7+7=14%	1	100	29%
Glacier	92%	21,066	40+6=46%	2	100	20%
Holland	81%	8,294	0+3=3%	3	100	53%

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	VEG S1- % of lynx habitat on NFS lands in stand initiation stage[a] (due to wildfire + harvest = total)	VEG S2 –% of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	% of lynx habitat in critical habitat in the LAU	% of lynx habitat on NFS lands in WUI
Krause	85%	13,308	<1+0=<1%	0	100	50%
Lion	98%	10,950	<1+4=4%	0	100	None
Lost	78%	12,365	12+0=12%	0	100	< 0.5%
Lower Beaver	86%	16,661	<1+7=7%	1	100	39%
Meadow	87%	7,248	41+5=46%	1	100	4%
North Crane	78%	10,258	0+2=2%	0	93	65%
Piper	91%	18,696	<1+7=7%	<1	100	15%
Porcupine	63%	8,087	0+0=0%	0	92	1%
Schmidt	83%	9,677	0+0=0%	0	100	52%
Soup	18%	2,351	0+0=0%	0	100	None
South Cold	93%	17,989	<1+2=2%	<1	100	13%
South Crane	97%	13,938	0+<1=<1%	0	100	36%
South Woodward	94%	13,370	1+3=4%	1	100	8%
Squeezer	51%	10,759	2+1=3%	0	100	None
Upper Beaver	96%	10,684	<1+<1=<1%	<1	100	< 0.5%
Woodward	21%	3,743	0+<1=<1%	0	100	1%
Ashley Herrig	30%	6,660	0+5=5%	5	95	87%
Evers Reid	73%	9,586	<1+10=10%	3	99	82%
Lost Tally	89%	9,590	0+4=4%	3	92	99%
Lower Good	84%	19,746	<1+6=6%	2	100	56%
Lower Griffin	93%	17,622	57+6=63%	1	100	25%
Martin Stillwater	90%	15,804	0+5=5%	0	100	16%
Sheppard	94%	21,352	80+17=97%	12	100	22%
Upper Good	98%	28,384	15+9=24%	5	100	23%
Upper Griffin	81%	15,844	5+5=10%	4	100	1%
Upper Logan	80%	17,893	<1+9=9%	5	100	15%

a. Assumption = acres burned by stand-replacing wildfire or regenerated by timber harvest 1997-2016 are not yet winter snowshoe hare habitat, on average. LAUs may have had regeneration harvest prior to wildfire so harvest acres and burned acres may overlap. Numbers have been added to display a "worst case scenario". These numbers are based upon forest scale data and are verified at the project level.

b. based on USFS FACTS database showing on-the-ground acres of regeneration harvest 2007-2016.

c. Shaded lynx analysis units are estimated to have more than 30 percent of lynx habitat that is not yet winter snowshoe hare habitat and in all LAUS this is due to stand-replacing wildfire. Estimates are verified at the project level.

Exemptions and Exceptions to the Vegetation Management Standards

The NRLMD authorized exemptions from standards VEG S1, S2, S5, and S6 for fuels management within the WUI. The NRLMD also provides exceptions listed in VEG S5 and S6 to allow for precommercial thinning to protect structures, for research, and to promote the conservation of tree species such as whitebark pine and aspen. The exemptions and exceptions would allow actions that may have adverse effects on lynx by reducing the horizontal structure of natural forest succession phases and or affecting the mosaics of the forested landscape in localized areas.

The exemptions for fuels treatments within the WUI was limited to six percent of lynx habitat on each National Forest considered "occupied" as defined in the NRLMD. On the FNF, the total area that could be affected by the exemption is limited to no more than 103,800 acres. Further, the area on the FNF that could be treated using exceptions to VEG S5 and S6 could be no greater than 1,460 acres over a 10 year period. This represents less than 0.1 percent of mapped lynx habitat on the FNF.

Annual monitoring and reporting is also a requirement of the NRLMD biological opinion in order to ensure that the level of incidental take is not exceeded. As of 2017, the FNF has treated (or has a decision to treat) just over 10,000 acres using the WUI exemptions (Table IV-7). This represents less than one percent of the total exemption acres allotted to the FNF under the 2007 NRLMD BO (103,800 acres allotted). It should be noted that the incidental take statement of the NRLMD BO was recently updated (USFWS 2017). During the same period, the Flathead National Forest has treated (or has a decision to treat) 940 acres using the exceptions to VEG S5 and S6 (Table IV-7). The vast majority of thinning completed under the exceptions was for western white pine restoration, in which 80 percent of the winter snowshoe hare habitat was retained as required by the standard.

Table IV-7. Acres of lynx habitat on the Flathead National Forest treated with exceptions and exemptions to the forest plan vegetation standards (decisions from 2007 thru January 2017, updated via consultation)

Habitat	Estimated acres in the 2007 BO	Sum of acres with decisions for treatment as of 2017
Lynx habitat outside the wildland-urban interface with decisions for precommercial thinning using the VEGS5 exceptions (only 1 acre was treated using the VEGS6 exceptions)	1,460 (over 10 years)	940* (2007-2016)
Lynx habitat inside the wildland-urban interface with decisions for treatments using the fuels reduction exemption	103,800 (cumulative)	10,079 (2007-2016)

*The Forest consulted on 940 acres but dropped 675 acres, so only 265 are actually planned for treatment.

Habitat Fragmentation

Fragmentation of the naturally patchy pattern of lynx habitat in the contiguous United States can affect lynx by reducing their prey base and increasing the energetic costs of using habitat within their home ranges. A variety of anthropogenic activities such as highways and major developments and associated infrastructure contribute to fragmentation. Highways also pose a risk of direct mortality and may inhibit lynx movement between previously connected habitats.

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The NRLMD recognizes the importance of linkage and addresses it through objectives, standards, and guidelines All O1, All S1, LINK O1, LINK S1, and All G1, which are identified below:

- ALL O1 - Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas;
- ALL S1 - New or expanded permanent development and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area;
- LINK O1 - In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat;
- LINK S1 - When Highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings.
- ALL G1 - Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses, or overpasses.

Linkage areas were initially identified and coarsely mapped at a broad scale by a group of experts. The group anticipated that linkage areas would be further refined as more information became available. Subsequently, Squires et al. (2013) used telemetry data for 64 lynx monitored during 1998–2007 to create a broad-scale resource selection model that predicted probable lynx habitat and "putative movement corridors" across the species' distribution in the Northern Rocky Mountains. This analysis included quantification of the relative likelihood of lynx crossing major highways, one of the major hypothesized anthropogenic threats to lynx connectivity.

Squires et al. (2013) reported that the putative movement corridors they identified for lynx also showed reasonable correspondence with previously published models for wolverine (Schwartz et al. 2009), wolves (Oakleaf et al. 2006), and grizzly bears (Mace et al. 1999). Most of the least-cost paths generated by their model went along the lower slope of the Swan Range to the east of highway 83 (on the Swan Lake Ranger District of the FNF) and crossed the U.S. Highway 2 corridor within a six-mile stretch of highway to the north of Hungry Horse Reservoir near the town of Hungry Horse, Montana. The travel route then moved northwest to the Whitefish Mountain divide and split into two routes, both within the Red Meadow LAU in the North Fork Flathead River watershed as it approached the Canadian border.

Recreation

Understanding of the effects of outdoor recreation on lynx and their habitat is incomplete. Recreational developments may remove forest cover or result in direct habitat loss or fragmentation. Human presence may disturb or displace lynx. NRLMD objectives, standards and guidelines address the most serious consequences of recreational development, requiring new or expanding permanent developments to maintain or where possible, promote habitat connectivity within LAUs and linkage areas (All O1, All S1, LINK O1, LINK S1, and All G1).

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Anecdotal information suggests that lynx are quite tolerant of humans, although individuals may behave differently in response to human presence (ILBT 2013). The NRLMD does not address the potential for human disturbance on lynx. The evidence supporting a risk to lynx from compacted snow routes (e.g. snowmobile trails and tracks) is limited. However, the NRLMD includes guidelines HU G11 which states:

- HU G11 - Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This may be calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.

Ski Resorts

Effects to lynx from Montana's ski resorts were assessed in 2000 and 2001 after listing (USFS-BLM 2000, USFWS 2001). In 2007, when consultation on the NRLMD occurred, the effects of ski areas and other types of winter recreation on lynx were further analyzed. There are two ski resorts on lands administered by the FNF; Whitefish Mountain Resort (formerly known as Big Mountain) and Blacktail Mountain Resort. Both of these resorts were addressed in the biological opinions (USFWS 2001, 2007). In the 2001 biological opinion, the Service stated that habitat loss results from clearing of trees for ski runs, roads, and other developments associated with ski areas. Winter activity associated with ski resorts, including skiing, ski-lift operation, and grooming of ski runs, may also cause disturbance or displacement of individual lynx. In its 2007 biological opinion, the Service determined that although individual lynx may be adversely affected by recreation developments, the management direction in the NRLMD would reduce potential impacts at a landscape scale, avoiding an appreciable reduction in the reproduction, numbers, and distribution of lynx.

Approximately 3,100 acres of the Lakalaho LAU is in the Whitefish Mountain Ski and Summer Resort permit area. Since 2007, the Forest has consulted on the effects of projects within the resort, including consultation for critical habitat (USFS-USFWS 2016; USFWS 2007a, 2011, 2013, 2015).

The Blacktail Mountain Resort is located in the Blacktail LAU. The resort includes cleared or gladed ski runs with heavily treed areas between. Primarily winter operations occur on about 600 acres of NFS lands at this downhill ski area on the summit of Blacktail Mountain. The resort is in mapped lynx habitat and was evaluated as part of the biological assessment and biological opinion for all ski areas in Montana on Forest Service and Bureau of Land Management lands (USFWS 2001). This resort in not located in lynx critical habitat.

Over-Snow Vehicle Use

In November 2006, the FNF issued a decision for a motorized winter recreation plan, also known as amendment 24 (A24) to the Forest Plan. Developed with consideration of the terms of a settlement agreement, the decision clarified where, when, and under what conditions over-snow

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vehicles are allowable on the FNF. The specific areas and routes that are suitable for motorized over-snow vehicle use are identified on maps that were incorporated into the existing Forest Plan. Under A24, about 32 percent of lynx habitat on the FNF is open to motorized over-snow use, or is in cross-country ski areas where trails are groomed. Across the FNF, there are about 1,098 miles of routes open to motorized over-snow use at various times throughout the year, snow conditions permitting (USFS 2017).

In the A24 biological opinion (USFWS 2006), the Service concurred with the FNF's determination that the proposed federal action was not likely to adversely affect lynx. The Service based their determination on (1) the proposal's compatibility with the Lynx Conservation and Assessment Strategy, (2) snow compaction that would occur in areas and routes remaining open for snowmobiling, (3) a decrease of more than 300,000 acres in the overlap between modeled lynx habitat and areas open to snowmobiling, (4) a decrease of about 220 miles in routes open for snowmobiling through lynx habitat, (5) no new snowmobile areas or routes would be opened under A24, and (6) there could be an indirect benefit of a reduced risk of inadvertent trapping.

Forest/Backcountry Roads and Trails

As described in Section B.6, construction of roads results in a small reduction of lynx habitat by removing forest cover. In some instances, vegetation along less-traveled roads provides good snowshoe hare habitat, and lynx may use the roadbed for travel and foraging. In general, forest roads with low vehicular or snowmobile traffic appear to have little effect on lynx seasonal resource-selection patterns in areas similar to the action area.

Since 2007, effects of roads on FNF lands in lynx habitat have been addressed through implementation of NRLMD guidelines All G1 and HU G6 through G9. These guidelines state:

- ALL G1 - Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses, or overpasses.

- HU G6 - Methods to avoid or reduce effects on lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.

- HU G7 - New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.

- HU G8 - Cutting brush along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.

- HU G9 - On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the

project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.

A large portion of the LAUs are also within the NCDE recovery zone for grizzly bears on the FNF (See grizzly bear chapter of this BO for further details). Implementation of Amendment 19 (A19) has resulted in decreased road mileage, decreased road maintenance, and many miles of public road use restrictions over the last decade (USFS 2017). Standards to maintain baseline densities of motorized routes in the grizzly bear primary conservation area and Salish demographic connectivity area would limit potential risks to lynx associated with motorized public access.

Livestock Grazing

Grazing or browsing by domestic livestock on FNF lands is unlikely to reduce the snowshoe hare prey base or have a substantial effect on lynx. However, grazing/browsing could have some localized effects on high elevation willow communities or aspen stands if not managed appropriately. Under the existing FNF Forest Plan grazing allotments in LAUs are managed in accordance with the NRLMD grazing objective GRAZ O1 and through guidelines GRAZ G1 through G4. Specifically, these guidelines state:

- GRAZ O1 - Manage livestock grazing to be compatible with improving or maintaining lynx habitat.

- GRAZ G1 - In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.

- GRAZ G2 - In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.

- GRAZ G3 - In riparian areas and willow carrs, livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.

- GRAZ G4 - In shrub-steppe habitats, livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs, to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.

Minerals and Energy Development

As described in Section B.6, activities associated with exploration and development of leasable minerals, locatable minerals, and mineral materials could affect lynx habitat by changing or eliminating the native vegetation and contributing to habitat fragmentation. Large-scale mining operations could result in additional habitat loss and fragmentation from site development and distribution facilities.

The effects of mining developments (habitat loss, roads, and human access) are addressed by the NRLMD guidelines HU G4, HU G5, HU G6, HU G9, and HU G12. Briefly, the guidelines state:

- HU G4 - For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction.

- HU G5 - For mineral and energy development sites and facilities that are closed, a reclamation plan that restores lynx habitat should be developed.

- HU G6 - Methods to avoid or reduce effects on lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.

- HU G9 - On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.

- HU G12 - Winter access for non-recreation special uses and mineral and energy exploration and development, should be limited to designated routes or designated over-the-snow routes.

At the present time, there is little exploration and no leasable development activity occurring on the FNF. Existing oil and gas leases were suspended and would require further NEPA analysis and consultation before any activity could occur. The Forest has low potential for locatable minerals and low to high potential for leasable minerals (such as oil and gas). Many acres of NFS lands on the FNF are withdrawn from mineral entry (Figure 22). The type of lands withdrawn from mineral entry and leasing in the Flathead National Forest plan area include:

- Administrative sites, such as campgrounds;

- Forest lands within the boundaries of a ski area permit;

- The Bob Marshall, Great Bear, and Mission Mountains Wilderness areas;

- Sections of the North, South and Middle Forks of the Flathead River;

- Portions of the Forest withdrawn from mineral development by the North Fork Watershed Protection Act of 2013.

4. Status of Critical Habitat in the Action Area

This section analyzes the environmental baseline conditions for critical habitat in the action area. Our analysis describes the environmental baseline of critical habitat in the action area, most

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influential is the Forest Plan direction in lynx habitat, which includes the direction in the NRLMD.

Critical Habitat in the Action Area

For the purposes of this biological opinion, we defined the action area to include lands administered by the FNF. The action area is within Unit 3 of designated lynx critical habitat and contains the physical and biological features essential for the conservation of the species, including the primary constituent element (PCE 1) and its four components (a-d). Our final rule determined that the conservation role of lynx critical habitat is to support viable lynx populations within core areas.

The FNF includes approximately 2.2 million acres of designated critical habitat for lynx in critical habitat Unit 3. This represents 35 percent of the designated critical habitat in Unit 3. About 37 percent of the critical habitat on the Flathead National Forest is in wilderness and special areas. Further, the majority of LAUs (100 of 109) on the FNF have 100 percent of the mapped lynx habitat in designated critical habitat (Table IV-6 above). Of those LAUs with less than 100 percent, seven (Bent Whitcomb, Twin Creek, North Crane, Porcupine, Ashley Herig, Evers Reid, and Lost Tally) have over 90 percent of mapped lynx habitat in critical habitat (see Table IV-6 above for exact percentages). There are only two LAUs (out of 109) on the FNF that do not include some critical habitat: the Haskill Mountain and Blacktail LAUs west of Flathead Lake and Highway 93.

The action area contains physical and biological elements essential for the conservation of the species, including the PCE. Stand initiation habitat, including early stand initiation habitat, potentially provides for PCE 1a; multi-story habitat potentially provides PCE 1a and/or 1c; habitat such as stem exclusion is one of the boreal forest successional stages comprising the PCE, also potentially providing denning habitat PCE 1c; areas of critical habitat not mapped as lynx habitat generally provide matrix habitat (PCE 1d); and the action area in general provides deep, fluffy snow conditions (PCE 1b). Table IV-7 displays the acres of critical habitat by Forest, including mapped lynx habitat and matrix habitat.

Snowshoe hare habitat (PCE 1a) in the action area is generally comprised of young forests in stand initiation and older, multi-story forests. Early stand initiation stands are characterized by dense growth of young trees, providing abundant forage and hiding cover for snowshoe hare during the summer. In the winter, these stands are covered by snow and unavailable to snowshoe hares. Stand initiation phase trees have grown tall enough to protrude above the snow, and provide forage and dense hiding cover for snowshoe hares in the winter and summer. Multi-story forests with dense horizontal cover (a dense understory of young trees and shrubs) provide both lynx and snowshoe hares with abundant forage and hiding cover during summer and winter. Summer habitat is not believed to limit snowshoe hare or lynx populations. However, winter habitat is believed to be a factor limiting snowshoe hare and lynx populations (Squires et al. 2010).

Stands of trees with a relatively closed overstory canopy and limited understory vegetation are characterized as stem exclusion habitat. These phases are forest successional stages that are part of the critical habitat boreal forest landscape described in the PCE. These stages are described as

having a closed canopy with limited understory. Little light reaches the forest floor so understory vegetation (including trees) are shaded and grow slowly; shrubs become dormant and new trees are precluded by a lack of sunlight and/or moisture. Thus, these structural stages do not currently provide snowshoe hare habitat due to the lack of horizontal cover described in PCE1a. In some stem exclusion stands, a limited amount of snowshoe hare forage may be available during the summer as a greater variety and quantity of deciduous forage and cover is available to hares due to the lack of snow cover and the growth of seasonal vegetation. This summer habitat is covered by snow during the winter and is unavailable to hares or lynx.

Under the NRLMD, exceptions and exemptions to standards VEG S1, S2, S5 and S6 are allowed to protect the WUI and other specific forest resources. Since 2007, the FNF has treated 11,019 acres of WUI in lynx critical habitat using these exceptions or exemptions. This amounts to less than 1 percent of critical habitat on the FNF treated under the exemptions and exceptions. Further, only 6,456 of the 11,019 acres treated using the exceptions and exemptions were considered to be showshoe hare habitat (PCE 1a) (Table IV-8). These amounts have not likely impaired the conservation role of critical habitat for the species in the LAUs as evidenced by the maintenance of the mosaic of boreal forested stands in differing successional stages across the LAUs.

Table IV-8. Acres of snowshoe hare habitat (PCE 1a) treated in critical habitat on the FNF.

Exception or Exemption category	Acres of critical habitat treated on the FNF that provide PCE 1a
VEGS5 exceptions	940
WUI exemptions	6,456

Winter conditions that provide and maintain deep, fluffy snow conditions for extended periods in boreal forest landscapes (PCE 1b) occur throughout the action area. These conditions likely restrict potential lynx competitors from effectively encroaching on or hunting snowshoe hares in winter lynx habitat. In addition to snow depth, other snow properties, including surface hardness or sinking depth, also influence lynx foraging success.

Lynx den sites (PCE 1c) are generally found in mature spruce-fir forests among downed logs or root wads in areas with abundant coarse woody debris and dense understories with high horizontal cover. Downed trees provide cover for den sites and kittens and are often associated with dense woody stem growth. The structural components of lynx den sites are common features in both managed and unmanaged stands. Because lynx have large home ranges and low den site fidelity, most lynx populations are not limited by a lack of immediate den sites (Squires et al. 2008).

The NRLMD focuses on maintaining and improving snowshoe hare habitat within mapped lynx habitat. Areas that are not mapped as lynx habitat generally do not have inherent potential to produce snowshoe hares at densities that would support lynx residency and reproduction. The Service designated critical habitat on Forest Service lands that in some instances were not mapped as lynx habitat by the Forest Service. This situation occurs where critical habitat,

specifically PCE1d, was designated in areas of 'matrix' habitat. The identification and description and use of the term "matrix habitat" did not arise until the designation of critical habitat. Matrix habitat is comprised of patches of habitat types that occur within or adjacent to boreal forest that do not have the capacity to produce high density snowshoe hare habitat. These habitat types typically consist of dry forest, hardwood forest, or non-forested habitat types. Matrix habitat cannot become lynx habitat through forest succession. Lynx use matrix habitat to travel within their home range, but do not depend upon it for foraging or denning sites.

Projects that occur within matrix habitat must still be analyzed for potential effects to matrix habitat. As for all critical habitat, including matrix habitat, the Forest Service may use the guidance in the Service's 2014 critical habitat designation (79 FR 54782) to assess and/or reduce or avoid negative effects on critical habitat. As stated in the final rule, activities that change vegetation structure or condition in matrix habitat are not considered an adverse effect to lynx critical habitat unless those activities create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat or if they adversely affect adjacent foraging and denning habitat.

Other types of management actions that have occurred in lynx critical habitat since 2007 include ski area development and expansion, road construction, oil and gas development, winter recreation management, and grazing management. Appendix K in the NRLMD Biological Assessment (USFS 2007) and Appendix D in the NRLMD Biological Opinion (USFWS 2007) provide lists of management actions that occur within lynx habitat. Such actions may also occur within lynx critical habitat. These appendices are incorporated by reference.

Since the NRLMD was amended to the existing Forest Plan in 2007, few new management actions (other than vegetation management projects described previously) have been implemented. The Big Mountain Ski Resort is within critical habitat; some new ski area improvements have been implemented within permitted ski area boundaries since 2007, including modifications to ski runs and installation of a new chair lift. But, no expansion or improvements outside ski area permit boundaries are known. The NRLMD does not provide for net increases in groomed snow trail routes for skiing or snowmobiles (without a project specific Forest Plan amendment), and no such net increases are known within lynx critical habitat in the action area since 2007. No new oil and gas development projects are known to have occurred. New grazing management plans have been implemented but no changes in grazing management that would affect lynx critical habitat are known. Some new roads have been constructed within lynx critical habitat, but the majority of new road construction since 2007 has been associated with vegetation management projects where new roads are usually temporary roads built to accommodate access to logging units. In addition, many acres of lynx critical habitat within the action area occur in non-developmental allocations such as wilderness.

Fire and other natural disturbance processes currently and historically played an important role in maintaining a mosaic of forest successional stages that provides habitat for both snowshoe hare and lynx (Ruediger et al. 2000, ILBT 2013), including the PCE for lynx critical habitat. In the action area, fire regimes are variable with both frequent (35-100 years) stand-replacing and mixed severity fires and infrequent (200+ years) stand replacement fires. Within the past seventy years, land management agencies began effective fire suppression with the advent of

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aircraft support; fire exclusion has the potential to alter vegetation mosaics and species composition that may reduce the quality and/or quantity of lynx habitat. In western forests, fire exclusion in areas with a history of infrequent fire return intervals has probably not had much impact. But areas where the fire regime was historically frequent or mixed has generally shifted to more intense fire regimes, resulting in forest compositions and structures that are more homogeneous, composed of more shade-tolerant species with more canopy layers, and are more susceptible to severe fires, insects, and diseases.

As noted in the critical habitat final rule, climate change has already reduced snowpack and the duration of snow cover in the lynx DPS range, and it is projected to further reduce these components of the PCE in the future (FR 79 54810-54811). By the end of this century in Units 3 and 5, climate change is expected to substantially reduce the distribution and duration of the deep, fluffy snow conditions favorable for lynx (FR 79 54825). Climate change is also extending fire prone seasons and can result in larger and higher intensity wildfires than occurred historically; such events are more likely in fire adapted western forests were active fire suppression over the past sixty years has interrupted historic fire regimes (Ruediger et al. 2000). Climate change has also been linked to increases in the extent, frequency, and intensity of outbreaks of native forest insects (e.g., spruce budworms and mountain pine beetles) that can impact lynx habitats. Over the longer-term, climate change is also anticipated to cause northward and upslope contractions in the boreal forest vegetation types with which hares and lynx are both strongly associated. In general, climate change is expected to directly and indirectly affect both snowshoe hare and lynx population dynamics through changes in precipitation patterns, vegetation distributions, and disturbance (i.e., fire, insects) regimes, and has the potential to adversely affect the lynx critical habitat PCE over the long term.

D. EFFECTS OF THE ACTION

Under section 7(a)(2) of the Act, “effects of the action” refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, and that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. [50 CFR §402.02]. Should the federal action result in a jeopardy and/or adverse modification conclusion, the Service may propose reasonable and prudent alternatives that the federal agency can take to avoid violation of section 7(a)(2). The effects discussed below are the result of direct and indirect impacts of implementing the proposed project.

1. Factors to be Considered

This section considers the effects to lynx, and designated critical habitat from implementation of the FNF’s Revised Forest Plan direction as guided by the Revised Forest Plan elements (goals,

objectives, desired condition, standards, and guidelines). This analysis also addresses how the specific elements for the conservation of lynx and lynx habitat moderate the effects of the Revised Forest Plan.

The FNF's Revised Forest Plan does not prescribe site-specific actions and so, this biological opinion does not provide an analysis of specific projects. Rather, the analysis is a broad-scale examination of the types of activities conducted under the Revised Forest Plan that could potentially result in effects on Canada lynx, lynx habitat, and designated critical habitat. Because of the broad-scale analysis, the FNF will retain the responsibility for section 7 consultation on all future projects (conducted under the Revised Forest Plan) that may affect the Canada lynx or its habitat or designated critical habitat even if those projects are consistent with the Revised Forest Plan.

Our analysis will be used to determine the potential for the Revised Forest Plan direction to jeopardize the affected population of lynx, or destroy or adversely modify lynx critical habitat. In our analysis, we will discuss the effects of the Revised Forest Plan and implementation of the MAs relative to LAUs, which are the units of analysis commonly used to describe effects on lynx (see Section A.1).

Notably, the Revised Forest Plan incorporates existing direction from the NRLMD, with some FNF-specific deviations. The analysis contained in our biological opinion on the effects of NRLMD on lynx (USFWS 2007) was considered in this analysis and updated where appropriate. Relevant sections of the NRLMD are cited by page number in our analysis below; our analysis is updated with recent science where appropriate. In this biological opinion we analyze the effects of the Revised Forest Plan, as it implements appropriate direction from the NRLMD as well as additional FNF-specific plan elements. As previously discussed (Section A.2), we determined that implementation of the NRLMD was not likely to jeopardize the continued existence of the Canada lynx (USFWS 2007). This analysis also considers the effects of the Revised Forest Plan, including the NRLMD, on designated critical habitat. Recently, the Service determined that implementation of the NRLMD is not likely to result in the destruction or adverse modification of lynx critical habitat (USFWS 2017a).

2. Analysis for Effects of the Action on Lynx

The following sections analyze the direct and indirect effects of implementing the elements of the FNF Revised Forest Plan on lynx. The effects will be discussed by factors as described in Section C.2:

1. Vegetation Management
2. Habitat Fragmentation
3. Recreation
4. Forest/Backcountry Roads and Trails

5. Livestock Grazing

6. Mineral and Energy Development

For each category of effect, we begin with a general summary of the potential impacts on lynx, followed by an analysis of the specific effects of the proposed action on lynx.

Effects of Vegetation Management on Lynx

General Effects

Timber harvest and associated forest management can be benign, beneficial, or detrimental to lynx depending on harvest methods, spatial and temporal specifications, and the inherent vegetation potential of the site (65 FR 16052). Regeneration harvest, for example, removes or alters stand structure, and temporarily eliminates snowshoe hare forage/cover and lynx cover until the site is regenerated to forest cover. In addition, this type of treatment reduces potential denning habitat by removing large trees and down logs from the site and reduces alternate prey habitat (i.e. red squirrel) with the removal of large trees. However, even-aged management, or regeneration harvest, can be a tool for creating high quality snowshoe hare habitat in the future, especially where natural regeneration would be expected to respond and provide dense young vegetation.

Uneven-aged management, such as single tree selection or group selection, results in varying effects to snowshoe hare and lynx, depending on the number of stems removed, canopy cover, harvest system and post-sale treatments. Removal of dense horizontal structure through timber harvest is typically detrimental to snowshoe hare habitat. However, where dense understory is lacking, removal of trees (overstory) allows light to penetrate the forest floor and so can stimulate pockets of dense regeneration and the development of horizontal cover preferred by hares.

Silvicultural thinning can reduce an area's carrying capacity for snowshoe hares by reducing dense horizontal structure within forest stand understories (Homyack et al. 2007). In northwestern Montana, Ausband and Baty (2005) found that within individual forest stands, hares had a significant affinity for dense, unthinned sapling patches. Research conducted in northwestern Montana found that precommercial thinning decreased snowshoe hare abundance, compared to both control and thinned stands where 80 percent of the entire stand was thinned but 20 percent of the total stand was retained with saplings uncut (Griffin and Mills 2007). Declines were prominent in the second winter after treatment. Additionally, estimated survival rates of snowshoe hares decreased as individuals spent proportionately more time in open young and open mature forest stand structure types (Griffin and Mills 2007).

Vegetation treatments focused on fuel reduction have the potential to reduce the quality of lynx habitat by simplifying stand structure and/or reducing stem densities below levels that provide suitable forage and cover conditions for snowshoe hares. These activities have the potential to reduce the affected area's carrying capacity for snowshoe hares. Fuel reduction projects or salvage of dead and dying trees can result in the removal of coarse woody material and may reduce the areas potential use as denning habitat for lynx.

As discussed in depth above, the abundance of snowshoe hare is the primary factor driving lynx populations, behavior, and distribution. Older forested stands provide high quality winter habitat when they provide multi-story structure that provides forage and horizontal cover, for both lynx and snowshoe hare (Murray et al. 1994, Squires et al. 2010). Regenerating forests providing dense sapling stands that protrude above the snow also provide important snowshoe hare habitat in Montana. Winter is the most constraining season for lynx in terms of resource use (Squires et al. 2010).

In summer, lynx broaden their habitat use to include younger forest stands with an abundance of shrub cover that support snowshoe hares (Squires et al. 2010). Dense, young sapling stands (more than 2,000 trees per acre) can also provide habitat for concentrations of hares in western Montana (Griffin 2004, pp.84-88). Lynx also require cover when searching for food (Brand et al. 1976). Lynx have been observed (via snow tracking) to avoid large openings during daily movements within the home range (Koehler 1990, Staples 1995). As a result, mature stands, along with stands in an early successional stage and intervening successional stages (i.e., stand initiation stage), provide the landscape mosaic of habitat conditions needed for snowshoe hare production and lynx foraging (hunting) habitat, and thus for recovery and survival of lynx.

The primary negative effects of vegetation management on lynx and lynx habitat include reduction in amount or quality of snowshoe hare habitat, indirectly impacting lynx foraging. However, vegetation management may also affect availability of denning habitat by reducing recruitment of downed woody debris. The common component of denning habitat appears to be large amounts of coarse woody debris (Koehler 1990; Staples 1995). This structure is most valuable when distributed throughout the home range, in or near foraging habitat. Coarse woody debris is needed at den sites for cover and shelter for kittens at den sites. Vegetation management activities such as salvage harvesting and prescribed fire may remove existing coarse woody debris and/or affect its recruitment by removing existing coarse woody material, which can affect the quality and quantity of available lynx denning habitat.

Effects of the Action

Under the Revised Forest Plan, approximately 528,010 acres of potential lynx habitat is located within the general forest management areas that are suitable for timber production (i.e., 6b and 6c) (Table IV-9). This makes up 29 percent of the potential lynx habitat on the FNF. Potential lynx habitat located within the general forest management areas provide a mosaic of successional stages in a roaded environment due to past road construction and timber harvest. In these areas, active management activities, including prescribed fire, timber harvest, fuels reduction, precommercial thinning, commercial thinning, and planting, are most likely to create a mosaic of forest conditions. Within management area 6, riparian management zones (RMZs) are not suitable for timber production, providing an interconnected network that contributes to habitat connectivity for lynx. In the North Fork, Hungry Horse, and Swan Valley geographic areas, some 6a and 6b management areas are located in areas along putative travel corridors identified by Squires and others (2013).

Of the general forest management areas, management area 6a is anticipated to have the lowest intensity of timber harvest, followed by management area 6b, which also contributes to habitat connectivity in key areas for lynx. Much of management areas 6c area is in the wildland-urban

interface (WUI), where timber harvest intensity is anticipated to be higher. This area is where exemptions to the vegetation standards for lynx are most likely to result in adverse effects to lynx.

Vegetation management may be allowable under certain conditions in management areas other than 1a and 1b. This represents an additional 17 percent of potential lynx habitat on the FNF (Table IV-9). While these management areas are not suitable for timber production, vegetation management may occur in these areas for purposes such as maintaining desired ecological conditions, or meeting research needs. Therefore, under the Revised Plan, vegetation management activities in these management areas could occur in lynx habitat.

As analyzed in the 2007 biological opinion on the NRLMD (USFWS 2007), the Service concluded that the ongoing implementation of the NRLMD under the existing FNF Forest Plan would conserve the most important components of lynx habitat: a mosaic of early, mature and late successional staged forests, with high levels of horizontal cover and structure. These components ensure habitat that maintains its inherent capability to support both snowshoe hare prey base and adequate lynx foraging habitat (and denning habitat, discussed later) during all seasons.

Table IV-9. Canada lynx habitat in each Forest management area (MA) under the FNF's Revised Forest Plan.

Management Area (MA)	Approximate Lynx Habitat Acres	Percentage of Potential Lynx Habitat
1a Designated wilderness	771,082	43
1b Recommended wilderness	155,820	9
2a Designated wild and scenic rivers	4,294	< 1
2b Eligible wild and scenic rivers	13,364	1
3b Special areas	1,001	< 1
4a Research natural areas	4,673	< 1
4b Experimental and demonstration forests	8,782	< 1
5a Backcountry nonmotorized year-round	122,511	7
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	45,047	3
5c Backcountry: motorized over-snow vehicle use	95,822	5
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	8,583	< 1
6a General forest low	106,027	6
6b General forest medium	255,311	14
6c General forest high	166,672	9
7 Focused recreation areas	36,578	2
Total	**1,795,567**	

The Revised Forest Plan applies the NRLMD objectives, standards, and guidelines that avoid or reduce adverse effects on lynx habitat and snowshoe hare habitat as a result of vegetation management. Specifically, timber harvest, thinning, and salvage harvest in lynx habitat would be subject to the standards of the NRLMD: VEG S1, VEG S2, VEG S5, and VEG S6, and guidelines: VEG G1, VEG G4, VEG G5, and VEG G11. These standards and guidelines were

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crafted to avoid or limit adverse effects to lynx by ensuring that habitat within each LAU would provide lynx with sufficient snowshoe hare prey (i.e. snow shoe hare habitat) and lynx foraging (i.e. hunting) habitat conditions. Briefly, the standards require:

- If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat no additional habitat may be regenerated by vegetation management projects (VEG S1).

- Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS or BLM lands in an LAU in a ten-year period (VEG S2).

- Pre-commercial thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat only in limited locations or under limited circumstances (VEG S5).

- Vegetation management projects, including prescribed fire, that reduce snowshoe hare habitat in multi-story mature or late successional forests may occur only in limited locations or under limited circumstances (VEG S6).

- Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available (VEG G1).

- Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided (VEG G4).

- Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU (VEG G5).

- Denning habitat should be distributed in each LAU (VEG G11),

These standards and guidelines work together to maintain the quality of lynx habitat by improving conditions for prey. If applied at the project level, adverse effects on lynx are mostly avoided, or minimized. In the NRLMD biological opinion, the Service concluded that this direction would conserve the most important components of lynx habitat: a mosaic of early, mature and late successional staged forests, with high levels of horizontal cover and structure (USFWS 2007).

Exemptions to Vegetation Standards

The NRLMD includes exemptions from standards VEG S1, S2, S5, and S6 to allow for fuels management within the WUI. These exemptions allow actions that may have adverse effects on lynx by reducing the horizontal structure of natural forest succession phases, and/or affecting the mosaics of the forested landscape in localized areas. These exemptions are brought forward into the FNFs Revised Forest Plan.

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Specifically, the NRLMD biological opinion constrains WUI exemption treatments to no more than 6 percent (cumulatively) of lynx habitat on an individual national forest. The Revised Forest Plan will carry forward the 6 percent exemption for vegetation treatments within the WUI. On the FNF this equates to 103,800 acres for the life of the Revised Forest Plan, which is anticipated to be 15 years.

During the period 2007-2016, the FNF used the exemption to treat fuels on 10,079 acres of lynx habitat within the WUI (see Table IV-7 above), or about 9 percent of the limit allowed under the NRLMD. Therefore, under the remaining allowance for exemptions in the Revised Forest Plan, up to 93,723 acres of lynx habitat could be treated fuels management in the WUI. Fuels treatments in the WUI are expected to have some adverse effects on lynx and snowshoe habitat because the intent would be to maintain lower tree density in these areas, resulting in less area of dense horizontal cover.

As analyzed in the NRLMD biological opinion (USFWS 2007), the exemptions from VEG S1 for fuels management would affect the forest mosaic by allowing more than 30 percent of lynx habitat within an LAU to be in a stand initiation stage. The exemption from VEG S2 would allow more than 15 percent of an LAU to be regenerated within a decade. Where the exemptions from VEG S1 or S2 are used within the WUI, there may be adverse effects to lynx by reducing the quality and productivity of lynx and snowshoe hare habitat for at least 10 to 15 years, depending up on the location, until treated stands regenerate to provide winter snowshoe hare habitat. Notably, these stands may be treated again to retain them as fuel breaks, and not allowed to regenerate extending the length of time they remain in early seral conditions. However, standard VEG S1 will limit effects by stating that fuel treatment projects may not result in more than three adjacent LAUs exceeding the standard.

The exemption from VEG S5 for fuels management may reduce natural levels of horizontal structure in early successional phases by allowing precommercial thinning prior to when the stand no longer provides winter snowshoe hare habitat. Thinning dense stands of young trees could adversely affect lynx by reducing the carrying capacity of these stands to produce snowshoe hares. Similarly, the exemption for fuels management from VEG S6 would likewise allow management actions that reduce the horizontal cover and thus the quality of snowshoe hare habitat in older, multi-layered stands.

Exceptions to Vegetation Standards

In addition to the exemptions described above, the NRLMD also includes exceptions from standards VEG S5 and S6 and would allow some precommercial thinning to protect structures, for research, and to promote the conservation of tree species such as whitebark pine and aspen. These exceptions allow actions that may have adverse effects on lynx by reducing the horizontal structure of natural forest succession phases, and/or affecting the mosaics of the forested landscape in localized areas.

The NRLMD exceptions to VEG S5 and S6 are brought forward into the FNFs Revised Forest Plan with one additional exception to VEG S6. Under the NRLMD direction carried forward into the Revised Plan, standard VEG S5 has an exception that allows precommercial thinning to

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restore whitebark pine. However, VEG S6 does not provide a comparable exception to accommodate vegetation treatments to protect whitebark pine in multistory mature stands.

Whitebark pine was historically widespread on the FNF and resilient to losses due to wildfire, drought, insects, or pathogens. However, white pine blister rust, has caused severe decline of whitebark pine across its distribution on the FNF. Some whitebark pine trees on the FNF are surrounded by dense forests dominated by larger subalpine fir, making whitebark pine very susceptible to wildfires. The FNF has already lost some of its remaining live whitebark pine trees of all sizes to high-severity wildfire, but it continues to serve as an important source of whitebark pine seeds that are used for restoration of the species throughout the region.

Under the Revised Forest Plan, standard VEG S6 would have an additional exception that would allow non-commercial felling of trees of any size that are growing within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. The text of this new exception can be found in Standard VEG S6 section of Appendix 4 (new exception category is indicated by bold text). Removal of these trees would be aimed at reducing the risk of mortality of whitebark pine trees due to wildfire, within-stand competition, and other stressors and making the trees more resilient and adaptable to changing future environments.

Under the FNFs new VEG S6 exception, along with the existing exception to VEG S5 for whitebark pine, it is estimated that a total of 2,500 acres over the next 15 years would be treated with precommercial thinning and about 4,400 acres would be treated with non-commercial thinning to protect and restore whitebark pine. The acreage estimated is for the entirety of existing whitebark pine stands, although not all of the acres within a stand would be affected by the new exception since only trees located within 200 feet of the selected, mature whitebark pine trees would be felled.

Preliminary analysis, subject to further site-specific analysis, indicates that 18 out of the 109 LAUs distributed in all but the Salish Mountains geographic area may have treatments using this new exception. No more than 6 percent of the lynx habitat in any one LAU that is identified for possible treatment (for estimated exception acres in LAUs on the FNF see Figures 28 and 29) will be treated.

Removal of the trees that surround selected mature, rust-resistant whitebark pine trees in mature multistory stands has the potential to decrease the habitat quality of lynx and snowshoe hare habitat. At this time, it is not known whether the stands that would be targeted for treatment actually provide the dense horizontal cover needed by snowshoe hares, and therefore the effects on lynx are uncertain, but site-specific consultation would be conducted when treatments are proposed. Since the felled trees would not be removed from the site, the downed logs would provide additional horizontal cover that may partially offset the adverse effects for a short period of time. Because whitebark pine grows at high elevations and no treatment areas were identified in the portions of the Salish geographic area west of Highway 93, treatments would not be adjacent to areas currently treated with WUI exemptions.

In total, the FNF is proposing that a maximum total of 15,460 acres will be treated using exceptions to standards VEG S5 and VEG S6. This estimate is an increase over what was

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originally allowed under the 2007 NRLMD biological opinion (1,460) and includes treatment acres for the newly proposed VEG S6 exception. In detail, these totals are anticipated to be distributed as follows:

- about 500 acres for defensible space (VEG S5/S6 exception 1);
- about 1,510 acres for research studies and genetic tree tests (VEG S5/S6 exception 2);
- about 1,800 acres for conifer removal or daylight thinning of aspen (VEG S5 exception 4);
- about 4,750 acres for daylight thinning of planted, rust-resistant western white pine (VEG S5 exception 5);
- about 2,500 acres to restore whitebark pine in wildfire areas and forests with sapling-size trees (VEG S5 existing exception 6);
- about 4,400 acres to restore whitebark pine in forests with trees larger than sapling-size (VEG S6 **new** Forest-specific exception).

Overall, although there could be adverse effects on individual lynx due to the limited number of acres of lynx habitat that would be treated, it is not likely that there would be a detectable impact on the lynx population as a result of the exceptions. Exceptions #2-6 to VEG S5 will only be utilized in LAUs where standard VEG S1 is met. Exceptions 2, 3, and 4 to VEG S6 will only be utilized in LAUs where VEG S1 is met. These limitations would continue to limit the concentration of impacts to Canada lynx in the future.

In summary, the FNFs Revised Forest Plan may result in adverse effects on snowshoe hare/lynx foraging habitat: 93,723 acres for future fuels treatments in the WUI (exemptions), and 15,460 acres for other future resource needs (exceptions). Under the Revised Forest Plan, about 25-30 percent of lynx habitat occurs in management areas where timber harvest is anticipated to occur. However, within these areas, riparian management zones are not suitable for timber production, so harvest is not likely to occur on all acres. Opportunistic timber harvest and harvest for resource benefit could occur on an additional 17 percent of lynx habitat. However, the Revised Forest Plan would apply desired conditions for vegetation and wildlife and the NRLMD objectives, standards, and guidelines to projects in lynx habitat in these areas.

Effects of Habitat Fragmentation on Lynx

General Effects

Maintaining linkage with lynx populations in Canada and between mountain ranges is important for lynx in the Northern Rocky Mountains Geographic Area and for populations farther south in the Rocky Mountains (Ruediger et al. 2000). Potential impediments to lynx dispersal include highways and areas of human settlement (Apps 2000, Ruediger et al. 2000). Lynx use a variety of habitats for dispersal and are known to travel great distances to use suitable habitat patches

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(Ruggiero et al. 2000). When dispersing, lynx have been documented to cross large, early-successional stage stands or very large openings, which would otherwise be avoided if located within breeding territories (Ruggiero et al. 2000). Although empirical data are limited, tracking of radio-collared lynx indicate they have crossed divided interstate and secondary highways. However, it is not yet understood how major highways and high levels of associated development may impact population connectivity. Private land development, especially along road corridors in mountain valleys, may fragment habitat and impede movement of lynx (Ruediger et al. 2000). Private land development on non-NFS lands is addressed in Cumulative Effects below.

Effects of the Action

Objectives, standards, and guidelines carried forward from the 2007 NRLMD in the Revised Forest Plan are aligned with the conservation measures to minimize habitat fragmentation in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (ILBT 2013) at a forestwide scale. Additional management direction for the FNF allows for activities to occur to meet social, economic, and multiple use objectives of the Forest while promoting recovery of the Canada lynx population, as discussed below:

- Emphasize land uses that promote or retain conservation of contiguous blocks of lynx habitat. (Desired condition FW-DC-LSU-01).

- Maintain a mosaic of vegetation and features such as riparian areas, forest stringers, unburned inclusions, or forested ridges to provide habitat connectivity within and between LAUs. (Standard FW-STD-RMZ-01, Guideline FW-GDL-RMZ-09, FW-GDL-TIMB-01, FW-DC-TE&V-19).

- Identify linkage areas where needed to maintain connectivity of lynx populations and habitat. Factors such as topographic and vegetation features and local knowledge of lynx movement patterns should be considered. Retain lynx habitat and linkage areas in public ownership and acquire land to secure linkage areas where needed and possible. On private lands in proximity to federal lands, agencies should strive to work with landowners to develop conservation easements, explore potential for land exchanges or acquisitions, or identify other opportunities to maintain or facilitate lynx movement. (Desired condition FW-DC-P&C-01).

- Minimize large-scale developments that would substantially increase habitat fragmentation, reduce snowshoe hare populations, or introduce new sources of mortality. (No large-scale developments are anticipated on NFS lands over the life of the plan).

- Give special attention to the design of highway improvements such as new road alignments, adding traffic lanes, installing Jersey or Texas barriers, or other modifications that increase highway capacity or speed. Upgrading unpaved roads should be avoided in lynx habitat if the result would be increased traffic speeds and volumes or a substantial increase in associated human activity or

development. Crossing structures or other techniques could be used to minimize or offset impacts (Guideline FW-GDL-IFS-12).

In summary, the Revised Forest Plan will contain multiple objectives, standards, and guidelines that apply in lynx habitat. Standard ALL S1 specifies that new or expanded permanent developments and vegetation management projects must maintain habitat connectivity in a lynx analysis unit and/or linkage area. Guideline ALL G1 says that methods that avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Objective LINK O1 encourages working with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions in mixed ownership areas to reduce the potential of adverse impacts on lynx and lynx habitat. In linkage areas, potential highway crossings will be identified (LINK S1), and Forest Service lands should be retained in public ownership (LINK G1). Guideline HU G6 says that methods to avoid or reduce the effects on lynx in lynx habitat should be used when upgrading unpaved roads to maintenance levels 4 or 5 if the result would be increased traffic speeds and volumes or a foreseeable contribution to increases in human activity or development in lynx habitat. Guideline HU G7 states that new permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.

Many actions that fragment habitat, such as highway expansions and residential developments, are not under the authority of the Forest Service and are discussed in the section on cumulative effects. However, the forest plan components listed above are beneficial in maintaining or improving habitat connectivity on National Forest System lands, and would help to reduce or minimize adverse effects. In addition, alternative B modified includes site-specific plan components to help provide connectivity for Canada lynx. In addition, other Forest-specific plan components promote connectivity between areas of Canada lynx habitat, including:

- Guideline FW-GDL-IFS-12 specifies: Within areas specifically identified as being important for wildlife connectivity across highways (see Table IV-10) the Forest should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety.

Table IV-10. Key highway crossing areas for wildlife

Area	Route	Mile Marker
east of Essex[1]	U.S. 2	181-184
east of Essex[1]	U.S. 2	189-190
east of Columbia Falls[1]	U.S. 2	141-143
north of Columbia Falls[1]	Rt 486	7-9

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Area	Route	Mile Marker
between Whitefish and Eureka[1]	U.S. 93	148
between Whitefish and Eureka[1]	U.S. 93	157-160
Swan Valley[2,3,4]	U.S. 83	31-36
Swan Valley[2,3,4]	U.S. 83	45-58

[1]Based on Ament and others (2014)
[2, 3, 4] Based on Huijser et al. (2006), Sandstrom (1996), and Weaver (2014)

- Desired condition FW-DC-TE&V-19 specifies that forest patterns contribute to connectivity of habitat for wildlife (e.g., Canada lynx, marten), movement within and between home ranges, and dispersal between populations.

- Desired condition FW-DC-LSU-01 specifies that land ownership adjustments, through purchase, donation, exchange, or other authority, improve national forest management by consolidating ownership, reducing wildlife-human conflicts, providing for wildlife habitat connectivity, improving public access to public lands, and retaining or acquiring key lands for wildlife and fish and within Wild and Scenic River corridors.

- Desired condition FW-DC-P&C-01 specifies that the Forest work towards an all-lands approach to management, cooperating with other land managers; this includes efforts to mitigate threats or stressors, provide for wildlife and fish habitat connectivity, and provide social, economic and ecological conditions that contribute to mutual objectives.

- GA-HH-DC-03 specifies that the Coram connectivity area provides habitat connectivity for a north-south movement corridor for wide-ranging species (e.g., grizzly bear, Canada lynx, wolverine) moving between the southern and northern watersheds on the Forest. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

- GA-MF-DC-04 specifies that the Nyack, Essex, and Pinnacle connectivity areas (see Figure B-29) provide habitat connectivity for wide-ranging species (e.g., grizzly bear, Canada lynx, wolverine) moving north-south between Glacier National Park and the Bob Marshall Wilderness Complex and east-west in the Middle Fork watershed. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

- GA-NF-DC-06 specifies that the Haskill Basin connectivity area (see Figure B-29) provides habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, wolverine) moving north-south between the Swan Range and the Whitefish Range. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

- GA-NF-DC-07 specifies that the North Fork and North Whitefish Range connectivity areas (see Figure B-29) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, wolverine) moving between Glacier National Park and the Whitefish Range. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

- GA-SM-DC-03 specifies that in areas between the [grizzly bear] primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. NFS lands in the Swift Creek-Stillwater connectivity area (see Figure B-10) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

- GA-SV-DC-07 specifies that the portion of the Seeley Clearwater connectivity area from Condon south to the boundary of the Swan Valley geographic area and the area near the town of Swan Lake (see Figure B-10) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, and wolverine) moving between the Swan and Mission Mountain Ranges. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

In addition, forestwide guidelines for riparian management zones would promote connectivity. Two of these guidelines state, “to protect water quality and maintain live trees that contribute to forest structural diversity for provide habitat for aquatic- and riparian-dependent species, clearcuts should not occur in an RMZ” and “If new openings are created in RMZs through even-aged regeneration harvest or fuel reduction vegetation management activities, the created opening’s distance to cover should not exceed 350 feet to provide wildlife habitat structural diversity, connectivity and cover”. These guidelines would benefit lynx and are consistent with findings by Squires and others (2013) regarding lynx avoidance of areas more than 364 feet to cover. We do not anticipate adverse effects on linkages and movement areas for lynx under the Revised Plan.

Effects of Recreation on Lynx

General Effects

The potential effects of recreation on lynx reproduction, behavior, habitat use and populations have not thoroughly been investigated. Anecdotal evidence suggests that lynx are tolerant of

human presence; however, this has not been rigorously tested (Staples 1995, Mowat et al. 2000). The growing popularity of outdoor recreation combined with improved technology has expanded recreation to previously undisturbed federal and state lands. Further, advances in snowmobile technology, expansion of trail grooming and an increase in off-trail recreation have led to easier and more frequent access to remote and rugged areas. Additionally, the use of helicopters and tracked vehicles for backcountry skiing is also increasing in popularity (Heinemeyer and Squires 2012).

Effects of the Action

The Revised Forest Plan retains the NRLMD objectives, standards, and guidelines that address the most serious consequence of development, requiring new or expanding permanent developments to maintain or where possible, promote habitat connectivity within LAUs and linkage areas (All O1, All S1, LINK O1, LINK S1, and All G1). If ski areas are expanded or proposed, they would be required to incorporate the NRLMD guidelines that reduce impacts within the proposed development itself, including: HU G1, HU G2, and HU G3.

The likelihood of construction of new or expanded recreation sites affecting a lynx den is extremely low. Lynx are rare, den sites are rare and are typically not re-used year to year, multiple den sites are used each year, and denning habitat is not limited in the action area (Squires et al. 2008, 2010). If human activities or presence near den sites disturbed lynx, it is unlikely that a lynx would select a site near a construction site or a new or existing developed area. We expect the likelihood of developed recreation disturbing a lynx den site to be so unlikely as to be discountable.

Developed Ski Areas

Under the FNF Revised Forest Plan, objective HU O3 encourages concentrating activities in existing developed areas; and HU O4 says to provide for lynx habitat needs and connectivity when developing or expanding existing developed recreation sites or ski areas (see text of individual plan components in Appendix 4). No standards were adopted because recreational activities were not considered to be a threat to the population of lynx. Two guidelines were included that address ski area development or expansion: HU G1 indicates that provisions should be made for inter-trail islands that maintain winter snowshoe hare habitat and HU G2 encourages providing foraging habitat consistent with the ski area's operational needs. Further, guideline HU G3 says that recreation development and operations should be planned to provide for lynx movement and maintain the effectiveness of lynx habitat.

As discussed in Section C.2, there are two ski resorts, Whitefish Mountain Resort (formerly known as Big Mountain Resort) and Blacktail Mountain Resort on the FNF that contain lynx habitat. The 2007 NRLMD biological opinion reconfirmed the conclusion that individual lynx may be adversely affected through habitat avoidance, alteration, or loss but that the total area affected is limited and the objectives, standards, and guidelines would reduce the potential impacts (USFWS 2007). Under the Revised Forest Plan the two ski resorts will continue to operate within their existing permit area boundaries, and the adverse effects to lynx as a result of these two resorts have been exempted under previous consultation with the Service (USFWS 2001, 2011, 2013, 2015). We do not expect additional adverse effects to lynx beyond what is discussed in these previous biological opinions.

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Motorized Over-Snow Use

In the past, researchers speculated that packed trails could indirectly affect lynx by serving as travel routes that might enable competing predators (e.g., coyotes) to access snowshoe hare prey in lynx habitat (Murray et al. 1994,). However, in 2003 the Service found no evidence of competition between lynx and other predators such as coyotes or, if competition exists, there is no evidence that it exerts a population-level impact on lynx, and therefore the Service did not consider this to be a threat to lynx (68 FR 40076). Additionally, Kolbe et al. (2007) completed a study of the effect of snowmobile trails on coyote movements in lynx habitat in northwestern Montana. They reported that coyotes in their study area were primarily scavengers in winter (snowshoe hare kills composed only 3 percent of coyote feed sites). Furthermore, coyotes did not forage closer to compacted snowmobile trails than random expectation, and the overall influence of snowmobile trails on coyote movements and foraging success appeared to be minimal. Subsequently, Squires et al. (2010) reported on the effects of snowmobiling on lynx in their Seeley Lake study area, south of the FNF. They were unable to quantify the number of snowmobiles using forest roads in lynx home ranges, but one primary groomed trail was used by approximately 130 snowmobiles per day. They reported that they found no evidence that lynx selected areas away from forest roads or groomed snowmobile trails during winter.

Existing NRLMD guideline HU G11 addresses designated over-the-snow routes or designated play areas and areas of consistent snow compaction, which are defined as areas that get enough human use that individual tracks are indistinguishable. Areas such as over-snow motorized vehicle use routes, groomed cross-country ski routes, parking lots, and adjacent openings with consistently high levels of use would meet this definition.

Unlike some other National Forests within the Northern Rockies, the FNF designated specific motorized over-snow routes and areas under A24 (see discussion in Section C.2), as well as seasons, for motorized over-snow vehicle use in accordance with §212.81 of the Travel Management Rule (USFS 2017). As a result, approximately 68 percent of the lynx habitat on the FNF is closed to motorized over-snow vehicle use (see Figures 33 and 36).

The FNF's Revised Forest Plan would change the wording of HU G11 to include a FNF-specific guideline to better mesh with the Forest's desired conditions for social and economic sustainability of motorized winter recreation while addressing ecological sustainability for lynx. The proposed change to HU G11 is presented below in Table IV-11:

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Table IV-11. NRLMD guideline HU G11

Northern Rockies Lynx Management Direction, guideline HU G11	Flathead National Forest-specific modification of HU G11 under Revised Forest Plan
Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This is calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.	To provide ecological conditions to support Canada lynx on NFS lands at a forestwide scale, there should be no net increase in miles of designated motorized over-snow vehicle routes, groomed routes or areas where motorized over-snow vehicle use would be suitable. The "no net increase" is in comparison to suitability displayed in figure B-11. This guideline does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by guideline HU G12.

The effects of this change to HU G11 would be that additional areas would be suitable for motorized over-snow use in seven LAUs. In the North Fork Flathead River geographic area, there would be an increase in acres suitable for over-snow use of about 217 acres in the Lower Big LAU, and 7,660 acres in the Canyon LAU. There would be an increase of about 485 acres in the middle of an existing route in the Upper Big LAU and an increase of about 260 acres in the Upper Coal LAU. In the Red Meadow LAU there would be an increase of about 235 acres adjacent to an existing area. In the Middle Fork geographic area there would be an increase of about 1,548 acres adjacent to an existing open area in the Bear Creek LAU, and about 602 acres in the Challenge-Granite LAU. Additional snow compaction would occur on some, but not all of this acreage, because there are portions where tree cover is too dense for snowmobiles to navigate. In total, about 11,007 acres will become suitable for motorized over-snow use.

In the LAUs with an increase in acres suitable for motorized over-snow vehicle use, an increase in over-snow use would be expected to occur. This increase could affect some individual lynx, but there are adjacent areas that are not suitable for motorized over-snow use where snow compaction would not occur. In vicinities that are already heavily used by motorized over-snow vehicles, such as Canyon Creek, there is a potential for the additional suitable areas to result in an increase in the area of consistent snow compaction, as defined by the NRLMD. The effects of this increase on Canada lynx are anticipated to be minor. In addition, not all of the acreage in added suitable areas would be expected to have an increase in the area of consistent snow compaction. This is due to terrain and vegetation that influence where over-snow vehicles can physically go.

At a forest-wide scale, the above increases would be offset by changing some areas in five different LAUs to make them unsuitable for motorized over-snow vehicle use. These changes would total 48 acres in the Bunker Creek LAU, 2,646 acres in the Kah Soldier LAU, 94 acres in the Stony Jungle LAU, 8,812 acres in Sullivan LAU, and 344 acres in the Slippery Bill LAU. In addition, there would be some very minor adjustments in suitable and non-suitable areas (generally less than 15 acres) scattered across 30 LAUs in order to clean up boundaries previously mapped in a raster format or to assist in enforcement of closed areas. In total, 11,934 acres previously suitable for over-snow use will become unsuitable. Thus, for the FNF as a whole there would be no net increase in the percentage of lynx habitat designated as suitable for

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over-snow vehicle use. In fact, the proposed change will result in a net decrease of 927 acres of lynx habitat that is suitable for motorized over-snow use.

This proposed change to guideline HU G11 provides a strategy for management of over-snow motorized recreation that is more adaptive in the future, as compared to the current guideline for addressing designated routes/play areas and areas of consistent snow compaction. Overall, there would be no net increase in routes, groomed routes, or areas that are suitable for over-snow vehicle use across the FNF as a whole under the Revised Forest Plan. By limiting where snow compaction and disturbance could occur in the future, a small benefit to lynx and snowshoe hares might result. Changes to over-snow motorized use would go through site-specific consultation at the project level.

In summary, with the application of NRLMD objectives standards and guidelines (listed above), and lynx tolerance of human activities, we do not anticipate adverse effects of developed recreation sites on lynx. Further, the we do not anticipate the changes proposed to HU G11 to have additional adverse effects on the lynx since there will be a net decrease in lynx habitat open to over-snow vehicle use.

Effects of Roads and Trails on Lynx

General Effects

In general, construction and reconstruction of forest roads are not considered a primary threat to resident lynx populations in and of themselves (USFWS 2007). Construction of forest roads typically results in a small reduction of lynx habitat by removing forest cover. In some instances, vegetation along less-traveled roads provides good snowshoe hare habitat, and lynx may use the roadbed for travel and foraging (Koehler and Brittell 1990). McKelvey et al. (2000c) demonstrated that lynx show no preference or avoidance of unpaved forest roads and the existing road density did not appear to affect lynx habitat selection. Hence, forest roads and trails likely do not represent an impediment to lynx movements. Information suggests that lynx do not avoid roads (Ruggiero et al. 2000), except at high traffic volumes (Apps 2000).

Vehicle speeds on forest roads in the mountainous west are relatively slow in comparison to highways or other public roads due to topography, substrate and road conditions. Thus, the potential for lynx mortality or injury due to collisions with vehicles is low on forest roads in the west. Further research directed at investigating the effects of road density on lynx is needed. Roads and trails can also fragment habitat; these effects are addressed under Effects on Linkage Habitat (above).

Effects of the Action

Construction of roads and trails results in a small reduction of lynx habitat by removing forest cover. In some instances, vegetation along less-traveled roads provides good snowshoe hare habitat, and lynx may use the roadbed for travel and foraging. In general, forest roads with low vehicular or snowmobile traffic appear to have little effect on lynx seasonal resource-selection patterns in areas similar to the action area.

Under the Revised Forest Plan effects of roads and trials on FNF lands in lynx habitat will continue to be addressed through implementation of NRLMD guidelines ALL G1 and HU G6 through G9 (see Section C.2 for text of guidelines). Guideline ALL G1 directs the FNF to use underpasses and overpasses where possible when constructing highways, and HU G7 directs the FNF to avoid building permanent roads in areas identified as important for lynx connectivity. These guidelines will reduce the potential for the Revised Forest Plan to result in habitat fragmentation. Guidelines HU G6, G8 and G9 also reduce to potential for the Revised Forest Plan to impact lynx by directing the FNF to use methods that avoid or reduce effects to lynx with upgrading unpaved roads, building new project roads, and cutting brush along low-volume unpaved roads. These guidelines will reduce the effects to lynx by minimizing both human disturbance and habitat loss that may result from road construction or maintenance. In summary, with the application of the NRLMD guidelines and revised plan standards, roads and trails under the Revised Plan are not expected to result in adverse effects to lynx.

Further, a large portion of the LAUs are also within the NCDE recovery zone for grizzly bears on the FNF (See grizzly bear chapter of this BO for further details). Standards to maintain baseline densities of motorized routes in the grizzly bear primary conservation area and Salish demographic connectivity area also would limit potential risks to lynx associated with motorized public access.

Effects of Livestock Grazing on Lynx

General Effects

Snowshoe hare densities and overwinter survival appear to be positively correlated with understory density (Litvaitis et al. 1985). Livestock may compete with snowshoe hares for forage resources (Ruediger et al. 2000). Browsing or grazing also could impact plant communities that connect patches of lynx habitat within a home range. Throughout the Rocky Mountains and other regions of the west, grazing and browsing by domestic livestock and wild ungulates has been identified as a factor in the decline or loss of aspen as a seral species in subalpine forests (Barnett and Stohlgren 2001). The habitats used by snowshoe hare that are most likely to be affected by livestock grazing are riparian willow and aspen communities. Heavy grazing by domestic livestock that inhibited aspen regeneration and survival thus could impact snowshoe hare habitat, indirectly affecting lynx.

There is no existing research that provides evidence of lynx being adversely affected by grazing within the Northern Rockies/Cascade Mountains Region or elsewhere, or of lynx movements within home ranges being impeded by grazing practices (USFWS 2007). Overall, grazing or browsing by domestic livestock on federal lands is unlikely to reduce the snowshoe hare prey base or have a substantial effect on lynx (ILBT 2013).

Effects of the Action

Grazing or browsing by domestic livestock on FNF lands is unlikely to reduce the snowshoe hare prey base or have a substantial effect on lynx. However, grazing/browsing could have some localized effects on high elevation willow communities or aspen stands if not managed appropriately. Section C.2 describes existing Forest Plan and NRLMD direction that reduces the impacts of livestock grazing on lynx. The Revised Forest Plan will carry forward this direction.

Under the Revised Forest Plan, objective GRAZ 01 will provide direction that livestock operations should be compatible with maintaining lynx habitat on the FNF. Further, guidelines GRAZ G1 under the Revised Forest Plan will also maintain lynx habitat by guiding livestock operations in a manner that allows for shrub and tree regeneration following fire, long-term health of aspen stands, and maintenance of multiple vegetation stages in riparian and shrub-steppe habitats. These plan components will reduce the potential for livestock grazing to result in the loss of lynx habitat. In summary, with the application of the NRLMD guidelines and revised plan standards, livestock grazing under the Revised Plan is not expected to result in adverse effects to lynx.

Effects of Minerals and Energy Development on Lynx

General Effects

Generally, the impacts of mining and energy development on lynx result from the habitat loss and fragmentation. See Sections B.6 and C.2 for further discussion.

Effects of the Action

The effects of mining developments (habitat loss, roads, and human access) are addressed by the NRLMD guidelines HU G4, HU G5, HU G6, HU G9, and HU G12 (see Section C.2 for text of guidelines). The Revised Forest Plan will carry forward these components. Guidelines HU G5, G6 and G9 will reduce the potential for mineral and energy development activities to result in loss of lynx habitat by directing the FNF to develop reclamation plans that restore lynx habitat, and reclaim or decommission roads following project completion. The Revised Forest Plan will also reduce the potential for mineral and energy development to increase snow compaction through implementation of guidelines HU G4 and G12. These guidelines state that mineral and energy facilities should be encouraged to reduce snow compaction, and winter access to these sites should be through designated routes only.

In addition, the Revised Forest Plan will contain a “no surface occupancy” stipulation for any new leases within the Primary Conservation Area of Northern Continental Divide grizzly bear ecosystem (see grizzly bear chapter of this biological opinion for further details). This stipulation will further limit the potential for future mining and/or energy development to effect lynx, or lynx habitat.

Activities associated with exploration and development of leasable minerals, locatable minerals, and mineral materials could affect lynx by altering vegetation, contributing to habitat fragmentation, and compacting deep fluffy snow. However, with the application of the NRLMD guidelines and revised plan standards, we do not expect mineral and energy development under the Revised Forest Plan to result in adverse effects to lynx.

3. Analysis for Effects of the Action on Lynx Critical Habitat

Lynx critical habitat on the FNF lies within Critical Habitat Unit 3. Critical habitat on the FNF is a subset of the total mapped lynx habitat and so is mostly addressed under the NRLMD direction carried forward in the Revised Forest Plan. The Revised Forest Plan includes standards

and guidelines intended to avoid or reduce the potential for projects to adversely affect lynx. The primary focus of the standards and guidelines is to conserve and promote the *habitat* conditions needed to produce adequate snowshoe hare (lynx primary prey) at densities adequate to sustain lynx home ranges, and thus sustain lynx populations. Thus, the NRLMD direction being carried forward in the Revised Forest Plan addresses the habitat types, habitat components, and habitat conditions detailed and described in the lynx critical habitat PCE 1 (outlined in Section B.5).

Effects of Vegetation Management on Critical Habitat

General Effects

Vegetation management includes activities that change the composition and structure of vegetation to meet specific objectives, using such means as prescribed fire or timber harvest. For the purposes of this discussion, vegetation management does not include removing vegetation for permanent developments like mineral operations, ski runs, roads, and the like, and does not apply to fire suppression or wildland fire use.

The primary factors driving lynx populations, behavior, and distribution is the abundance and distribution of snowshoe hares. Vegetation management or natural fire can set back vegetation succession to an early stand initiation structural stage, which may be used by snowshoe hares during the summer but is snow-covered and thus unavailable to hares during the winter. Eventually these stands regenerate into a stand initiation structural stage, providing high stem densities and horizontal structure extending above the snowpack during winter, and become high quality snowshoe hare habitat, particularly in the summer (Squires et al. 2010, Kosterman 2014). Older forested stands also provide high quality habitat when they provide multi-story mature or late successional forests that provide high horizontal cover for both lynx and snowshoe hare (Murray et al. 1994, Squires 2010, Kosterman 2014). In Montana, these stands were used consistently by both lynx and snowshoe hare during the winter (Squires et al. 2010). These stands, along with stands in a stand initiation structural stage (including early stand initiation), provide the landscape mosaic of habitat conditions needed for snowshoe hare production and lynx foraging (hunting) habitat (Kosterman 2014), and thus provide for PCE 1a.

Effects of the Action

The Revised Forest Plan will carry forward four NRLMD objectives related to vegetation management that would improve the quality of lynx critical habitat by improving conditions for prey: (1) manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx (Objective VEG O1); (2) provide a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hare, and provide winter snowshoe hare habitat in both the stand initiation structural stage and in the mature, multi-story conifer vegetation (Objective VEG O2); (3) conduct fire use activities to restore ecological processes and maintain or improve lynx habitat (Objective VEG O3); and (4) focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover (Objective VEG O4).

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Vegetation management activities can result in a conversion of vegetation types. For example, if silvicultural prescriptions are designed to change species composition to western larch, which has a high economic value, and eliminate lodgepole pine, which has low economic value but provides better lynx habitat, that would negatively affect lynx critical habitat. However, prescriptions designed to maintain a diverse mix of species (e.g., sub-alpine fir, spruce) may be beneficial to lynx critical habitat. The Objectives VEG O1, O2, O3, and O4 reduce the potential for adverse effects to lynx from such conversions of habitat. Attainment of the vegetation management objectives through projects designed using vegetation management standards and guidelines would support lynx survival and recovery. With the application of these measures, we do not anticipate that the proposed action would adversely affect lynx critical habitat via habitat conversions within the action area.

Under the Revised Forest Plan, standards VEG S1, VEG S2, VEG S5, and VEG S6 would lead to attainment of the vegetation objectives described above by limiting the disturbance to snowshoe hare habitat and ensuring that enough habitat within each LAU would be available to provide lynx with sufficient snowshoe hare prey and lynx foraging habitat conditions (PCE 1a). Under standard VEG S1, if more than 30 percent of lynx habitat in an LAU is in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects. Additionally, standard VEG S2 requires that timber management projects shall not regenerate (i.e., change to stand initiation structural stage) more than 15 percent of lynx habitat within an LAU in a 10-year period. It is important to note that early stand initiation structural stages are not considered adverse if they occur in less than 30 percent of an LAU. Indeed, these young stands typically contain high stem densities and horizontal cover, which provides summer habitat and eventually grows into essential winter foraging habitat for snowshoe hares. Vegetation standards VEG S1 and VEG S2 promote a balance, a mosaic, of young and older stands within each LAU.

Thinning stand initiation structural stages can reduce horizontal cover that is critical to maintain the snowshoe hare prey base. High horizontal cover is important to hares and lynx. Reducing dense horizontal structure through silvicultural thinning would likely reduce an area's carrying capacity for snowshoe hares (Ruggiero et al. 2000). By deferring precommercial thinning that reduces snowshoe hare habitat until the stand no longer provides winter snowshoe hare habitat, standard VEG S5 ensures that stand initiation snowshoe hare and lynx habitat (PCE 1a) is not degraded. This standard protects and maintains the high stem densities that provide high quality snowshoe hare forage during summer and/or winter seasons and maintains the inherent capacity of the habitat to produce snowshoe hares and provide for PCE 1a.

Lynx preferentially forage in spruce-fir forests with high horizontal cover, abundant hares, deep snow, and large-diameter trees during the winter (Squires et al. 2010). The high horizontal cover found in multi-story conifer stands is a major factor affecting winter hare densities (Ibid.). During winter, snowshoe hares were consistently found in multi-story forest stands. These older, multi-story stands provide forage, hiding cover, and likely thermal cover for both snowshoe hares and lynx. Standard VEG S6 precludes vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests. This standard protects mature, multi-story habitat that provides a dense understory and high quality snowshoe hare

habitat and also maintains the inherent capacity of the habitat to produce snowshoe hares and provide for PCE 1a.

Guideline VEG G1 directs that vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey. In other words, emphasis should be on those stands that do not currently provide snowshoe hare habitat, which in turn may improve snowshoe hare habitat (PCE 1a) over the long-term. Adverse effects to lynx critical habitat are not anticipated as a result of treatments in a stem exclusion or similar stage. Such stands are characterized as having a closed canopy with limited understory, lacking dense cover preferred by hares and are generally not progressing towards year-round snowshoe hare habitat. Treatment of stem exclusion stands would open up the stands and encourage an increase in horizontal cover (understory regeneration). Thus, treatments in these stands do not reduce existing snowshoe hare habitat (PCE 1a) and have the potential to improve the habitat for snowshoe hares by either creating openings to allow understory growth or stimulating the regeneration of dense stands of young trees used by hares.

Vegetation management typically does not influence the overall winter conditions that provide and maintain deep fluffy snow for extended periods of time (PCE 1b), as such conditions are a function of topography and climate. However, actions may result in some level of localized snow compaction, which can promote an increase in use by competing predators or lynx. As explained further in the recreation section, we have no evidence that snow compaction facilitates competition to a level that negatively affects lynx. Further minimizing the potential for snow compaction related to vegetation management, guideline VEG G4 directs that prescribed fire activities should not create permanent travel routes that facilitate snow compaction and that constructing permanent firebreaks on ridges or saddles should be avoided. Thus, while vegetation management may affect PCE 1b to some degree via localized snow compaction, we expect any effects would be insignificant.

Guideline VEG G5 is focused on habitat for alternate prey species, primarily red squirrel and directs that such habitat should be provided in each LAU. Red squirrel habitat typically contains snags and downed wood, generally associated with mature or older forests, which may be used by lynx for denning (PCE 1c) if the required components are provided and it is in close proximity to snowshoe hare habitat. Guideline VEG G11 directs that denning habitat (PCE 1c) should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees (“jack-strawed” piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future. Denning habitat elements are generally found distributed across the Forests. Vegetation management projects may result in localized effects to PCE 1c by removing existing coarse woody material and/or affecting its recruitment. This can affect the quality and quantity of available lynx denning habitat (PCE 1c). In most cases, denning habitat is not known to be limited within lynx habitat in the action area, and the vegetation management objectives, standards, and guidelines either directly or indirectly promote the development and retention of adequate amounts of denning habitat. In the cases where PCE 1c may be affected by vegetation

management, guidelines VEG G5 and VEG G11 would apply and would minimize the potential for effects by requiring that such habitat be provided and well distributed. Therefore, vegetation management is unlikely to result in adverse effects to PCE 1c.

While vegetation management direction in the Revised Forest Plan does not include standards and guidelines specific to matrix habitat (PCE 1d), we do not expect vegetation management activities that are implemented under the Revised Plan to have adverse impacts on PCE 1d. As described in the 2014 lynx critical habitat final rule, activities in matrix habitat that change vegetation structure or conditions would not be considered an adverse effect to lynx critical habitat unless those activities would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range, or if they would adversely affect adjacent foraging habitat or denning habitat (FR 79 54827). While vegetation management activities may affect vegetation within PCE 1d, we do not expect that such activities would affect the ability of a lynx to travel through such habitat because vegetation management is not likely to create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential lynx home range. As such, the effects from vegetation management that occur within PCE 1d would be insignificant.

In addition to the vegetation management standards, standard ALL S1 also applies to vegetation management projects in that vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area. Having this standard apply to each LAU (which represents a lynx home range) would maintain connectivity among LAUs and throughout the larger landscape, thus minimizing the potential impacts to habitat connectivity and linkage areas from vegetation management. We do not expect habitat connectivity or linkage to be adversely affected from vegetation management projects.

Based on the best available information, the Service concludes that the Revised Forest Plan would conserve the most important components of lynx critical habitat: a mosaic of early and mature multi-story forests with high levels of horizontal cover and structure. These components ensure habitat that maintains its inherent capability to support both snowshoe hare prey base and adequate lynx foraging habitat (PCE 1a) and denning habitat (PCE 1c). These standards and guidelines are applicable to all vegetation management actions on at least 94 percent of mapped lynx habitat within the action area. As analyzed below, areas within the WUI (totaling approximately six percent of mapped lynx habitat) are exempt from the standards; however guideline VEG G10 would apply and requires consideration of the standards in designing fuel treatment projects. Where these standards and guidelines are applied to vegetation management projects, we anticipate few projects, if any, would have adverse effects on lynx critical habitat. Collectively, application of the vegetation management standards and guidelines is expected to avoid most adverse effects to lynx critical habitat and the PCE would continue to serve its intended conservation role for lynx. The physical and biological features would not be altered to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

Exemptions to Vegetation Standards

The Revised Forest Plan would protect existing lynx habitat that provides PCE 1a except for allowed exemptions to the vegetation standards within the wildland-urban interface, and allowed exceptions for other resource purposes listed under VEG S5 and VEG S6. Exemptions to standards VEGS1 and VEGS2 are allowed for fuel treatment projects within the WUI, subject to a cumulative limit of no more than 6 percent of lynx habitat on the FNF (USFWS 2007). The WUI is defined in the NRLMD as the area adjacent to an at-risk community that is identified in a community wildfire protection plan. If there is no community wildfire protection plan in place, the WUI is the area 0.5 mile from the boundary of an at-risk community or within 1.5 miles of the boundary of an at-risk community under special conditions (USFS 2007). Additionally, fuels treatment projects may not result in more than three adjacent LAUs exceeding the standards. This requirement helps to ensure actions that would remove understory vegetation and reduce the quantity or quality of hare habitat within boreal forest stands do not occur disproportionately in one portion of lynx critical habitat. Figure 34 displays critical habitat in relation to the current WUI within the geographic areas of the FNF.

The maximum exemption area for treatment in the WUI is 103,800 acres for the FNF. Lynx critical habitat totals about 2.2 million acres of NFS lands on the FNF, so cumulative WUI exemptions could be used on approximately five percent of critical habitat across the FNF. As of 2017, about 0.4 percent of critical habitat had been affected by WUI exemptions (USFS 2017). Fuels treatments under the WUI exemption may result in adverse effects to lynx critical habitat by reducing the density of the understory that provides PCE1a. The maximum amount of remaining lynx critical habitat providing PCE1a the FNF can treatment in the WUI is 94,250 acres. This means that implementation of the Revised Forest Plan may adversely affect PCE 1a on an additional 4.3 percent of critical habitat across the FNF over the life of the plan, which is anticipated to be 15 years.

Exceptions to Vegetation Standards

Under the Revised Forest Plan, the acreage that could be treated under the existing exceptions to VEG S5 and VEG S6 (based upon incidental take determined during NRLMD consultation; USFWS 2007) may be increased relative to estimates provided in 2007. In total, the FNF is proposing that a maximum total of 15,460 acres will be treated using exceptions to standards VEG S5 and VEG S6. This estimate is an increase over what was originally allowed under the 2007 NRLMD biological opinion (1,460 acres) and includes treatment acres for the newly proposed VEG S6 exception. In detail, these totals will be distributed as follows:

- 500 acres for defensible space (VEG S5/S6 existing exception 1)
- 1,510 acres for research studies and genetic tree tests (VEG S5/S6 existing exception 2)
- 1,800 acres for conifer removal or daylight thinning of aspen (VEG S5 existing exception 4)

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- 4,750 acres for daylight thinning of planted, rust-resistant western white pine (VEG S5 existing exception 5)

- 2,500 acres to restore whitebark pine in wildfire areas and forests with sapling-size trees (VEG S5 existing exception 6)

- 4,400 acres for non-commercial felling within 200 feet of existing whitebark pine trees (VEG S6 ***new*** exception: see detail below)

In the Revised Forest Plan, the vegetation exception categories under the existing Forest Plan would remain in place with one forest-specific change. An additional exception to VEG S6 would allow non-commercial felling of trees within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. Since this is non-commercial felling, trees will be left on-site and will continue to provide some degree of horizontal cover and denning material. This new exception to VEG S6 would be anticipated to remove understory vegetation and reduce the quality of snowshoe hare habitat within about 4,400 acres of boreal forest stands, affecting about 0.2 percent of Canada lynx critical habitat, a minor amount. Further, the estimate of 4,400 acre makes up the entire stand of whitebark pine, but clearing will only occur within 200 feet of desireable trees. As a result, the acres of habitat treated will actually be much less than the 4,400 acres.

As previously analyzed during the consultation for the NRLMD, the Forest anticipates that the overall acres will be constrained but that there will be flexibility as to which exception categories are used in order to respond to changing conditions and needs. Use of exceptions to standards VEG S5 and VEG S6 may result in an adverse effect to PCE 1a. As mentioned above, the Revised Forest Plan will allow these exceptions to be used on a maximum of 15,460 acres of lynx critical habitat over the life of the plan (15 years). This represents less than one percent (0.7 percent) of critical habitat on the FNF.

Summary of Effects of Exemptions and Exceptions on Critical Habitat

The conservation role of lynx critical habitat is to support viable core area lynx populations. The activities that treat PCE 1a may have adverse effects on lynx critical habitat by reducing snowshoe hare forage and numbers. Snowshoe hare forage would be diminished primarily through the removal of the dense horizontal structure of natural forest succession phases and/or altering the mosaics of the forested landscape in localized areas.

Although the exemptions from and exceptions to vegetation management standards may result in some adverse effects to lynx critical habitat, vegetation objectives, standards, and guidelines overall would contribute to creating and maintaining landscape patterns that sustain snowshoe hare and lynx populations. No permanent loss (such as paving or building construction) of habitat or conversion of the boreal forest would occur as a result of vegetation management under the NRLMD direction carried forward in the Revised Forest Plan. The habitat would retain its inherent capacity to regenerate. Some vegetative treatments may degrade the function of the PCE by delaying the development of high density snowshoe hare habitat through succession; however, they do not remove the PCE from the site. Such actions may change the

successional stage of a stand, but do not affect that stand's potential to produce snowshoe hare habitat in the future. Although vegetation management under the Revised Forest Plan may adversely affect areas of critical habitat, specifically PCE 1a, lynx critical habitat is expected to remain capable of producing adequate densities of snowshoe hares to support continual lynx presence and would continue to serve the intended conservation role for lynx. The physical and biological features would not be altered to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

Effects of Habitat Fragmentation on Critical Habitat

The Revised Forest Plan will promote maintenance and improvements in connectivity to the extent that the FNF has authority to influence or control actions that affect connectivity. Connected forest habitats allow lynx to move long distances to find food, cover, and mates.

In addition to objectives, standards, and guidelines related to site-specific actions, the following objective, standard, and guidelines apply within linkage areas in occupied habitat, subject to valid existing rights. Such management direction is incorporated to improve connectivity. Objective Link O1 directs the FNF to work with landowners in areas of intermingled land ownership to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. Standard LINK S1 requires the FNF to identify potential highway crossings when highway or forest highway construction or reconstruction is proposed in linkage areas. In addition, guideline LINK G1 guides the FNF to retain Forest land in public ownership and guideline LINK G2 guides management of livestock grazing in shrub steppe habitats to contribute to maintaining or achieving a preponderance of mid- to late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.

In addition, standard ALL S1 addresses the impacts to lynx critical habitat from loss of connectivity within occupied habitat in the action area. Standard ALL S1 requires that new or expanded permanent developments and vegetation management projects in a LAU or linkage area maintain habitat connectivity. Thus, under this standard, FNF actions will not be permitted to degrade connectivity in lynx habitat or in linkage areas.

The objective, standards, and guidelines described above would reduce or minimize the potential for effects to lynx in most cases, and therefore the Revised Forest Plan would ultimately conserve adequate connectivity with occupied lynx critical habitat. The specific effects of projects that may impact connectivity would be analyzed during project-specific consultation. Squires et al. (2013) concluded that while changes to habitat structure can affect lynx movement, there is no evidence that genetic isolation is an issue. We do not anticipate that implementation of the Revised Forest Plan would result in adverse impacts to lynx connectivity. Such actions are not likely to create a barrier or impede lynx movements. Thus, linkage and connectivity within lynx critical habitat would continue to serve their intended conservation role for lynx. The physical and biological features would not be altered to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

Effects of Recreation on Critical Habitat

General Effects

Dispersed winter recreational uses and activities, such as snowmobiling, cross-country skiing, and snowshoeing also occur within lynx critical habitat. The range of lynx is restricted to forested areas with deep snow conditions (PCE 1b) during the winter. Lynx evolved in and are highly adapted to a boreal forest environment. Morphologically, lynx are well-adapted to hunting snowshoe hares in deep snow (Murray and Boutin 1991) in densely forested environments. Lynx have very large feet in relation to body mass, which prevents them from sinking deep into snow. This provides lynx with an inherent competitive advantage over many other mammalian carnivores in deep snow conditions. Their primary prey, snowshoe hare are also adapted to living in dense boreal forests in areas with abundant snow. Within the last century, coyotes have expanded their range from western and central prairie regions in North America to forests of the east and far north. Morphologically, coyotes are at a disadvantage hunting in high snow areas, as their feet are fairly small in relation to body mass and they therefore sink into soft snow (Murray and Boutin 1991).

To date, research has confirmed that lynx and coyote populations coexist, despite dietary overlap and competition for snowshoe hare and alternate prey species. In some regions and studies, coyotes were found to use supportive snow conditions more than expected, but none confirm a resulting adverse impact on lynx populations in the area. The best scientific information from within the action area, an area populated by both lynx and coyotes, concludes that coyotes did not require compacted snow routes to access winter snowshoe hare habitat (ILBT 2013). In the final rule (March 24, 2000; 65 FR 16052), snow compaction created by human activities was not found to be a threat to the lynx DPS. Currently there is no evidence that packed snow trails facilitated competition to a level that negatively affects lynx or lynx populations.

Winter dispersed recreation such as snowmobiling is unlikely to affect PCE 1a, 1c, or 1d. Insignificant effects to PCE 1b may indirectly occur via snow compaction. However, while snow compaction may occur, the areas of compaction are localized and snow compaction does not impact the overall ability for winter condition to provide and maintain deep fluffy snow for extended periods of time. Thus, adverse effects from winter dispersed recreation are not anticipated.

Developed recreation can result in the direct loss of lynx critical habitat, and depending on the structural stage, could affect PCE 1a, 1c, and/or 1d. Large developed sites, such as four-season resorts, alters lynx habitat, results in direct loss of lynx habitat on the footprint of the development itself, and may fragment habitat depending upon size and location. Developments such as ski areas result in permanent loss of lynx habitat through the development of permanently groomed runs and resort infrastructure, such as lift termini, buildings and roads. Some loss of lynx habitat is unavoidable with development, but at larger scales (e.g., Forest-wide), relatively small areas are affected. The most serious impact of ski or four-season resort development is the associated private land development at the base, with resulting increases in highway traffic, speeds, and surrounding development. Such development can impact connectivity between areas of lynx habitat, typically valley bottoms between mountain ridges.

Effects of the Action

The proposed action includes objective HU O1 to maintain the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat. In addition, recreation activities should be managed to maintain lynx habitat and connectivity (Objective HU O2) and rather than developing new areas in lynx habitat, activities should be concentrated in existing developed areas (Objective HU O3). The NRLMD Guideline HU G11 will be modified in the Revised Forest Plan (see Table IV-11). Further, guideline HU G12 limits winter access for non-recreation special uses and mineral and energy exploration and development to designated routes or designated over-the-snow routes.

The Revised Forest Plan will carry forward NRLMD objectives, standards, and guidelines that address the most serious consequence of development, requiring new or expanding permanent developments to maintain or where possible, promote habitat connectivity within LAUs and linkage areas (Objective All O1, Standard All S1, Guideline All G1, Objective LINK O1, and Standard LINK S1). Recreational activities should be managed to maintain lynx habitat and connectivity (Objective HU O1), with activities concentrated in existing developed areas, rather than developing new areas in lynx habitat (Objective HU O3). Objective HU O4 provides for lynx habitat needs and connectivity when developing new or expanding existing developed recreation sites or ski areas.

The Revised Forest Plan will also carry forward several guidelines from the NRLMD that will reduce impacts within the development itself, including: adequately sized inter-trail islands that support winter snowshoe hare habitat (Guideline HU G1), providing foraging habitat for lynx that is consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes (Guideline HU G2), provide for lynx movement and maintain the effectiveness of lynx habitat (Guideline HU G3), and consider the location of access roads and lift termini to maintain and provide lynx security habitat if identified as a need (Guideline HU G10).

Although effects to winter snow conditions (PCE 1b) (via compaction) and denning habitat (PCE 1c) may occur from new developments, we do not anticipate the effects to be adverse because overall winter conditions are not influenced and denning habitat is not limited. We also do not anticipate adverse effects to matrix habitat (PCE 1d) because the scale of disturbance is not expected to create a barrier or impede lynx movement within an LAU.

The main effect of non-winter recreation is disturbance to lynx rather than effects to habitat. Due to the low susceptibility of lynx to displacement by humans, this activity presents low risk of effects to how lynx use critical habitat. Effects to the PCE from non-winter dispersed recreation, including effects to 1a, 1b, 1c, and/or 1d, are not likely to adversely impact lynx critical habitat.

In summary, although areas of lynx critical habitat may be adversely affected by recreation management such as ski areas, the Revised Forest Plan has objectives, standards, and guidelines to reduce the potential impacts and lynx critical habitat would continue to serve the intended conservation role for lynx. The physical and biological features would not be altered as a result

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of recreation management to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

Effects of Roads and Trails on Critical Habitat

General Effects

Non-highway roads on NFS lands rarely receive motorized use at levels that create barriers or impediments to lynx movements. Lynx have been documented using less-traveled roadbeds for travel and foraging (Koehler and Brittell 1990). In Montana, Squires et al. (2010) concluded that roads with use levels that are low had little effects on how lynx used seasonal resources. Lynx show no preference or avoidance of unpaved forest roads, and the existing road density does not appear to affect lynx habitat selection (McKelvey et al. 2000). The best information suggests that the types of roads managed by the Forest Service do not likely adversely affect lynx. Lynx mortality from vehicle strikes are unlikely, and to date have not been documented on Forest lands in the action area given the relatively slow speeds at which vehicles on these roads travel (due to topography and road conditions) and generally low traffic volumes. Any new permanent road construction may affect lynx critical habitat. The relatively small amount of snowshoe hare habitat (PCE 1a) affected within the route prism would be minor and likely insignificant. Temporary routes constructed in snowshoe hare habitat may also have minor impacts on the PCE. However, temporary routes are restored and/or decommissioned such that effects are temporary and not permanent and vegetation grows back. Furthermore, the amount of vegetation and area impacted for the linear structures tends to be limited. Thus, impacts to the PCE and its components would likely be insignificant as a result of new road construction.

Effects of the Action

To reduce highway effects on lynx, objective HU O6 directs the FNF to work cooperatively with other agencies to provide for lynx movement and habitat connectivity and to reduce the potential of lynx mortality. While this objective relates to highways, which typically do not occur on NFS land, it encourages cooperation with other agencies in order to reduce the potential for effects. The Revised Forest Plan will carry forward several NRLMD guidelines relate to potential impacts of roads, including upgrading (Guideline HU G6), new permanent roads (Guideline HU G7), cutting brush (Guideline HU G8), and new roads built for project use (Guideline HU G9). These guidelines generally discourage improving road access for people and minimize impacts of road construction (permanent and/or temporary) and maintenance on lynx critical habitat.

As described in the critical habitat final rule (79 FR 54823) human-made structures including paved and gravel roadbeds, parking lots, and other structures that lack the PCE for the lynx, are not intended to be designated as critical habitat and have been excluded by text. While the roadbed itself may not be designated as lynx critical habitat, it can affect the way lynx use the adjacent habitat. However, based on the information above, we do not anticipate any effects to lynx critical habitat related to roads to be significant or adverse. Lynx critical habitat would continue to serve the intended conservation role for lynx. Forest roads would not alter the physical and biological features to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function

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Effects of Livestock Grazing on Critical Habitat

General Effects

Livestock may compete with snowshoe hares for forage resources (Ruediger et al. 2000). Browsing or grazing also could impact plant communities that connect patches of lynx habitat within a home range. Snowshoe hare habitat such as riparian willow and aspen communities are most likely to be affected by grazing (ILBT 2013). Conversely, appropriate grazing management can rejuvenate and increase forage and browse in some habitats. At the time of the lynx listing, the Service found no evidence that grazing was a factor threatening lynx, therefore, grazing was not addressed in the final lynx listing rule (March 24, 2000; 65 FR 16052). Overall, grazing is not likely to reduce the snowshoe hare prey base or have substantial effects on lynx (ILBT 2013). As such, there is no existing research that provides evidence of lynx critical habitat being adversely affected by grazing, or of lynx movements within home ranges being impeded by grazing practices.

Effects of the Action

The FNF's Revised Forest Plan will contain one objective and four guidelines related to livestock management. As with other plan components, these are being carried forward from the NRLMD. Objective GRAZ O1 directs the FNF to manage livestock grazing to be compatible with improving or maintaining lynx habitat. The Revised Plan would reduce the potential for grazing to affect lynx critical habitat through the guidelines for livestock management practices that provide for: regeneration of trees and shrubs (guideline GRAZ G1), aspen stands (guideline GRAZ G2), riparian areas and willow cars (guideline GRAZ G3), and shrub-steppe habitats (guideline GRAZ G4). These guidelines should adequately minimize the potential for effects of grazing to lynx critical habitat and may improve the habitat over baseline conditions. The quality and quantity of snowshoe hare habitat (PCE 1a) would not be significantly diminished as a result of grazing livestock. Livestock management is not likely to affect snow conditions (PCE 1b). Effects to lynx denning habitat (PCE 1c) would likely be none to very negligible. Impacts to matrix habitat (PCE 1d) would not create a barrier or impede lynx movement within a potential home range.

With implementation of the plan components outlined above, the effects of grazing across the action area would be minimal and livestock management under the Revised Forest Plan is expected to either have no effects to lynx critical habitat or have insignificant and/or discountable effects to lynx critical habitat depending on site-specific information. Thus, the PCE and its components (PCE 1a, 1b, 1c, and 1d), would not be significantly affected. Lynx critical habitat would continue to serve their intended conservation role for lynx. Grazing would not alter the physical and biological features to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

Effects of Minerals and Energy Development

General Effects

Mining, oil and gas exploration, and production can result is habitat loss and fragmented. These effects of these activities are similar to other development: loss of boreal forest; construction of

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roads, railroads, and transmission lines; and increased human access and disturbance where lynx occur.

Effects of the Action

Mining and energy development on the FNF may directly impact lynx critical habitat. New development could result in small, localized effects to lynx critical habitat, including PCE 1a, 1c, and or 1d. The Revised Plan will contain objective HU O5 which directs the FNF to manage human activities, such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors, to reduce impacts on lynx and lynx habitat. The Revised Plan also contains the following three guidelines that would minimize the potential impacts of mineral and energy development on lynx critical habitat by remote monitoring to reduce snow compaction (HU G4), reclamation plans that restore lynx habitat (HU G5), and limitations on winter access to designated routes or designated over-the snow routes (HU G12).

With the application of these measures, the mineral and energy development would likely result in either no effects or only minor, insignificant effects to lynx critical habitat depending upon the scale of development. Lynx critical habitat would continue to serve its intended conservation role for lynx. Mineral and energy development would not alter the physical and biological features to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

4. Summary of Response to the Proposed Action

Lynx Response to the Proposed Action

The final rule listing lynx as a threatened species (March 24, 2000; 65 FR 16052) concluded that the primary factor threatening the lynx DPS is the inadequacy of existing regulatory mechanisms, specifically, the lack of guidance for conservation of lynx in federal land management plans. The NRLMD biological opinion (USFWS 2007) concluded that the programmatic and project-level objectives, standards, and guidelines in the amended Forest Plans provide comprehensive conservation direction adequate to reduce adverse effects to lynx from Forest management and to preclude jeopardy to the lynx DPS. The Revised Plan incorporates the continued implementation of the NRLMD on the FNF. In addition, the Revised Plan would implement two FNF-specific modifications that affect lynx, and upon review of the Revised Plan in its entirety, our conclusions remain the same as in 2007 (USFWS 2007): most actions in lynx habitat that are in compliance with the NRLMD would avoid or substantially reduce adverse effects on lynx in the action area.

Conservation of snowshoe hares and their habitat is of prime importance to sustaining lynx populations. Forest management under the Revised Plan has the potential to reduce the quality and quantity of snowshoe hare habitat. The Revised Plan incorporates the continued implementation of the vegetation management direction contained in the NRLMD on the FNF, with one additional resource exception (i.e., whitebark pine).

The NRLMD vegetation objectives, standards, and guidelines conserve snowshoe hare habitat, and avoid or minimize the effects on lynx and on most lynx habitat in the action area. The Revised Plan includes exemptions and exceptions to the standards that allow adverse effects on

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snowshoe hare and lynx habitat. However, the Revised Plan limits the total acres that may be treated under the exemptions and exceptions in the future to no more than 93,723 acres and 15,460 acres of lynx habitat for the anticipated life of the plan (15 years), respectively. Combined, no more than six percent of lynx habitat on the FNF could be treated in ways that adversely affect lynx, or snowshoe hare, or lynx habitat. In addition to implementing the NRLMD, the Revised Forest Plan would maintain or improve vegetative desired conditions for lynx and their prey in the long-term by providing for more resilient and resistant vegetative conditions and allowing natural disturbance processes to function nearer to historical conditions (USFS 2017). This means that adverse effects would be avoided on about 94 percent of lynx habitat on the FNF, which would maintain the landscape mosaic of habitat conditions needed for snowshoe hare production. Thus, we expect that lynx and within the action area will respond favorably to the management under the Revised Plan and that implementation of the Revised Plan will provide for the recovery of lynx in the action area.

As discussed above, this biological opinion considers the effects of implementation of the the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

Critical Habitat Response to the Proposed Action

Conservation of snowshoe hares and their habitat is of prime importance to sustaining lynx populations. Forest management actions have the potential to alter boreal forest landscapes that support a mosaic of differing successional forest stages (PCE 1); and may adversely affect the quality and quantity of PCE 1a (snowshoe hare habitat). Forest management actions may also affect PCE 1d (snow conditions), PCE 1c (denning habitat) and PCE 1d (matrix habitat), but adverse effects to these PCE components are not expected. Overall, the Revised Plan avoids or minimizes most adverse effects on lynx critical habitat and supports the PCE.

The majority of adverse effects to lynx critical habitat from implementation of the Revised Forest Plan would come from the exemptions from (fuel treatment projects in the WUI) and exceptions to (activities for other resource benefit) the vegetation standards. Other than vegetation management, many activities authorized by Forests will have relatively minor or less substantial impacts on lynx critical habitat. A limited number of actions where third parties are involved, such as ski area expansions and development, may also have adverse effects on lynx critical habitat. The likelihood of this occurring is low, but if such activities were to occur, the effects specific to such activities would be analyzed in site-specific analysis.

We anticipate adverse effects to lynx critical habitat only from the actions proposed under the Revised Forest Plan that occur within lynx foraging habitat, PCE 1a (snowshoe hare habitat). A maximum of 94,250 acres of lynx critical habitat that provides PCE1a could be treated using WUI exemptions to the vegetation standards, and a maximum of 15,460 acres that provide for lynx critical habitat PCE 1a could be treated using other resources exceptions to the vegetation standards. This represents less than five percent of critical habitat on the FNF. Potential treatments could occur for the life of the Revised Forest Plan, which is anticipated to be 15 years.

We do not anticipate adverse effects to critical habitat as a result of the treatments in stem exclusion stands that do not provide snowshoe hare habitat, winter snow conditions (PCE 1b), areas that provide PCE1c (denning habitat), or areas that provide PCE1d (matrix habitat). Although the exemptions from and exceptions to the vegetation management standards may result in some adverse effects to lynx critical habitat, vegetation objectives, standards, and guidelines overall would contribute to creating and maintaining landscape patterns that sustain snowshoe hare and lynx populations. The habitat would retain its inherent capacity to regenerate. Vegetation management under the Revised Forest Plan may adversely affect areas of critical habitat, specifically PCE 1a. However, critical habitat on the FNF is expected to remain capable of producing adequate densities of snowshoe hares to support continual lynx presence and would continue to serve their intended conservation role for lynx. Thus, the physical and biological features would not be altered to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

As discussed about, this biological opinion considers the effects of implementation of the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

F. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Past and present impacts of non-Federal actions are part of the environmental baseline, as are the impacts of Federal activities that have undergone section 7 consultation. This analysis addresses the potential cumulative effects on lynx, lynx habitat, and critical habitat in the action area.

While activities such as recreation, minerals and energy management, forest/backcountry roads and trails, and grazing by domestic livestock may affect individual lynx, they are not expected to have adverse effects. Substantial effects on the overall lynx population are unlikely.

The Montana Department of Natural Resources and Conservation (DNRC) manages the Stillwater State Forest, the Coal Creek State Forest, and the Swan State Forest, as well as sections acquired from Plum Creek Timber Company in the Swan Valley. In a record of decision on the proposed issuance of a permit to DNRC authorizing incidental take of endangered and threatened species on forested trust lands in western Montana, the Service concluded that removal of winter foraging habitat from scattered DNRC parcels in occupied habitat would not result in adverse effects on lynx for the following reasons: (1) scattered parcels in occupied lynx habitat support about 13 percent (11,600 acres) of the total winter foraging habitat in the project area, (2) the anticipated 230 acres of annual harvest of winter foraging habitat would be spread across more than 11,600 acres of winter foraging habitat on scattered parcels in occupied habitat, (3) the amount of occupied habitat treated would likely represent a small proportion of a lynx home range and would not be enough to measurably reduce snowshoe hare productivity in the home range, and (4) viable lynx habitat would be retained through implementation of DNRC commitments under their habitat conservation plan, combined with the availability of habitat on adjacent LAUs where standards on federal lands regulate treatments of winter foraging habitat in multistoried stands (USFWS 2011a). Where practicable, DNRC will consider harvest unit designs at the project level to maintain a connected network of suitable lynx habitat along riparian areas, ridge tops, and saddles that connect third-order drainages. Measures for grizzly bears that will limit the size of forest openings that can be created through timber harvesting, as well as measures for secure cover, will also provide habitat connectivity for Canada lynx.

Private lands represent a small fraction of lynx habitat, and the final rule listing the lynx as a threatened species did not find that present conditions on private lands threaten the lynx. Most private lands within the FNF geographic areas are at elevations too low to support lynx foraging, but lynx do cross through these areas. There is a potential for future management to have negative effects on lynx, although the Service concluded that some of the negative effects would be moderated by federal land management within the large landscapes inhabited by an individual lynx (USFWS 2007). Fuels treatments and fire suppression that occurs in lower montane forests where many private lands occur can help to control wildfires that have the potential to spread up in elevation into lynx habitat.

There are some private parcels along the Middle Fork and North Fork of the Flathead River, in the Swan Valley, and Stillwater Valley near Olney. These areas are at elevations suitable for lynx. Some of these landowners are clearing vegetation to reduce the risk of wildfire, which may reduce the potential for lynx foraging, although whether lynx would forage in close proximity to human dwellings, dogs, etc. is unknown. Former Plum Creek Timber Company lands in the Stillwater River watershed are now managed by Weyerhauser. In this watershed, vegetation management, including timber harvest and precommercial thinning, is likely to continue. These activities may decrease habitat quality for lynx, depending upon the specific location, rate, and type of treatment. In addition to private lands, lynx and lynx habitat also occur on the Flathead Reservation south of Kalispell, Montana. The Confederated Salish and Kootenai Tribe

incorporated the Lynx Conservation Assessment and Strategy (ILBT 2013) into their management plans, which helps to minimize adverse effects on those lands.

On state and private lands with lynx critical habitat, vegetation projects, fuel treatment projects, mineral extraction, oil and gas exploration, urban and rural development, recreation site construction and use, road construction, and utility corridors all have the potential to affect the PCE and its components. Some snowshoe hare habitat (PCE 1a) may be temporarily reduced in quantity and/or quality or may be permanently lost to development. The cumulative effects to PCE 1a may range from insignificant to adverse depending on site-specific conditions and actions. Some non-federal actions may slightly impact localized snow conditions (PCE 1b) via snow compaction. However, we do not expect such actions to significantly affect the overall winter conditions that provide and maintain deep fluffy snow for extended period of time. Some non-federal actions may reduce the availability of den sites (PCE 1c) through removal of coarse woody debris. Because denning habitat is not limiting throughout the action area, any cumulative effects to PCE 1c would be insignificant. Vegetation management and/or development of private lands to support increased human populations will likely continue and may reduce habitat connectivity in matrix habitat (PCE 1d). Since new developments would likely occur at lower elevations and because the amount of private land within the action area is very small, we do not expect such actions would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within in a potential lynx home range. Thus, cumulative impacts to PCE 1d would likely be insignificant.

Not all lands would be developed or used in ways that have negative impacts on lynx critical habitat. Combined, private lands developed or used in ways that would have negative impacts on lynx critical habitat would constitute a fairly small proportion of lynx critical habitat within the action area. At elevations suitable for lynx, non-federal lands are scattered throughout the action area and comprise a fairly small portion of the action area relative to the large LAU landscape required by an individual lynx to support its home range. Many non-federal lands are and would be adjacent to or interspersed with Forest Service land, and therefore some of the potential negative effects on the private parcels would be moderated by federal land management. Therefore, we anticipate that the lynx critical habitat within the action area would retain its current ability for the PCE to function and critical habitat would continue to serve its intended conservation role for the species.

The state of Montana prohibits trapping of lynx; however, legal trapping of other species occurs in Montana and lynx could be unintentionally injured or killed, incidentally. Poaching may also occur. More restrictive trapping regulations were implemented in 2008, and we believe that the potential magnitude of this effect has decreased. Some lynx home ranges overlap the international border, making those lynx susceptible to harvest because Canada has a legal trapping season for lynx.

This biological opinion considers the effects of implementation of the proposed framework of the Revised Forest Plan. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on Canada lynx and critical habitat, which will include a project-specific cumulative effects analysis.

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G. CONCLUSION

1. Conclusion for Lynx

After reviewing the current status of the Canada lynx, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is the Service's biological opinion that the effects of the proposed FNF Revised Forest Plan are not likely to jeopardize the continued existence of the Canada lynx.

Regulations implementing section 7 of the Act define "jeopardize the continued existence of" as: "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." (50 CFR 402.02). The best information suggests that implementation of the Revised Forest Plan would not appreciably reduce the likelihood of survival and recovery of Canada lynx. Our conclusion is based on the literature and information referenced in this document, meetings and discussions with FNF, discussions with Canada lynx experts, the information in the biological assessment (USFS 2017), and information in our files.

We find that although adverse effects are likely to some individual lynx, the proposed action is expected to support and sustain lynx populations within the action area, the FNF, and so is not reasonably expected to reduce appreciably the likelihood of both the survival and recovery of lynx populations in the wild. The Revised Plan elements include measures to maintain the habitat mosaic, structure, and components required to support lynx and their primary prey, the snowshoe hare. Further, in this biological opinion, we determined that the FNF's Revised Forest Plan is compatible with our understanding of recovery needs for lynx.

The following are key findings, which are discussed in detail in the preceding sections of this biological opinion:

- Timber production and vegetation management in lynx habitat would be subject to standards VEG S1, S2 (described above), S5 and S6, which prohibit pre-commercial thinning that reduces snowshoe hare habitat unless certain conditions are met; and prohibit reduction of snowshoe hare habitat in multi-story mature or late successional forests, with certain exemptions or exceptions. The guidelines would further limit effects on lynx from vegetation management projects by requiring projects be planned to: recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available (VEG G1); provide habitat for alternate prey species, primarily red squirrel, in each LAU (VEG G5); and provide denning habitat distributed in each LAU (VEG G11).

- Prescribed fire in lynx habitat may be conducted under standard VEG S6. This standard prohibits vegetation management projects (including prescribed fire) that reduce snowshoe hare habitat in multi-story mature or late successional forests with certain exemptions or exceptions such as treatment around administrative sites, for research studies, or for incidental removal during

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salvage. This standard would greatly limit the number of prescribed fires that could reduce the amount of this high quality snowshoe hare habitat type. Further at the project level, guideline VEG G4 would limit prescribed fire activities such that permanent travel routes that facilitate snow compaction are not created and constructing permanent firebreaks on ridges or saddles are avoided (VEG G4).

- Most adverse effects on lynx will be associated with vegetation management projects such as precommercial thinning or timber harvest that use exemptions to and/or exceptions from the vegetation standards in the Revised Forest Plan.

- The Revised Forest Plan may result in adverse effects to lynx, primarily from the following actions on up to 6 percent of the Forest:

    - Future fuels management projects that are exempted from vegetative management standards inside WUI on up to 93,723 acres of mapped lynx habitat on the FNF; and

    - Future exceptions to vegetative standards for other resource benefits (e.g., whitebark pine restoration) on up to 15,460 acres.

- Snowshoe hare and lynx habitat will be conserved on at least 94 percent of mapped lynx habitat within the action area. The Revised Forest Plan would promote forested landscape patterns and connectivity designed to maintain or restore lynx habitat.

- Since 2007, all projects on the FNF have complied with the direction in the NRLMD. Under the NRLMD, the Forest has conducted vegetation management on thousands of acres in lynx habitat; however, adverse effects were limited to:

    - 10,079 acres of lynx habitat within the WUI, and

    - 940 acres of lynx habitat of precommercial thinning in lynx habitat.

- To date, under these exemptions and exceptions, the FNF has treated substantially fewer acres than anticipated (and authorized) in 2007 under the NRLMD. We expect that trend to continue under the revised Forest Plan. The relatively low total acres of lynx habitat treated within the WUIs and the current condition of lynx habitat related to landscape standards VEG S1 and VEG S2, indicate that the overall baseline condition of lynx habitat in regard to vegetation is in good condition on the FNF. While acres burned by wildlife have increased and effected some LAUs, modeling indicates that is has remained within the natural range of variation.

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- The total amounts above are based on what the maximum extent allowed under the Revised Forest Plan. While we use the maximum extent allowable in our analysis, many actions that are allowed and projected may not actually occur. Many activities that are allowed by the Forest Plan direction are never fully carried out for a variety of reasons, such as funding limitations and environmental or policy considerations.

- While the Revised Forest Plan would allow vegetation activities that may adversely affect lynx by altering snowshoe hare habitat, the nature of these activities is typically temporary and reversible (i.e. forests regrow or can be restored). Such actions may change the successional stage of a stand, but do not affect that stand's potential to produce snowshoe hare habitat in the future. The adverse effects on lynx from vegetation management carried out under the Revised Forest Plan are temporary and no permanent loss of the inherent capacity of treated stands to provide snowshoe hare habitat is expected.

- Acres treated are expected to be distributed throughout the Forests and are not likely to be excessively concentrated within any one LAU or group of adjacent LAUs because exemptions and exceptions are limited by standards VEG S1 and S2 and cannot occur in more than three adjacent LAUs. Thus, adverse effects, while possible, are likely to affect only portions of any individual lynx home range.

- Based on research done by Squires et al. (2008), denning habitat is found in a variety of forest conditions, and suitable den site attributes occur in small pockets scattered across the landscape at relatively high densities. As a result den site availability is not limiting for lynx. Further, when denning habitat is lacking, guideline VEG G11 requires that denning habitat be distributed in an LAU. Effects to denning habitat would be insignificant.

- Since 2007, most National Forests have managed lynx habitat under the NRLMD or similar strategies. This management provides comprehensive conservation direction adequate to reduce adverse effects to lynx from Forest management and to preclude jeopardy to the lynx DPS. Such management strategy is expected to continue under the Revised Forest Plan.

Other activities on the Forest are expected to result in no or limited effects on lynx:

- Management of roads or trails under the Revised Plan would not result in adverse effects on lynx. Most lynx habitat is in wilderness MAs and backcountry MAs where all motorized vehicle access is prohibited. The Revised Plan incorporates the guidelines ALL G1 and HU G6 through G9 that would reduce the potential effects of forest roads on lynx and lynx habitat.

- Effects on lynx from developed recreation site are expected to remain low under the Revised Plan. Implementation of plan components addresses effects of developed recreation on connectivity and linkage as well as measures to reduce

site specific impacts. The Revised Plan desired conditions for wildlife further reduce the likelihood of adverse effects.

- The Guideline HU G11 will result in a minor net decrease in the acres of lynx habitat open to over-snow motorized use.

- The likelihood that dispersed recreation on or off trails would occur in proximity of a den site and/or that the dispersed recreation activities occurring would actually disturb a lynx den site or in other ways adversely affect lynx is so low as to be discountable.

- There is no indication that compacted snow routes from winter recreational activities increase competition from other species to levels that adversely impact lynx populations, and under the proposed action, the amount of areas affected by snow compaction by snowmobiles within the action area would decrease.

- Guidelines for grazing management (Graz G1, G2, G3, G4) provide for the regeneration of trees, shrubs and aspen clones in lynx habitat and should avoid the potential for adverse effects of grazing to lynx, potentially improving the habitat over baseline conditions.

We find that the Revised Forest Plan would allow some actions that may result in adverse effects to some individual lynx. The proposed action overall promotes the conservation and recovery of lynx and their habitat through the desired conditions and guidelines of the Revised Forest Plan. These conditions would maintain the habitat mosaic, structure, and components required to support lynx and their primary prey, the snowshoe hare. We have examined the impacts of the proposed action on individuals and on the lynx within the action area. We conclude that the proposed action would not appreciably reduce the numbers or distribution of lynx on the FNF or the Northern Rocky Mountains Region of the DPS. Thus, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of lynx in the wild, and is not likely to jeopardize the continued existing of the contiguous United States Canada lynx DPS.

As discussed above, this biological opinion considers the effects of implementation of the the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

2. Conclusion for Lynx Critical Habitat

After reviewing the current status of designated lynx critical habitat, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is the Service's biological opinion that the effects of the proposed FNF Revised Forest Plan are not likely to result in the destruction or adverse modification of designated Canada lynx critical habitat. Implementing regulations for section 7 define "destruction or adverse modification" as "a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (50 C.F.R. § 402.02). The Lynx Critical Habitat Final Rule (79 FR 54826) explains that "the key factor related to the adverse modification determination is whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species. Activities that may destroy or adversely modify critical habitat are those that alter the physical and biological features to an extent that appreciably reduces the conservation value of critical habitat for the lynx DPS." The role of critical habitat is to support life-history needs of the species and provide for conservation of the species.

The Revised Forest Plan will not preclude continued adequate amounts of snowshoe hare habitat needed to sustain lynx in the LAUs within the action area and thus, critical habitat in the LAUs would remain functional. When added to the status of the critical habitat units, the effects of the Revised Forest Plan are such that the conservation role of lynx Critical Habitat Unit 3 will continue to serve its intended conservation role for lynx and the physical or biological features, including the PCE components essential to the conservation of lynx, will not be altered to a point that precludes or significantly delays development of these features. Thus, the Service concludes that while the FNF Revised Forest Plan may result in some level of adverse effects to lynx critical habitat, the level of adverse effects are not reasonably expected to alter the physical and biological features to an extent that appreciably reduces the conservation value of critical habitat for the lynx DPS.

Our conclusion is based primarily on the information presented in the biological assessment on the effects of the Revised Forest Plan on lynx critical habitat (USFS 2017), information in our files, and informal discussions between the Service, the Forest, and other personnel. Our rationale for the no destruction or adverse modification conclusion is based on, but not limited to the following factors summarized below, as detailed earlier in this biological opinion.

- Implementation of the Revised Forest Plan will allow land management actions that may adversely affect key lynx habitat components. While negative effects on lynx critical habitat may not be totally eliminated, the Service considers the retention of high quality snowshoe hare habitat (PCE 1a) within in lynx critical habitat as most essential to lynx conservation. The vegetation standards contained in the Revised Forest Plan directly address the major impacts identified from vegetation management (impacting stand initiation and multi-story stands that provide PCE 1a). Managing and moderating these impacts will

minimize affects to snowshoe hare habitat and production, thus benefiting lynx critical habitat.

- As described in our biological opinion, we anticipate adverse effects to lynx critical habitat from those actions that occur within snowshoe hare habitat and impact PCE1a within the action area. The majority of these adverse effects would be a result of actions using the exemptions from and/or exceptions to the vegetation management standards.

- In areas that provide lynx critical habitat but not snowshoe hare habitat, we do not anticipate adverse effects to the remaining PCE and components, including PCE 1b (deep fluffy snow), PCE 1c (denning habitat), PCE 1d (matrix habitat), and stem exclusion habitat (part of the PCE boreal forest).

- Future actions conducted during the anticipated life-span of the Revised Forest Plan (15 years) that may adversely affect PCE 1a using exemptions from and exceptions to the vegetation management standards will occur on no more than 93,723 and 15,460 acres, respectively. This is less than five percent of lynx critical habitat on the FNF.

- A total of approximately five percent of PCE 1a on the FNF may be treated using the exemptions from and exceptions to the Revised Forest Plan vegetation standards.

- The adverse effects of vegetation management on lynx critical habitat would occur on a very small portion of Critical Habitat Units 3. When considering all critical habitat in Unit 3, 109,710 acres of critical habitat in Unit 3 may be adversely affected by implementation of the Revised Forest Plan. This is approximately 1.7 percent of all critical habitat in Unit 3 (Unit 3 is 9,783 square miles or 6,261,095 acres).

- It is important to note that mapped lynx habitat consists of a mosaic of various forest structural stages and not all mapped lynx habitat is providing PCE 1a at the same time. However, at a programmatic scale such as this, it is not possible to accurately map PCE 1a at every point in time for the life of the Revised Forest Plan (anticipated to be 15 years). Forest structural stages change over time and what is providing PCE 1a today may not be at some point in the future and what is not providing PCE 1a today may provide such in the future. As a result, we are analyzing the maximum amount that could be treated to be sure we do not overlook any potential effect. While the percentages provided above display the maximum percentage of mapped lynx habitat that may provide PCE 1a that could be treated, it is not expected that this maximum would be reached all at the same time. Future site-specific consultations on projects will provide both the amount of PCE 1a within the action area LAU(s) and the amount of PCE 1a affected by the action, thus, analyzing the specific amount of PCE 1a that will be affected.

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- The Revised Forest Plan direction provide would require monitoring and recording of actions to ensure that the number of acres treated through exemptions and exceptions do not exceed the amounts described here.

- The total amounts above are based on what the maximum extent allowed under the Revised Forest Plan. While we use the maximum extent allowable in ourt analysis, many actions that are allowed and projected may not actually occur. Many activities that are allowed by the Forest Plan direction are never fully carried out for a variety of reasons, such as funding limitations and environmental or policy considerations.

- While the Revised Forest Plan would allow activities that may adversely affect lynx critical habitat, the nature of most vegetation management alteration is temporary and reversible (i.e. forests regrow or can be restored). Some vegetative treatments may degrade the function of the PCE by delaying the development of high density snowshoe hare habitat through succession; however, they do not remove the PCE from the site. Such actions may change the successional stage of a stand, but do not affect that stand's potential to produce snowshoe hare habitat in the future. The adverse effects on lynx critical habitat from vegetation management carried out under the Revised Forest Plan are temporary and no permanent loss of the inherent capacity of treated stands to provide lynx habitat is expected.

- Acres treated will be constrained by standards VEG S1 and S2and are not likely to be excessively concentrated within any one LAU or group of adjacent LAUs. Thus, adverse effects, while possible, are likely to affect only portions of any individual lynx home range.

- Other projects types that may adversely affect lynx critical habitat, such as recreation development are constrained by other standards such as mandating maintenance of connectivity and would likely only affect a relatively small proportion of lynx critical habitat within the action area. Such actions would undergo site-specific consultation to determine such effects.

- A large proportion of lynx critical habitat in the action area occurs in lands with non-developmental status (e.g., designated and proposed wilderness) where management focuses on the maintenance of natural ecological processes, or conservation of rare ecological settings or components.

- Under the Revised Forest Plan, LAUs are expected to continue to provide conditions that would be conducive to supporting lynx. Although some actions may adversely affect areas of critical habitat, they are expected to have small to insignificant effects on Critical Habitat Unit 3 as a whole. The critical habitat is expected to remain capable of producing adequate densities of snowshoe hares to support continual lynx.

- While vegetation management projects that use the exemptions from and/or exceptions to the vegetation standards may adversely affect PCE 1a, the limited amount of PCE 1a that could be treated is not likely to result in adverse impacts to the survival and recovery of lynx. The Revised Forest Plan would allow for the action area as a whole to serve its role in the conservation of lynx, by maintaining its inherent capacity to provide a prey base and foraging habitat for a breeding population of lynx and connectivity for lynx movement within home ranges, and dispersal. The vegetation objectives, standards, and guidelines would contribute to sustaining and growing snowshoe hare and lynx populations within lynx critical habitat in the action area, and the Revised Forest Plan would not appreciably diminish the value of lynx critical habitat for the conservation of lynx.

We conclude that the adverse effects of the Revised Forest Plan on PCE 1a are limited in severity and in scale to the extent that critical habitat would continue to produce adequate densities of snowshoe hares and adequate levels of cover to support persistent lynx populations across Critical Habitat Unit 3. We conclude that the proposed action will not alter the physical and biological features of critical habitat to an extent that appreciably diminishes the value of critical habitat for the conservation of lynx. The alterations will not preclude or significantly delay development of such features. The critical habitat units would retain their current ability for the primary constituent element to be functionally established. Therefore, the proposed action is not likely to result in the destruction or adverse modification of designated Canada lynx critical habitat.

H. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of an incidental take statement.

In general, an incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize the impacts of the take and sets forth terms and conditions which must be complied with in order to implement the reasonable and prudent measures.

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1. Amount or Extent or Incidental Take

This biological opinion considered the effects to lynx from implementation of the Revised Forest Plan as guided by the proposed plan elements (goals, objectives, desired condition, standards, and guidelines). It includes specific elements for the conservation of lynx and lynx habitat, but does not authorize specific actions. The Revised Forest Plan (as proposed) contains sufficient specificity through its suite of elements to permit an adequate analysis of the effects of projects and activities on lynx. As a result, the Service was able to make a determination that the extent of adverse effects on lynx as a result of the Revised Plan does not rise to levels that are likely to jeopardize lynx. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

We anticipate that take associated with implementation of the proposed action would occur through vegetation management when projects are conducted in lynx habitat under the exemptions and exceptions to the Revised Forest Plan vegetation standards VEG S1, S2, S5 and S6, as described and analyzed in this biological opinion. We anticipate this take in the form of harm, as the exemptions and exceptions allow modification of lynx habitat that could result in decreased production and density of snowshoe hares, their primary prey. As a result, we anticipate that some, but not all, adult female lynx within home ranges affected by such projects could fail to complete a pregnancy or could be less successful in finding adequate food resources needed to ensure maximum survival potential for kittens. Thus, significant reproductive impairment and kitten survival may be affected.

The Service anticipates that incidental take of lynx will be difficult to quantify and detect for the following reasons:

- Lynx are wide-ranging and not easily detected in the wild.
- Although we have a general understanding of where lynx population centers are within the action area, the distribution of individual lynx across the FNF or at smaller scales within the action area is not known.
- Information required to accurately quantify snowshoe hare and alternate prey needed for the survival of adult lynx or kittens is not available.
- Snowshoe hare populations exhibit population cycles in Canada and although not well understood, populations likely fluctuate in the United States as well. This variation could cloud our ability to demonstrate a direct cause and effect

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relationship. It may be difficult in many cases to determine whether mortality or injury of lynx is attributable to incidental take of lynx as a result of the proposed action, or whether it was natural mortality or injury of lynx due to natural declines in snowshoe hares.

- We lack information to predict with precision the densities of hares in various habitat and forest stands, before and after specific treatments, especially in relationship to the host of naturally occurring environmental variables that may affect hare densities.

- Thus, we lack information to predict with precision the densities of hares in various habitat and forest stands within the home range of individual females, before and after specific treatments.

- Discovery or detection of lynx injury or mortality attributed to habitat alteration is very unlikely.

In addition to the difficulties outlined above, monitoring lynx is difficult and very expensive. For example, because individual lynx are sparsely distributed over tens of square miles often in snowy terrain, specialized equipment is necessary to safely access their habitat for capturing and collaring. Also, in order to capture and collar enough lynx for an adequate sample size for scientifically valid trends, hundreds of square miles of this habitat must be surveyed and monitored over multiple years. These circumstances would drive the yearly cost of monitoring into hundreds of thousands of dollars and require a commitment of several biologists to the monitoring for several years. For these reasons, direct monitoring is not practical or reasonable.

In cases such as these, Service policy, as stated in the Endangered Species Consultation Handbook (USFWS and NMFS 1998) (Handbook), is to provide some detectable measure of effect, such as the relative occurrence of the species or a surrogate species in the local community, or amount of habitat used by the species, to serve as a measure for take. Take also may be expressed as a change in habitat characteristics affecting the species. Because of the difficulty of estimating the precise number of lynx that would experience take in the manner described above, we have developed a surrogate measure to estimate the amount of anticipated take. Here we will use the number of acres of snowshoe hare habitat treated through the exceptions and exemptions of vegetation management standards as a surrogate measure of the anticipated incidental take of lynx.

The FNF has provided explicit estimates on the number of acres of snowshoe hare habitat that may be impacted by vegetation management under the Revised Forest Plan. As a result, we are able to accurately assess take from these activities. In the biological assessment, the FNF provided estimates of the number of acres that could treated through (a) fuels treatment projects within the WUI conducted under the exemptions from vegetation standards VEG S1, S2, S5 and S6, and (b) precommercial thinning and non-commercial felling projects for “resource benefit” (detailed earlier in this biological opinion) allowed under exceptions to VEG S5 and S6. Projects conducted under the exceptions and exemptions may reduce the quality of habitat that produces snowshoe hares. We have determined that many, but likely not all, of the projects conducted

under the exemptions or exceptions could significantly reduce the capacity of affected snowshoe hare habitat to produce hares, and so could result in take in the form of harm. Therefore, we are using the number of acres treated under these exemptions and exceptions under the proposed action as a detectable surrogate for the number of lynx taken in the form of harm, through significant degradation or modification of habitat. This approach is consistent with Service policy (USFWS and NMFS 1998), which endorses the use of acres of species' habitat destroyed or disturbed as a reasonable surrogate measure for the number of a species harmed.

The FNF has proposed to carry forward existing direction of the NRLMD, using the 2007 projections for acres of WUI to be treated for fuel reduction under exemptions. Further, the FNF is proposing additional acres for pre-commercial thinning and non-commercial felling for other resource benefits under exceptions. In 2007, the NRLMD decision projected the number of acres on the FNF that may need to be treated using (a) exemptions to the vegetation standards for fuels treatment to protect life and property in the WUI: 103,800 acres; and (b) exceptions to the vegetation standards for other resource benefits: 1,460 acres, over a period of 10 years (USFWS 2007). Since 2007, the FNF consulted on treatment of 10,077 acres under WUI exemptions, and 940 acres under exceptions for other resource benefits. Including the acres already treated since 2007, the FNF anticipates treating no more than the total numbers of acres identified in 2007 under WUI exemptions (103,800) over the life of the Revised Plan. The FNF anticipates treating no more than 15,460 acres under exceptions for other recourse benefits for the life of the Revised Plan (anticipated to be 15 years).

In this biological opinion, we analyzed the effects of treating the total number of acres projected for the proposed action under the exceptions and exemptions to vegetation standards. This was the uppermost estimate as being necessary for fuels reduction in the WUI to protect human safety and property, or for other resource benefits. Thus, we are using the total number of acres that could potentially be treated under these exemptions and exceptions as our anticipated amount of incidental take. The acres treated under exemptions and exceptions on the FNF since 2007 are well below those anticipated in our 2007 biological opinion. Further, of the 10,077 acres treated through fuel reduction projects, not all treatments resulted in adverse effects to lynx; however, we do not expect, but cannot rule out that: (1) the total number of acres identified above would be treated over the life of the plan, or that (2) all treatments in the WUI or for other resource benefit may result in adverse effects on lynx. Therefore, this biological opinion analyzed the greatest level of adverse effects on lynx allowed under the proposed action.

This biological opinion anticipates the following amounts of take in the form of harm (modification of habitat that will significantly reduce the snowshoe hare prey base for lynx, resulting in significant impairment of lynx breeding (i.e. reproduction) and feeding): treatment of up to 93,723 acres of lynx habitat over the life of the Revised Forest Plan due to fuels management in the WUI, and up to 15,460 acres of lynx habitat due to pre-commercial thinning and non-commercial felling for vegetation management for other resource benefits. Because the exemptions and exceptions are limited to a total of no more than about six percent of lynx habitat on the FNF, the decrease in prey base would translate to a low amount of impairment of reproduction and feeding during some years. Specifically, we anticipate that some adult female lynx within home ranges affected by such projects may fail to complete a pregnancy or could be

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less successful in finding adequate food resources needed to ensure maximum survival potential for kittens. Thus, reproductive impairment and/or kitten survival may be affected.

At any time during the course of the action (i.e. beginning on the date of the signed ROD for this proposed action to 15 years later, or during the life of the Revised Forest Plan, whichever comes first) the level of take anticipated in this incidental take statement would be exceeded if:

- more than 93,723 acres of lynx habitat in the WUI is treated under the exemptions from VEG S1, S2, S5 or S6 for fuel treatment projects; or

- more than 15,460 acres on the FNF is treated under the exceptions to VEG S5 and S6 for other resource benefits.

2. Effect of Take

In this biological opinion we determined that the level of anticipated take is not likely to result in jeopardy to the species. To provide perspective on what these impacts on habitat mean to lynx, the average lynx territory in the action area is 53,375 acres for males and 21,745 acres for females (Squires et al. 2004). The proposed action limits adverse effects on lynx (through reductions in snowshoe hare habitat) to projects conducted in the WUI and for resource benefits, which would affect no more than six percent (109,183 acres) of lynx habitat on the FNF over the anticipated life of the Revised Forest Plan (15 years).

Therefore, the number of individual lynx home ranges that would be affected would be low, or if the acres treated were widely distributed, the acres treated within any one home range would be low. In areas treated through exemptions and exceptions, the level of reduction in snowshoe hare prey base and its specific impact on female lynx will vary. This variation is caused by differences in the scale of the project, site specific snowshoe hare habitat conditions within the project area, and the existing prey base, as well as the habits of the individual lynx. Without the details on the actual project site and the variations mentioned, the Service has made assumptions regarding the condition and distribution of the habitat that leads to an overestimate of the amount and quality habitat impacted. Our assumptions therefore lead to an overestimate of the effect and the associated level of take, because not all treated acres would intersect with snowshoe hare and lynx habitat in a way that represents harm to the lynx.

As discussed above, this biological opinion considers the effects of implementation of the the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of

acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

3. Reasonable and Prudent Measures

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of lynx:

- **RPM #1:** The Forest shall minimize harm of lynx from fuels management by ensuring that the acres impacted are not concentrated in several adjacent LAUs.

- **RPM #2:** The Forest shall minimize harm of lynx from pre-commercial thinning and other vegetation management projects by ensuring that female lynx home ranges, as represented by LAUs, either retain sufficient foraging habitat (when sufficient foraging habitat already exists in an LAU) or does not substantially reduce foraging habitat (when sufficient foraging habitat does not already exist in an LAU).

- **RPM #3:** The Forest shall monitor and report the progress of the action and the impact on the species.

These reasonable and prudent measures, with their implementing terms and conditions (detailed below), are designed to minimize the impact of incidental take that might otherwise result from the proposed action, and to ensure that the level of take exempted in this incidental take statement is not exceeded.

4. Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, the Forest must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

The following terms and conditions implement reasonable and prudent measure #1:

The Forest Service shall ensure that new or future projects conducted under the exemptions from standards VEG S1, S2, S5 and S6 on the FNF:

1. Do not occur in greater than 93,723 acres in the WUI.

2. Do not result in more than 3 adjacent LAUs that do not meet the standard VEG S1 of no more than 30 percent of an LAU that is not yet snowshoe hare habitat.

3. Projects allowed per the exemptions or exceptions to VEG S5 and S6, shall not occur in any LAU exceeding VEG S1, except for protection of structures.

The following term and conditions implement reasonable and prudent measure #2:

The Forest Service shall ensure that vegetation management projects conducted under exceptions to VEG S5 and S6 on the FNF adhere to the following:

4. Timber management projects (*as defined in Appendix 5*) shall not regenerate more than 15 percent of lynx habitat on FNF lands within a LAU in a ten-year period.

5. Do not occur in greater than 15,460 acres.

The following term and conditions implement reasonable and prudent measure #3:

5. In support of the monitoring and reporting requirements of the NRLMD, the FNF shall provide to the Service and the Forest Service Northern Region (Region 1) Office in Missoula, summaries of the reporting requirements listed below. The summaries shall be submitted to the Service's Montana Ecological Services Office in Helena, Montana by April 1 of each year, or other date through mutual agreement. The summaries shall document the following information related to fuel treatment and vegetation management projects occurring in lynx habitat:

   a. Individual fuels treatment and vegetation management projects conducted in lynx habitat under the exemptions and exceptions to the vegetation standards VEG S1, S2, S5 and S6 may reduce the quality or quantity of snowshoe hare habitat. Some projects are likely to result in detectable and measurable effects to lynx (and our biological opinion's analysis found may rise to the level of take) while other projects will not result in a detectable, measurable effect to lynx (i.e. may affect, but not likely to adversely affect). The acreages of all projects will be tracked and aggregated to ensure that over the life of the Revised Forest Plan, the number of acres impacted does not exceed the acres projected to be treated and the effects analyzed in our biological opinion. This approach to tracking and monitoring ensures that the proposed action is implemented as proposed and is consistent with our analysis. In addition, given the long timespan of the proposed action, this process provides information that can help determine whether consultation reinitiation ever becomes necessary.

      Thus report as follows:

      The BA prepared for each site-specific project shall include a report of the acres to be treated under the exemptions and/or exceptions from the vegetation management standards VEG S1, S2, S5, and S6. The report shall also include the total acres treated to date on the FNF as a whole, a map indicating the spatial distribution of past treatments, and acres treated by LAU. This total shall include the acres in the proposed project, other projects that have signed decisions (including those that have been

completed since implementation of NRLMD in 2007), and those projects that have completed section 7 consultation.

b. In addition, each BA shall report whether or not the site-specific project meets all applicable Revised Forest Plan guidelines for lynx. If guidelines were not met, provide rationale as to why they could not be met.

c. To ensure that term and condition # 2 is met, each project level biological assessment shall report any three adjacent LAUs within the action area that have more than 30 percent of lynx habitat in a stand initiation structural state that does not yet provide winter snowshoe hare habitat, either because of natural events, vegetation management or fuel treatment projects, or any combination of these or other causes.

d. To ensure that term and condition # 4 is met, report by LAU the amount of lynx habitat treated through vegetation management projects as allowed by exceptions to VEG S5 and S6; record the type of exception, acres, location (LAU) and whether or not standard VEG S1 was adhered to.

e. The FNF shall report this project level monitoring information at the time a site-specific decision is signed to the designated Forest Service office with responsibility for maintaining an accurate accounting of reports. These data will be provided in a biennial report to the Service's Montana Ecological Services Office by April 1st.

I. CONSERVATION RECOMMENDATIONS

Sections 7(a)(1) of the Act directs federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibilities.

This biological opinion identifies the following conservation recommendations that, in addition to the proposed action and other ongoing conservation actions, will support recovery of listed species. As discussed above, these conservation recommendations are discretionary agency activities meant to minimize or avoid adverse effects to listed species. The conservations recommendations are:

1. In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat.

2. When highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings.

3. Participate in inter-agency efforts to understand the effects of climate change, wildlife, and post-fire treatments in lynx habitat.

4. The Service commends the Forest Service for initiating and implementing important efforts to increase our understanding of lynx and lynx habitat with completion of the Science Report, lynx habitat mapping, and linkage zone identification, and assuming leadership roles on both the Lynx Biology Team and Lynx Steering Committee. We recommend that you continue to be a leader in these arenas, in coordination/cooperation with other Federal, State, or private entities.

In addition to management direction that will contribute to the recovery of Canada lynx, direction relative other listed species (i.e., bull trout, grizzly bear, water howelia) is also contained in the FNF's Revised Forest Plan. These elements are documented in the biological assessment (USFS 2017) or species-specific chapters of this biological opinion. Upon review the Service concludes that the FNF's Revised Forest Plan demonstrated a commitment to conservation of threatened and endangered species, and will continue to contribute to the recovery of these species.

Upon review of Forest Plan components that will be carried forward, and components that are being proposed, we conclude that the features of the amended Forest Plans can be considered elements of a program for the conservation of endangered species and threatened species, as described in section 7(a)(1) of the Act. Further, we conclude that this proposed action demonstrates the USFS's commitment to conservation of threatened and endangered species on NFS lands in the action area.

J. REINITIATION NOTICE

This concludes formal consultation on the FNF's Revised Forest Plan and its effects on Canada lynx and its critical habitat. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded (not applicable to critical habitat); (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

As detailed in the incidental take statement in this biological opinion, at any time during the course of the action (i.e. beginning on the date of the signed ROD for this proposed action to exactly 15 years later, or during the life of the Revised Plan, whichever comes first) the level of take anticipated in this incidental take statement would be exceeded if:

- more than 93,723 acres of lynx habitat in the WUI on the FNF is treated under the exemptions from VEG S1, S2, S5 or S6 for fuel treatment projects; or

- more than 15,460 acres of lynx habitat on the FNF is treated under the exceptions to VEG S5 and S6 for other resource benefits.

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Appendix 1: Maps and Figures

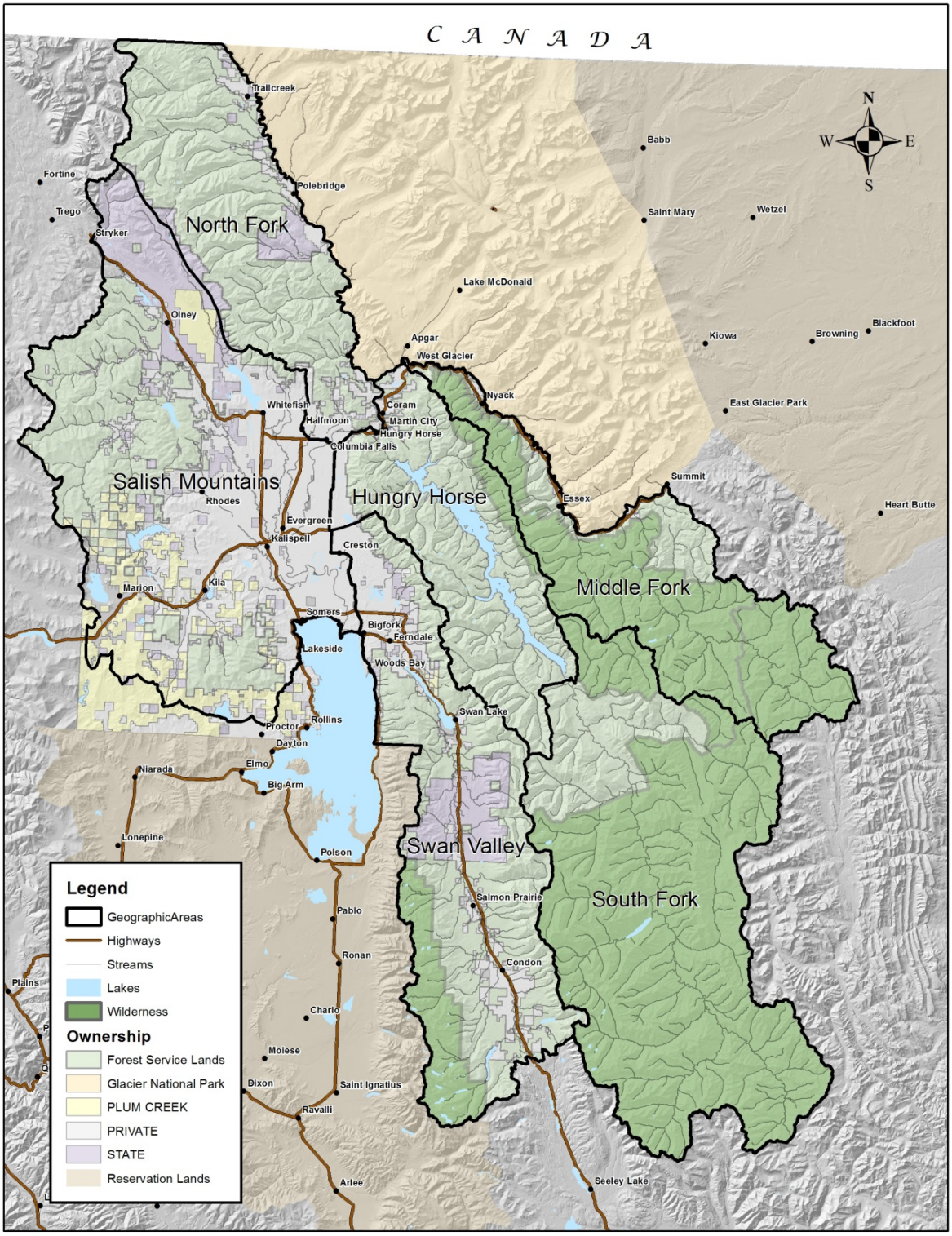


Figure 1. Flathead National Forest geographic area (GA) boundaries and land ownership (Note: lands shown as Plum Creek on the legend are now owned by Weyerhauser).

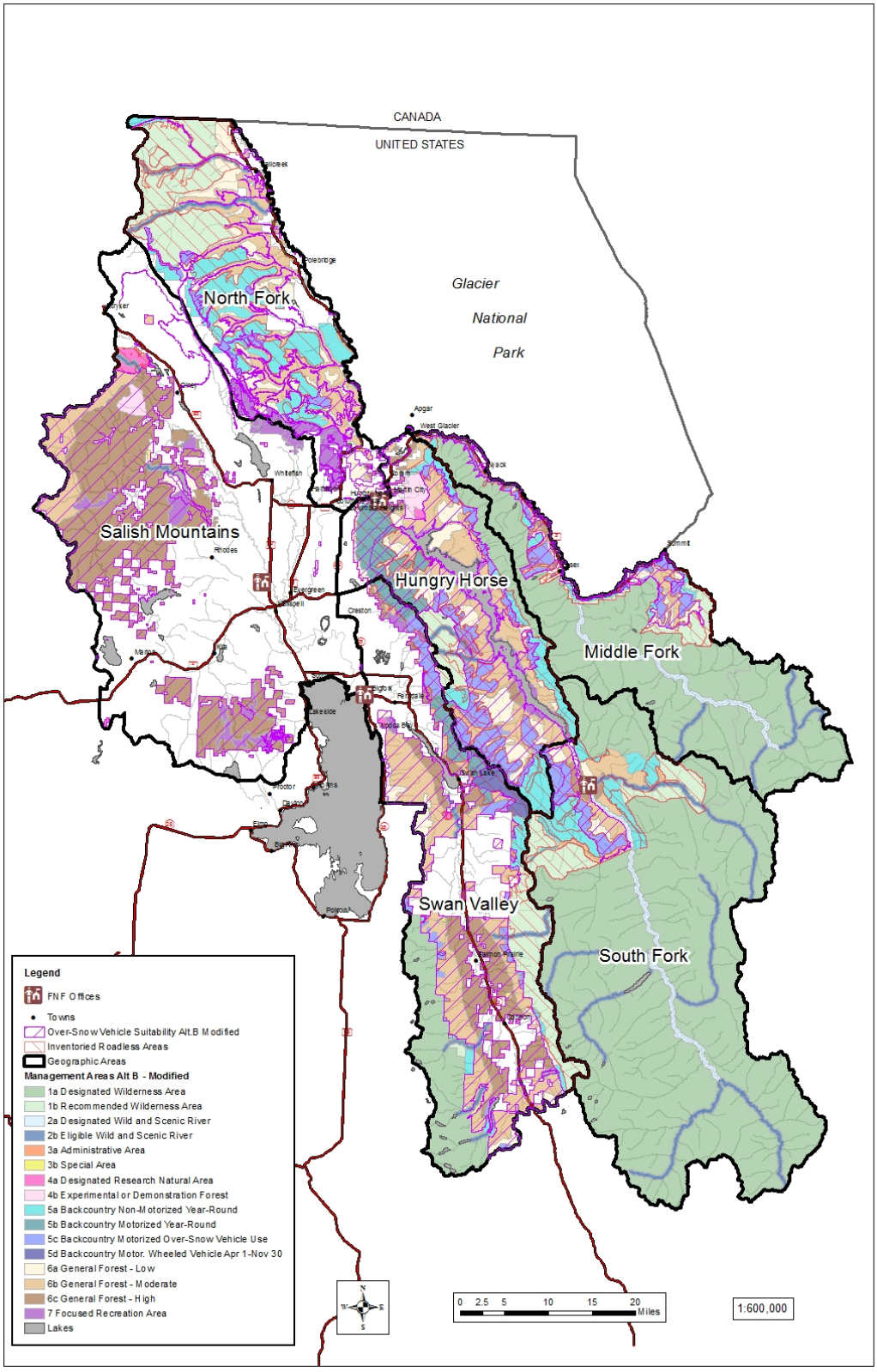


Figure 2. Management area designations under the Flathead National Forest Revised Forest Plan.

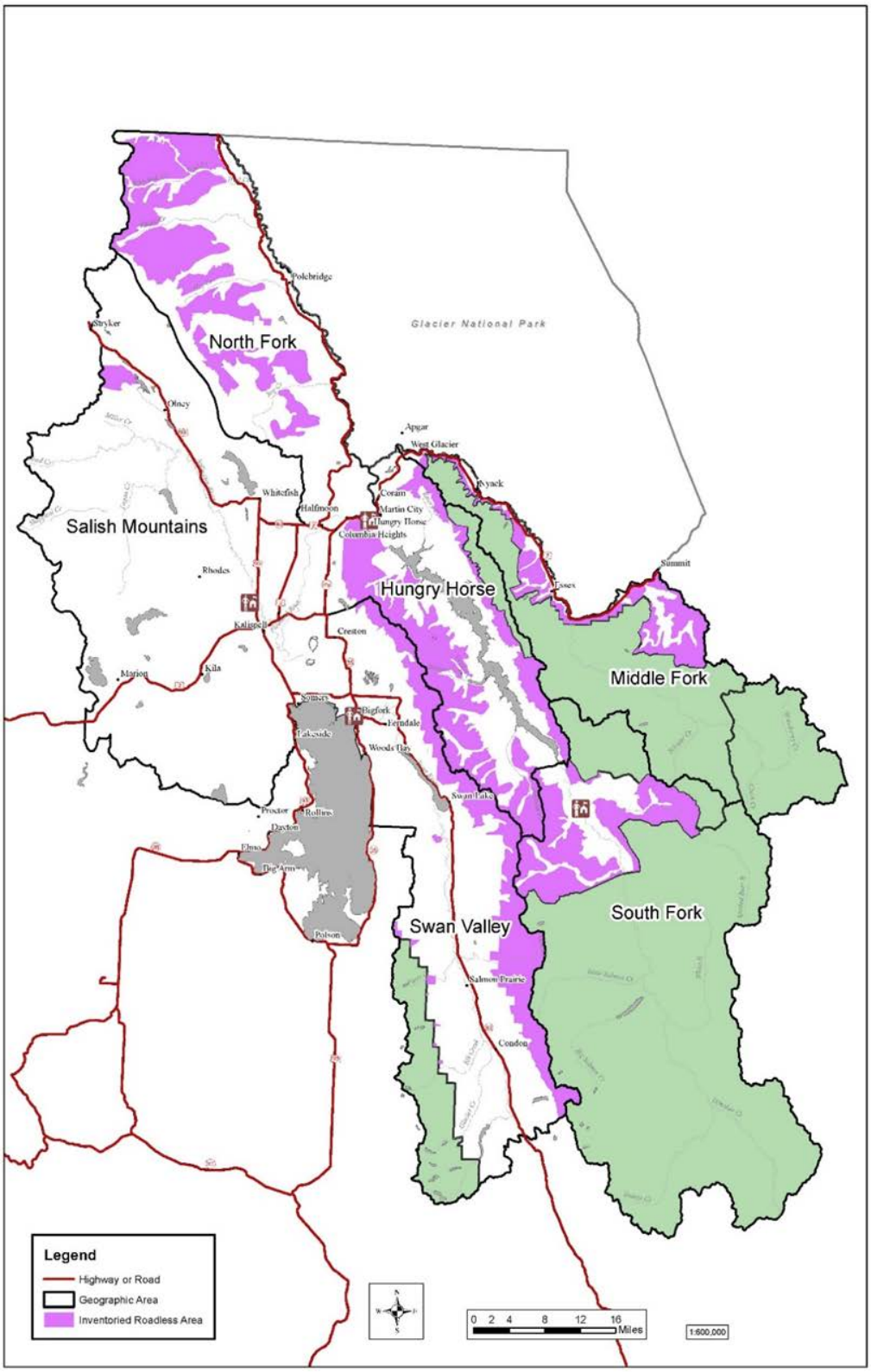


Figure 3. Inventoried roadless areas (IRAs) on the Flathead National Forest.

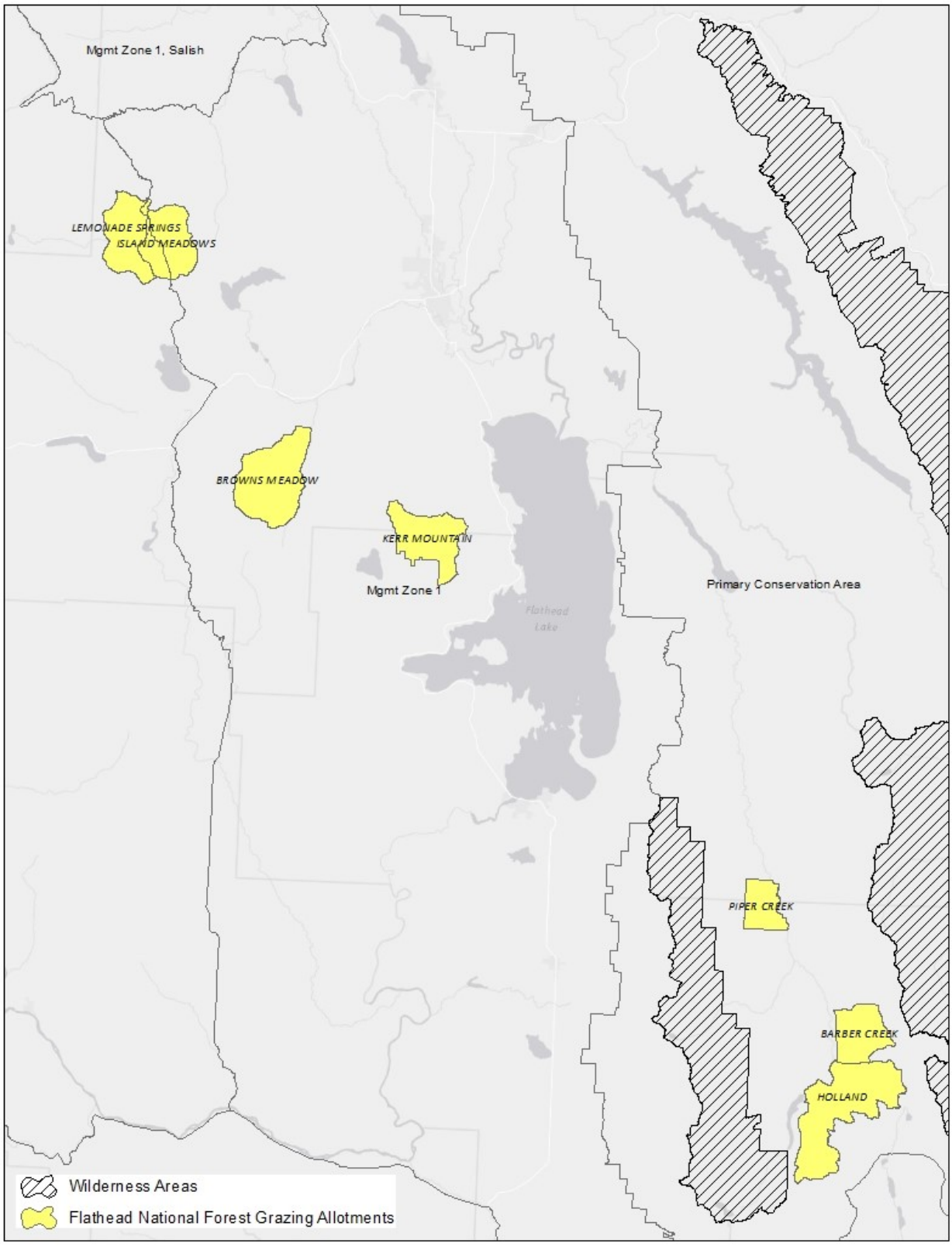


Figure 4. Grazing allotments on the Flathead National Forest.

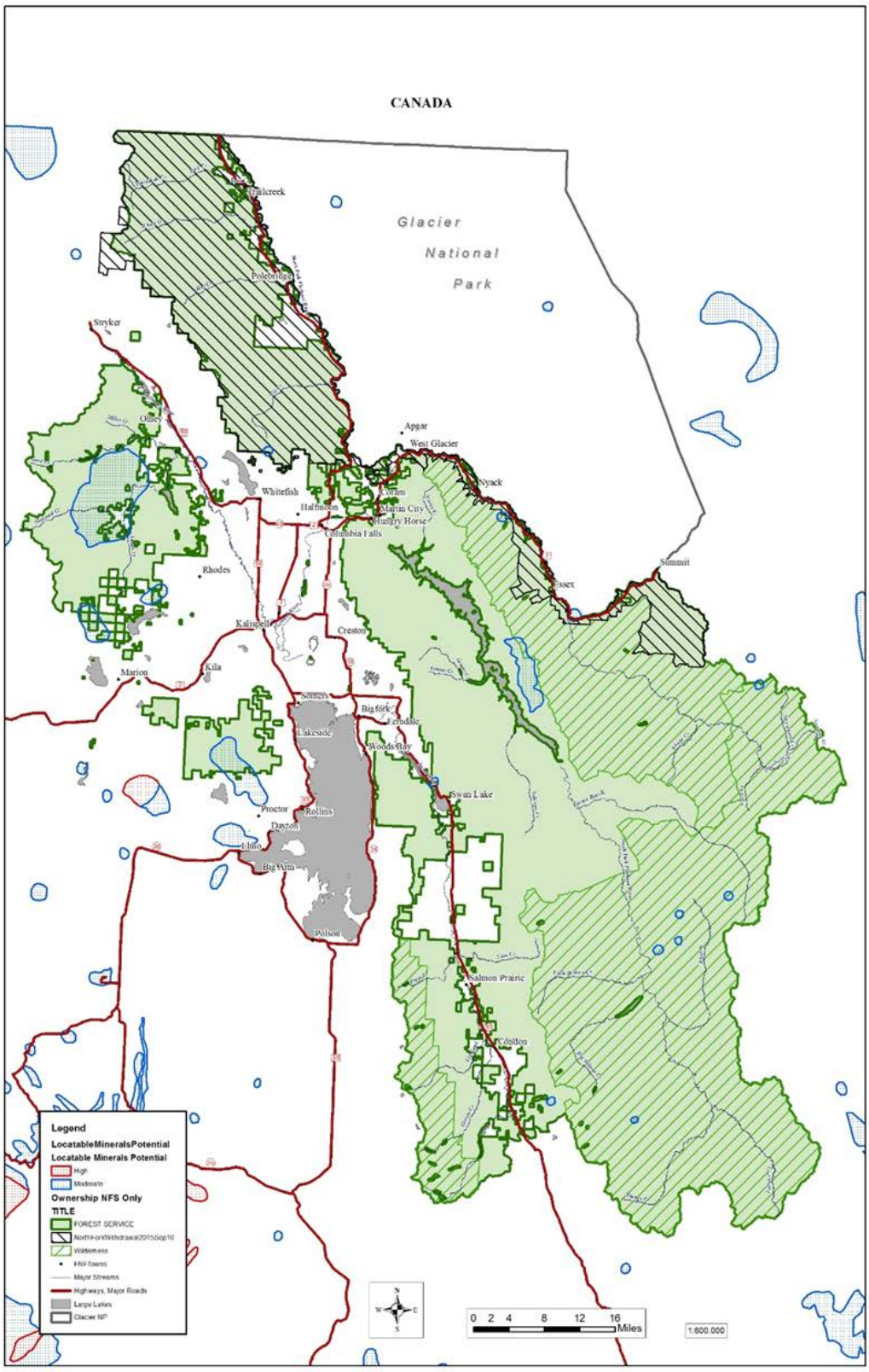


Figure 5. Potential locatable minerals on the Flathead National Forest.

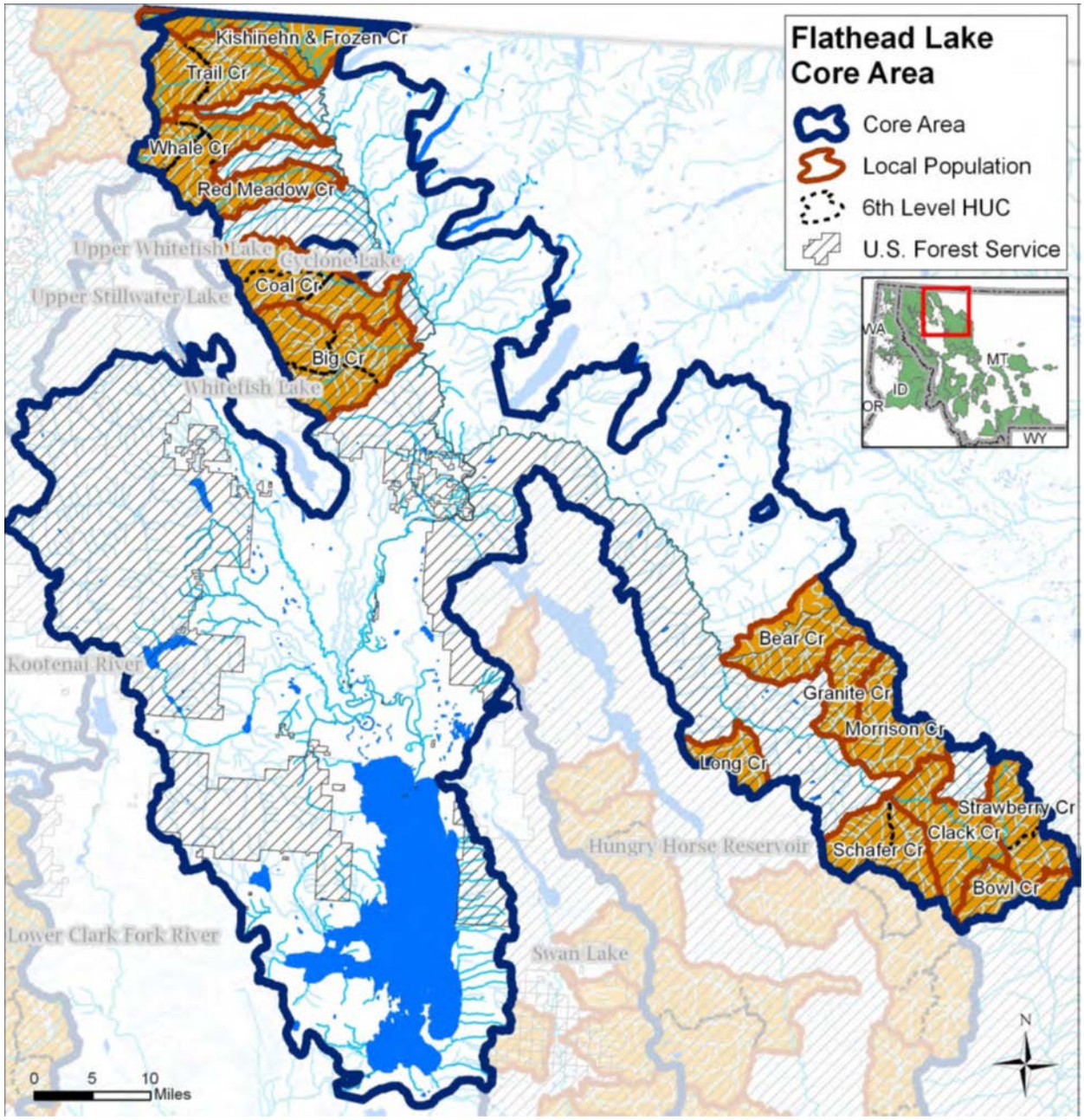


Figure 6. Flathead Lake Bull Trout Core Area.

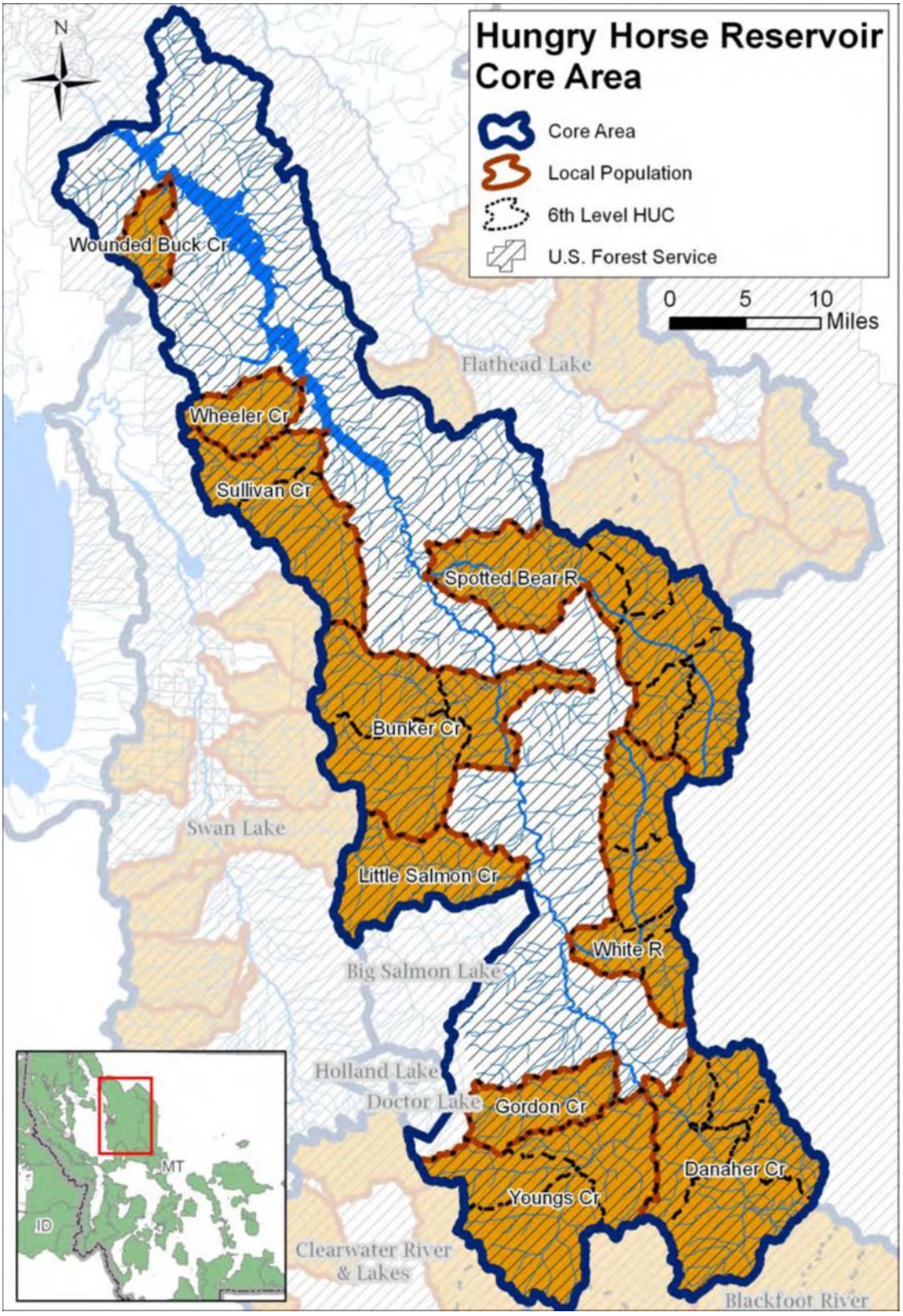


Figure 7. Hungry Horse Reservoir Bull Trout Core Area.

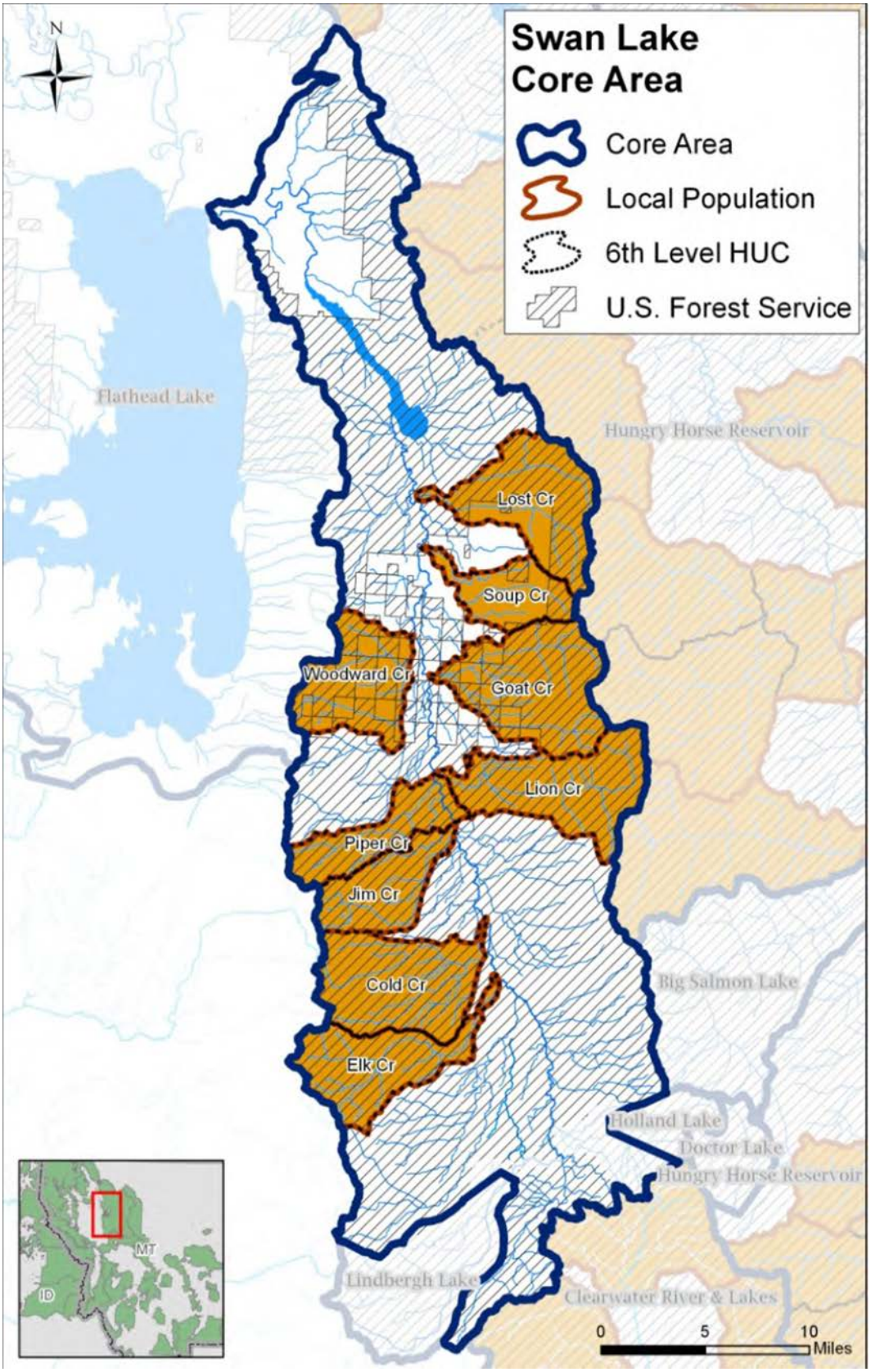


Figure 8. Swan Lake Bull Trout Core Area.

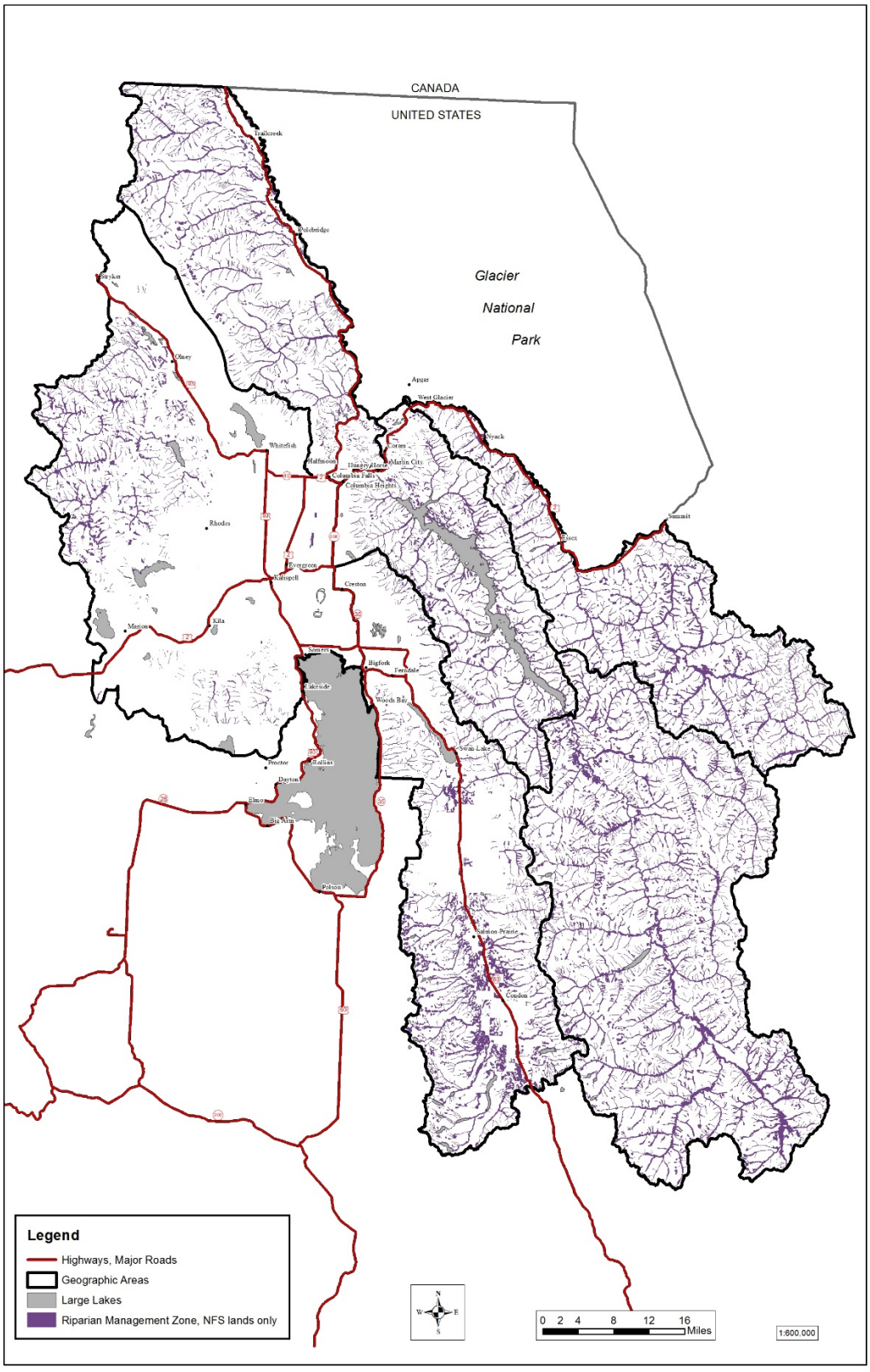


Figure 9. Areas that will be designated as riparian management zones (RMZ) on the FNF.

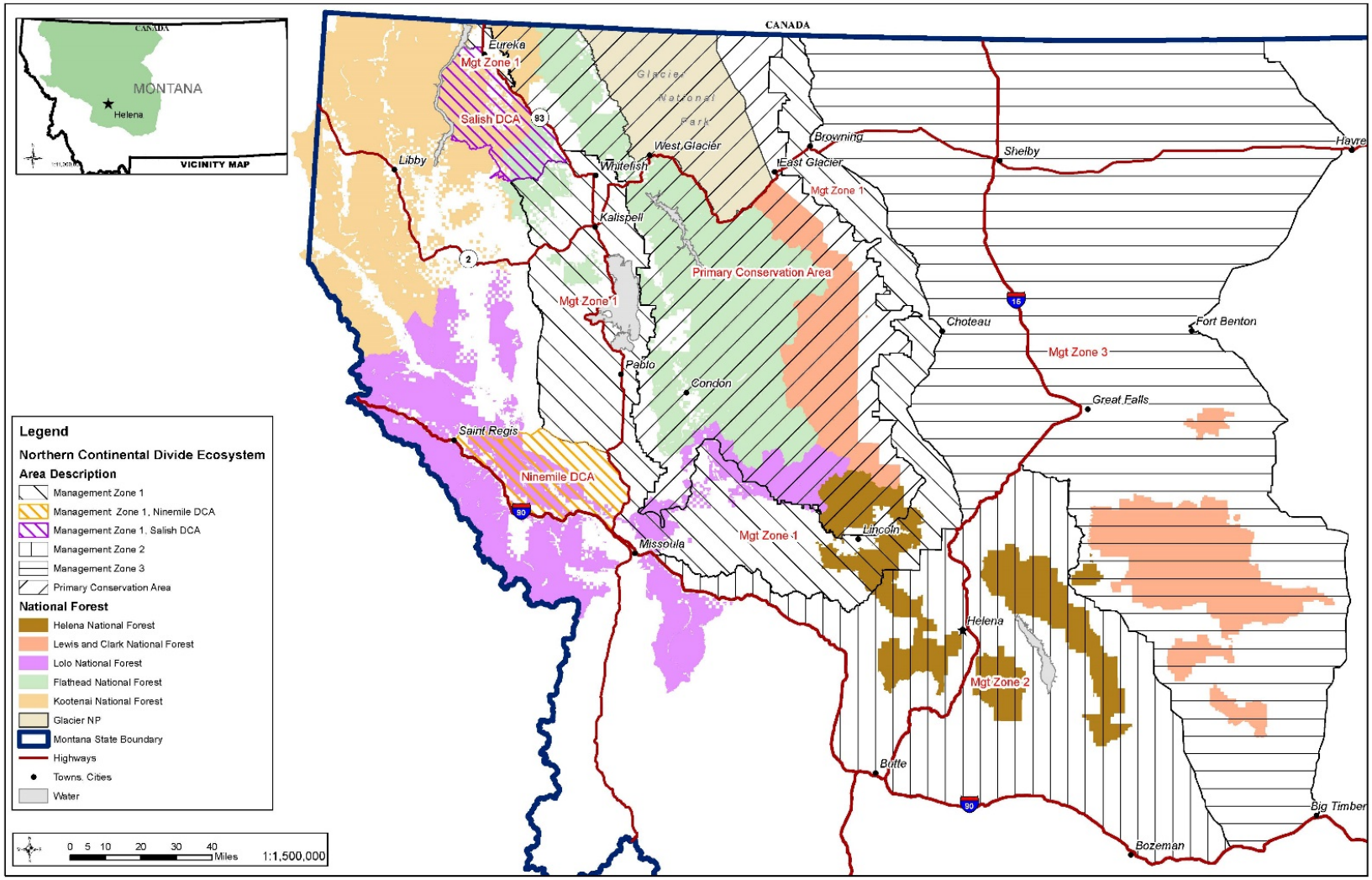


Figure 10. NCDE grizzly bear management zones.

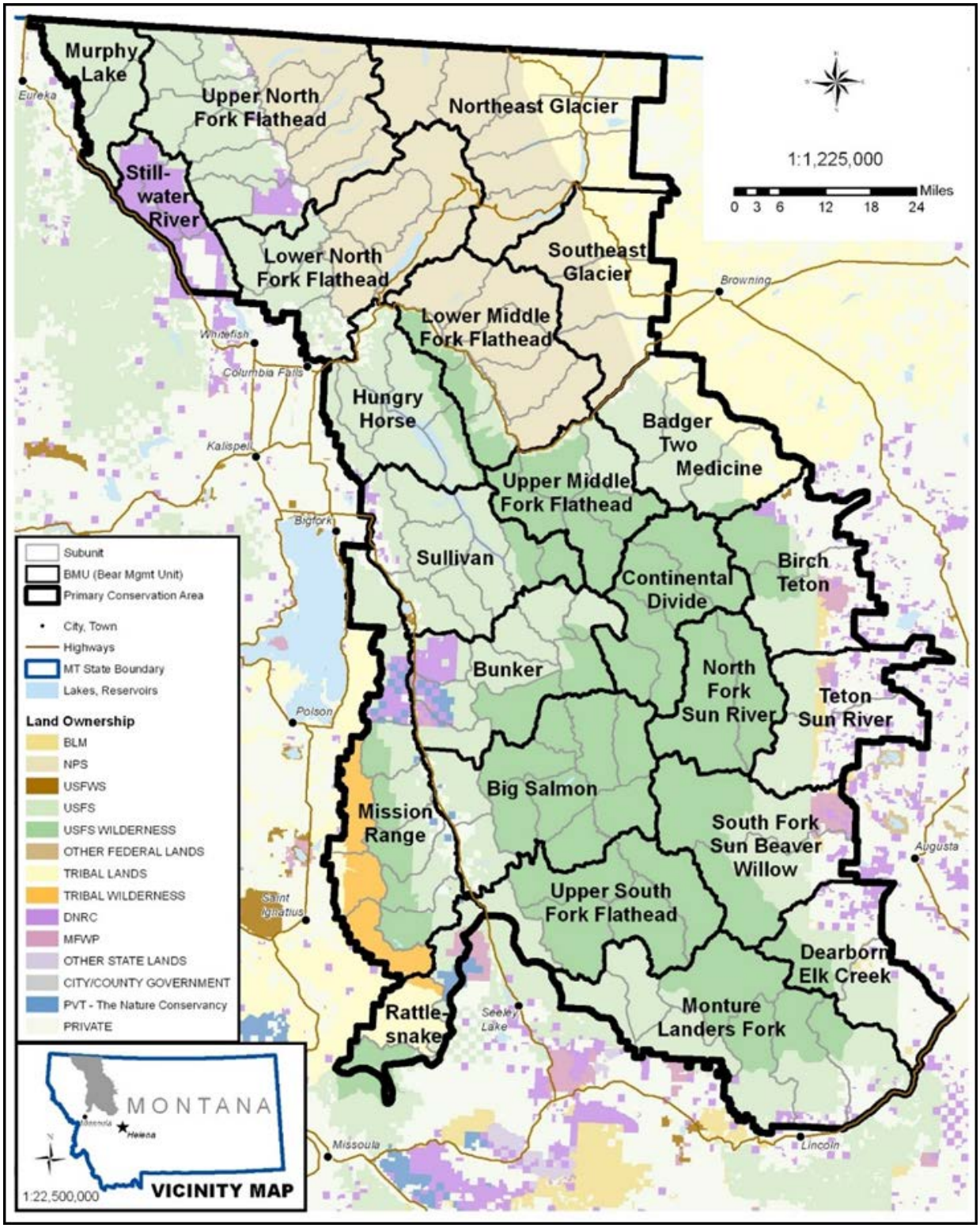


Figure 11. Bear management units (BMUs) in the NCDE primary conservation area of the Flathead National Forest (subunits outlined in light gray).

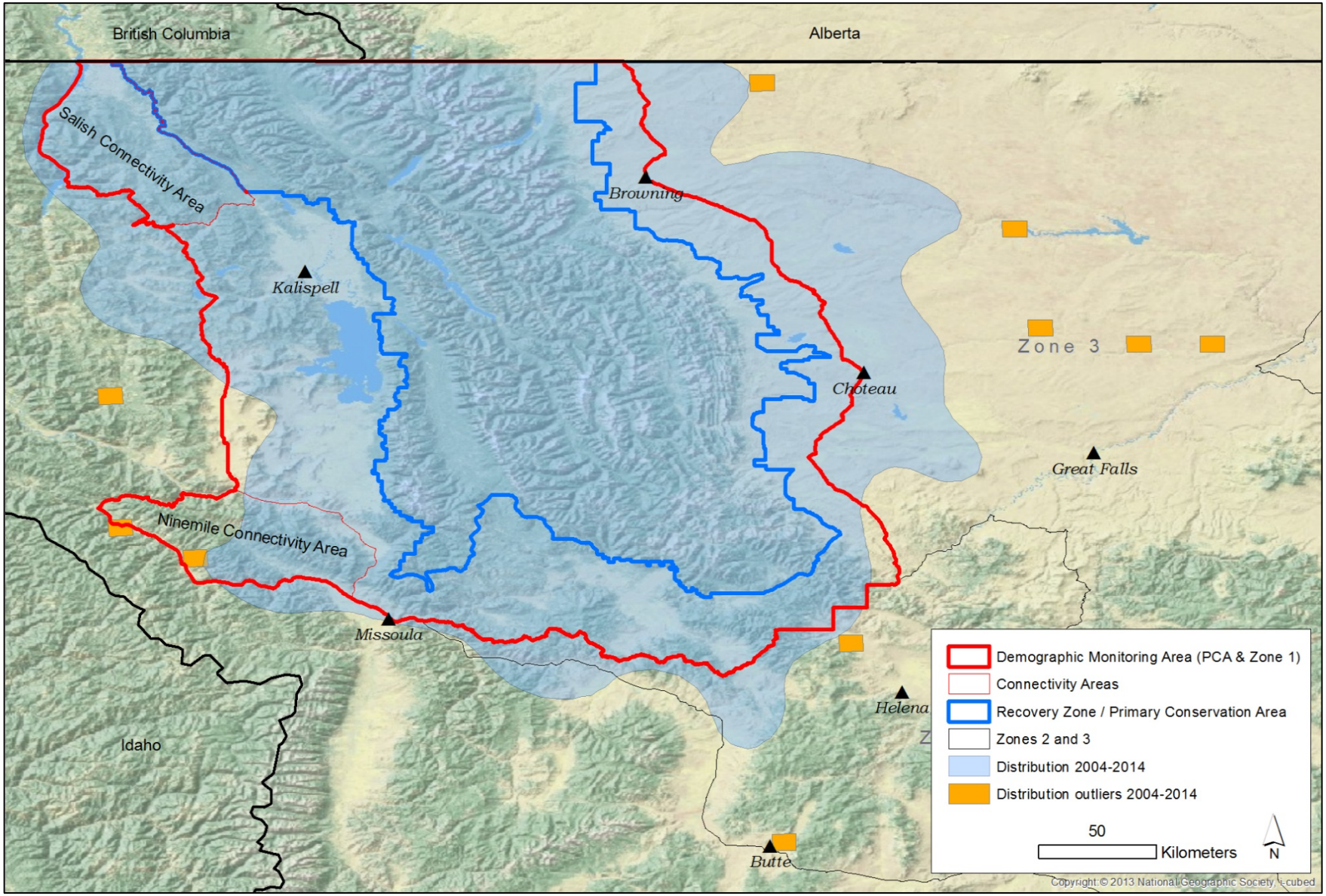


Figure 12. Distribution of grizzly bears (2004 to 2014) in the NCDE (Costello et al. 2016).

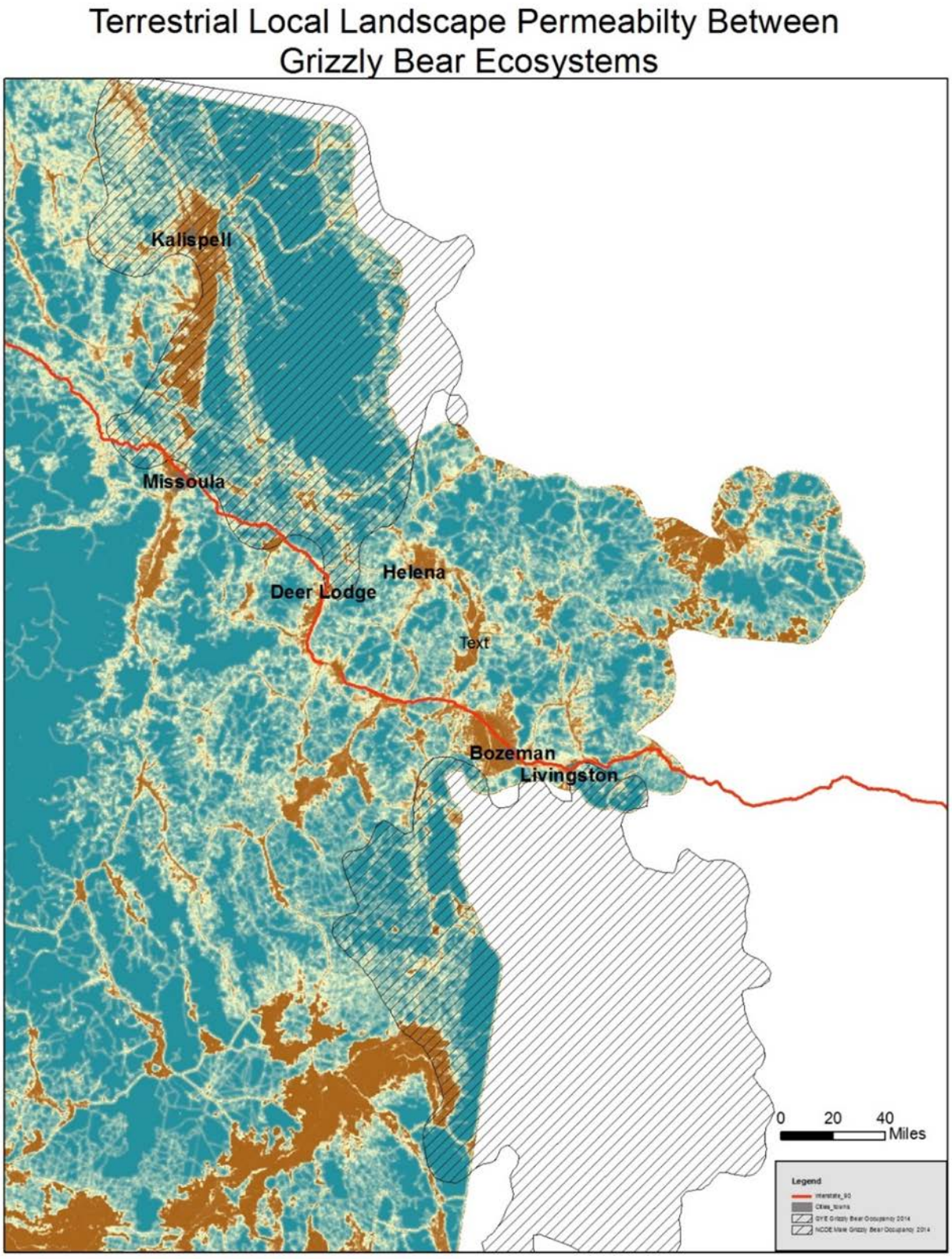


Figure 13. Terrestrial local landscape permeability between areas occupied by the grizzly bear in the Northern Continental Divide and Greater Yellowstone Ecosystems (obtained from databasin.org 2016).

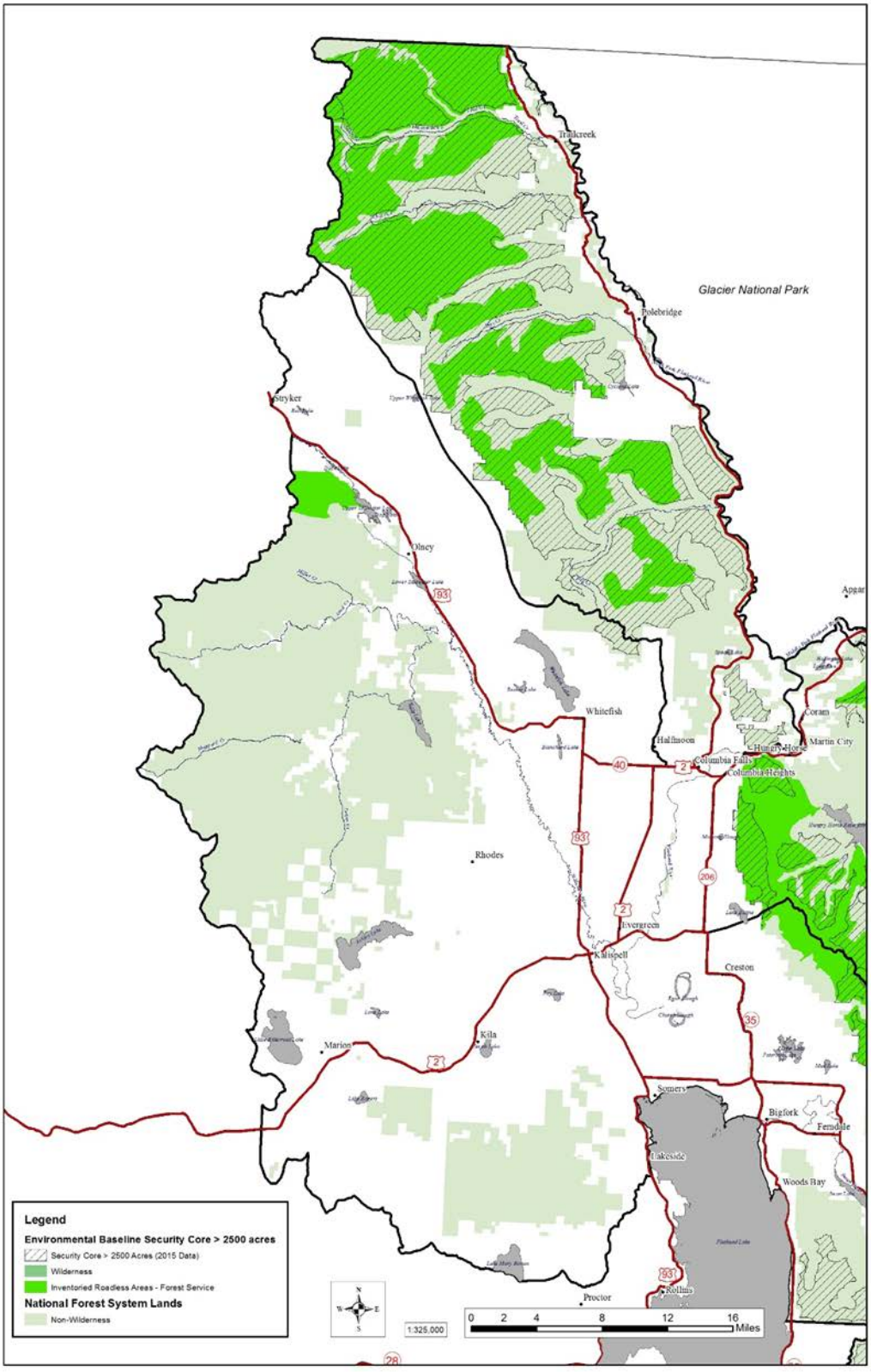


Figure 14. Grizzly Bear security core, wilderness, and IRAs on the north half of the Flathead National Forest.

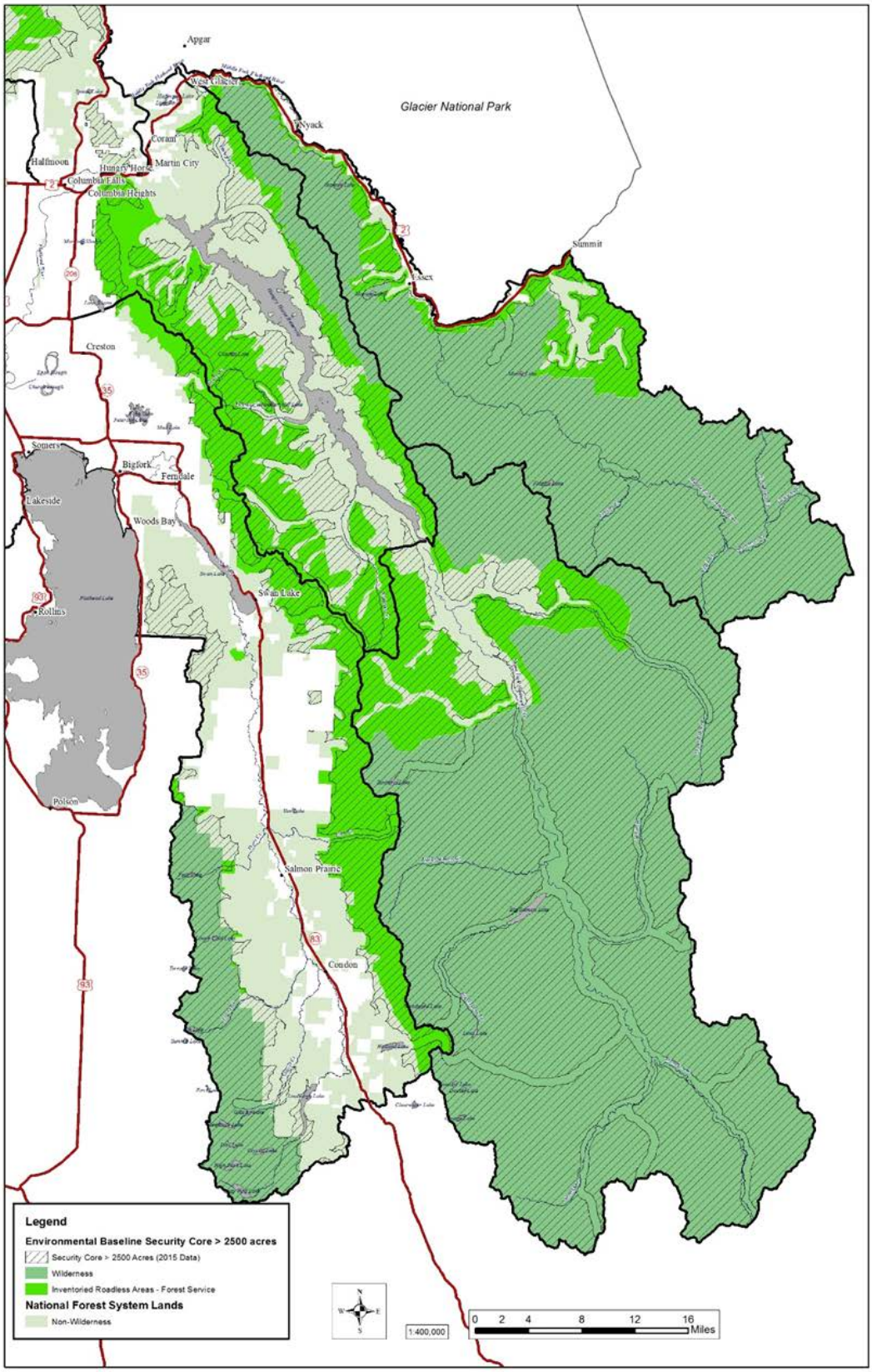


Figure 15. Grizzly Bear security core, wilderness, and IRAs on the south half of the Flathead National Forest.

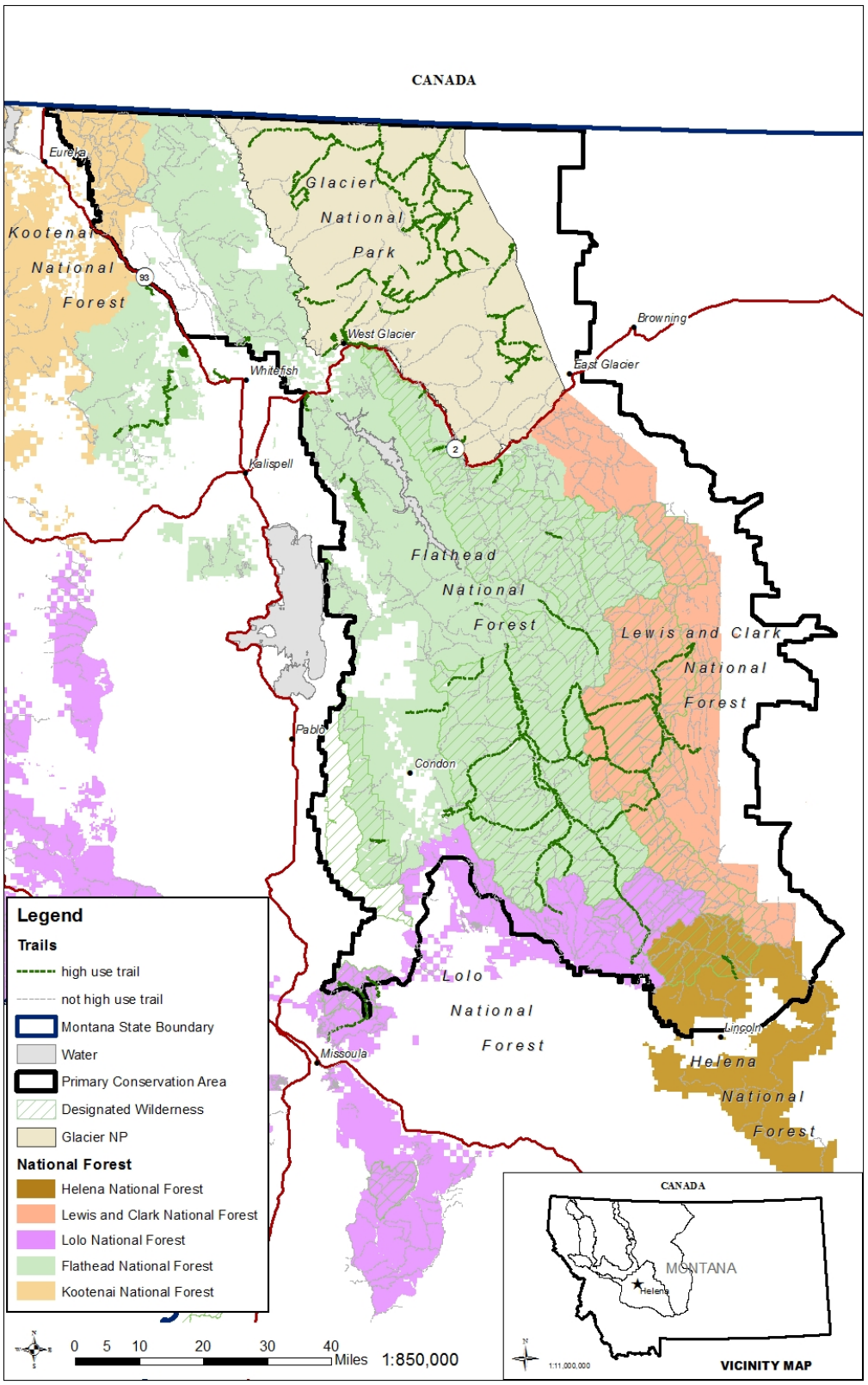


Figure 16. High use trails in the NCDE.

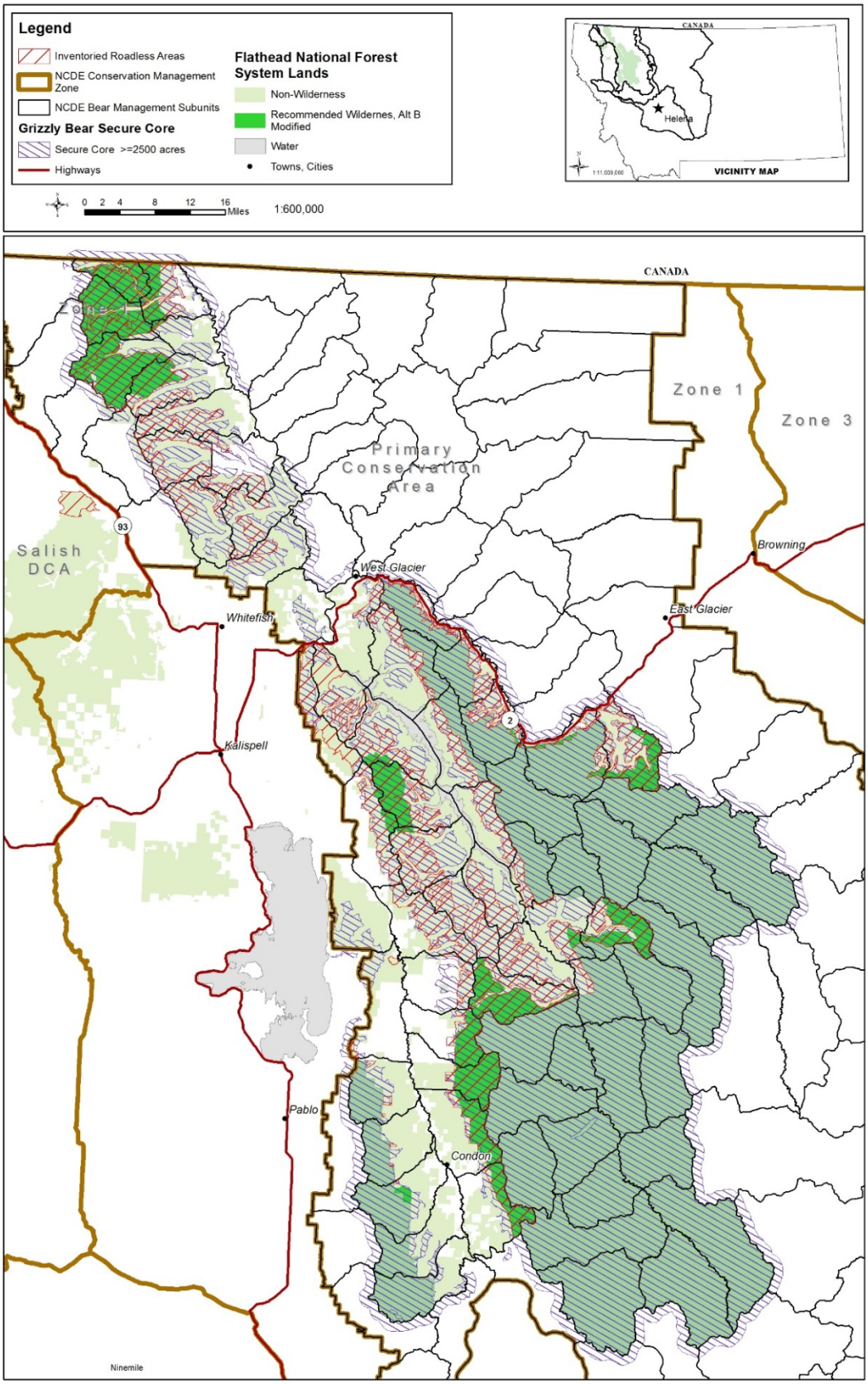


Figure 17. Grizzly bear security core with wilderness, recommended wilderness, and inventoried roadless areas under the Flathead National Forest's Revised Forest Plan.

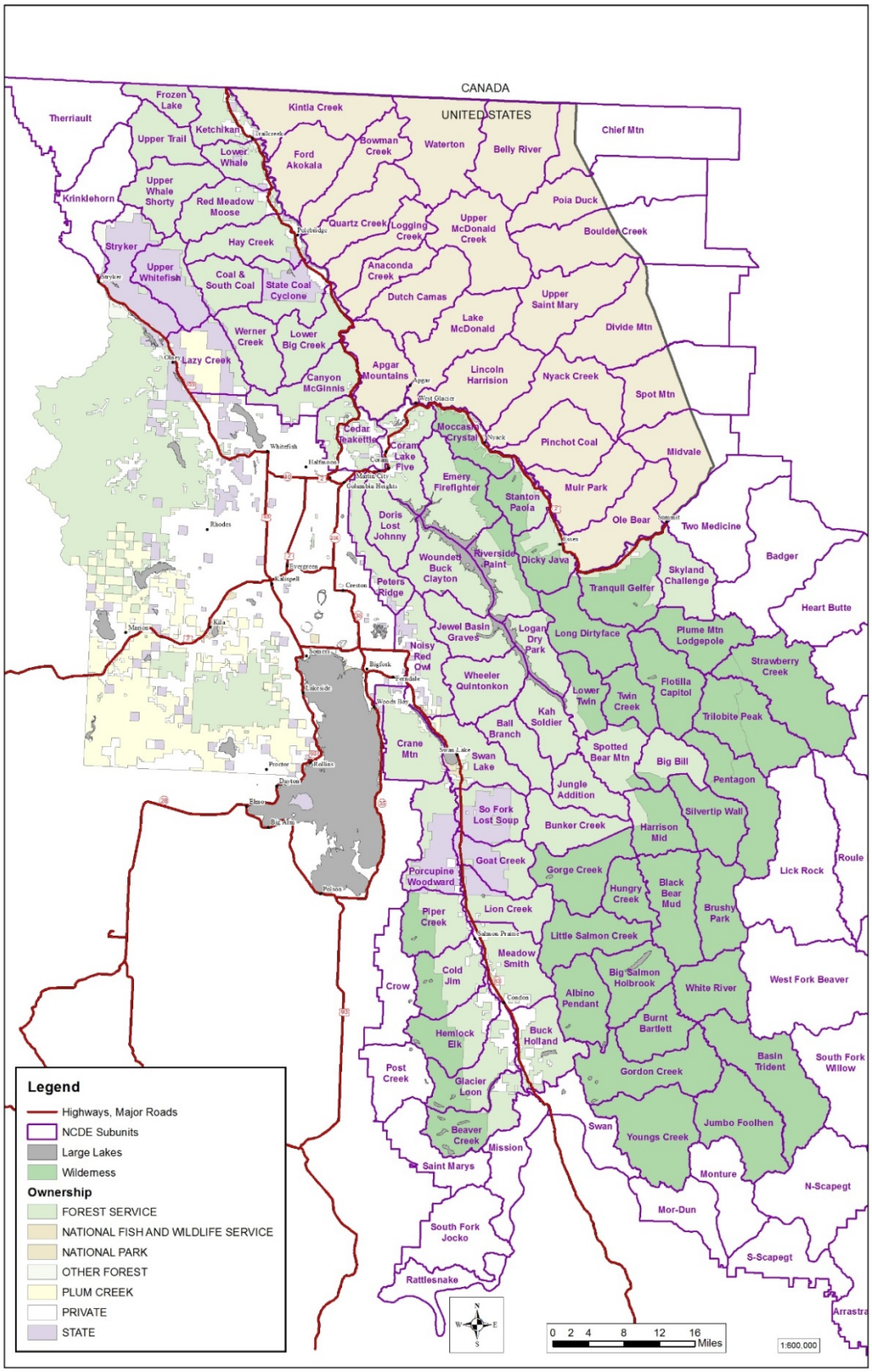


Figure 18. All bear management unit (BMU) subunits in the NCDE.

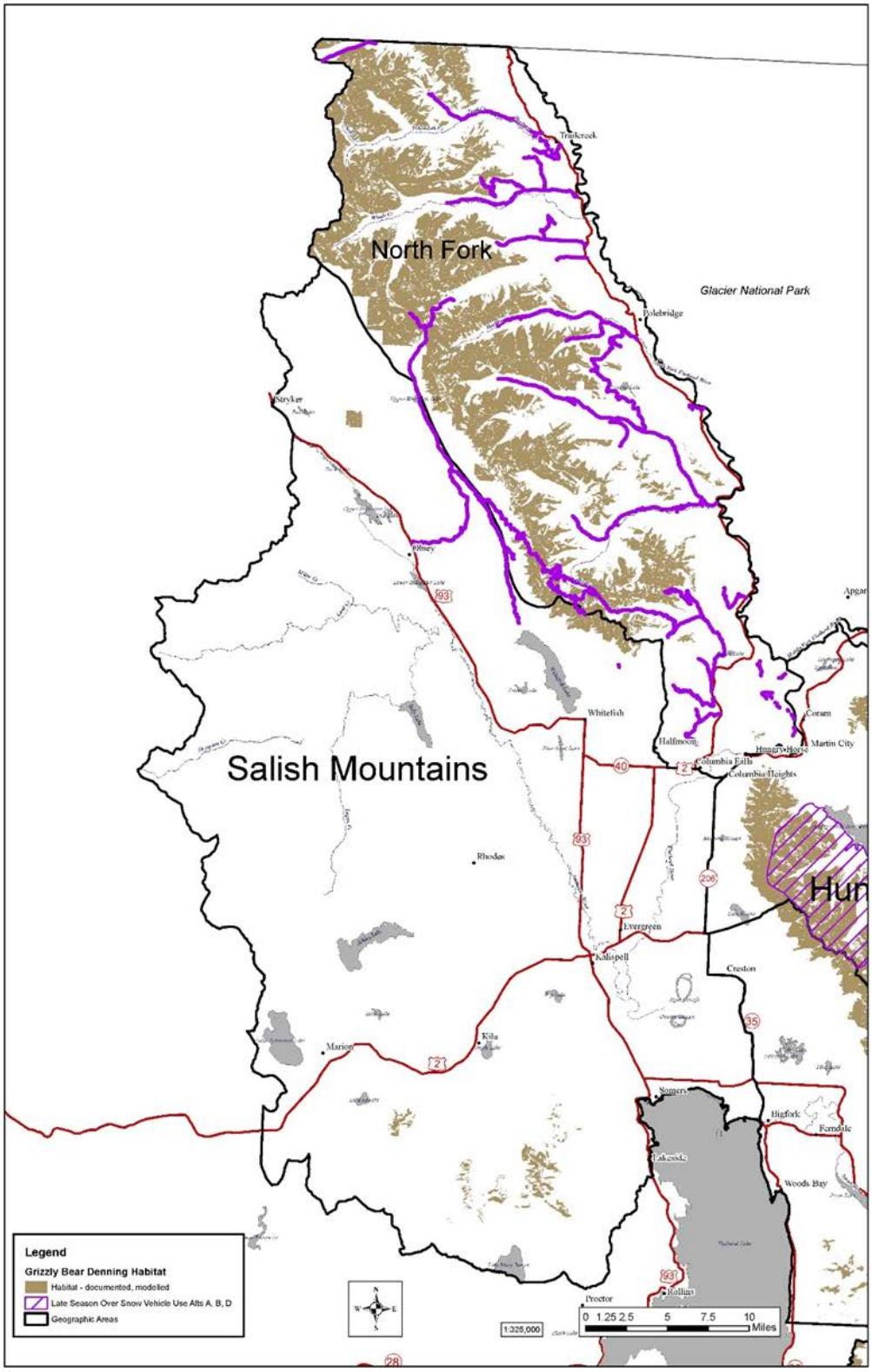


Figure19. Modeled grizzly bear denning habitat with amendment 19's designated late-season over-snow routes—north half Flathead National Forest.

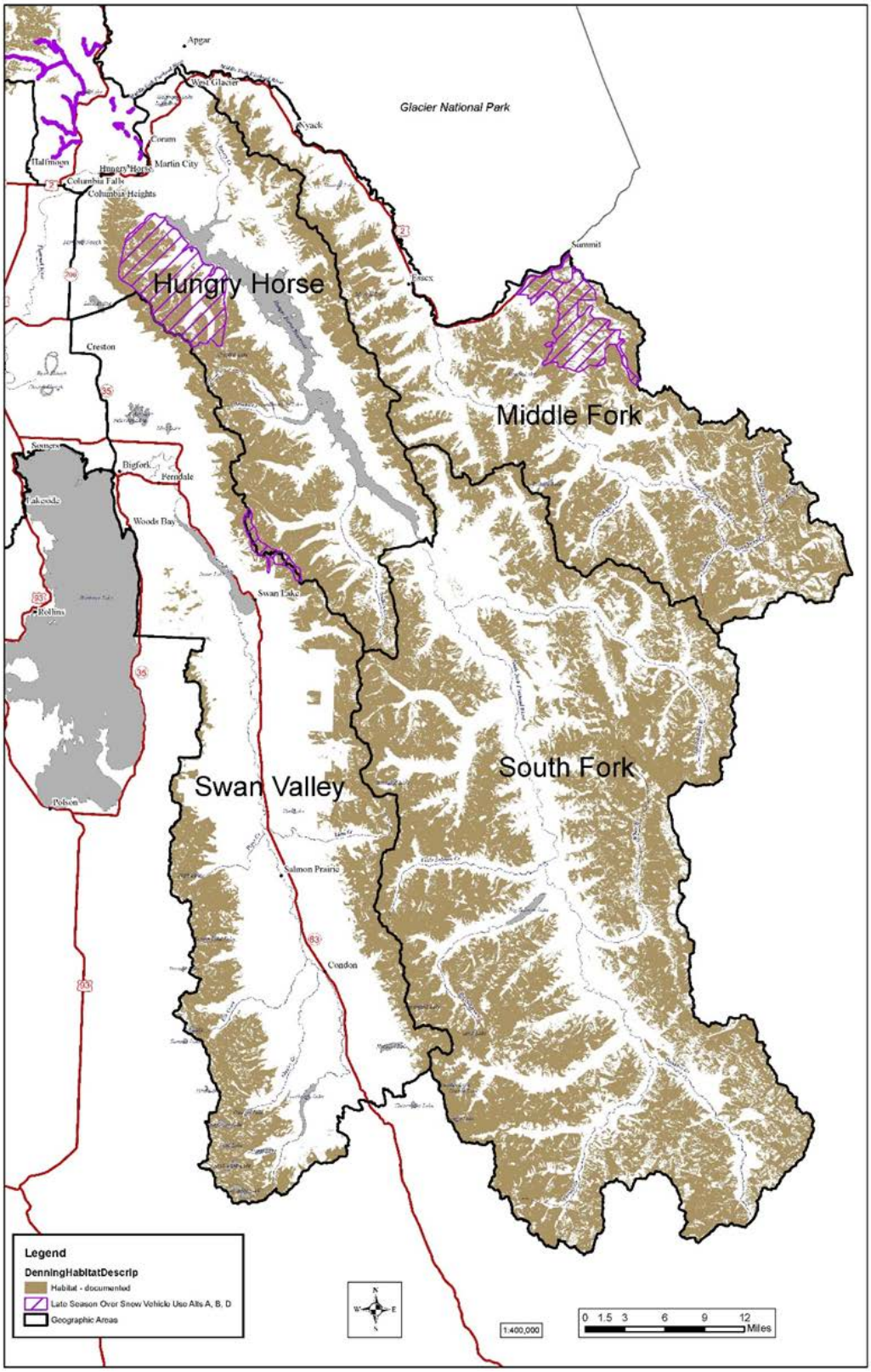


Figure 20. Modeled grizzly bear denning habitat with amendment 19's designated late-season over-snow areas—south half Flathead National Forest.

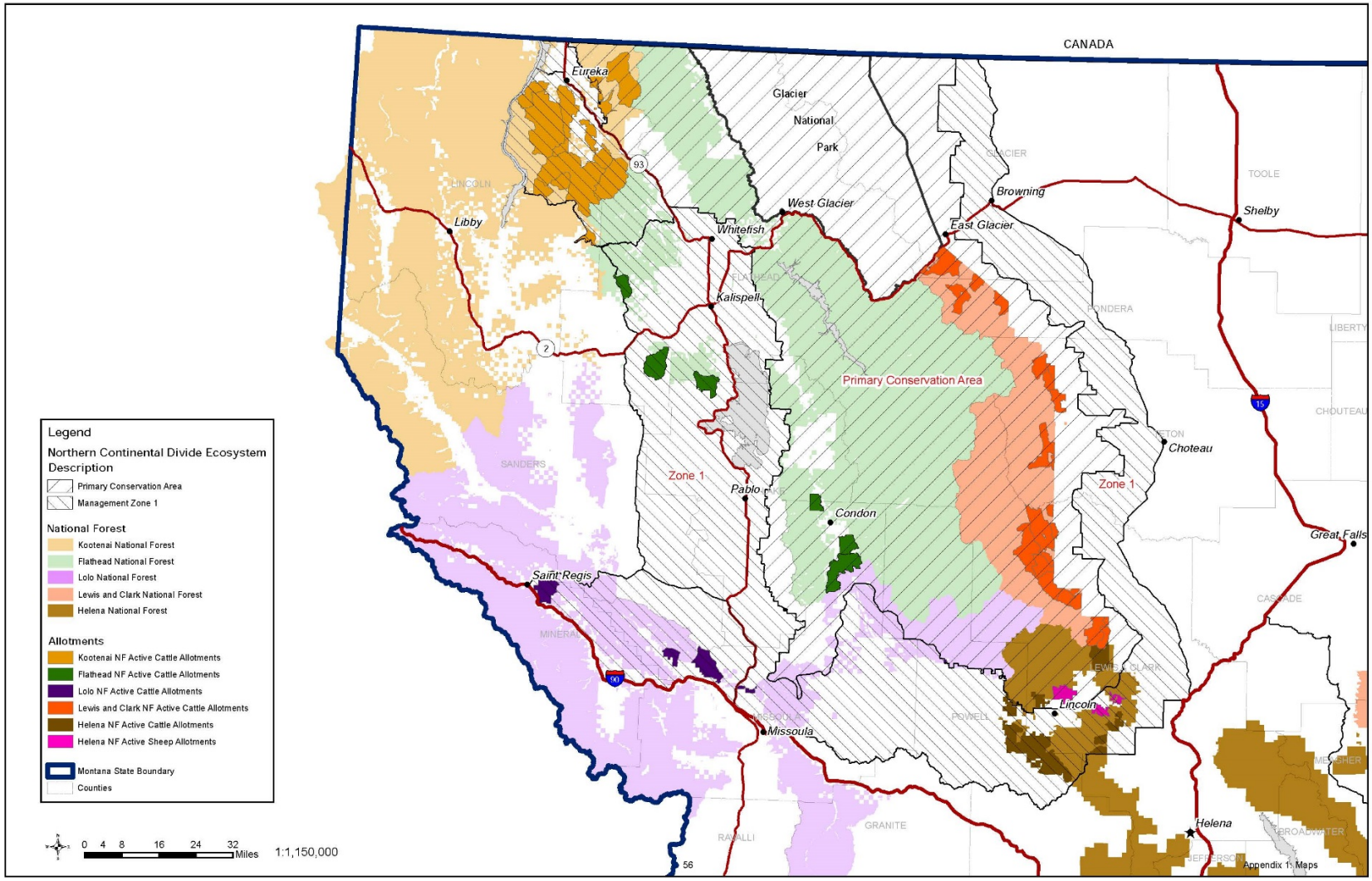


Figure 21. Grazing allotments on the NCDE.

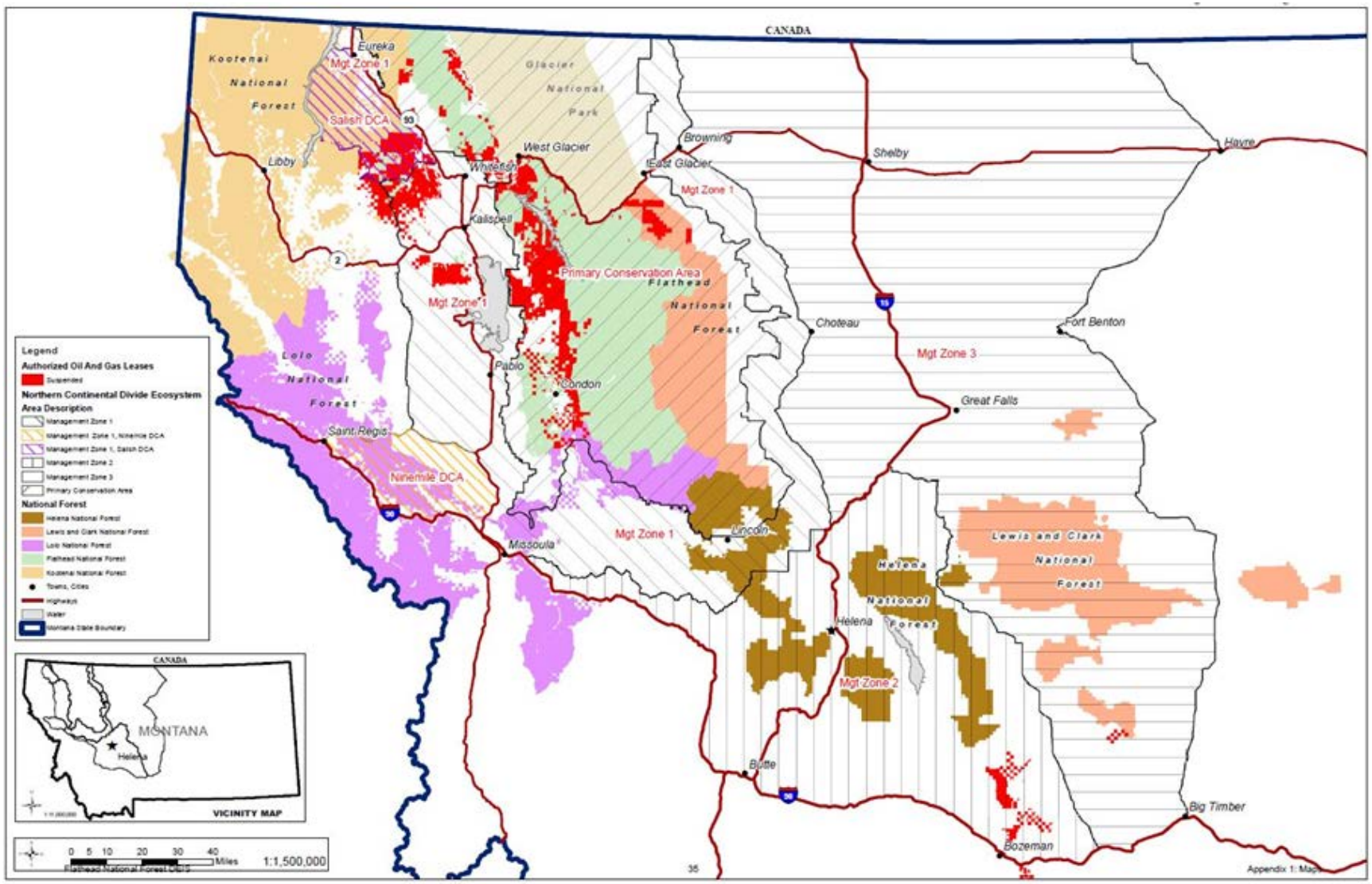


Figure 22. Suspended oil and gas leases in the Northern Continental Divide Ecosystem.

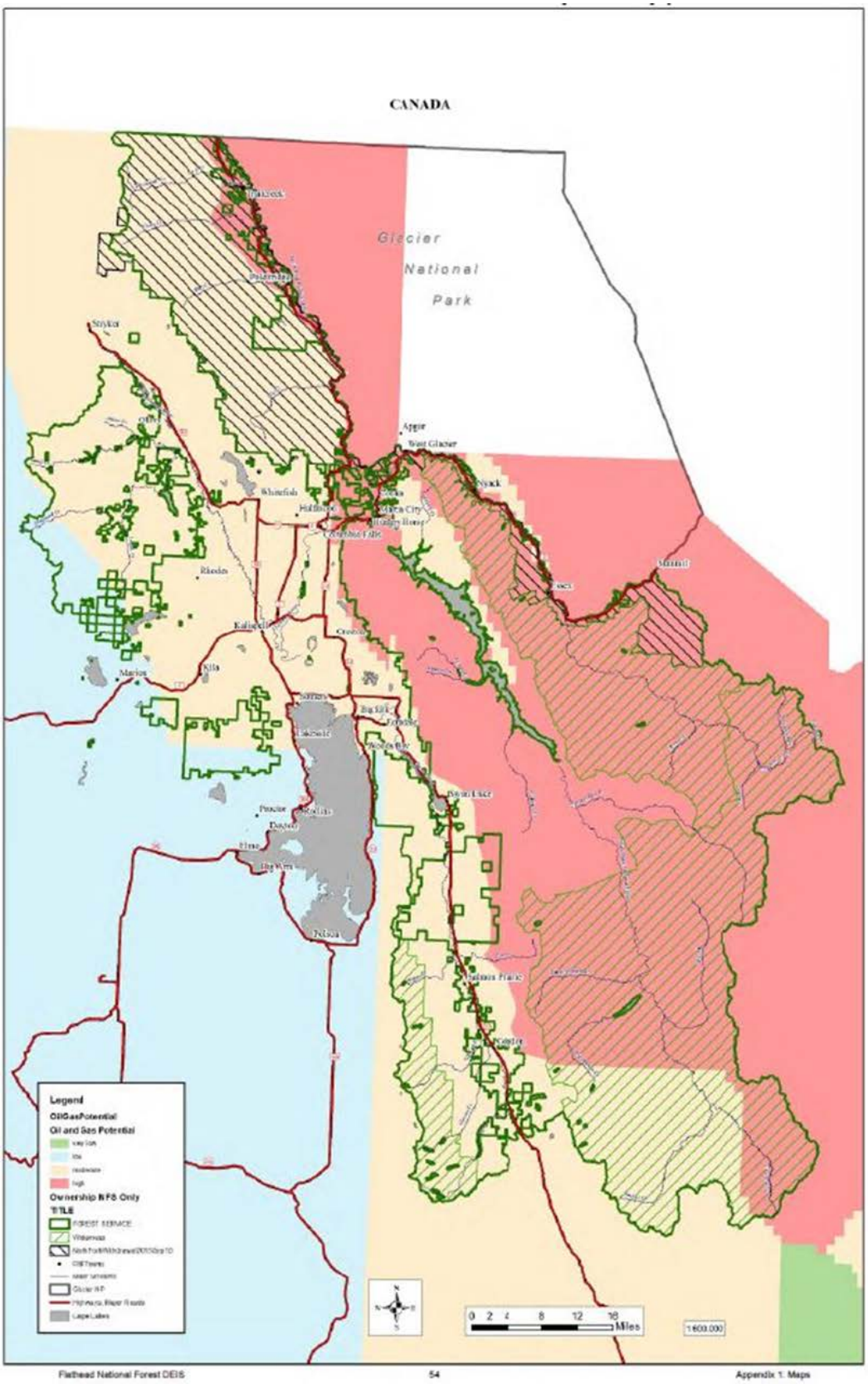


Figure 23. Oil and gas potential and withdrawal areas on the Flathead National Forest.

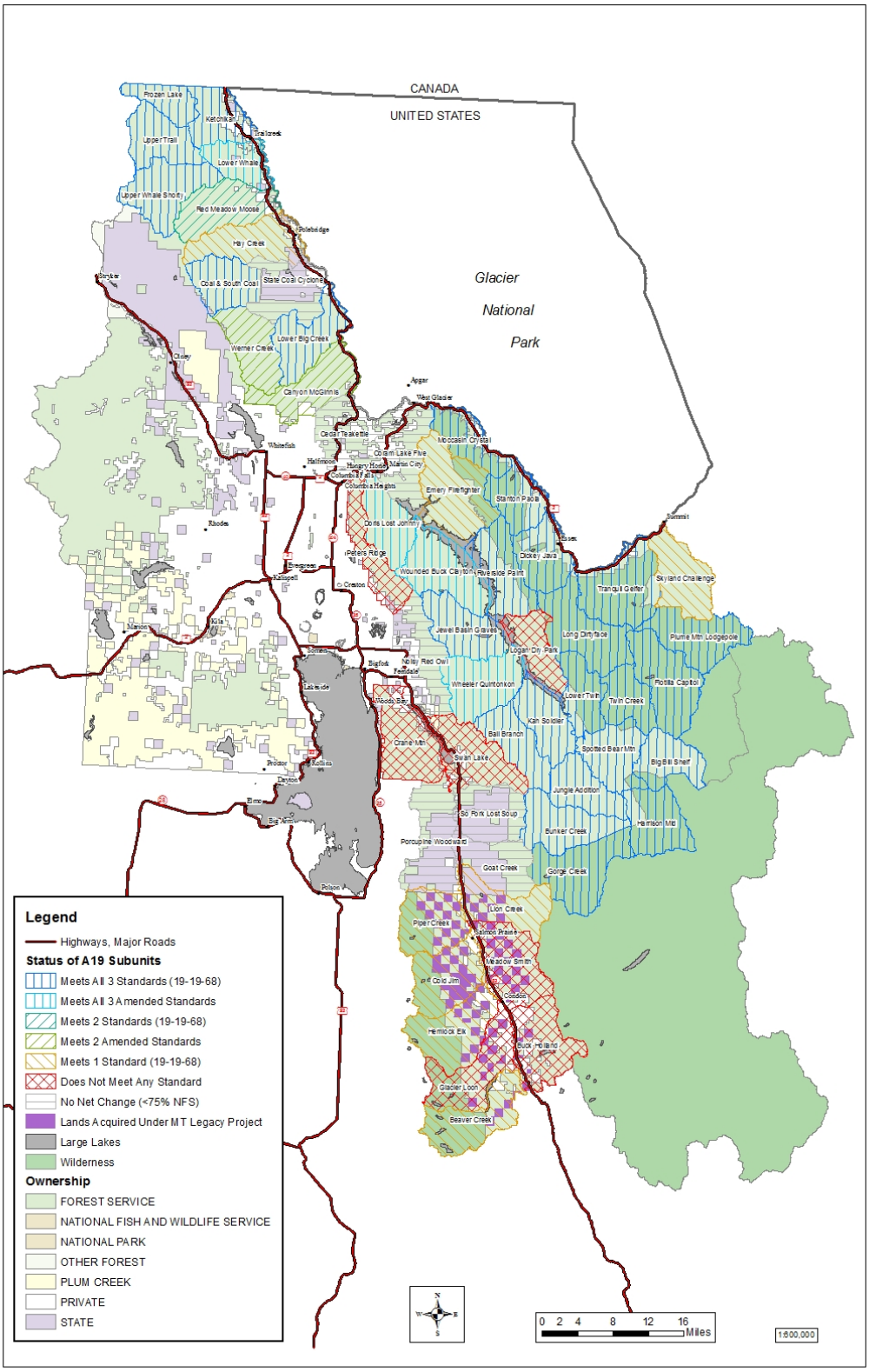


Figure 24. Status of grizzly bear subunits.

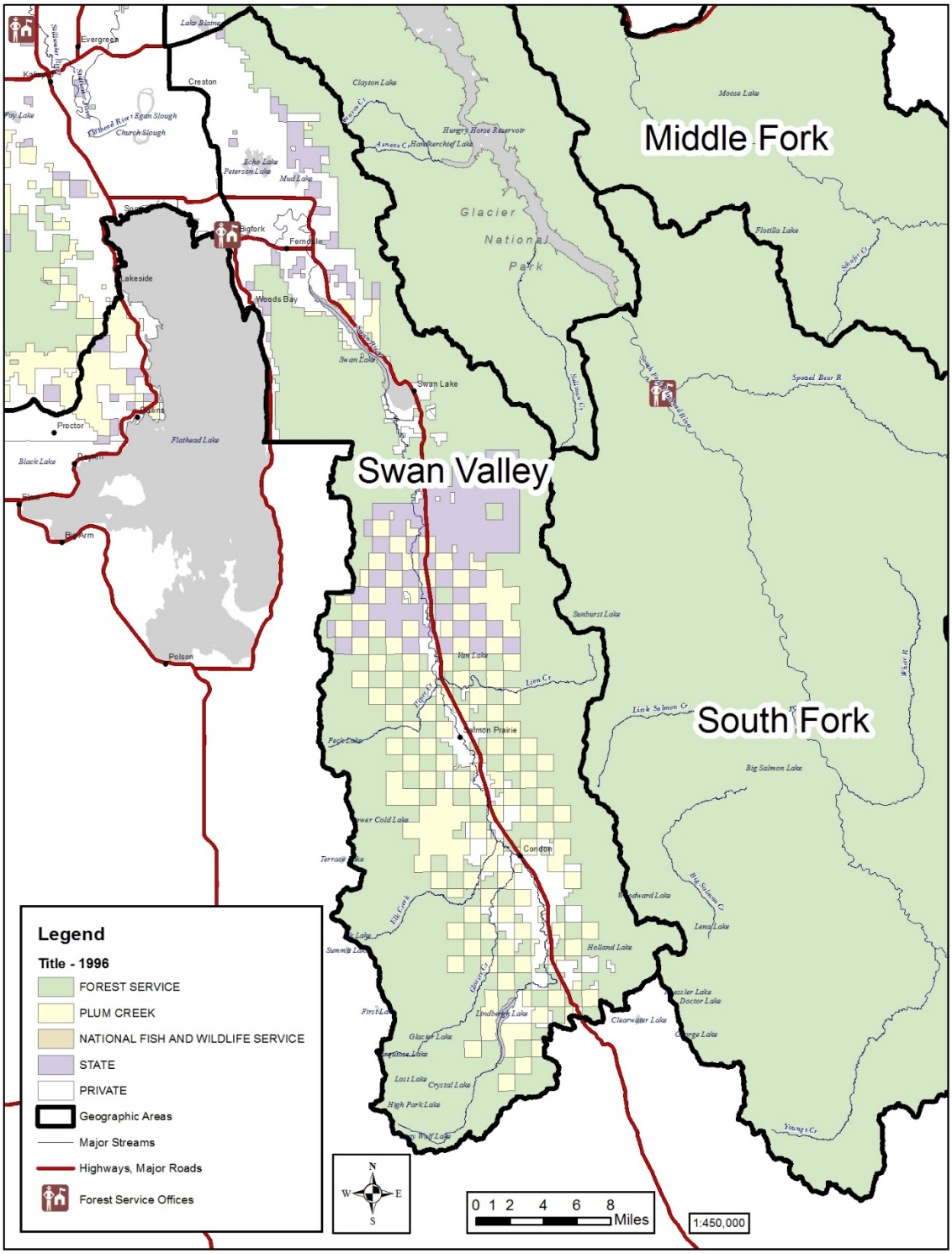


Figure 25. Swan Valley ownership prior to Legacy Land acquisition.

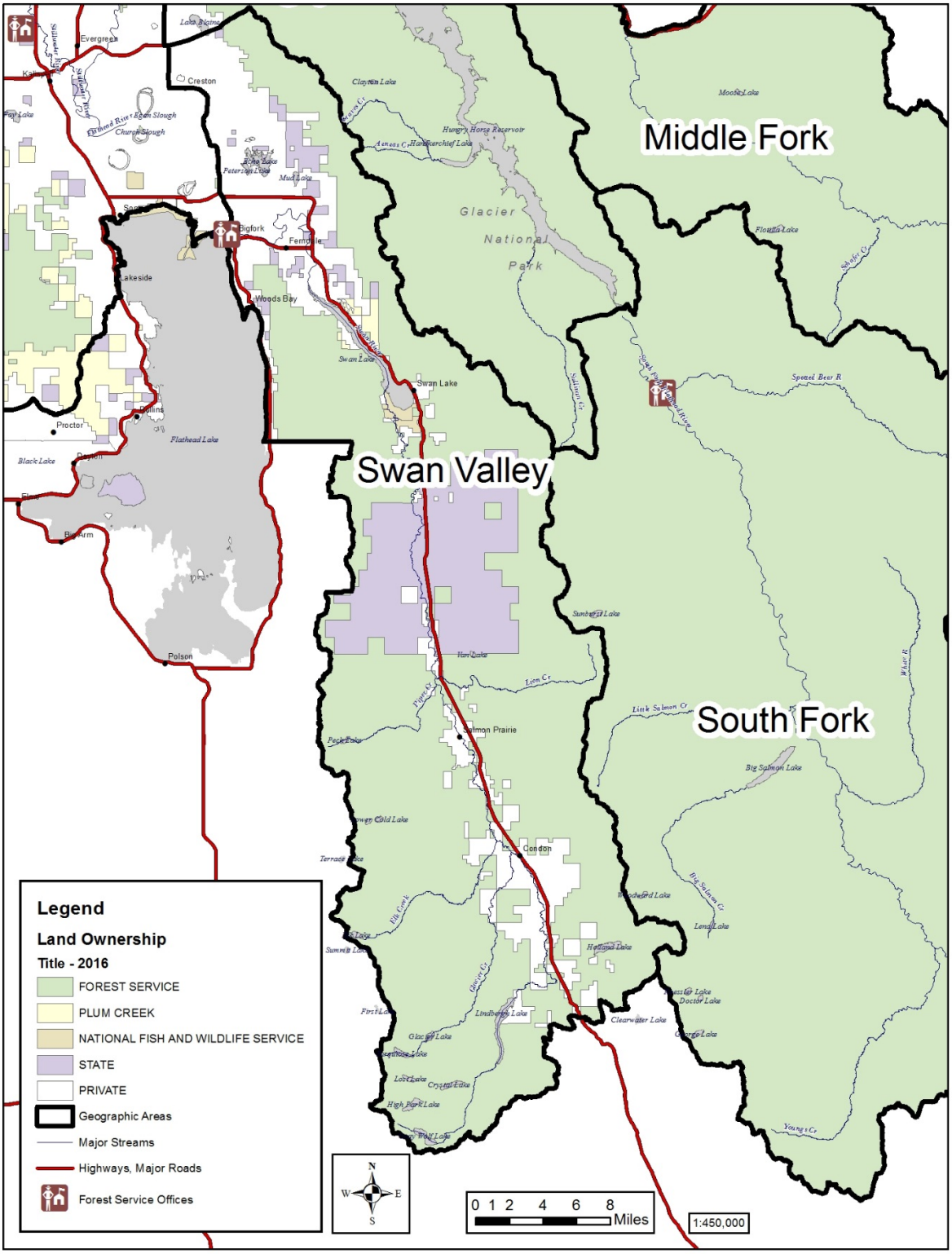


Figure 26. Swan Valley ownership following the Legacy Land acquisition and other acquisitions.

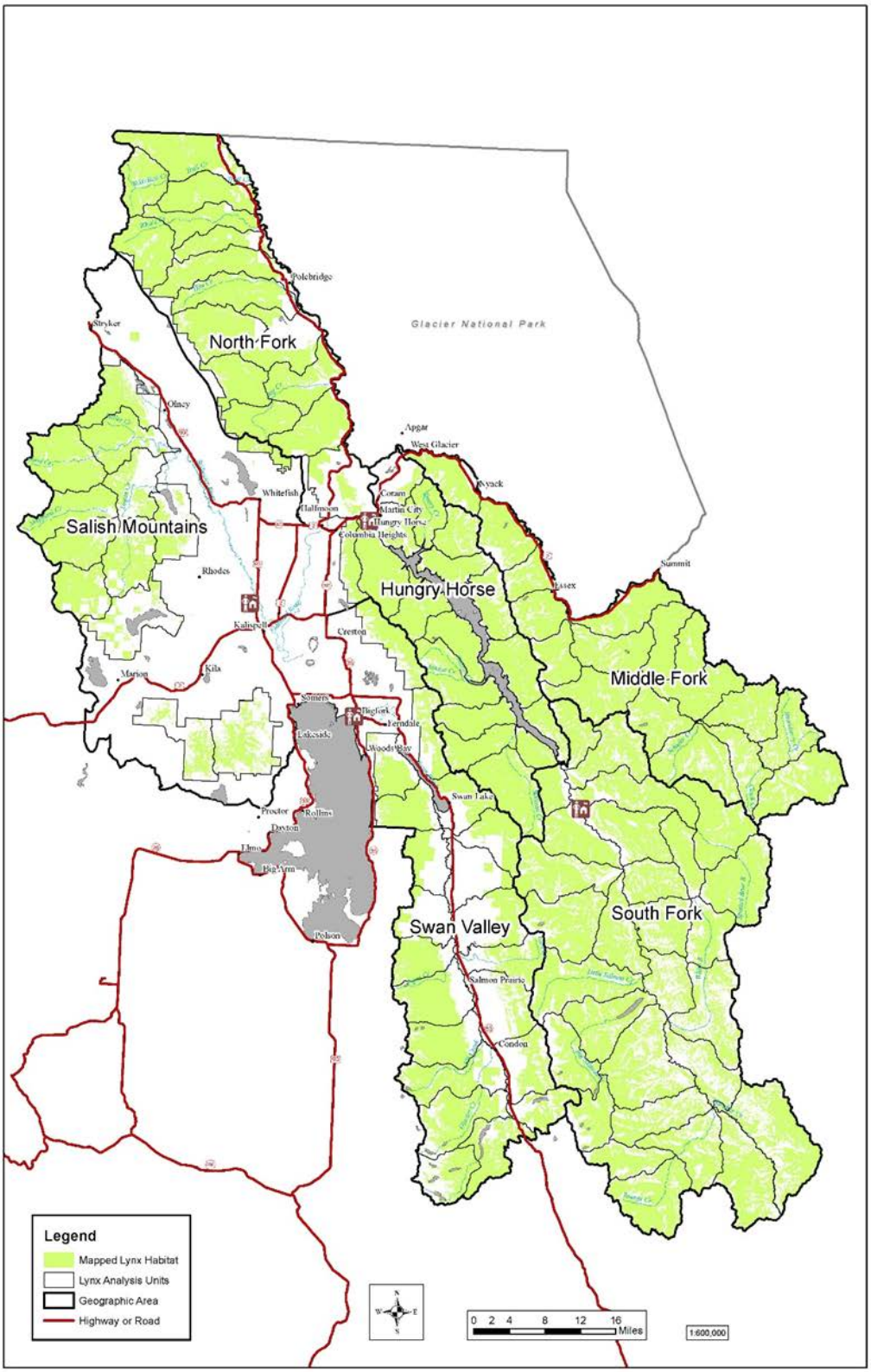


Figure 27. Lynx analysis units (LAUs) on the Flathead National Forest.

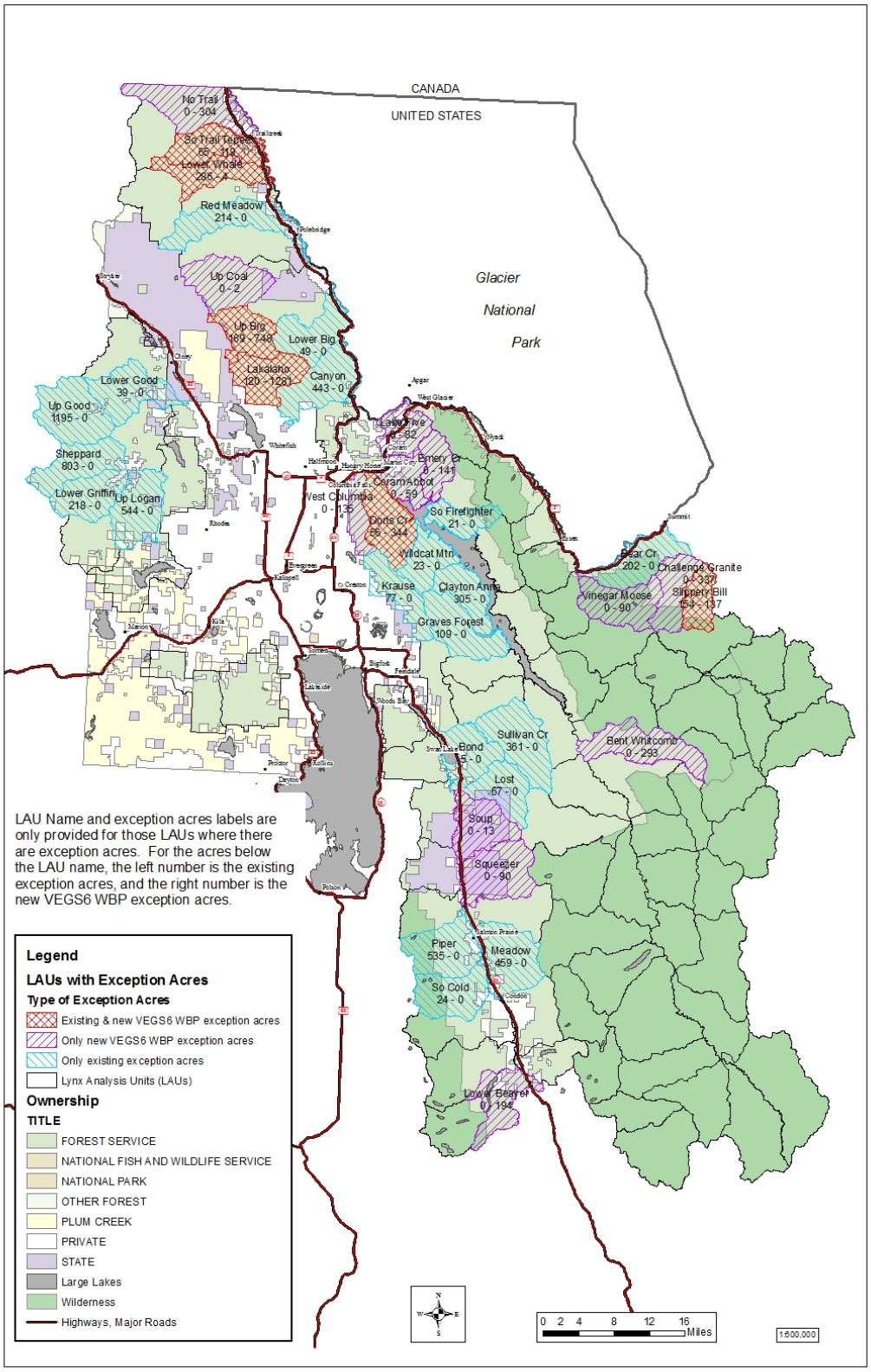
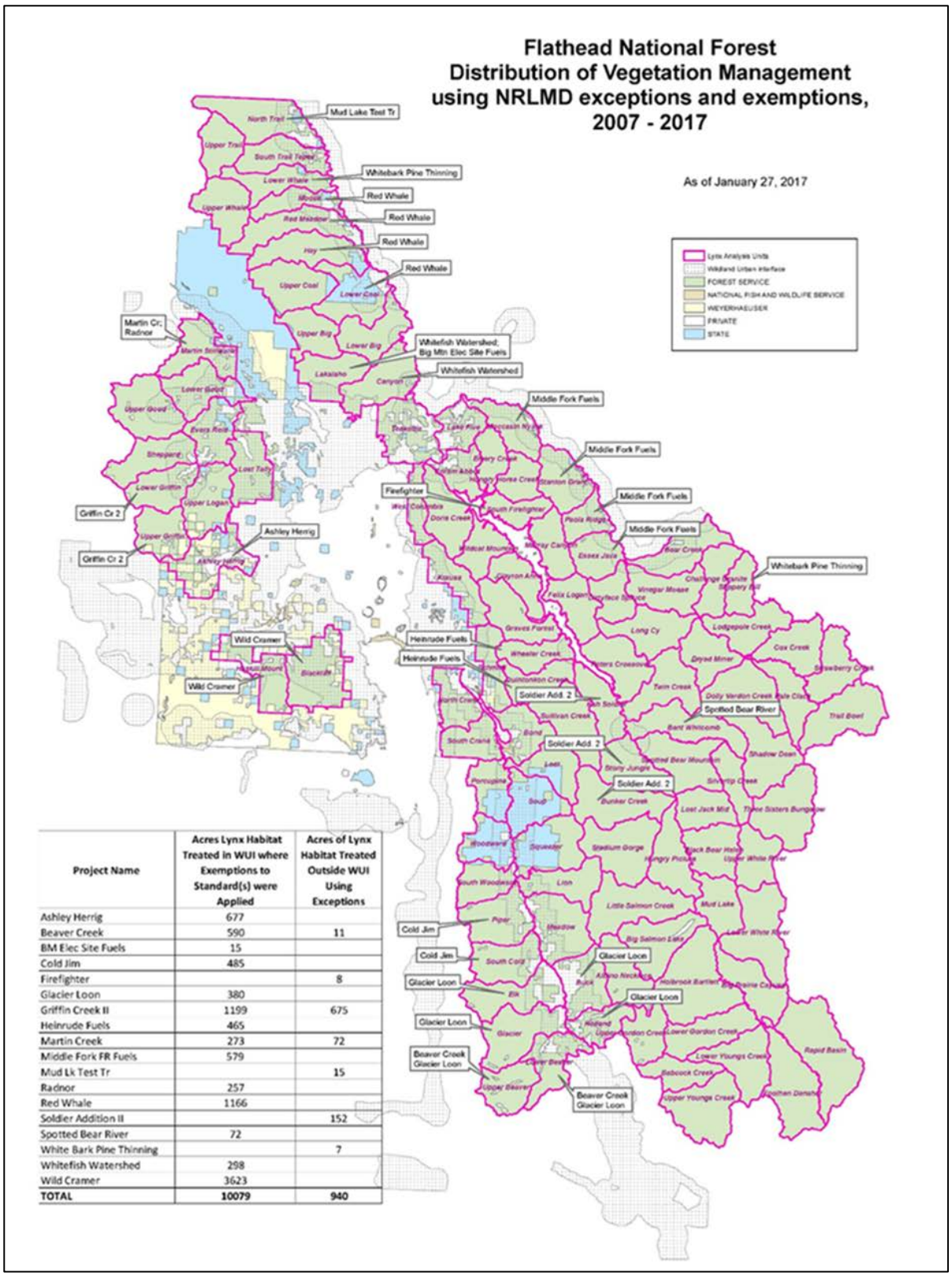


Figure 28. LAUs Lynx analysis units with exception acres to NRLMD standards.



Project Name	Acres Lynx Habitat Treated in WUI where Exemptions to Standard(s) were Applied	Acres of Lynx Habitat Treated Outside WUI Using Exceptions
Ashley Herrig	677	
Beaver Creek	590	11
BM Elec Site Fuels	15	
Cold Jim	485	
Firefighter		8
Glacier Loon	380	
Griffin Creek II	1199	675
Heinrude Fuels	465	
Martin Creek	273	72
Middle Fork FR Fuels	579	
Mud Lk Test Tr		15
Radnor	257	
Red Whale	1166	
Soldier Addition II		152
Spotted Bear River	72	
White Bark Pine Thinning		7
Whitefish Watershed	298	
Wild Cramer	3623	
TOTAL	10079	940

Figure 29. LAUs on the Flathead National Forest that have used NRLMD exceptions and exemptions from 2007 to 2017.

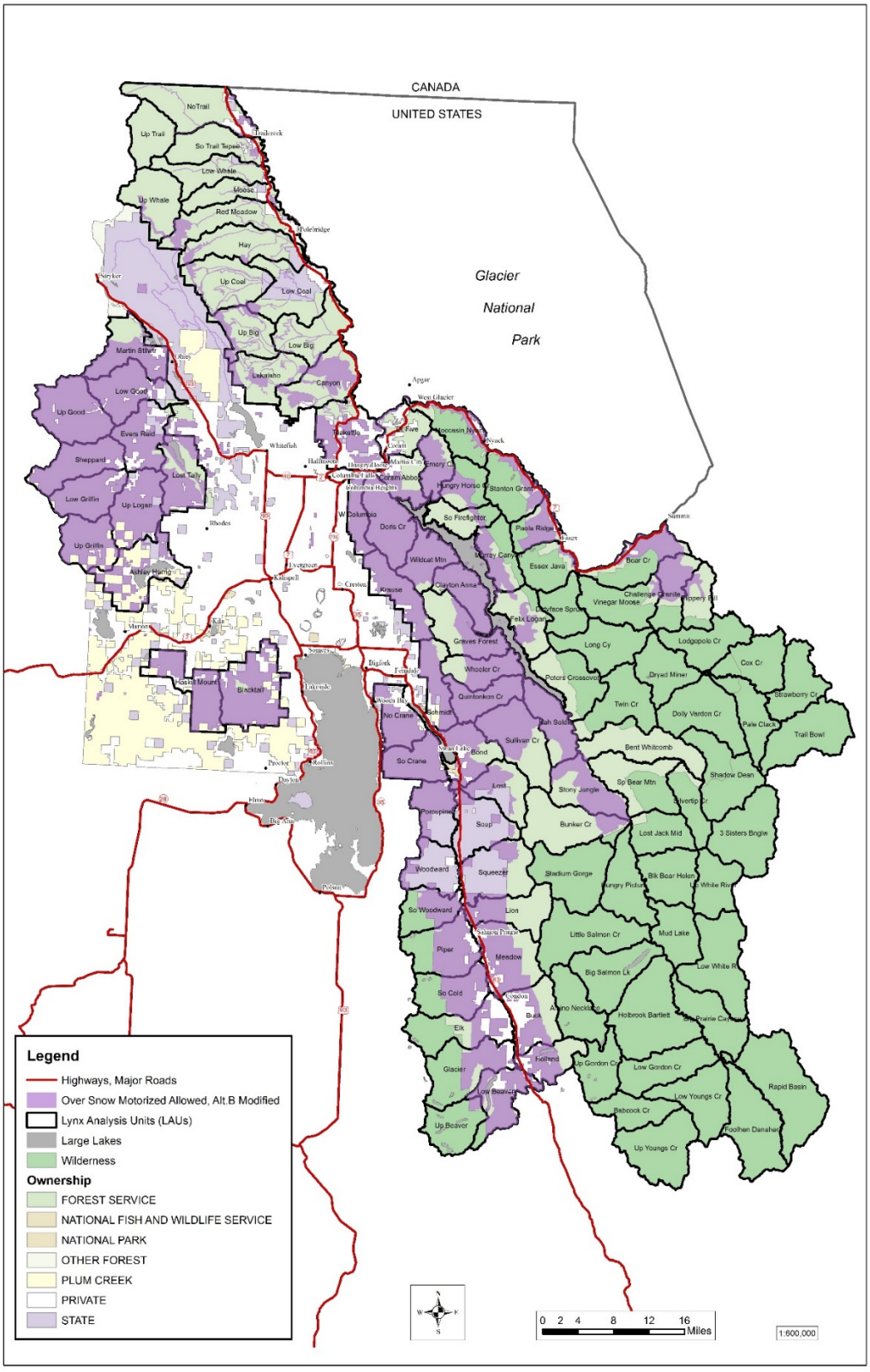


Figure 30. LAUs with over-snow motorized use under the Revised Forest Plan.

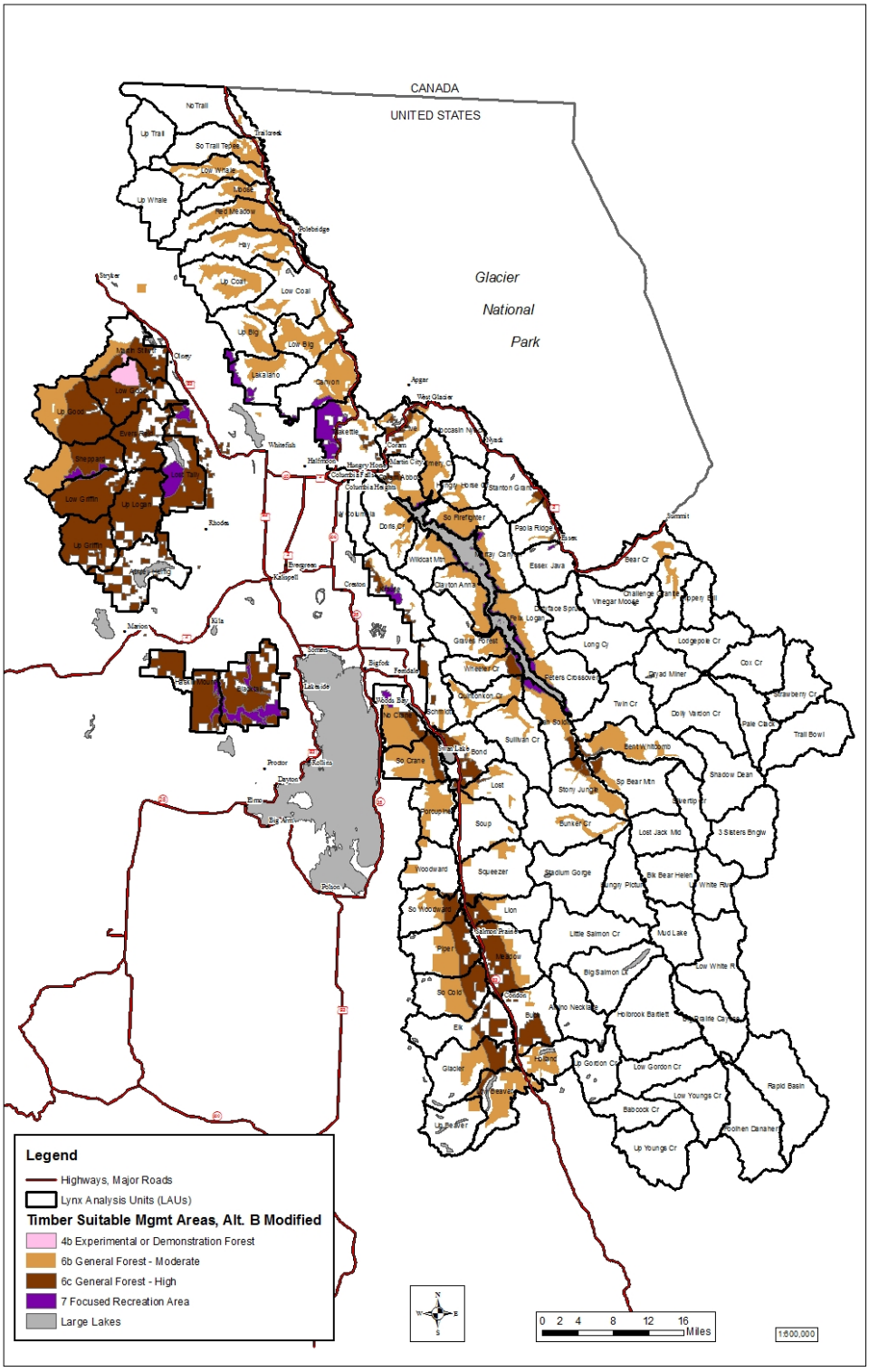


Figure 31. LAUs with timber suitable management areas under the Revised Forest Plan.

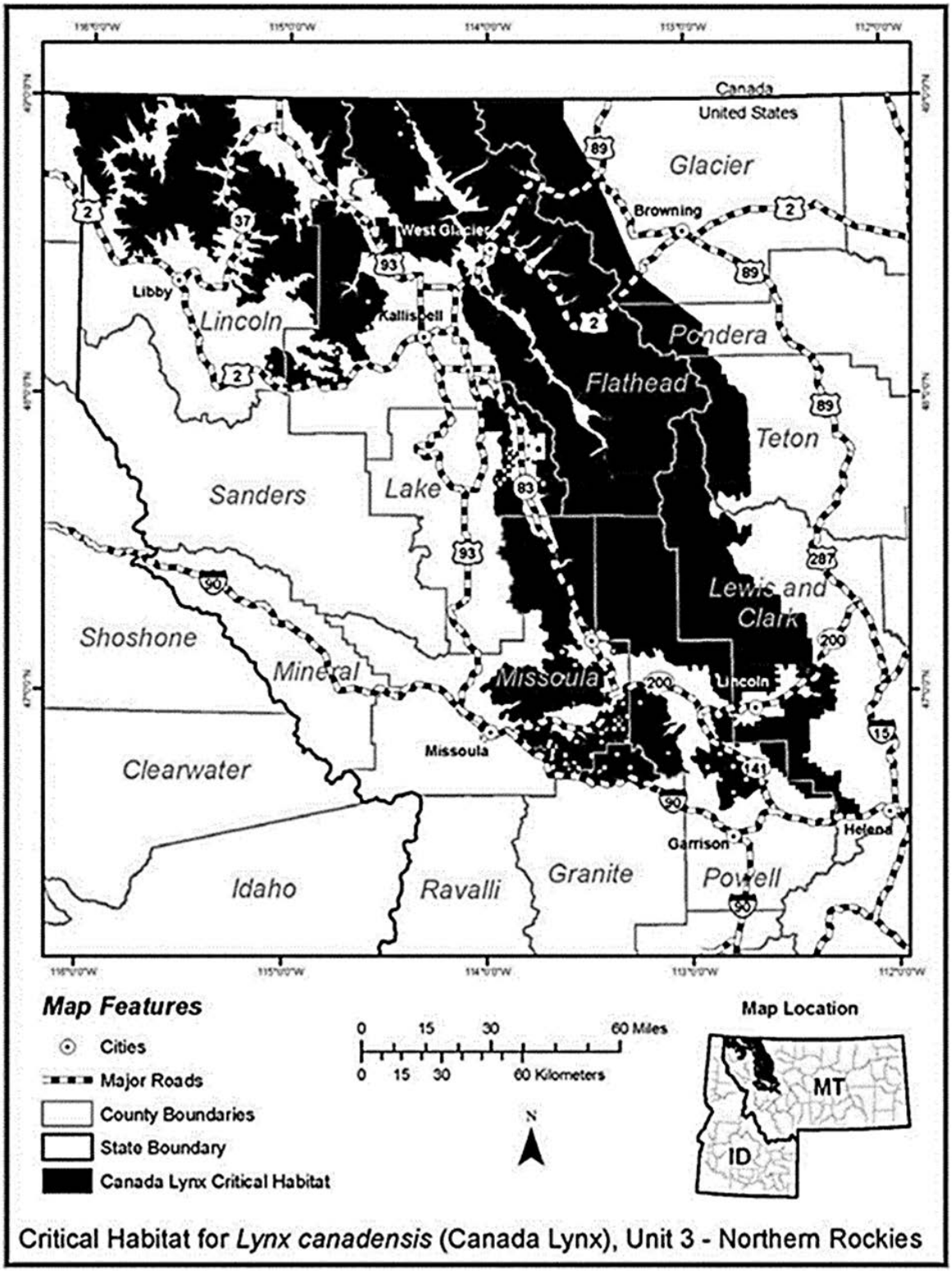


Figure 32. Canada lynx Critical Habitat Unit 3, as shown in the final rule (Federal Register Vol. 79, No. 177, Friday, September 12, 2014).

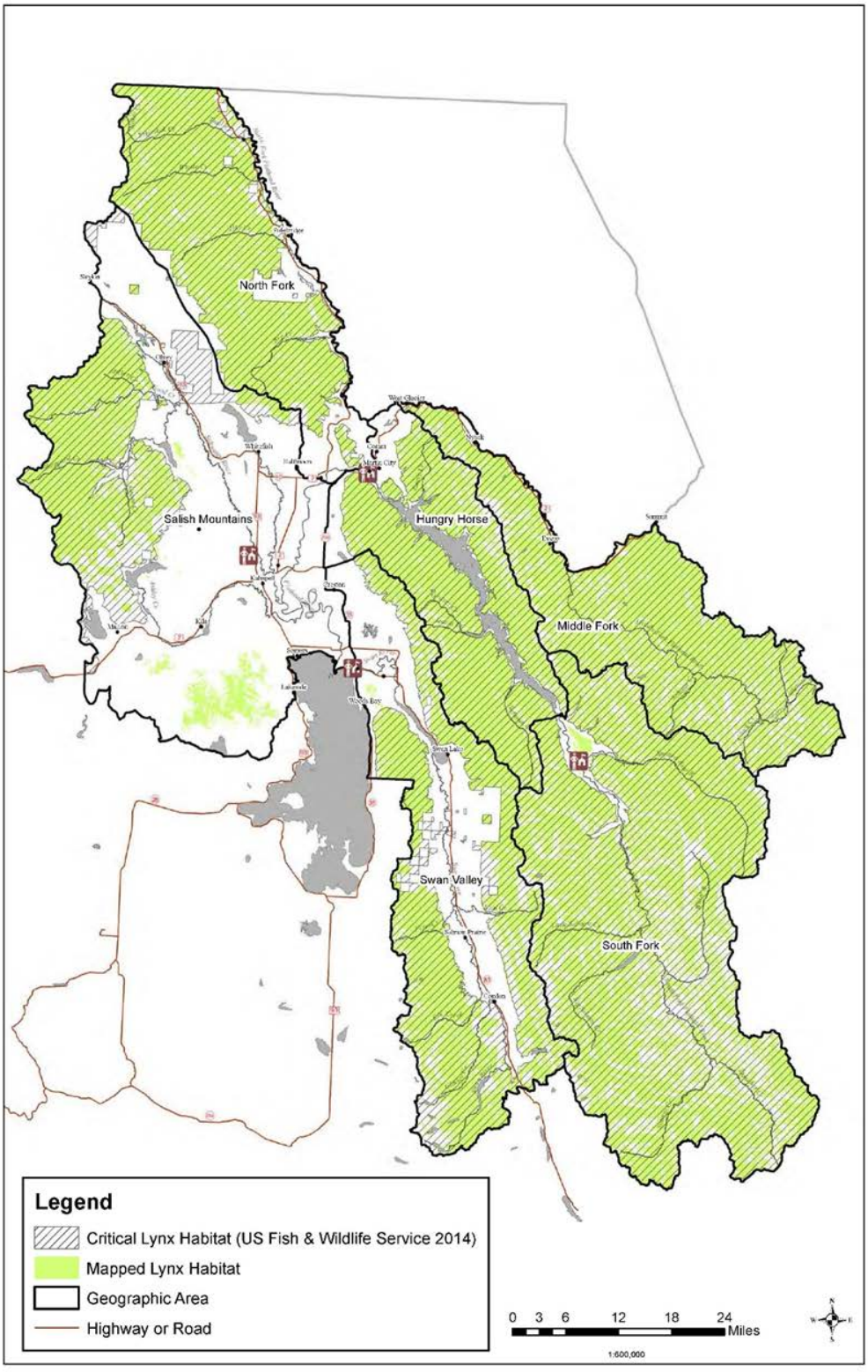


Figure 33. Canada lynx critical habitat and modeled potential lynx habitat on the Flathead National Forest.

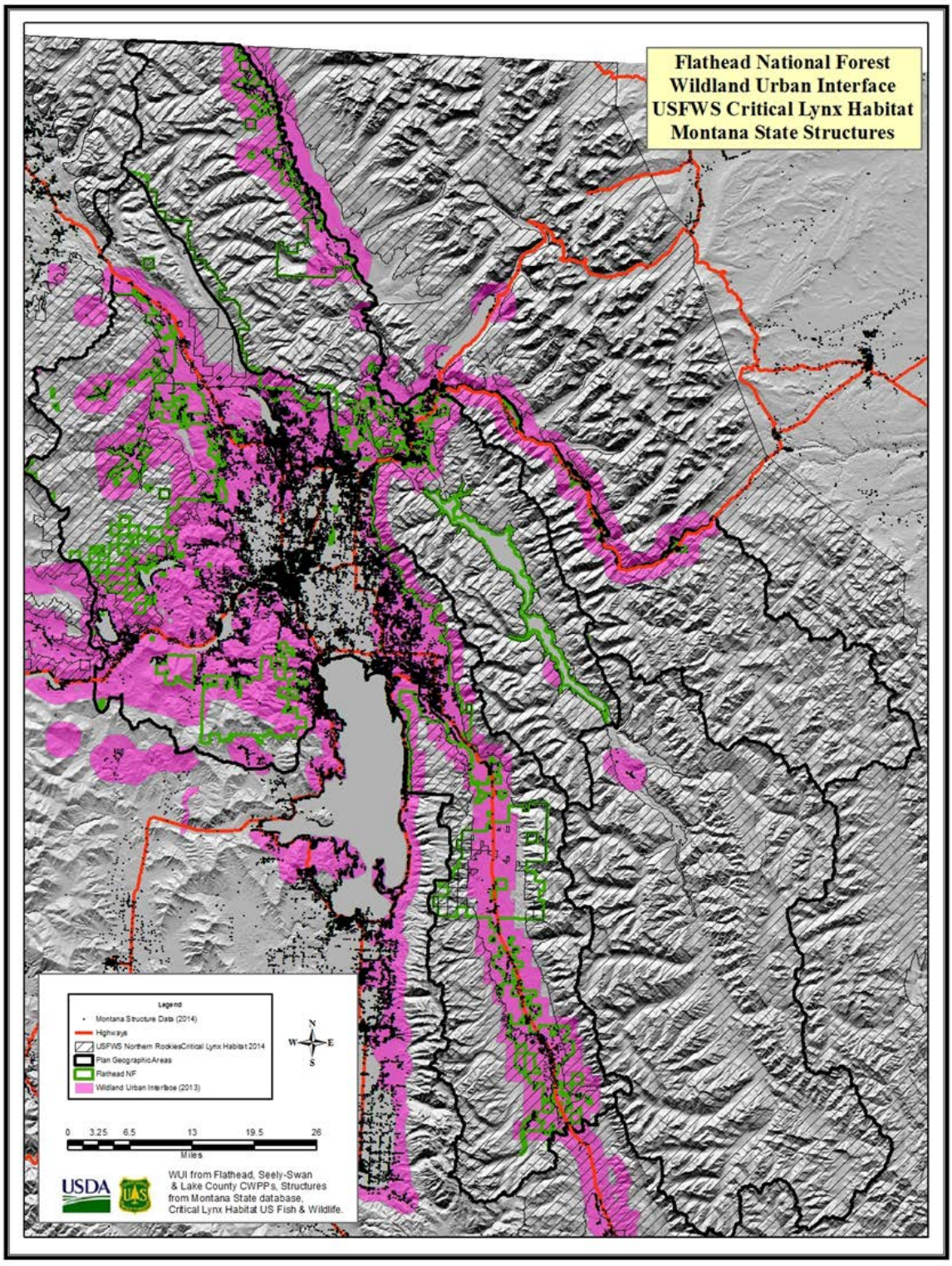


Figure 34. Canada Lynx critical habitat on the Flathead National Forest in relation to private lands and the wildland-urban interface (WUI).

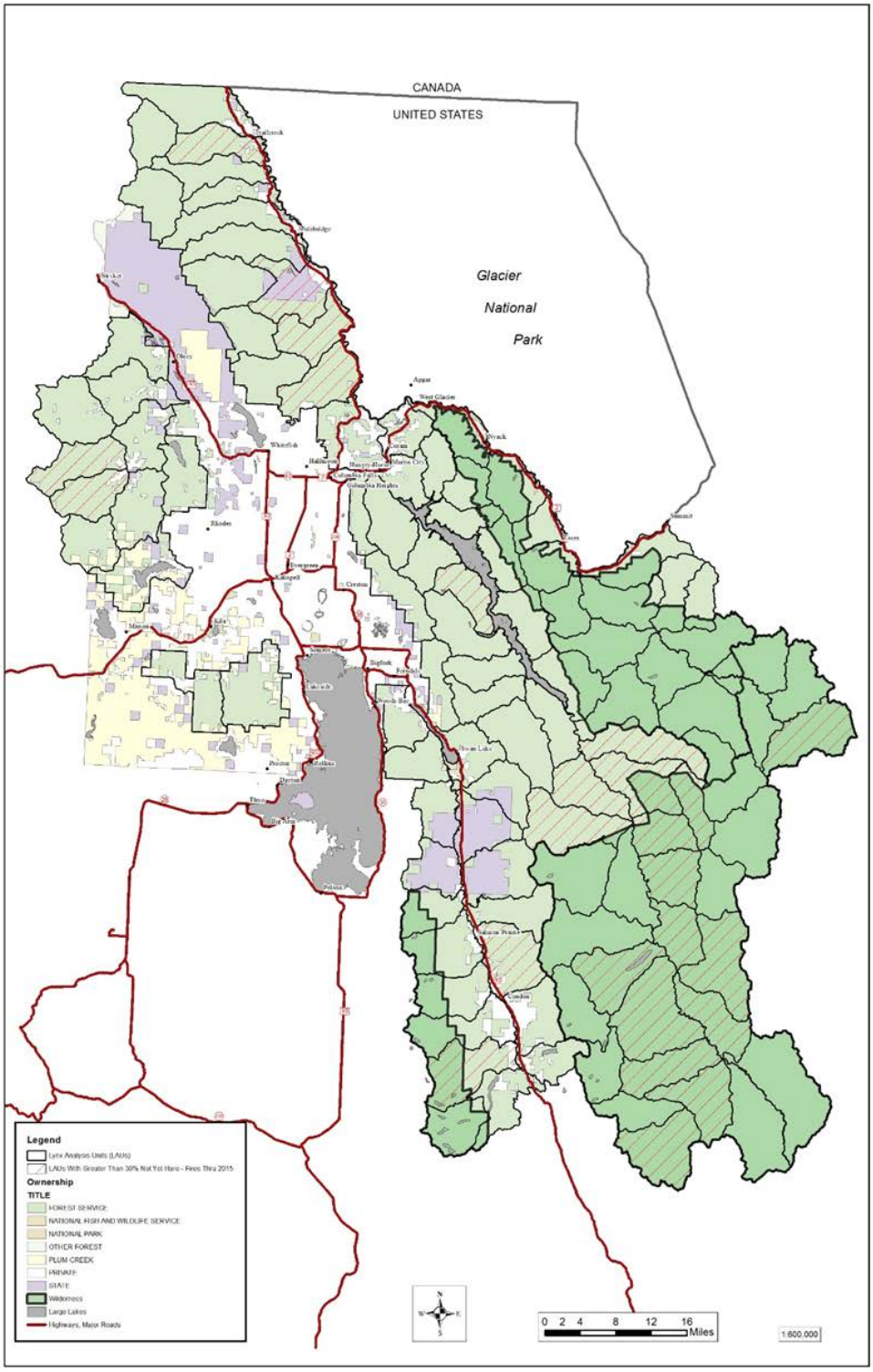


Figure 35. LAUs on the Flathead National Forest that have greater than 30% of lynx habitat that is not yet snowshoe hare habitat due to wildfires as of 2017.

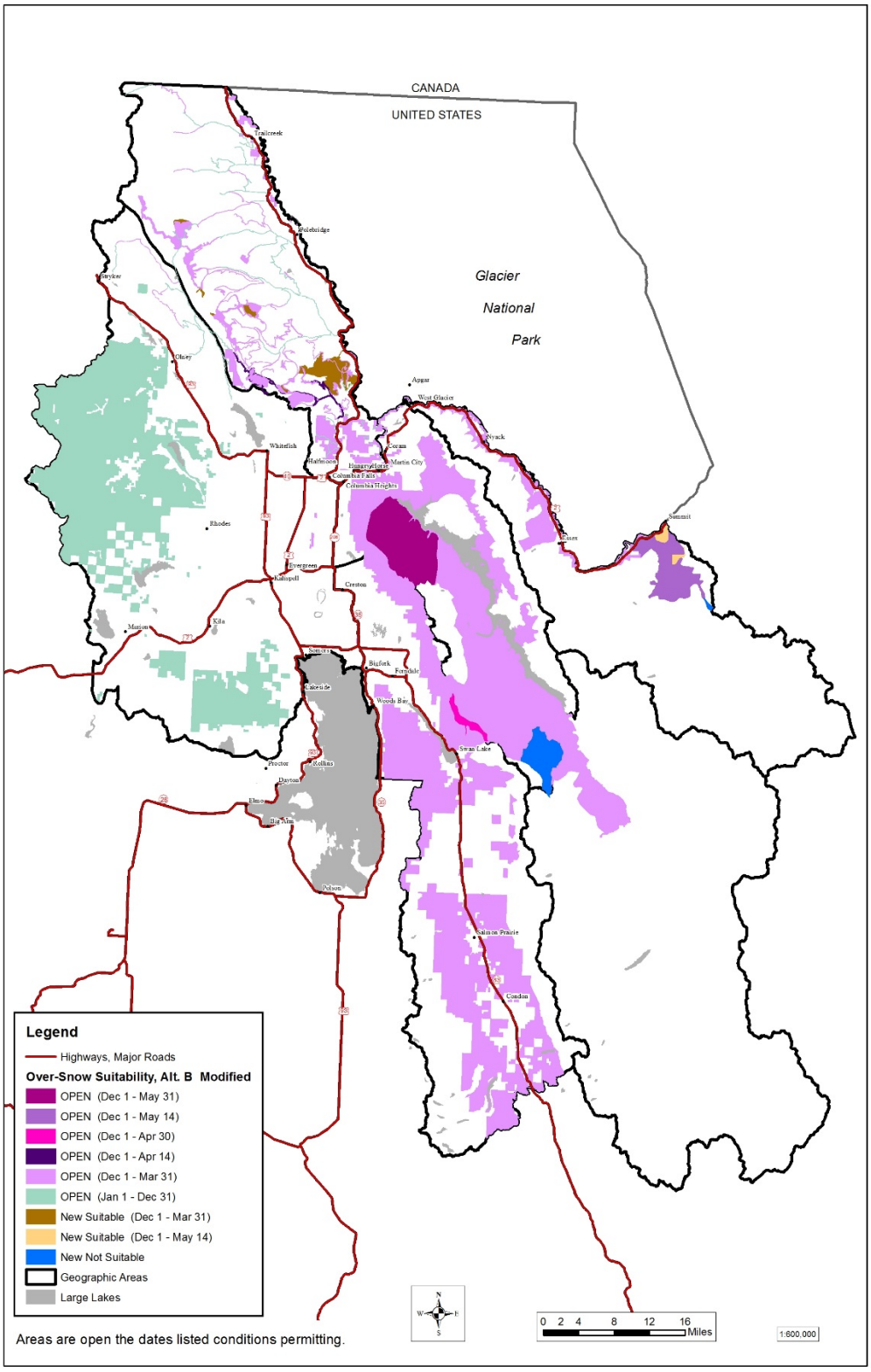


Figure 36. Over snow suitability for under the Revised Forest Plan.

Appendix 2: Flathead National Forest Revised Forest Plan Key Components: Bull Trout

The following presents component of the Flathead National Forest's Revised Forest Plan that pertain to bull trout. This appendix is organized by plan component (e.g., desired conditions, objectives, standards, etc.). The exact nomenclature of the plan component is either listed in the sub-heading, or an alphanumeric combination of the heading code and number following.

Example: FW-STD-WTR-02 would be forest-wide (FW) standard (STD) for watersheds (WTR) number two (02).

DESIRED CONDITIONS

A desired condition is a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be described in terms that are specific enough to allow progress toward their achievement to be determined, but do not include completion dates (36 CFR 219.7(e)(1)(i)).

Desired conditions describe the aspirations or visions of what the plan area (or portions thereof) should look like in the future and drive the development of the other plan components. Desired conditions essentially set forth the desired landscape of the future and the other plan components give guidance on how to get there. Desired conditions should be developed with the context of the plan area's distinctive roles and contributions within the broader landscape in mind (sec.22.32 of this Handbook). A plan's set of desired conditions must be internally consistent so they are feasible and attainable, and they must be written clearly so that they can be understood by the public as well as the Agency. The set of desired conditions must reflect the capability of the plan area and the fiscal capability of the Agency. The set of desired conditions for plan revision must cover ALL the requirements for a plan set out at 36 CFR 219.8 through 219.11—to provide for sustainable ecosystems with ecological integrity, in the context of multiple-use management. The set of desired conditions should integrate the ecological, economic, social, and cultural desired conditions. The format function of desired conditions is addressed in this section. Sections 23 through 24.44 of this Handbook set forth guidance for the resource requirements for plan components.

Desired conditions, as key plan components, are fundamental to determining monitoring strategies and requirements. Desired conditions should define the geographic scale, where applicable, used to measure change associated with them. Responsible Officials should include sufficiently detailed descriptions of desired conditions so they are useful to determine the purpose and need for many projects such as restoration projects and activities. Other plan content may identify, if applicable, how desired conditions may differ from existing conditions.

Implementation of the revised Plan is driven in large part by the Desired Conditions which were developed to move the affected forest resources toward environmental stability and diversity.

The intent of these desired conditions is to create a proactive commitment to the recovery of bull trout within the Flathead National Forest. These desired conditions make the commitment to implement the Bull Trout Recovery Plan. The forest determined making bull trout recovery a focus was the most effective way to benefit bull trout and minimize adverse effects due to ongoing management.

Desired Condition – Partnerships and Coordination (FW-DC-P&C)

16 The bull trout population trends towards recovery through cooperation and coordination with USFWS, tribes, State agencies, other Federal agencies, and interested groups. Recovery is supported through the Bull Trout Conservation Strategy and the Bull Trout Recovery Plan.

Desired conditions - Watersheds (FW-DC-WTR)

The following desired conditions apply at the larger (e.g., watershed) scale (10 or 12 digit hydrologic unit scale), not at particular sites, e.g., stream reaches. The national hydrologic unit is the basis for defining the specific scales at which the watershed desired conditions apply. The three watershed scales most relevant to the implementation of the forest plan are subbasin (8-digit hydrologic unit), watershed (10-digit hydrologic unit), and subwatershed (12-digit hydrologic unit). Individual project assessments often use data collected at finer scales, such as the subwatershed, drainage, valley segment, site, or stream reach scale.

01 NFS lands provide the distribution, diversity, and complexity of watershed- and landscape-scale features, including natural disturbance regimes and the aquatic and riparian ecosystems, to which species, populations, and communities are uniquely adapted. Watersheds and associated aquatic ecosystems retain their inherent resilience and are able to respond and adjust to disturbances without long-term adverse changes to their physical or biological integrity.

02 Spatial connectivity exists within or between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, groundwater, wetlands, upslope areas, headwater tributaries, and intact habitat refugia. These network connections provide chemically and physically unobstructed routes to areas critical for fulfilling the requirements of aquatic, riparian-associated, and many upland species of plants and animals.

03 Habitat and ecological conditions support self-sustaining populations of native aquatic and riparian-associated plant and animal species.

04 Instream habitat conditions for managed watersheds move in concert with or towards those in reference watersheds. Aquatic habitats are diverse, with channel characteristics and water quality reflective of the climate, geology, and natural vegetation of the area. Stream habitat features across the Forest, such as large woody material, percent pools, residual pool depth, median particle size, and percent fines, are within reference ranges as defined by agency monitoring.

05 Aquatic systems and riparian habitats possess physical integrity, including physical integrity of shorelines, banks, and bottom configurations, within their natural range of variation.

06 Water quality, including groundwater, meets or exceeds applicable state water quality standards, fully supports designated beneficial uses, and meets the ecological needs of native aquatic and riparian-associated plant and animal species. The Forest has no documented lands or areas that are delivering water, sediment, nutrients, and/or chemical pollutants that would result in conditions that violate the State of Montana's water quality standards (e.g., TMDLs) or are permanently above natural or background levels.

07 The sediment regime within waterbodies is within the natural range of variation. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

08 In-stream flows are sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows are retained. Streamflow regimes maintain riparian ecosystems and natural channel and floodplain dimensions. Stream channels transport sediment and woody material over time while maintaining reference dimensions (e.g., bankfull width, depth, entrenchment ratio, slope, and sinuosity).

09 The timing, variability, and duration of floodplain inundation is within the natural range of variation. Floodplains are accessible to water flow and sediment deposits. Over-bank floods allow floodplain development and the propagation of flood-associated riparian plant and animal species.

10 Groundwater-dependent ecosystems, including peatlands, bogs, fens, wetlands, seeps, springs, riparian areas, groundwater-fed streams and lakes, and groundwater aquifers, persist in size and seasonal and annual timing and exhibit water table elevations within the natural range of variation. Surface and groundwater flows are connected, provide late-season stream flows and cold water temperatures, and sustain the function of surface and subsurface aquatic ecosystems.

11 Upland areas surrounding wetlands that have the most direct influence on wetland characteristics, as well as stream segments that flow directly into wetlands, sustain the characteristics and diversity of those wetlands. Non-forested areas in and surrounding wetlands are composed of plant and animal communities that support and contribute to wetland ecological and habitat diversity.

12 Habitats and native assemblages of aquatic and riparian-associated plants and animals are free of persistent non-native species such as zebra mussels, New Zealand mud snails, quagga mussels, Eurasian milfoil, and brown trout. Non-native species (e.g., non-native bullfrogs, Chytrid fungus, yellow flag iris, or reed canary grass) are not expanding into waterbodies.

13 Peatlands, including fens, have the necessary soil, hydrologic, water chemistry, and vegetative conditions to provide for continued fen development and resilience to changes in climate and other stressors. Peatlands support unique plant and animal species that are characteristic of historical conditions. Trees exist on drier hummocks within and on the edge of peatlands but do not retard development.

14 Beavers play an important ecological role benefiting groundwater, surface water, stream aquatic habitat complexity, and adaptation to changing climate conditions.

15 Watersheds provide high-quality water for downstream communities dependent upon them.

16 Educational and informational programs are provided to enhance understanding of wetlands, stream ecosystems, and watersheds.

17 The Forest cooperates with Federal, tribal, State, and local governments to identify and secure instream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.

Desired Conditions – Conservation Watershed Network (FW-DC-CWN)

01 The conservation watershed network has high-quality habitat and functionally intact ecosystems that are contributing to and enhancing the conservation and recovery of specific

threatened or endangered fish species or aquatic species of conservation concern[1] and providing high water quality and quantity. The watersheds contribute to the conservation and recovery of native fish and other aquatic species and help make habitat conditions more resilient to climate change.

Desired Conditions – Riparian Management Zone (FW-DC-RMZ)

01 Riparian management zones reflect a natural composition of native flora and fauna and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes and processes affecting the area. In addition to natural processes, vegetation management activities contribute to vegetation conditions that are resilient. The species composition and structural diversity of native plant communities in riparian management zones, including wetlands, provide summer and winter thermal regulation, nutrient filtering and appropriate rates of surface erosion, bank erosion, and channel migration.

02 Riparian management zones provide key conditions, including slope stability and associated vegetative root strength, wood delivery to streams and streambanks, input of leaf and organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality, operating consistently with local disturbance regimes.

03 Riparian management zones in forested settings have more diverse vegetation structure relative to areas outside the riparian management zone. This includes a higher density of large downed wood, snags, and decadent live trees and higher amounts of litter and duff to support terrestrial riparian-associated plants and animals that feed, nest, den, or roost near water. Downed wood greater than 9 inches in diameter is available, consisting of intact pieces of a variety of species, sizes, and stages of decay, including cull tree tops and cull logs.

04 Riparian management zones have more diverse vegetation composition relative to areas outside the riparian management zone. This includes riparian-associated grasses, forbs, shrubs (e.g., willows); deciduous trees (e.g., cottonwoods, birch, aspen), and conifer trees to support terrestrial animals that feed, nest, den, or roost near water.

05 A mosaic vegetation pattern, including forest patches of different shapes, successional stages, and tree densities, occurs within riparian management zones. Early successional forest openings are typically irregularly shaped, with variable tree densities or patches of larger trees along their boundaries that reduce the risk of windthrow and reduce edge effects for wildlife.

06 Cover conditions in riparian management zones contribute to habitat connectivity for a variety of wildlife species (e.g., Canada lynx, grizzly bear, marten, fisher).

Desired conditions (FW-DC-SOIL)

01 Soil function and long-term productivity is conserved.

[1] Species of conservation concern are identified by the Regional Forester; more information is available at http://bit.ly/NorthernRegion-SCC.

OBJECTIVES

An objective is a concise, measurable, and time-specific statement of a desired rate of progress toward a desired condition or conditions. Objectives should be based on reasonably foreseeable budgets (36 CFR 219.9(e)(1)(ii)).

A project or activity is consistent with the objectives of the Plan if it contributes to or does not prevent the attainment of any other applicable objectives. The project documentation should identify any applicable objective(s) to which the project contributes. If there are no applicable objectives, project documentation should state that fact. It should be noted that although desired conditions can be represented by an unconstrained budgets, objectives under the proposed action are based upon current

Objectives - Watersheds (FW-OBJ-WTR)

01 Complete all essential work identified within the Class 2 priority watersheds as identified under the watershed condition framework (see appendix E).

02 Enhance or restore 25 to 50 miles of stream habitat to maintain or restore structure, composition, and function of habitat for fisheries and aquatic species other than fish. Activities include, but are not limited to, berm removal, large woody debris placement, road decommissioning or stormproofing, riparian planting, and channel reconstruction.

03 Reconnect 10 to 20 miles of habitat in streams disconnected by roads or culverts where aquatic and riparian-associated species' migratory needs are limiting distribution of those species.

04 Improve watershed conditions on 4,000 to 8,000 acres, with an emphasis on priority watersheds under the watershed condition framework and the conservation watershed network.

Objectives – Conservation Watershed Networks (FW-OBJ-CWN)

01 The conservation watershed network is the highest priority for restoration actions for native fish and other aquatic species. The stormproofing of 15 to 30 percent of the roads in the conservation watershed network is prioritized, as funding allows, to benefit aquatic species (e.g., bull trout). See appendix C for specific strategies for treatment options and for prioritization, such as of roads paralleling streams vs. ridgetop roads.

02 Over the life of the plan, stormproofing the transportation system (e.g., upsizing culverts, reducing sediment on roads, realigning stream-constraining road segments, etc.) will be accomplished as opportunities are identified on the following prioritized subwatersheds: Sullivan Creek, Wounded Buck Creek, Trail Creek in the North Fork, Whale Creek (includes Upper Whale, Lower Whale, and Shorty Creeks), Granite Creek, Bear Creek, Goat Creek, and Lion Creek.

Objectives – Riparian Management Zone (FW-OBJ-RMZ)

01 Improve 300 to 1,000 acres of riparian habitat.

FS-108354

Objectives - Infrastructure (FW-OBJ-IFS)

01 Decommission or place into intermittent stored service 30 to 60 miles of roads.[2] Priorities are roads causing resource damage in priority watersheds and/or roads located within desired nonmotorized recreation opportunity spectrum settings and/or roads within bull trout watersheds.

STANDARDS

A standard is a mandatory constraint on project and activity decision making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1) (iii)).

There are several ways to constraint projects and activities: standards, guidelines, and other sources of constraints. A standard differs from a guideline in that a standard is a strict constraint, allowing no variation, whereas a guideline allows variation if the result would be equally effective. Examples of other sources of constraints on the design of projects and activities include congressional direction, regulations, timber sale contract clauses, and special use authorization standard clauses.

Standards are used when the requirement is absolute such as to ensure projects will not prevent achievement of a desired condition, or to ensure compliance with laws such as the timber requirements of sections 6(g)(3)(E) and (F) of the NFMA to protect aesthetics, fish, recreation, soil, watershed, and wildlife (16 U.S.C. 1604(g)(3)(E) and (F)), or to protect threatened or endangered species under the Endangered Species Act of 1973 as amended (16 U.S.C. 1531- 1544). Standards can be used to limit disturbances from projects and activities to animal dens, perennial streams, and wildlife habitat. Standards can also be used to protect resources by restricting authorization of specific uses in appropriate circumstances. Such uses might include firewood gathering, grazing, motor vehicle use, road construction, timber harvest, removal of sand and gravel, sanitary waste facilities, storage of fuel, and surface occupancy in riparian areas.

Standards – Watersheds (FW-STD-WTR)

01 New stream diversions and associated ditches shall have screens placed on them to prevent capture of fish and other aquatic organisms.

02 Project-specific best management practices (including both Federal and State of Montana practices) shall be incorporated into project plans as a principle mechanism for controlling non-point pollution sources in order to meet soil and watershed desired conditions and to protect beneficial uses.

03 Portable pump set-ups shall include containment provisions for fuel spills, and fuel containers shall have appropriate containment provisions.

Standards – Riparian Management Zone (FW-STD-RMZ)

01 The entire width of the riparian management zones shall be delineated as follows.

[2] USDA. (2014). Travel analysis report for Flathead National Forest. Kalispell, MT: USDA Forest Service, Flathead National Forest. Planning record exhibit # 00413.

Category 1 Fish-bearing streams: Riparian management zones consist of the stream and the area on both sides of the stream extending from the edges of the active channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to a distance equal to the height of two site-potential trees,[3] or 300 feet slope distance (600 feet total, which includes both sides of the stream channel), whichever is greatest.

Category 2 Permanently flowing non-fish-bearing streams: Riparian management zones consist of the stream and the area on both sides of the stream extending from the edges of the active channel to the top of the inner gorge, or to the outer edges of the riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, which includes both sides of the stream channel), whichever is greatest.

Category 3 Seasonally flowing or intermittent streams and lands identified as potentially unstable or landslide prone: This category includes features with high variability in size and site-specific characteristics. At a minimum, the riparian management zone must include (1) the intermittent stream channel and the area to the top of the inner gorge; (2) the intermittent stream channel or wetland and the area to the outer edges of the riparian vegetation; (3) the area from the edges of the stream channel, wetland, or landslide-prone terrain to a distance equal to the height of one site-potential tree or 100 feet slope distance (200 feet total, which includes both sides of the stream channel), whichever is greatest; or (4) the extent of unstable and potentially unstable areas (including earthflows).

Category 4a Ponds, lakes, reservoirs, and wetlands greater than 0.5 acre and all sizes of howellia ponds and fens/peatlands: Riparian management zones consist of the body of water or wetland and the area to the outer edges of the riparian vegetation; or to the extent of the seasonally saturated soil; or to the distance of the height of one site-potential tree; or 300 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond, or lake—whichever is greatest. For management direction related to water howellia, refer to the following plan components: FW-DC-PLANT-01 and 02, FW-GDL-PLANT-01, 02, and 03, FW-DC-NNIP-01, MA3b-Special Area-DC-04, and GA-SV-DC-01 and 02.

Category 4b Ponds, lakes, reservoirs, and wetlands less than 0.5 acre (except howellia ponds and fens/peatlands; see category 4a): Riparian management zones consist of the body of water or wetland and the area to the outer edges of the riparian vegetation; or to the extent of the seasonally saturated soil; or to the distance of the height of one site-potential tree; or 100 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond, or lake—whichever is greatest.

The riparian management zone is divided into two areas called the inner and outer riparian management zones. Management direction may differ in these two zones. If an already established road is located within the riparian management zone, a site-specific determination shall be made as to the width of the inner riparian management zone. The width defined in the descriptions below can be made larger to protect sensitive resources.

The *inner* riparian management zones are defined as follows:

- For category 1 and 2 streams, the width of the inner riparian management zone shall be a minimum of 150 feet on each side of the stream.

[3] The height of a site-potential tree is the expected average maximum height a tree in the dominant crown class (upper forest canopy layer) would achieve, given the site productivity.

- For category 3 streams where side slopes are greater than 35 percent, the width of the inner riparian management zone shall be a minimum of 100 feet on each side of the stream or to the top of the inner gorge slope break, whichever is greater.
- For category 3 streams where side slopes are less than 35 percent, the inner riparian management zone shall be a minimum of 50 feet on each side of the stream.
- For category 4a and 4b ponds, lakes, reservoirs, and wetlands, the width of the inner riparian management zone shall be a minimum of 50 feet except for peatlands, fens, and bogs, where the minimum width is 300 feet.

The following standards apply to the entire riparian management zones for all categories:

02 Vegetation management activities within riparian management zones must be consistent with State law (e.g., Montana Streamside Management Zone Law).

03 Storage and refueling sites within riparian management zones must be approved by a Forest aquatics specialist or resource advisor and have an approved spill containment plan.

04 Herbicides, pesticides, and other chemicals shall not be applied within riparian management zones. Exceptions may be made if chemical use is necessary to maintain, protect, or enhance aquatic and riparian resources or to restore native plant or animal communities.

The following standard applies to the entire riparian management zone for peatlands, fens, and bogs within category 4a:

05 Ground-disturbing vegetation treatments in the riparian management zones for peatlands, fens, and bogs shall only occur in order to restore or enhance aquatic and riparian-associated resources.

The following standard applies to the inner riparian management zone for all categories except peatlands, fens, and bogs within category 4a:

06 Vegetation management shall only occur in the *inner* riparian management zone in order to restore or enhance aquatic and riparian-associated resources. Exceptions may occur as long as aquatic and riparian-associated resources are maintained. Exceptions shall be limited to (1) non-mechanical treatments such as prescribed fire, sapling thinning, or hand fuel reduction treatments; (2) mechanical fuel reduction treatments in the wildland-urban interface within 300 feet of private property boundaries; or (3) treatments that address human safety hazards (e.g., hazard trees) adjacent to infrastructure or within administrative or developed recreation sites.

Standards – Soil (FW-STD-SOIL)

01 Vegetation management activities do not create detrimental soil conditions on more than 15 percent of an activity area. In activity areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current condition and proposed activity must not exceed 15 percent following project implementation and restoration. In areas where more than 15 percent detrimental soil conditions exist from prior activities, the effects from project implementation and restoration must address currently impaired soil functions to improve the long-term soil condition.

02 Project-specific best management practices and design features shall be incorporated into land management activities as a principle mechanism for protecting soil resources.

03 Soil function shall be restored on temporary roads (and decommissioned road prisms used as temporary roads) when management activities that use these roads are completed. Restoration treatments shall be based on site characteristics and methods that have been demonstrated to measurably improve soil productivity.

04 When decommissioning existing roads, soil function shall be restored. Restoration treatments shall be based on site characteristics and methods that have been demonstrated to measurably improve soil productivity.

Standards - Infrastructure (FW-STD-IFS)

05 During dust abatement applications on roads, chemicals shall not be applied directly to watercourses, waterbodies (e.g., ponds, lakes), or wetlands.

06 For new road construction and reconstruction of existing road segments within or adjacent to riparian management zones, side-casting of fill material shall not occur.

07 To maintain free-flowing streams, new, replacement, and reconstructed stream crossing sites (culverts, bridges, and other stream crossings) shall accommodate at least the 100-year flow, including associated bedload and debris.

Standards – Grazing (FW-STD-GR)

08 New livestock handling and/or management facilities must be located outside of riparian management zones. New areas for livestock trailing, bedding, watering, salting, loading, and other handling or management efforts shall be limited to those areas and times that would not adversely affect listed animal and plant species or animal and plant species of conservation concern.

GUIDELINES

A guideline is a constraint on project and activity decision making that allows for departure from its terms, so long as the purpose of the guideline is met (§ 219.15(d)(3)).

Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iv)).

Guidelines serve the same purpose as standards but they differ from standards in that they provide flexibility in defining compliance, while standards are absolute constraints.

Guidelines – Watershed (FW-GDL-WTR)

01 In order to restore watersheds, sediment-producing activities in watersheds with approved TMDLs should be designed to comply with the Montana Department of Environmental Quality's TMDL implementation plan.

02 To maintain stream channel stability and aquatic habitat, large woody debris should not be cut and/or removed from stream channels unless it threatens critical infrastructure or human safety, such as mid-channel bridge piers, or poses long-term risks to bull trout passage.

03 When drafting water from streams, pumps should be screened to prevent capture of fish and aquatic organisms. During the spawning season for native fish, pumping sites should be located away from spawning gravels.

04 When beaver dams are threatening infrastructure or impairing bull trout spawning, preferred techniques that sustain beavers (e.g., using pipes to reduce water levels, notching dams to restore fish passage) should be used.

05 To protect spawning fish, eggs, and embryos, in-stream management activities that may disturb native salmonids or that have the potential to directly deliver sediment to their habitats should be limited to times outside of spawning and incubation seasons for those species, as displayed in table 1.

Table 1. Operational restrictions to protect spawning fish and fry emergence while operating within the high water mark

Species	Location	Inoperable activity period
Westslope cutthroat trout	Known spawning streams	May 1 through July 15
Bull trout	Known spawning streams	September 1 through March 15

06 Information on preventive measures related to aquatic invasive species should be provided at water-based recreation sites such as boat ramps to help prevent the introduction of non-native species.

07 To prevent the introduction of non-native species, equipment that comes in contact with a waterbody should be inspected and cleaned of aquatic invasive species prior to use in a waterbody or when moving between watersheds, including drafting equipment, water tenders, and helicopter buckets.

08 When aquatic invasive species (e.g., zebra mussels, quagga mussels, Eurasian milfoil, reed canary grass) are detected, they should be controlled in cooperation with appropriate agencies.

09 New management activities shall be consistent with applicable state source water protection requirements and goals. Short-term effects[4] from activities may be acceptable when those activities support long-term benefits[5] to aquatic resources.

Guideline – Conservation Watershed Networks (FW-GDL-CWN)

01 To reduce sedimentation, for subwatersheds included in the conservation watershed network, net increases in stream crossings and road lengths should be avoided in riparian management zones unless the net increase improves ecological function in aquatic ecosystems. The net increase is measured from the beginning to the end of each project.

Guidelines – Riparian Management Zone (FW-GDL-RMZ)

The following guidelines apply to entire riparian management zones for all categories:

01 Downed trees (e.g., windthrow) should be left on-site inside of riparian management zones to meet large wood desired conditions, where it is safe and practical to do so.

[4] Effects that occur during, or immediately following, implementation of activity.

[5] Benefits that occur following completion of the activity.

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02 Aerial application of chemical retardant, foam, or other fire chemicals and petroleum should not occur in mapped aerial retardant avoidance areas (see glossary) in order to protect terrestrial and aquatic resources associated with riparian management zones.

03 Temporary fire facilities (e.g., incident bases, camps, staging areas, helispots, and retardant batch plants) for incident activities should not be located in riparian management zones in order to protect terrestrial and aquatic resources associated with riparian management zones.

04 To protect the integrity of aquatic and riparian ecosystems, refueling, equipment maintenance, and storage of fuels or other toxicants should not occur in riparian management zones.

05 When conducting wildland fire operations within riparian management zones, minimum impact suppression tactics should be used to protect terrestrial and aquatic resources associated with riparian management zones.

06 Sand and gravel mining and extraction at new sites should not occur within riparian management zones to protect terrestrial and aquatic resources associated with riparian management zones. Exceptions may occur for trail work.

07 At developed recreation sites and administrative sites, trees within the riparian management zone that are determined to be a hazard should be felled to provide for public safety, in consultation with a Forest aquatics specialist. If felled, downed trees should be left on-site as needed to meet large wood desired conditions, where it is safe and practical to do so.

08 If tree harvest activities occur within riparian management zones, live reserve trees should be retained (if present) to protect water quality and contribute to forest live tree structural diversity (and future dead standing and downed wood) for aquatic- and riparian-dependent species (e.g., the clearcut harvest method should not be used). Because site and forest conditions vary considerably, the sizes, species, density, and pattern of reserve trees would be determined at the project level.

09 If new openings are created in riparian management zones through even-aged regeneration harvest (see glossary) or fuel reduction activities, each created opening's distance to cover (see glossary) should not exceed 350 feet to provide wildlife habitat structural diversity, connectivity, and cover.

10 If harvest activities occur within riparian management zones, all snags greater than or equal to 12 inches d.b.h. should be retained within the harvest area to contribute towards more diverse forest structure and desired habitat conditions by providing higher snag and downed wood densities (once the snags fall) as compared to areas outside riparian management zones. Exceptions to this guideline and development of an alternative snag prescription may be considered where there are issues of human health and safety (i.e., developed recreation sites, sites adjacent to landings) or where a decreased amount of wildland fuels is desired to protect communities and community assets (i.e., within the wildland-urban interface). Due to the high density and variability in snags and landscape conditions created by wildfire, exceptions and alternative prescriptions may also be considered in areas burned by stand-replacing fire based on a site-specific analysis.

11 To reduce the risk of sediment input and to protect the integrity of aquatic and riparian ecosystems, new roads (including temporary roads) and new landings should not be constructed in category 1, 2 or 3 riparian management zones, except where it is necessary for

a road to cross a stream. Exceptions may be considered where site-specific analysis and implementation of mitigation measures are determined appropriate by a Forest aquatics specialist to protect aquatic and riparian resources.

The following guidelines apply to the entire riparian management zone for category 1, 2, and 3 streams and for fens/peatlands:

12 Vegetation management activities should be designed to include one or more of the following measures to avoid ground disturbance that may deliver sediment and reduce the risk of alteration of hydrologic processes:

- no ground-based logging equipment except during suitable winter logging periods;
- full suspension yarding;
- falling and yarding methods that promote retention of understory vegetation and other groundcover

13 If prescribed fire activities occur, ignition should take place outside the riparian management zone and fire should be allowed to naturally spread into the riparian management zones. The intent is to allow fire to enter and cross the zone at predominantly low to moderate intensity and create vegetation conditions consistent with natural fire regimes.

The following guidelines apply only to the inner riparian management zone for categories 4a and 4b (except fens/peatlands):

14 To reduce the risk of sediment input and to protect the integrity of aquatic and riparian ecosystems, new landings and new roads (including temporary roads) should not be constructed. Exceptions for temporary roads and landings may be considered only where site-specific analysis and implementation of mitigation measures are determined to be appropriate by a Forest aquatics specialist to protect aquatic and riparian resources.

15 If vegetation treatments occur in the inner riparian management zones, they should be designed to include one or more of the following measures to avoid ground disturbance that may deliver sediment to wetlands and to reduce the risk of alteration of hydrologic processes:

- no ground-based logging equipment unless occurring during suitable winter logging periods;
- full suspension yarding;
- falling and yarding methods that promote retention of understory vegetation and other groundcover

Guidelines (FW-GDL-SOIL)

01 Ground-based equipment for vegetation management should only operate on slopes less than 40 percent to protect soil quality. Exceptions will be considered only with site-specific analysis where soil, slope, and equipment are determined appropriate to maintain soil functions.

02 To maintain soil quality and stability, ground-disturbing management activities should not occur on landslide-prone areas.

03 Project activities should provide sufficient effective ground cover with a post-implementation target of 85 percent to provide nutrients and reduce soil erosion.

04 To maintain organic matter for soil function, vegetation management activities should conserve coarse woody debris at levels described in FW-DC-TE&V-17 and FW-GDL-TE&V-08 in the Vegetation and Terrestrial Ecosystems section. Management activities should either retain forest floor at half the current thickness or no less than 1 centimeter thick on average across activity areas.

Guidelines (FW-GDL-IFS)

03 Roads, skid trails, temporary roads, and trails should have water drainage systems that possess minimal hydrological connectivity to waterbodies (except at designated stream crossings) to maintain the hydrologic integrity of watersheds and protect them from the delivery of water, sediment, and pollutants.

04 To reduce the risk to aquatic resources when decommissioning roads, making roads impassable, or storing roads, roads should be left in a hydrologically stable condition. For example, drainage off roads should be routed away from resources and landslide prone areas and towards stable areas of the forest floor to provide filtering and infiltration.

05 Prior to placing physical barriers such as berms on travel routes (e.g., roads, skid trails, temporary roads, or trails), the Forest should ensure that road drainage features are in place to protect aquatic and other resources.

06 To maintain and/or improve watershed ecosystem integrity and reduce road-related mass wasting and sediment delivery to watercourses, new and relocated roads, trails (including skid trails and temporary roads), and other linear features[6] should not be located on lands with high mass wasting potential.

07 To maintain free-flowing streams, new, replacement, and reconstructed stream crossing sites (culverts, bridges, and other stream crossings) should be designed to prevent diversion of stream flow out of the channel in the event the crossing is plugged or has a flow greater than the crossing was designed for.

08 When constructing or reconstructing trail and road fords, measures to harden the streambed, banks, and approaches for new trail and road fords should be included in the project design in order to maintain channel stability and reduce sediment delivery to watercourses.

09 To protect water quality, maintenance activities such as road blading and snowplowing on existing roads, should not side-cast into or adjacent to waterbodies. When plowing snow, breaks should be designed in the snow berms to direct water off the road.

10 When constructing or reconstructing roads, drainage should be routed away from potentially unstable channels, fills, and hillslopes to reduce sediment delivery into streams.

11 To provide safe and functioning airstrips, management and maintenance of airstrips should follow Federal Aviation Administration recommendations.

12 Within areas specifically identified as being important for wildlife connectivity across highways (see table 18), the Forest should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety.

[6] Linear features include powerline rights-of-way and utility corridors.

Table 2. Key highway crossing areas for wildlife

Area	Route	Mile Marker
east of Essex[1]	U.S. 2	181-184
east of Essex[1]	U.S. 2	189-190
east of Columbia Falls[1]	U.S. 2	141-143
north of Columbia Falls[1]	Rt. 486	7-9
between Whitefish and Eureka[1]	U.S. 93	148
between Whitefish and Eureka[1]	U.S. 93	157-160
Swan Valley[2, 3, 4]	U.S. 83	31-36
Swan Valley[2, 3, 4]	U.S. 83	45-58

1. Based on R. Ament, P. McGowen, M. McClure, A. Rutherford, C. Ellis, & J. Grebenc (2014), *Highway mitigation for wildlife in northwest Montana*, Bozeman, MT: Sonoran Institute, Northern Rockies Office, retrieved from http://largelandscapes.org/media/publications/Highway-Mitigation-Wildlife-NW-Montana.pdf.

2. Based on M. P. Huijser, K. E. Gunson, & C. Abrams (2006), Animal-vehicle collisions and habitat connectivity along Montana Highway 83 in the Seeley-Swan Valley, Montana: A reconnaissance, Western Transportation Institute, retrieved from http://www.mdt.mt.gov/research/projects/env/seeley.shtml.

3. Based on P. L. Sandstrom (1996), *Identification of potential linkage zones for grizzly bears in the Swan-Clearwater valley using GIS* (MS thesis), University of Montana, Missoula, retrieved from http://scholarworks.umt.edu/etd/.

4. Based on J. L. Weaver (2014), *Conservation legacy on a flagship forest: Wildlife and wildlands on the Flathead National Forest, Montana*, Bozeman, MT: Wildlife Conservation Society, retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjI5LmQ19nKAhUK6mMKHeRNC38QFggcMAA&url=http%3A%2F%2Fwww.wcsnorthamerica.org%2FAdmin-Plus%2FDocustore%2FCommand%2FCore_Download%2FEntryId%2F28194.aspx&usg=AFQjCNFbCN6XJslT6iW_LSda_zKBLU1O8g&bvm=bv.113034660,d.cGc.

13 To maintain and protect natural hydrologic flow paths, the transportation infrastructure should not alter stream courses. For example, streams should have crossing structures and not be routed down ditches.

14 To provide and maintain native aquatic organisms in fish-bearing streams, construction, reconstruction, or replacement of stream crossings should provide and maintain passage for all life stages of native aquatic organisms unless barriers are created or maintained to prevent spread or invasion of non-native species in alignment with fish and wildlife management agencies.

15 When designing, constructing, or reconstructing system trails, information on how to avoid and respond to bear-human encounters should be posted at trailheads. In addition, site-specific trail design should include one or more methods to limit the risk of bear-human conflicts such as, but not limited to,

- locating trails outside of riparian management zones or avalanche chutes unless it is necessary to cross or to access an existing developed recreation site, and
- designing and/or maintaining trails to increase sight distance and/or to address speed of travel consistent with site-specific conditions for the managed use of the trail.

16 To protect fisheries resources and riparian-associated resource conditions and to maintain quality and quantity of water flows to, within, or between groundwater-dependent ecosystems, groundwater use developments (e.g., drinking water wells, wastewater facilities) should not:

- be developed in riparian management zones (unless no alternatives exist);

- measurably lower river flows, lake levels, or flows to wetlands or springs (e.g., change springs from perennial to intermittent or eliminate springs altogether); and/or
- discharge pollutants directly to groundwater.

Guidelines – Lands and Special Uses (FW-GDL-LSU)

01 Special use authorizations in the primary conservation area should have permit requirements to help reduce or limit the risk of grizzly bear-human conflicts.

02 To maintain or improve habitat conditions for fish, water, and other riparian associated species and resources, authorizations for new special-use permits should include requirements for best management practices and at the conclusion of the permit should restore in-stream and riparian conditions if necessary.

03 To protect riparian and aquatic habitat, new support facilities should be located outside of riparian management zones. Support facilities include any facilities or improvements (e.g., workshops, housing, switchyards, staging areas, transmission lines) not directly integral to the production of hydroelectric power or necessary for the implementation of prescribed protection, mitigation, or enhancement measures. At time of permit reissuance, the removal of such support facilities, where practical, should be considered.

Guidelines - Recreation (FW-GDL-REC)

02 To protect resources, new solid and sanitary waste facilities should be located outside of the inner riparian management zone.

06 To protect fishery resources and riparian-associated plant and animal species, new developed recreation sites should not be located within the inner riparian management zone, except when they are related to health and safety or water, such as boat ramps and fish platforms. Structures should be developed with a Forest aquatics specialist so that fisheries and riparian-associated plant and animal species are protected.

Guidelines - Grazing (FW-GDL-GR)

03 Livestock trailing, bedding, watering, salting, loading, and other handling activities should be avoided in riparian management zones.

04 To reduce bank trampling of perennial vegetation on or near the water's edge (i.e., the greenline):

- do not exceed 20 percent streambank alteration;
- do not exceed 40 percent utilization of mean annual vegetative production on woody vegetation; and
- maintain at least 4-6 inches or do not exceed 40 percent utilization of mean annual vegetative production on herbaceous vegetation.

SUITABILITY

FW-SUIT-RMZ-01 Riparian management zones are not suitable for timber production. Timber harvesting for other multiple-use purposes is allowable.

AQUATIC ECOSYSTEM MONITORING

Plan monitoring questions and indicators for aquatic ecosystems

Table 3. Plan monitoring questions and indicators for aquatic ecosystems

Monitoring Question(s)	Plan Component(s)	Potential Indicator(s)
MON-WTR-01: What are the changed conditions of instream physical habitat parameters in managed vs. unmanaged sites?	**FW-DC-WTR-04**	**IND-WTR-** **01.** PIBO monitoring: positive trend in PIBO metrics such as bank angle, wood frequency, percent fines, residual pool depth, percent pools, and median substrate size (D50) **02**. Results of McNeil core samples of percent fines
MON-WTR-02: To what extent are forest management activities moving towards habitat objectives for native fish?	**FW-OBJ-CNW-01** **FW-OBJ-WTR-01 through 04**	**IND-WTR-** **03.** Number of fish passage barriers removed or created **04.** Number of roads decommissioned within the riparian management zone **05.** Number of culverts removed or upgraded **06.** Number of activities with stream miles of habitat improvements
MON-WTR-03: What activities have occurred in the riparian management zone?	**FW-STD-RMZ-03, 04** **FW-DC-RMZ-03**	**IND-WTR-** **07.** Treatment type and acres within riparian management zones **08.** Number of entries and road crossing inside riparian management zones
MON-WTR-04: What is the condition of water quality in waterbodies?	**FW-DC-WTR-06**	**IND-WTR-09**: Number of waterbodies listed on the Montana Department of Environmental Quality integrated report (305b/303d)
MON-WTR-05: What is the status of native fish populations?	**FW-DC-CNW-01**	**IND-WTR-** **10.** Number of redds (bull trout) **11.** Fish density—number/100 square meters **12.** Degree of spread of hybridization (MFWP data, redd counts)
MON-WTR-06: Do management activities contribute nutrients to Flathead Lake?	**FW-DC-WTR-17**	**IND-WTR-13**: Amount of phosphorus, nitrites, and nitrates that originate from NFS lands.
MON-WTR-07: What is the status of streambanks within grazing allotments?	**FW-GDL-05**	**IND-WTR-** **13.** Percent streambank alteration **14.** Percent utilization on woody vegetation **15.** Percent utilization on herbaceous vegetation

Appendix 3: Bull Trout Framework/Matrix and PCE Description

Table A3-1. Framework/matrix indicators and values describing each functional level.

DIAGNOSTIC OR PATHWAY	INDICATORS	FUNCTIONING APPROPRIATELY	FUNCTIONING AT RISK	FUNCTIONING AT UNACCEPTABLE RISK
SPECIES:				
Subpopulation Characteristics within subpopulation watersheds	***Subpopulation Size***	Mean total subpopulation size or local habitat capacity more than several thousand individuals. All life stages evenly represented in the subpopulation.[1]	Adults in subpopulation are less than 500 but >50.[1]	Adults in subpopulation has less than 50. [1]
	Growth and Survival	Subpopulation has the resilience to recover from short term disturbances (e.g. catastrophic events, etc) or subpopulation declines within one to two generations (5 to 10 years).[1] The subpopulation is characterized as increasing or stable. At least 10+ years of data support this estimate.[2]	When disturbed, the subpopulation will not recover to predisturbance conditions within one generation (5 years). Survival or growth rates have been reduced from those in the best habitats. The subpopulation is reduced in size, but the reduction does not represent a long-term trend. [1]. At least 10+ years of data support this characterization.[2] If less data is available and a trend can not be confirmed, a subpopulation will be considered at risk until enough data is available to accurately determine its trend.	The subpopulation is characterized as in rapid decline or is maintaining at alarmingly low numbers. Under current management, the subpopulation condition will not improve within two generations (5 to 10 years). [1] This is supported by a minimum of 5+ years of data.
	Life History Diversity and Isolation	The migratory form is present and the subpopulation exists in close proximity to other spawning and rearing groups. Migratory corridors and rearing habitat (lake or larger river) are in good to excellent condition for the species. Neighboring subpopulations are large with high likelihood of producing surplus individuals or straying adults that will mix with other	The migratory form is present but the subpopulation is not close to other subpopulations or habitat disruption has produced a strong correlation among subpopulations that do exist in proximity to each other. [1]	The migratory form is absent and the subpopulation is isolated to the local stream or a small watershed not likely to support more than 2,000 fish.[1]

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		subpopulation groups. [1]		
	Persistence and Genetic Integrity	Connectivity is high among multiple (5 or more) subpopulations with at least several thousand fish each. Each of the relevant subpopulations has a low risk of extinction. [1] The probability of hybridization or displacement by competitive species is low to nonexistent.	Connectivity among multiple subpopulations does occur, but habitats are more fragmented. Only one or two of the subpopulations represent most of the fish production. [1] The probability of hybridization or displacement by competitive species is imminent, although few documented cases have occurred.	Little or no connectivity remains for refounding subpopulations in low numbers, in decline, or nearing extinction. Only a single subpopulation or several local populations that are very small or that otherwise are at high risk remain.[1] Competitive species readily displace bull trout. The probability of hybridization is high and documented cases have occurred.
HABITAT:				
Water Quality:	***Temperature***	7 day average maximum temperature in a reach during the following life history stages: [1, 3] incubation 2 - 5°C rearing 4 - 12 °C spawning 4 - 9°C also temperatures do not exceed 15□C in areas used by adults during migration (no thermal barriers)	7 day average maximum temperature in a reach during the following life history stages: [1, 3] incubation <2°C or 6°C rearing <4°C or 13 - 15 °C spawning <4°C or 10°C also temperatures in areas used by adults during migration sometimes exceeds 15°C	7 day average maximum temperature in a reach during the following life history stages: [1, 3] incubation <1°C or >6°C rearing >15 °C spawning <4 °C or > 10°C also temperatures in areas used by adults during migration regularly exceed 15°C (thermal barriers present)
	Sediment (in areas of spawning and incubation; rearing areas will be addressed under substrate embeddedness)	Similar to chinook salmon [1]: for example (e.g.): < 12% fines (<0.85mm) in gravel[4]; e.g. ≤20% surface fines of ≤6mm[5, 6]	Similar to chinook salmon [1]: e.g. 12-17% fines (<0.85mm) in gravel[4]; e.g. 12-20% surface fines [7]	Similar to chinook salmon [1]: e.g. >17% fines (<0.85mm) in gravel[4]; e.g. >20% fines at surface or depth in spawning habitat[7]
	Chemical Contamination/ Nutrients	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches[8]	moderate levels of chemical contamination from agricultural, industrial and other sources, some excess nutrients, one CWA 303d designated reach[8]	high levels of chemical contamination from agricultural, industrial and other sources, high levels of excess nutrients, more than one CWA 303d designated reach[8]
Habitat Access:	***Physical Barriers*** (address subsurface flows impeding fish passage under the pathway	man-made barriers present in watershed allow upstream and downstream fish	man-made barriers present in watershed do not allow upstream and/or downstream fish passage at	man-made barriers present in watershed do not allow upstream and/or downstream fish passage at a

	flow/hydrology)	passage at all flows	base/low flows	range of flows
Habitat Elements:	***Substrate Embeddedness*** in rearing areas (spawning an1d incubation areas were addressed under the indicator sediment)	reach embeddedness <20%[9, 10]	reach embeddedness 20-30% [9,10]	reach embeddedness >30%[4,10]
	Large Woody Debris	current values are being maintained at greater than 80 pieces/mile that are >24"diameter and >50 ft length on the Coast [9], or >20 pieces/ mile >12"diameter >35 ft length on the Eastside[11] ; also adequate sources of woody debris are available for both long and short-term recruitment	current levels are being maintained at minimum levels desired for ☐functioning appropriately☐, but potential sources for long term woody debris recruitment are lacking to maintain these minimum values	current levels are not at those desired values for ☐functioning appropriately☐, and potential sources of woody debris for short and/or long term recruitment are lacking
	Pool Frequency and Quality	pool frequency in a reach closely approximates [5]: Wetted width (ft) / #pools/mile 0-5: 39 5-10: 60 10-15: 48 15-20: 39 20-30: 23 30-35: 18 35-40: 10 40-65: 9 65-100: 4 (can use formula: pools/mi = 5,280/wetted channel width / #channel widths per pool); also, pools have good cover and cool water[4], and only minor reduction of pool volume by fine sediment	pool frequency is similar to values in ☐functioning appropriately☐, but pools have inadequate cover/temperature[4], and/or there has been a moderate reduction of pool volume by fine sediment	pool frequency is considerably lower than values desired for ☐functioning appropriately☐; also cover/temperature is inadequate[4], and there has been a major reduction of pool volume by fine sediment
	Large Pools (in adult holding, juvenile rearing, and overwintering reaches where streams are >3m in wetted width at baseflow)	each reach has many large pools >1 meter deep[4]	reaches have few large pools (>1 meter) present[4]	reaches have no deep pools (>1 meter)[4]

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	Off-channel Habitat (see reference 18 for identification of these characteristics)	watershed has many ponds, oxbows, backwaters, and other off-channel areas with cover; and side-channels are low energy areas[4]	watershed has some ponds, oxbows, backwaters, and other off-channel areas with cover; but side-channels are generally high energy areas[4]	watershed has few or no ponds, oxbows, backwaters, or other off-channel areas[4]
	Refugia (see Checklist footnotes for definition of this indicator)	habitats capable of supporting strong and significant populations are protected and are well distributed and connected for all life stages and forms of the species [12, 13]	habitats capable of supporting strong and significant populations are insufficient in size, number and connectivity to maintain all life stages and forms of the species[12, 13]	adequate habitat refugia do not exist[12]
Channel Condition & Dynamics:	***Average Wetted Width/ Maximum Depth*** Ratio in scour pools in a reach	≤10[7, 5]	11 - 20[5]	>20[5]
	Streambank Condition	>80% of any stream reach has ≥90% stability[5]	50 - 80% of any stream reach has ≥90% stability[5]	<50% of any stream reach has ≥90% stability[5]
	Floodplain Connectivity	off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation/succession	severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly
Flow/Hydrology:	***Change in Peak/Base Flows***	watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography	some evidence of altered peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography	pronounced changes in peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography
	Increase in Drainage Network	zero or minimum increases in active channel length correlated with human caused disturbance	low to moderate increase in active channel length correlated with human caused disturbance	greater than moderate increase in active channel length correlated with human caused disturbance
Watershed Conditions:	***Road Density & Location***	<1mi/mi [13]; no valley bottom roads	1 - 2.4 mi/mi [13]; some valley bottom roads	>2.4 mi/mi [13]; many valley bottom roads
	Disturbance History	<15% ECA of entire watershed with no concentration of disturbance in unstable or	<15% ECA of entire watershed but disturbance concentrated in unstable or	>15% ECA of entire watershed and disturbance concentrated in unstable

		potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area there is an additional criteria of □15% LSOG in watersheds[14]	potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area there is an additional criteria of □15% LSOG in watersheds[14]	or potentially unstable areas, and/or refugia, and/or riparian area; does not meet NWFP standard for LSOG
	Riparian Conservation Areas (RHCA - PACFISH and INFISH) (Riparian Reserves - Northwest Forest Plan)	the riparian conservation areas provide adequate shade, large woody debris recruitment, and habitat protection and connectivity in subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community/ composition >50%[15]	moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian conservation areas, or incomplete protection of habitats and refugia for sensitive aquatic species (□70-80% intact), and adequately buffer impacts on rangelands : percent similarity of riparian vegetation to the potential natural community/composition 25-50% or better[15]	riparian conservation areas are fragmented, poorly connected, or provides inadequate protection of habitats for sensitive aquatic species (<70% intact, refugia does not occur), and adequately buffer impacts on rangelands : percent similarity of riparian vegetation to the potential natural community/composition <25%[15]
	Disturbance Regime	Environmental disturbance is short lived; predictable hydrograph, high quality habitat and watershed complexity providing refuge and rearing space for all life stages or multiple life-history forms. [1] Natural processes are stable.	Scour events, debris torrents, or catastrophic fire are localized events that occur in several minor parts of the watershed. Resiliency of habitat to recover from environmental disturbances is moderate.	Frequent flood or drought producing highly variable and unpredictable flows, scour events, debris torrents, or high probability of catastrophic fire exists throughout a major part of the watershed. The channel is simplified, providing little hydraulic complexity in the form of pools or side channels. [1] Natural processes are unstable.
SPECIES AND HABITAT:				
Integration of Species and Habitat Conditions		Habitat quality and connectivity among subpopulations is high. The migratory form is present. Disturbance has not altered channel equilibrium. Fine sediments and other habitat characteristics influencing survival or growth are consistent with pristine habitat. The subpopulation has the resilience to recover from short-term disturbance within one to two generations (5 to 10 years). The subpopulation is	Fine sediments, stream temperatures, or the availability of suitable habitats have been altered and will not recover to predisturbance conditions within one generation (5 years). Survival or growth rates have been reduced from those in the best habitats. The subpopulation is reduced in size, but the reduction does not represent a long-term trend. The subpopulation is	Cumulative disruption of habitat has resulted in a clear declining trend in the subpopulation size. Under current management, habitat conditions will not improve within two generations (5 to 10 years). Little or no connectivity remains among subpopulations. The subpopulation survival and recruitment responds sharply to

	fluctuating around an equilibrium or is growing.[1]	stable or fluctuating in a downward trend. Connectivity among subpopulations occurs but habitats are more fragmented.[1]	normal environmental events. [1]

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[2] Rieman, B.E. and D.L. Meyers. 1997. Use of redd counts to detect trends in bull trout (*Salvelinus confluentus)* populations. Conservation Biology 11(4): 1015-1018.

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[4] Washington Timber/Fish Wildlife Cooperative Monitoring Evaluation and Research Committee, 1993. Watershed Analysis Manual (Version 2.0). Washington Department of Natural Resources.

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[6] Overton, C.K., S.P. Wollrab, B.C. Roberts, and M.A. Radko. 1997. R1/R4 (Northern/Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Gen Tech. Rep. INT-GTR-346.

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[9] Biological Opinion on Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). National Marine Fisheries Service, Northwest Region, January 23, 1995.

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[11] Interior Columbia Basin Ecosystem Management Project Draft Environmental Impact Statement and Appendices.

[12] Frissell, C.A., Liss, W.J., and David Bayles, 1993. An Integrated Biophysical Strategy for Ecological Restoration of Large Watersheds. Proceedings from the Symposium on Changing Roles in Water Resources Management and Policy, June 27-30, 1993 (American Water Resources Association), p. 449-456.

[13] Lee, D.C., J.R. Sedell, B.E. Rieman, R.F. Thurow, J.E. Williams and others. 1997. Chapter 4: Broadscale Assessment of Aquatic Species and Habitats. *In* T.M. Quigley and S. J. Arbelbide eds □An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins Volume III. U.S. Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management, Gen Tech Rep PNW-GTR-405.

[14] Northwest Forest Plan, 1994. Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. USDA Forest Service and USDI Bureau of Land Management.

[16] Winward, A.H., 1989 Ecological Status of Vegetation as a base for Multiple Product Management. Abstracts 42nd annual meeting, Society for Range Management, Billings MT, Denver CO: Society For Range Management: p277.

Table A3-2. Descriptive relationships between Framework indicators and PCEs of bull trout critical habitat.

PCE 1 - Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.

The analysis of *floodplain connectivity* considers the hydrologic linkage of off-channel areas with the main channel and overbank-flow maintenance of wetland function and riparian vegetation and succession. Floodplain and riparian areas provide hydrologic connectivity for springs, seeps, groundwater upwelling and wetlands and contribute to the maintenance of the water table. The *sediment* and *substrate embeddedness* indicators describe the level of fine sediment in the gravel which affects hyporheic flow. Fine sediment fills interstitial spaces making the movement of water through the substrate less efficient. The *chemical contamination/nutrients* and *temperature* indicators evaluate the water quality of groundwater. The *off-channel habitat* indicator suggests how much off-channel habitat is available, and generally off-channels are connected to adjacent channels via subsurface water. The *change in peak/base flows* indicator considers whether or not peak flow, base flow, and flow timing are comparable to an undisturbed watershed of similar size, geology, and geography. Peak flows, base flows, and flow timing are directly related to subsurface water connectivity and the degree to which soil compaction has decreased infiltration and increased surface runoff. The *drainage network increase* and *road density and location* indicators assess the influence of the road and trail networks on subsurface water connectivity. If there is an increase in drainage network and roads are located in riparian areas, it is likely that subsurface water is being intercepted before it reaches a stream. If groundwater is being intercepted then it is likely that water quality is being degraded through increased temperatures, fine sediment, and possibly chemical contamination. *Streambank condition* addresses groundwater influence through an assessment of stability. The *disturbance history* indicator evaluates disturbance across the watershed and provides a picture of how management may be affecting hydrology. The *riparian conservation areas* indicator determines whether riparian areas are intact and providing connectivity. If riparian areas are intact it is much more likely that springs, seeps, and groundwater sources are able to positively affect water quality and quantity.

PCE 2 - Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

The *physical barriers* indicator provides the most direct assessment of this PCE. Analysis of this indicator includes consideration of whether man-made barriers within the watershed allow upstream and downstream passage of all life stages at all flows. However, some indicators further evaluate physical impediments and others evaluate the biological or water quality impediments that may be present. The *temperature, sediment, substrate embeddedness,* and *chemical contamination/nutrients* indicators assess whether other barriers may be created, at least seasonally, by conditions such as high temperatures, high concentrations of sediment, or contaminants. The *average wetted width/maximum depth ratio* indicator can help identify situations in which water depth for adult passage may be a problem. A very high average wetted width/maximum depth value may indicate a situation where low flows, when adults migrate, are so spread out that water depth is insufficient to pass adults. The *change in peak/base flows* indicator can help determine if change in base flows have been sufficient to prevent adult passage during the spawning migration. The *persistence and genetic integrity* indicator addresses biological impediments by evaluating negative interactions (e.g., predation, hybridization, and competition) with other species.

PCE 3 - An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

None of the indicators directly address this PCE, but a number of them address it indirectly. The *sediment* and *substrate embeddedness* indicators document the extent to which substrate interstitial spaces are filled with fine sediment. Interstitial spaces provide important habitat for aquatic macroinvertebrates, sculpin, and other substrate-oriented prey which are important food sources for bull trout. The *chemical contamination/nutrients* indicator evaluates the level to which a stream is contaminated by chemicals or has a high level of nutrients. Chemicals and nutrients greatly affect the type and diversity of aquatic invertebrate communities present in a water body. The *large woody debris* and *pool frequency and quality* indicators assess habitat complexity. High stream habitat complexity is associated with diverse and abundant macroinvertebrate and fish prey. The *off-channel habitat* and *floodplain connectivity* indicators document the presence of off-channels which are generally more productive than main channels. Off channel areas are important sources of forage, particularly for juveniles. The *streambank condition* and *riparian conservation areas* indicators both shed light on the very basis of the food base of a stream. Vegetation along streambanks and in riparian areas provide important habitat for terrestrial macroinvertebrates that can fall into the water as well as sources of nutrient inputs that support aquatic invertebrate production.

PCE 4 - Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.

Several indicators address this PCE directly. The *sediment* and *substrate embeddedness* indicators provide insight into how complex substrates are within a stream by documenting percent fines and embeddedness. As percent fines and embeddedness increase, substrate complexity decreases. The *large woody debris* indicator provides an excellent picture of habitat complexity. The indicator rates the stream based on the amount of in-channel large woody debris. Habitat complexity increases as large wood increases. The *pool frequency and quality* and *large pools* indicators address habitat complexity by rating the stream based on the frequency of pools and their quality. Habitat complexity increases as the number of pools and their quality increase. The *off-channel habitat* indicator directly addresses complexity associated with side channels. The indicator is rated based on the amount of off-channel habitat, cover associated with off-channels, and flow energy levels. *Average wetted width/maximum depth ratio* is an indicator of channel shape and pool quality. Low ratios suggest deeper, higher quality pools. The *streambank condition* and *riparian conservation areas* indicators both shed light on the complexity of river and stream shorelines. Vegetation along streambanks and in riparian areas provides important habitat complexity and channel roughness. The *streambank condition* indicator also provides information about the capacity of an area to produce undercut banks, which can be a very important habitat feature for bull trout. The *floodplain connectivity* indicator addresses complexity added by side channels and the ability of floodwaters to spread across the floodplain to dissipate energy and provide access to high-flow refugia for fish. The *road density and location* indicator addresses complexity by identifying if roads are located in valley bottoms. Roads located in valley bottoms reduce complexity by eliminating vegetation and replacing complex habitats with riprap or fill, and often confine the floodplain. The *disturbance regime* indicator documents the frequency, duration, and size of environmental disturbance within the watershed. If scour events, debris torrents, or catastrophic fires are frequent, long in duration, and large, then habitat complexity will be greatly reduced.

PCE 5 - Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.

The *temperature* indicator addresses this PCE directly. The indicator rates streams according to how well temperatures meet bull trout requirements. Other matrix indicators address temperature indirectly. The *off-channel habitat* and *floodplain connectivity* indicators address how well stream channels are hydrologically connected to off-channel areas. Floodplains and off-channels are important to maintaining the water table and providing connectivity to the channel for springs, seeps, and groundwater sources which contribute cool water to channels. The *average wetted width/maximum depth ratio* indicator also corresponds to temperature. Low width to depth ratios indicate that channels are narrow and deep with little surface area to absorb heat. The *streambank condition* indicator documents bank stability. If the streambanks are stabilized by vegetation rather than substrate then it is likely that the vegetation provides shade which helps prevent increases in temperature. The *change in peak/base flows* indicator evaluates flows and flow timing characteristics relative to what would be expected in an undisturbed watershed. If base flow has been reduced, it is likely that water temperature during base flow has increased since the amount of water to heat has decreased. The *road density and location* and *drainage network increase* indicators documents where roads are located. If roads are located adjacent to a stream then shade is reduced and temperature is likely increased. Roads also intercept groundwater and can reduce this cooling influence, as well as discharge typically warmer stormwater. The *disturbance history* indicator describes how much of the watershed has been altered by vegetation management and therefore indicates how much shade has been removed. The *riparian conservation areas* indicator addresses stream shade which keeps stream temperatures cool. The presence of *large pools* may provide thermal refugia when temperatures are high.

PCE 6 - In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.

The *sediment* and *substrate embeddedness* indicators directly address this PCE. These indicators evaluate the percent fines within spawning areas and the percent embeddedness within rearing areas. The *streambank condition* and *riparian conservation areas* indicators indirectly address this PCE by documenting the presence or lack of potential fine sediment sources. If streambanks are stable and riparian conservation areas are intact then there is a low risk of introducing fine sediment from bank erosion. Also, the *floodplain connectivity* indicator indirectly addresses this PCE. If the stream channel is connected to its floodplain, then there is less risk of bank erosion during high flows because stream energy is reduced as water spreads across the floodplain. The *increase in drainage network* and *road density and location* indicators assess the effects of roads on the channel network and hydrology. If the drainage network has significantly increased as a result of human-caused disturbance or road density is high within a watershed and roads are located adjacent to streams, then it is likely that in-channel fine sediment levels will be elevated above natural levels. The *disturbance regime* indicator documents the nature of environmental disturbance within the watershed. If the disturbance regime includes frequent and unpredictable scour events, debris torrents, and catastrophic fire, then it is likely that fine sediment levels will be elevated above background levels. A consideration for all indicators directly or indirectly influencing this PCE is that it is desirable to achieve an appropriate balance of stable areas to provide undercut banks and eroding areas that are sources for recruiting new spawning gravels. Too little sediment in a stream can also be detrimental.

PCE 7 - A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

The *change in peak/base flows* indicator addresses this PCE directly by documenting the condition of the watershed hydrograph relative to an undisturbed watershed of similar size, geology, and geography. There are several indicators that address this PCE indirectly. The *streambank condition* indicator documents bank stability. If the streambanks are stabilized by vegetation rather than substrate then it is likely that the streambank can store water during moist periods and releases that water during dry periods which contributes to water quality and quantity. The *floodplain connectivity* indicator is relevant to water storage within the floodplain which directly affects base flow. Floodplains are important to maintaining the water table and providing connectivity to the channel for springs, seeps, and groundwater sources which contribute to water quality and quantity. The *increase in drainage network* and *road density and location* indicators assess the influence of the road and trail networks on hydrology. If there is an increase in drainage network and roads are located in riparian areas, it is likely is being intercepted and quickly routed to a stream which can increase peak flow. The *disturbance history* indicator evaluates disturbance across the watershed and provides a picture of how management may be affecting hydrology; for example, it may suggest the degree to which soil compaction has decreased infiltration and increased surface runoff. The *riparian conservation areas* indicator determines whether riparian areas are intact, functioning, and providing connectivity. If riparian areas are intact it is much more likely that springs, seeps, and groundwater sources are able to positively affect water quality and quantity.

PCE 8 - Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

This PCE is closely related to PCE 7, with PCE 8 adding a water quality component (i.e., there is a high level of overlap in indicators that apply to both PCEs 7 and 8). The *temperature* and *chemical contamination/nutrients* indicators directly address water quality by comparing water temperatures to bull trout water temperature requirements, and documenting 303(d) designated stream reaches. Several other indicators indirectly address this PCE by evaluating the risk of fine sediment being introduced that would result in decreased water quality through increased turbidity. The *streambank condition* and *riparian conservation areas* indicators indirectly address this PCE by documenting the presence or lack of potential fine sediment sources. If streambanks are stable and riparian conservation areas are intact then there is a low risk of introducing fine sediment from bank erosion. Also, the *floodplain connectivity* indicator indirectly addresses this PCE. If the stream channel is connected to its floodplain, then there is less risk of bank erosion during high flows because stream energy is reduced as water spreads across the floodplain. *Average wetted width/maximum depth ratio* is an indication of water volume, which indirectly indicates water temperature, (i.e., low ratios indicate deeper water, which in turn indicates possible high-flow refugia). This indicator in conjunction with *change in peak/base flows* is an indicator of potential water quality and quantity deficiencies, particularly during low flow periods. The *increase in drainage network* and *road density and location* indicators assess the effects of roads on the channel network and hydrology. If the drainage network has significantly increased as a result of human-caused disturbance or road density is high within a watershed and roads are located adjacent to streams, then it is likely that suspended fine sediment levels will be elevated above natural levels. If roads are located adjacent to a stream then shade is reduced and temperature is likely increased. Roads also intercept groundwater and can reduce this cooling influence, as well as discharge typically warmer stormwater. The *disturbance regime* indicator documents the nature of environmental disturbance within the watershed. If the disturbance regime includes frequent and unpredictable scour events, debris torrents, and catastrophic fire, then it is likely that turbidity levels will be elevated above background levels.

PCE 9 - Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

The only indicator that directly addresses this PCE is the *persistence and genetic integrity* indicator. This indicator addresses the likelihood of predation, hybridization, or displacement of bull trout by competitive species. The *temperature* indicator can provide indirect insights about whether conditions are conducive to supporting “warm water” species.

Appendix 4: Flathead National Forest Revised Forest Plan Key Components: Grizzly Bear

The following presents component of the Flathead National Forest's Revised Forest Plan that pertain to grizzly bear. This appendix is organized by plan component (e.g., desired conditions, objectives, standards, etc.). The exact nomenclature of the plan component is either listed in the sub-heading, or an alphanumeric combination of the heading code and number following.

Example: FW-STD-WTR-02 would be forest-wide (FW) standard (STD) for watersheds (WTR) number two (02).

The following set of plan components are consistent with the other amendment forests in the NCDE. The Flathead National Forest has additional plan components which affect the grizzly bear and these are also discussed in the biological assessment. The full set of plan components are listed in the revised Flathead National Forest Plan (2017).

Wildlife (WL)

Desired Conditions

FW-DC-WL-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area; see figure B-010), bear attractants on NFS lands are stored in a manner that reduces the risk of grizzly bear-human conflicts in the NCDE.

FW-DC-WL-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), grizzly bear habitat on NFS lands contributes to sustaining recovery of the grizzly bear population in the NCDE and contributes to connectivity with neighboring grizzly bear recovery zones.

FW-DC-WL-03. The risk of bear-human conflicts is reduced by information, education, and design features or criteria for management activities.

Standards

FW-STD-WL-01. Grizzly bear habitat on NFS lands in the NCDE shall be delineated and managed as the primary conservation area, zone 1 (including the Salish demographic connectivity area) (see figure B-10 or subsequent USFWS updates, if applicable).

FW-STD-WL-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area; see figure B-10), food/wildlife attractant storage special order(s) shall apply to all NFS lands.

FW-STD-WL-03. In each bear management subunit within the NCDE primary conservation area, temporary changes in the open motorized route density, total motorized route density, and secure core shall be allowed for roads used for projects (as defined by "project (in grizzly bear habitat in the NCDE)" during the non-denning season (see glossary). Calculations will include estimated changes for each year of the anticipated duration of the project and shall be incorporated into the 10-year running average required by standard FW-STD-IFS-03.

Guidelines

FW-GDL-WL-01. Within the NCDE primary conservation area, zone 1 (including the Salish demographic connectivity area), contractors, permittees, lessees, operators, and their employees should be informed of procedures for safely working and recreating in grizzly bear country and of food/wildlife attractant storage special order(s) prior to turn-out of livestock or beginning work and annually thereafter, in order to reduce the risk of grizzly bear-human conflicts.

FW-GDL-WL-02. Within the NCDE primary conservation area, zone 1 (including the Salish demographic connectivity area), if a contractor, permittee, lessee, operator, or their employee elects to camp on NFS lands other than in a developed recreation site, the site should be evaluated and written authorization (i.e., a campsite agreement that includes the food/attractant storage special order) should

be provided before the campsite is established. The purpose is to reduce the risk of grizzly bear-human conflicts.

FW-GDL-WL-03. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), clover should not be used in seed mixes on NFS lands. Native seed mixes or those that are less palatable to grizzly bears should be used so that seeded areas do not become an attractant.

Infrastructure (IFS) and Recreation (REC)

Desired Conditions

FW-DC-IFS-01. Within the NCDE primary conservation area, motorized access provides for multiple uses (such as harvesting of timber and non-timber forest products; hunting, fishing, and recreation opportunities) on NFS lands and also provides open motorized route density, total motorized route density, and secure core levels that contribute to sustaining the recovery of the grizzly bear population in the NCDE.

FW-DC-REC-01. Within the NCDE primary conservation area, the number, capacity, and improvements of developed recreation sites (NCDE definition) provide for user comfort and safety while minimizing the risk of grizzly bear-human conflicts on NFS lands.

FW-DC-REC-02. Within each bear management unit in the primary conservation area, increases in the number and capacity of developed recreation sites (NCDE definition) on NFS lands that are designed and managed for overnight use during the non-denning season are at levels that contribute to sustaining the recovery of the grizzly bear population in the NCDE.

Standards

FW-STD-IFS-01. Within the NCDE primary conservation area, motorized use of roads with public restrictions shall be permitted for administrative use (see glossary), as long as it does not exceed either six trips (three round trips) per week *or* one 30-day unlimited use period during the non-denning season (see glossary).

The exception to this standard is:

- emergency situations as defined by 36 CFR § 218.21.

Note: Administrative use is not included in baseline calculations and is not included in calculations of net increases or decreases. If the level of administrative use exceeds this standard, the use is counted as a project (see “project (in grizzly bear habitat in the NCDE)” in the glossary).

FW-STD-IFS-02. In each bear management subunit within the NCDE primary conservation area, there shall be no net decrease to the baseline (see glossary) for secure core and no net increase to the baseline open motorized route density or total motorized route density on National Forest System lands during the non-denning season (see glossary). The following conditions are not considered a net increase/decrease from the baseline:

- administrative use (see glossary);
- temporary use of a motorized route for a project (see “project in grizzly bear habitat in the NCDE” definition in the glossary and FW-STD-IFS-03);
- mining activities (as authorized under the Mining Law of 1872) and oil and gas activities (as authorized under the Federal Onshore Oil and Gas Leasing Reform Act of 1987) conducted in accordance with valid existing rights and applicable standards and guidelines;
- updated/improved data on a motorized route without an actual change on the ground;

- changes in technology or projections that result in changed calculations without actual change on the ground (e.g., a switch from the North American Datum of 1927 to the North American Datum of 1983 geodetic reference system);
- a road closure location is moved a short distance (e.g., to the nearest intersection or turnout) to a better location to allow turn-arounds providing for public safety, to reduce vandalism, or to improve enforcement of the road closure;
- **the agency exchanges, acquires, buys**, or sells lands;
- a change in a motorized route is necessary to comply with Federal laws (e.g., Federal Rehabilitation Act);
- a change in a motorized route is necessary to address grizzly bear-human conflicts, human safety concerns, or resource damage/concerns (e.g., a road paralleling a stream may be decommissioned and replaced by a new upslope road to reduce water quality impacts);
- a change is made by an adjacent landowner that decreases secure core or increases motorized route densities on a particular national forest;
- emergency situations as defined by 36 CFR § 218.21; and
- temporary roads (see glossary).

FW-STD-IFS-03. In each bear management subunit within the NCDE primary conservation area, temporary changes in the open motorized route density, total motorized route density, and secure core shall be calculated for projects (as defined by "project (in grizzly bear habitat in the NCDE)" in the glossary).

- 5 percent temporary increase in open motorized route density in each subunit (i.e., open motorized route density baseline plus 5 percent);
- 3 percent temporary increase in total motorized route density in each subunit (i.e., total motorized route density baseline plus 3 percent);
- 2 percent temporary decrease in secure core in each subunit (i.e., secure core baseline minus 2 percent).

Exceptions to this standard include:

- emergency situations as defined by 36 CFR 218.21;
- actions where valid existing rights preclude or constrain agency discretion (e.g., certain contracts, permits, leases, etc.).

Refer to appendix 1 for examples of how to calculate and apply the 10-year running average and temporary increase/decrease.

FW-STD-IFS-04. Within the NCDE primary conservation area, the number and capacity of developed recreation sites on NFS lands that are designed and managed for overnight use by the public during the non-denning season (e.g., campgrounds, cabin rentals, huts, guest lodges, recreation residences) shall be limited to one increase above the baseline (see glossary) in number or capacity per decade per bear management unit. The following conditions are not considered an increase from the baseline:

- the agency obtains better information or updated information in its database(s);
- the agency acquires land that contains developed recreation sites;
- the agency increases the number or capacity of a developed recreation site in order to comply with Federal laws;

- the agency maintains or modifies an existing overnight developed or dispersed recreation site in such a way that does not increase the number or capacity of the site (e.g., installing a pit toilet to avoid damage to water resources or installing a bear-resistant food storage structure to reduce grizzly bear-human conflicts);
- the agency modifies an existing developed recreation site to enhance human safety (e.g., enlarging a road pull-out to allow trailers to turn around safely); or
- the agency operates a developed recreation site to allow overnight use only during the denning season (see glossary).

The agency makes a corresponding reduction in the number or capacity of overnight developed recreation sites in the same bear management unit through any of the following means: (1) equal reduction in capacity at another site; (2) closure of a developed site(s); or (3) consolidation and/or elimination of dispersed camping, when and where it can be enforced effectively and it is reasonably assured that new dispersed sites will not develop nearby. Note: If these measures are used to offset an increase in number or capacity, they must be in place before the initiation of the increase. If the agency reduces the number or capacity of developed sites below baseline levels, these reductions may be used at a future date to mitigate equivalent impacts of an increase, expansion, or change of use in developed sites within that bear management unit.

Note: This standard does not apply to dispersed recreation sites or to developed recreation sites managed for day-use only (e.g., outfitter camps, roadside trail crossings or interpretive pull-outs; trailheads, picnic areas, or boat launches that are closed at night; ski areas that do not have overnight lodging).

FW-STD-REC-02. Within the NCDE primary conservation area, new or reauthorized recreation permits shall include a clause providing for modification, cancellation, suspension, or temporary cessation of activities if needed to resolve a grizzly bear-human conflict situation.

FW-STD-REC-04. Within the NCDE primary conservation area, new or reauthorized permits for ski areas on NFS lands that operate during the non-denning season shall include measures to limit the risk of grizzly bear-human conflicts (e.g., a requirement to store garbage in a bear-resistant manner).

FW-STD-REC-05. Within grizzly bear denning habitat modeled by MTFWP in the NCDE primary conservation area, there shall be no net increase in percentage of area or miles of routes designated for motorized over-snow vehicle use on NFS lands during the den emergence time period (see glossary).

Guidelines

FW-GDL-IFS-01. In each bear management subunit within the NCDE primary conservation area, each project (as defined by "project (in grizzly bear habitat in the NCDE)" in the glossary) should be designed so that on-the-ground implementation does not exceed 5 years to reduce the potential of grizzly bears being disturbed or displaced. Exceptions may be made where necessary to accommodate, for example,

- actions where existing rights preclude or constrain agency discretion (e.g., certain contracts, permits, leases);
- prescribed burning (including slash disposal), best management practices to protect water quality, or required reforestation activities; or
- emergency situations as defined by 36 CFR § 218.21.

If an extension to the five-year time limitation is required (e.g., to meet contractual obligations or to complete on-the-ground treatments), the reasons should be documented in writing prior to authorization of the extension.

FW-GDL-IFS-02. Within the NCDE primary conservation area, levels of secure core, open motorized route density, and total motorized route density should be restored to pre-project levels (as defined

by "project (in grizzly bear habitat in the NCDE)" in the glossary) within one year after completion of the project in order to reduce the duration of grizzly bear displacement or disturbance due to project-related activities. Exceptions may be made where necessary to accommodate, for example,

- actions where existing rights preclude or constrain agency discretion (e.g., certain contracts, permits, leases);
- prescribed burning (including slash disposal), best management practices to protect water quality, or required reforestation activities; or
- emergency situations as defined by 36 CFR § 218.21.

If an extension to the one-year time limitation is made (e.g., to meet contractual obligations or to complete on-the-ground treatments), the reasons should be documented in writing prior to authorization of the extension.

FW-GDL-REC-01. Within the NCDE primary conservation area, if the number or capacity of day use or overnight developed recreation sites is increased, the project should include measures to reduce the risk of grizzly-bear human conflicts in that bear management unit (e.g., with additional public information and education; by providing backcountry food-hanging poles or bear-resistant food or garbage storage devices; by including design criteria that would limit capacity increases to those needed for public health and safety; by increasing law enforcement and patrols).

Terrestrial Ecosystems Vegetation (VEG)

Desired Conditions

FW-DC-TE&V-01. Within the NCDE primary conservation area, the amount, type, and distribution of vegetation provides for the ecological, social, and economic sustainability of NFS lands while also providing habitat components that contribute to sustaining the recovery of the grizzly bear population in the NCDE.

FW-DC-TE&V-02. Within the NCDE primary conservation area, there is a mosaic of successional stages to provide for grizzly bear habitat needs over the long term.

Guidelines

FW-GDL-TE&V-01. Within the NCDE primary conservation area, measures to reduce the risk of disturbance to the grizzly bear population should be incorporated into vegetation and fuels project design criteria, which vary on a site-specific basis (e.g., some activities should be restricted in spring habitat during the spring time period; areas with low levels of human activity should be provided adjacent to areas with high levels of disturbance). Note: Management activities such as pre-commercial thinning, burning, weed spraying, and implementation of road best management practices may need to be completed during the spring time period in order to meet resource objectives (especially if needed to prevent resource damage), in which case other measures should be used to reduce the risk of disturbance (e.g., limiting the duration of the activity or limiting the use of closed roads).

FW-GDL-TE&V-02. Within the NCDE primary conservation area, vegetation management activities should be designed to avoid detrimental effects on the grizzly bear population and to include one or more measures to protect, maintain, increase, and/or improve grizzly habitat quantity or quality (e.g., promoting growth of berry-producing shrubs, forbs, or grasses known to be bear foods) in areas where it would not increase the risk of grizzly bear-human conflicts.

FW-GDL-TE&V-03. Within the NCDE primary conservation area, measures to retain cover (where present) along a portion of grass/forb/shrub openings, riparian wildlife habitat, or wetlands should be incorporated in project design criteria (this varies on a site-specific basis).

FW-GDL-TE&V-04. Within the NCDE primary conservation area, vegetation management projects (including timber sales and other non-commercial vegetation management contracts) should include a provision providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve grizzly bear-human conflict situations.

FW-GDL-TE&V-05. To reduce the risk of grizzly-bear human conflicts within the NCDE primary conservation area, vegetation management activities designed to enhance grizzly habitat (e.g., to increase huckleberry production) should not occur in or next to campgrounds, administrative facilities, or other developed recreation sites that operate during the non-denning season.

Grazing (GRZ)

Desired Condition

FW-DC-GR-01. Within the NCDE primary conservation area, the number, capacity of, and improvements on livestock grazing allotments support ecologically sustainable grazing, and temporary grazing permits are used effectively for management of noxious weeds, while minimizing the risk of bear-human conflicts on NFS lands.

Standards

FW-STD-GR-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), new or reauthorized livestock grazing permits and annual operating plans shall incorporate requirements to reduce the risk of grizzly bear-human conflicts (e.g., food/wildlife attractant storage special order). New or reauthorized permits shall include a clause providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation.

NCDE-STD-GR-02. Within the NCDE primary conservation area and zone 1, a sheep grazing permit in non-use status shall not be allowed to increase allowable animal unit months beyond what was previously permitted prior to being in non-use when it is returned to use. Note: The Flathead National Forest does not have any sheep allotments.

FW -STD-GR-03. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), permits for livestock grazing shall include a provision that requires reporting livestock carcasses within 24 hours of discovery, which shall be followed by proper disposal of the carcass. Boneyards shall not be established on NFS lands.

FW -STD-GR-04. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), there shall be no net increase in the number of active sheep allotments on NFS lands. Note: The Flathead National Forest does not have any sheep allotments.

FW-STD-GR-05. Within the NCDE primary conservation area, there shall be no increase in the number of active cattle grazing allotments above the baseline (see glossary) on NFS lands. Note: Existing allotments may be combined or divided as long as that does not result in grazing allotments in currently unallotted lands.

FW-STD-GR-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), temporary permits for grazing by small livestock for purposes such as controlling invasive exotic weeds or reducing fire risk, or for trailing of small livestock across NFS lands, shall not result in an increase in bear-small livestock conflicts.

Guidelines

FW-GDL-GR-02. Within the NCDE primary conservation area, an allotment management plan and plan of operation should specify any needed measures to protect key grizzly bear food production areas (e.g., wet meadows, stream bottoms, aspen groves, and other riparian wildlife habitats) from conflicting and competing use by livestock (this varies on a site-specific basis).

Other Forest Products (OFP)

Desired Condition

FW-DC-OFP-01. Provide a variety of public services and special forest products (such as mushrooms, huckleberries, firewood) from NFS lands while minimizing the risk of grizzly bear–human conflicts on NFS lands in the NCDE.

Standard

FW-STD-OFP-01. Special-use permits for apiaries (beehives) located on NFS lands shall incorporate measures including electric fencing to reduce the risk of grizzly bear–human conflicts, as specified in the food/wildlife attractant storage special order.

Renewable/Non-Renewable Energy and Mineral Resources (MIN)

Desired Condition

FW-DC-E&M-01. Mineral materials are available based upon public interest, in-service needs, material availability, and valid existing rights, where consistent with desired conditions for other resources.

Standards

FW-STD-E&M-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), mining activities (as authorized under the Mining Law of 1872) and oil and gas activities (as authorized under the Federal Onshore Oil and Gas Leasing Reform Act of 1987) occurring on NFS lands, where feasible, shall avoid, minimize, and/or mitigate environmental impacts to grizzly bears or their habitat, subject to existing rights. Stipulations or mitigation measures already included in existing leases, permits, or plans of operation on NFS lands shall not be changed, nor will additional stipulations or mitigation measures be added without the agreement of the holder of the lease, permit, or plan of operation.

FW-STD-E&M-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), new or reauthorized permits, leases, and/or plans of operation shall include a clause providing for modification or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation.

FW-STD-E&M-03. New plans of operation, permits, and/or leases for mineral activities shall include measures to reasonably mitigate potential impacts of mineral development for the following:

- land surface and vegetation disturbance;
- water table alterations that affect bear foods on the surface; and
- construction, operation, and reclamation of mine-related facilities such as impoundments, rights of way, motorized routes, pipelines, canals, transmission lines or other structures.

FW-STD-E&M-04. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), in addition to measures included in the food/wildlife attractant storage special order(s), new plans of operation, permits, and/or leases for mineral activities shall include the following measures regarding grizzly bear attractants:

- bear resistant food storage and garbage containers shall be used at development sites and at any campgrounds or dispersed sites where exploration or production-related human occupancy is anticipated;
- garbage shall be removed in a timely manner;
- road kills shall be removed daily during active operating periods to a designated location determined in close coordination with Montana Fish, Wildlife and Parks;

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- feeding of wildlife shall not be allowed;
- locations of work camps shall be approved in advance of operations. Food storage requirements shall be strictly adhered to in any work camps.

FW-STD-E&M-05. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), if minerals activities have the potential to adversely affect grizzly bears or their habitat as determined by a site-specific analysis, new plans of operation, permits, and/or leases for mineral activities shall include the following mitigation measures, stipulations, and surface use criteria regarding grizzly bear habitat:

- Ground-disturbing activities in identified grizzly bear spring habitat (as identified in a site-specific biological evaluation or other environmental document) shall be avoided between April 1 and June 30. If timing restrictions are not practicable, other measures shall be taken to reasonably mitigate negative impacts of mineral activity to grizzly bears.
- Seismic activity in identified grizzly bear denning habitat (as identified in a site-specific biological evaluation or other environmental document) shall be avoided during the denning season (see glossary). If timing restrictions are not practicable, other measures shall be taken to reasonably mitigate negative impacts of mineral activity to grizzly bears.
- Cumulative impacts of multiple, concurrent seismic and/or drilling operations shall be limited by timing restrictions. If timing restrictions are not practicable, reasonable and appropriate measures shall be taken to mitigate negative impacts to the grizzly bear.
- Reasonable and appropriate measures regarding the maintenance, rehabilitation, restoration, or mitigation of functioning aquatic systems and riparian management zones shall identify how reclamation will occur, plant species to be used in reclamation, a time frame of when reclamation will be completed, and monitoring criteria.
- Reclamation and revegetation of motorized routes, drilling pads, and other areas disturbed from mineral activities shall be completed as soon as practicable by the operator.

FW-STD-E&M-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), if mineral activities have the potential to adversely affect grizzly bears or their habitat as determined by a site-specific analysis, new plans of operations, permits, and/or leases shall include the following mitigation measures regarding motorized access:

- public motorized use that is not associated with minerals activities shall be prohibited on motorized routes constructed for exploration and/or development;
- a traffic management plan shall be developed as part of the proposed activity to identify when and how motorized routes will be used, maintained, and monitored (if required) and how motorized route standards and guidelines will be implemented after activities have ended;
- helicopter use associated with seismic activity, exploration, drilling, or development must follow an approved plan or permit; and
- speed limits shall be adopted on motorized routes if needed to prevent or reduce collisions with grizzly bears.

FW-STD-E&M-07. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), minerals contractors and lessees shall require employees to attend training related to safely living near and working in grizzly bear habitat prior to starting work and on an annual basis thereafter.

FW-STD-E&M-08. Within the NCDE primary conservation area, new leases for leasable minerals shall include a no surface occupancy stipulation (see glossary).

Guidelines

FW-GDL-E&M-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), in addition to forestwide guidelines, the following guidelines apply to new leasable minerals activities including leases, surface use plans for proposed wells or operations, or permits to conduct seismic exploration or drilling. To reduce potential grizzly bear disturbance or displacement, helicopter use plans should:

- avoid establishing recurring helicopter use (see glossary), especially in spring habitats or other known important grizzly bear habitats or use areas;
- avoid establishing landing zones, especially in spring habitats or other known important grizzly bear habitats or use areas. If a landing zone is deemed necessary for safe implementation of the seismic or surface use plan or permit to drill, the landing zone should be constructed only in an area that has had site-specific analysis and approval.

FW-GDL-E&M-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), leasable energy activities should use the best available noise-reduction technology on equipment and motorized vehicles to reduce potential disturbance or displacement of grizzly bears, whenever possible.

FW-GDL-E&M-03. Within the NCDE primary conservation area and zone 1 (including the Salish and demographic connectivity area), along motorized routes, seismic corridors, and pipelines constructed for leasable energy activities, wildlife cover should be maintained at regular intervals, where present (this varies on a site specific basis), in order to provide habitat connectivity for grizzly bears.

FW-GDL-E&M-04. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), for locatable and non-energy leasable minerals activities with the potential to adversely affect the grizzly bear or its habitat, the following tiered measures should be used to mitigate impacts to grizzly bear habitat. Beginning at step 1, any subsequent steps would be implemented only if the prior steps are not possible or achievable.

- Step 1: The operator should reclaim the affected area back to suitable bear habitat that has similar or improved characteristics and qualities compared to the original habitat (such as the same native vegetation).
- Step 2: If step 1 is not attainable, operators should either acquire a perpetual conservation easement (or easements) or purchase comparable or better replacement grizzly bear habitat within the primary conservation area. Acquisition of habitat within connectivity corridors could also be considered for mitigation, when appropriate. Habitat acquired for mitigation may require a purchase rate of > 1:1 on an acreage basis, depending on the quality of habitat degraded and the habitat available for acquisition.
- Step 3: If steps 1 and 2 are not achievable, the next option is to offset negative effects to bears and grizzly bear habitat with other appropriate types of actions.

FW-GDL-E&M-05. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), carrying bear spray should be recommended to mineral permittees, lessees, and operators to reduce the risk of grizzly bear-human conflicts.

FW-GDL-E&M-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), available resources at existing gravel pits should be used before constructing new pits to reduce the risk of grizzly bear disturbance or displacement associated with blasting of rock or crushing of gravel.

How changes in route density and secure core would be implemented

As stated in FW-STD-IFS-03, in each bear management subunit within the NCDE primary conservation area, temporary changes in the open motorized route density, total motorized route density and secure

core shall be allowed for projects (as defined by "project (in grizzly bear habitat in the NCDE)" in the glossary).

The 10-year running average for open motorized route density, total motorized route density, and secure core numeric parameters shall not exceed the following limits per bear management subunit:

- 5% temporary increase in open motorized route density in each subunit (i.e., open motorized route density baseline plus 5%);
- 3% temporary increase in total motorized route density in each subunit (i.e., total motorized route density baseline plus 3%);
- 2% temporary decrease in secure core in each subunit (i.e., secure core baseline minus 2%).

Hypothetical example

The following hypothetical example (displayed as Table D-2 and Table D-3) shows how temporary changes in open motorized route density (OMRD), total motorized route density (TMRD), and secure core would be implemented for a project.

Hypothetical example of how temporary changes in OMRD, TMRD, and Secure Core would be implemented for a project. Table D-2 shows the baseline values in a BMU subunit for OMRD, TMRD, and Secure Core from previous years and anticipated increases during the project (i.e., years 11 – 14).

Table D-3 uses the data from table D-2 to show the 10 year running averages for OMRD, TMRD, and Secure Core before, during, and after project completion, demonstrating that these 10-year running averages do not violate the Application Rules for Temporary Changes in Motorized Access. It should be noted that in this hypothetical example, another project in this subunit would not be possible until yr 24, unless that project did not require any changes in values for OMRD, TMRD, or Secure Core.

Table D-4. Values in a bear management subunit for OMRD, TMRD, and secure core for project in years 11 through 14

Variable	Baseline Value	Allowed Value for Project	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	project year 11	project year 12	project year 13	project year 14	year 15	year 16	year 17
OMRD	19	24	19	19	19	19	19	19	19	19	19	19	31	31	31	31	19	19	19
TMRD	19	22	19	19	19	19	19	19	19	19	19	19	22	22	22	22	19	19	19
Secure Core	69	67	69	69	69	69	69	69	69	69	69	69	63	63	63	69	69	69	69

Table D-5. Using data from table 5 to show the 10-year running averages for OMRD, TMRD, and secure core before, during, and after project completion

Variable	Before yr 1-10	During yr 2-11	During yr 3-12	During yr 4-13	During yr 5-14	During yr 6-15	After yr 7-16	After yr 8-17
OMRD	19	20	21	23	24	24	24	24
TMRD	19	19	20	20	20	20	20	20
Secure Core	69	69	68	67	67	67	67	67

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Flathead NF - Zone 1

Desired Conditions

GA-SM-DC-01 Within the Flathead National Forest portion of NCDE zone 1 (including the Salish demographic connectivity area) (see figure B-10), roads and trails provide for public and administrative access to NFS lands while contributing to sustaining the grizzly bear population in the NCDE. Grizzly bear habitat in zone 1 contributes to sustaining recovery of the grizzly bear population in the NCDE. The demographic connectivity area provides habitat that can be used by female grizzly bears and allows for bear movement between grizzly bear ecosystems.

GA-SM-DC-03 In areas between the primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. National Forest System lands in the Swift Creek-Stillwater connectivity area (see figure B-30) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges.

Standards

GA-SM-STD-01 Within the Flathead National Forest portion of NCDE zone 1 *outside* the Salish demographic connectivity area (see figure B-10), there shall be no net increase above the baseline (see glossary) in the density of roads open to public motorized use on NFS lands. *Inside* the Salish demographic connectivity area, there shall be no net increase above the baseline (see glossary) in the density of roads and trails open to public motorized use during the non-denning season on NFS lands. Density is calculated by dividing the total miles open to public motorized use on NFS lands during the non-denning season, by the total square miles of NFS lands in that same area. This standard does not apply to the following:

- motorized use by agency personnel or others authorized by the appropriate agency personnel;
- the temporary opening of a road for a short period of time to allow for public firewood gathering and other authorized uses (see also standard FW-STD-IFS-04);
- updated/improved road data without an actual change on the ground;
- changes in technology or projections that result in changed calculations without actual changes on the ground (e.g., a switch in geodetic systems from the North American Datum of 1927 to the North American Datum of 1983);
- moving a road closure location a short distance (e.g., to the nearest intersection or turnout) to a better location to allow turn-arounds that provide for public safety, to reduce vandalism, or to improve enforcement of the road closure;
- exchanging, acquiring, buying, or selling lands by the agency;
- a change in an open road that is necessary to comply with Federal laws (e.g., the Architectural Barriers Act of 1968, as amended);
- motorized use for mining activities (as authorized under the Mining Law of 1872) and oil and gas activities (as authorized under the Federal Onshore Oil and Gas Leasing Reform Act of 1987) because these types of permitted resource development are subject to existing rights and have a separate set of standards and guidelines;

- a change in an open road that is necessary to address grizzly bear-human conflicts, human safety concerns, or resource damage or concerns (e.g., a road paralleling a stream may be decommissioned and replaced by a new upslope road to reduce water quality impacts);
- motorized use for emergency situations as defined by 36 CFR § 218.21;
- temporary roads (see glossary).

Grizzly Bear Monitoring

Plan monitoring questions and indicators for grizzly bear

Monitoring Question	Plan Component(s)	Potential Indicator(s)
MON-NCDE-01: Within the NCDE primary conservation area, what is the level of secure core, open motorized route density (> 1 square mile) and total motorized route density (> 2 square miles) within each bear management subunit during the non-denning season?	**FW-STD-IFS-02**	**IND-WLD-** For each grizzly bear subunit in the PCA: **01**. Open motorized route density percentage **02**. Total motorized route density percentage **03**. Secure core percentage
MON-NCDE-02: Within the NCDE PCA, what is the number and overnight capacity of developed recreation sites designed and managed for overnight use on NFS lands within each bear management unit, and how does this compare to the baseline? Within the NCDE primary conservation area, what is the status of administrative sites, day-use developed recreation sites, and trailheads in each bear management unit?	**FW-STD-REC-01** **FW-GDL-REC-01**	**04.** Number of developed recreation sites (NCDE definition) managed for overnight use in each grizzly bear management unit. **05.** Capacity of sites managed for overnight developed recreation use in each grizzly bear management unit. **06.** If increases in number or capacity occur, measures used to reduce the risk of grizzly-bear human conflicts. **07.** Number of new administrative sites, day-use developed recreation sites or trailheads (NCDE definition) in each grizzly bear management unit.
MON- NCDE-03: Within the NCDE primary conservation area, is there a change in the number of allotments? Have conflicts occurred between grizzly bears and livestock on NFS lands?	**FW-STD-GR-05**	**IND-WLD-** **08**. Number of livestock allotments in the PCA (by livestock type). **09**. Permitted animal unit months for sheep allotments. **10.** Number of grizzly bear-livestock conflicts on NFS lands by grizzly bear management zone (e.g., PCA, DCA) and livestock type.
MON- NCDE-04: If new leasable and locatable mineral activities occur in the PCA, do the record of decision and permit/plan of operation include a monitoring plan for changes in habitat and/or measures to avoid, minimize, or mitigate environmental impacts to grizzly bears or their habitat?	**FW-STD-E&M-01, 03 through 06**	**IND-WLD-** **11**: Number of permits authorized in the PCA and mitigation measures included in the permit/plan of operations where it is determined there is potential for adverse effects to the grizzly bear population or its habitat resulting from leasable or locatable mineral activities.

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Monitoring Question	Plan Component(s)	Potential Indicator(s)
MON- NCDE-05: Within the NCDE primary conservation area, what is the status of grizzly bear subunits that have temporary increases in motorized access due to projects (see glossary)?	**FW-STD-IFS-03**	**IND-WLD-** **12**. Percent change in the 10-year running average of open motorized route density, total motorized route density, and secure core for each subunit that has had temporary increases in projects (see appendix C for examples of methods). If the 10-year running average allowed by FW-STD-IFS-03 is exceeded, what are the reasons?
MON-NCDE-06: Within the NCDE primary conservation area, are projects (see glossary) completed within the five-year time period specified by guideline FW-GDL-IFS-01?	**FW-GDL-IFS-01**	**IND-WLD-** **13**. For each grizzly bear subunit in the PCA with a project (see glossary): Number of years to complete a project (see the definition of "project (in grizzly bear habitat in the NCDE)" in the glossary)**.** If an extension to a project beyond five years is necessary, what is the reason?
MON-NCDE-07: In the Salish DCA, what is the density of roads and motorized trails on NFS lands that are open to public use during the non-denning season? In zone 1 outside the Salish DCA, what is the density of roads on NFS lands that are open to public use during the non-denning season?	**GA-SM-STD-01**	**IND-WLD-** **14.** Density of roads and motorized trails on NFS lands in the DCA that are open to public motor vehicle use during the non-denning season. **15.** Density of roads on NFS lands in zone 1 outside the DCA that are open to public motor vehicle use during the non-denning season.
MON-NCDE-08: What is the risk of human disturbance in areas modeled as grizzly bear denning habitat during the den emergence time period (see glossary)?	**FW-STD-REC-05**	**IND-WDL-** **16.** Percentage of modeled grizzly bear denning habitat where public motorized over-snow vehicle use is allowed during the den emergence time period (MFWP model for the NCDE or subsequent updates)

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NCDE Glossary

administrative site a location or facility constructed for use primarily by government employees to facilitate the administration and management of public lands. Examples on National Forest Service lands include, but are not limited to, ranger stations, warehouses, and guard stations.

administrative use a generic term for authorized agency activity. Specifically, in the portion of the NCDE for grizzly bears mapped as the primary conservation area, motorized use of roads closed to the public is permitted for Federal agency personnel or personnel authorized to perform duties by appropriate agency officials, as long as it does not exceed either 6 trips (3 round trips) per week OR one 30-day unlimited use period during the non-denning season (see **non-denning season**).

baseline the baseline for the NCDE is defined as conditions as of December 31, 2011, as modified by changes in numbers that were evaluated and found to be acceptable through the Endangered Species Act Section 7 consultation with USFWS while the grizzly bear was listed as Threatened. The baseline will be updated to reflect changes allowed under the standards and guidelines.

bear management subunit an area of a bear management unit, in the portion of the NCDE for grizzly bears mapped as the primary conservation area, representing the approximate size of an average annual female grizzly bear home range (e.g., 31-68 mi^2 [Mace and Roberts 2012]).

bear management unit an area about 400 m^2, in the portion of the NCDE for grizzly bears mapped as the primary conservation area that meets yearlong habitat needs of both male and female grizzly bears.

best management practice (BMP) the method(s), measure(s), or practice(s) selected by an agency to meet its nonpoint source control needs. BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (36 CFR 219.19).

boneyard an established site that is used by a grazing permittee for disposing of entire animal carcasses.

capacity (of developed recreation sites within the NCDE primary conservation area) the number of sites available in a campground; or the number of rooms available for lodging (as a commercial rental); or the number of cabins, bunkhouses or recreation residences available for overnight use (managed under a special use permit).

cover the elements of the environment used by an animal for hiding. Cover varies depending upon the species or the time of year and may include a variety of vegetation types as well as topography. The amount and quality of cover needed depends on the animal's size, mobility, and reluctance or willingness to venture into relatively open areas.

demographic connectivity area an area intended to allow female grizzly bear occupancy and potential dispersal beyond the NCDE to other recovery areas.

den emergence time period the spring-time period when a grizzly bear emerges from its den and remains in the vicinity before moving to lower elevations. The den emergence time period

occurs at the beginning of the non-denning season. Females with cubs usually emerge later and spend more time (a few days to a few weeks) near the den after emergence, than do male bears.

denning season the typical time period, within the NCDE, during which most grizzly bears are hibernating in dens. There are no restrictions on motorized use related to grizzly bears during the denning season, which occurs:

- west side of the Continental Divide: from 1 December through 31 March.
- east of the Continental Divide: from 1 December through 15 April.

emergency situation a circumstance on National Forest System lands for which immediate implementation of all or part of a decision is necessary for relief from hazards threatening human health and safety or natural resources on those National Forest System or adjacent lands; or that would result in substantial loss of economic value to the Federal Government if implementation of the decision were delayed. (36 CFR 218.21)

grazing allotment a designated area of land that is available for livestock grazing and is represented on a map. A grazing allotment can include National Forest Service (NFS) and non-NFS lands. Permits are issued for the use of allotments or portions of allotments. Allotments may be:

- **active**: Livestock grazing allotments that are in use, including pack and saddle stock allotments.
- **closed**: Areas having suitable livestock range that have been closed to livestock grazing by administrative decision or action.
- **combined**: An allotment that has been combined into another allotment and therefore, no longer exists as an independent allotment.
- **vacant**: An allotment that does not have a current grazing permit issued. (Forest Service Manual 2205)

grazing permit in non-use status a term that applies to livestock numbers. Non-use of a term grazing permit, in whole or in part, must be approved by a Forest Supervisor and is allowed for permittee convenience, resource protection or development, or range research (Forest Service Manual 2231.7).

grazing permit in inactive status all permitted uses have expired, been cancelled, or been waived.

grizzly bear–human conflict an interaction between a grizzly bear and human in which bears either do, or attempt to, injure people, damage property, kill or injure livestock, damage beehives, obtain anthropogenic foods or attractants or agricultural crops.

livestock a type of domestic animal raised for commercial production purposes, e.g., cattle. Small livestock includes animals smaller than a cow, such as sheep, goats, and llamas.

motorized route a National Forest System road or trail that is designated for motorized use on a motor vehicle use map pursuant to 36 CFR 212.51.

motorized use the designation of roads, trails, and areas that are open to motor vehicle use as specified in Federal Register / Vol. 70, No. 216 / Wednesday, November 9, 2005 /36 CFR Parts 212, 251, 261, Travel Management; Designated Routes and Areas for Motor Vehicle Use; Final Rule.

moving window analysis a geographic information system procedure that quantifies the density of roads and trails by incrementally moving a template across a digital map.

net change the difference in a measurement (such as road density) after on-the-ground changes are accounted for pre- and post-project; allows for temporary changes during a project.

no surface occupancy (NSO) a fluid mineral leasing stipulation that prohibits use or occupancy of the land surface in order to protect identified resource values. Lessees may develop the oil and gas or geothermal resources under the area restricted by this stipulation through use of directional drilling from sites outside the no surface occupancy area.

Northern Continental Divide Ecosystem a region identified in the Grizzly Bear Conservation Strategy encompassing about 27.3 million acres of land in western and central Montana that is one of five areas in the lower 48 states where grizzly bear populations occur.

NCDE Coordinating Committee an interagency group that evaluates implementation of the NCDE grizzly bear conservation strategy, promotes the exchange of data and information about the NCDE grizzly bear population among agencies and the public, and makes recommendations to the management agencies regarding implementation of the NCDE grizzly bear conservation strategy. Members of the interagency group may include Montana Fish, Wildlife and Parks; U.S. Fish and Wildlife Service; U.S. Park Service; U.S. Forest Service; APHIS-Wildlife Services; U.S. Geological Survey; U.S. Bureau of Land Management; Blackfeet Tribe, and the Confederated Salish and Kootenai Tribes.

non-denning season the time period when grizzly bears typically are not hibernating:

- west side of the Continental Divide: from 1 April through 30 November.
- east side of the Continental Divide: from 16 April through 30 November.

open motorized route density a moving window analysis calculation that applies to the primary conservation area portion of the NCDE and includes Federal, State, and Tribal roads and motorized trails that are open to wheeled motor vehicle use by the public for any part of the non-denning season. *Note*: Motorized routes closed only by sign or order are considered to be open for purposes of this calculation. See also **moving window analysis**.

primary conservation area an area identified in the NCDE Grizzly Bear Conservation Strategy to be managed as a source area for the grizzly bear population, where continuous occupancy by grizzly bears would be maintained. Habitat within the primary conservation area would receive the most stringent protection. The primary conservation area is the same area as the NCDE grizzly bear recovery zone identified in the Recovery Plan (http://www.fws.gov/mountain-prairie/species/mammals/grizzly/ [U.S. Fish and Wildlife Service 1993]).

project an organized effort to achieve an outcome on National Forest System lands identified by location, tasks, outputs, effects, times, and responsibilities for execution (36 CFR 219.19).

project (in grizzly bear habitat in the NCDE) a project in grizzly bear habitat in the NCDE, for purposes of the motorized access standards and guidelines in the primary conservation area of the NCDE, refers to any temporary activity requiring construction of new roads, temporary roads, reconstruction or opening of restricted roads during the non-denning season, if such use exceeds administrative use levels (see **administrative use**). Activities involving recurring helicopter use (see **recurring helicopter use**) are also considered to be a project.

recreation site a defined, public recreation area. The Forest Service uses two categories for recreation sites: dispersed and developed. Both types may have improvements needed to protect resources such as signs, road closure devices, bear resistant food storage devices, and/or sanitation facilities. Some developed recreation sites are designed and managed for overnight use and some are designed and managed for day-use only (e.g., interpretive signs at roadside pull-outs; trailheads at roadside pull-outs or at road closures; day-use picnic areas or boat launches; ski areas that do not have overnight lodging).

- Developed recreation sites have agency improvements made out of manmade materials that are intended to provide for public recreation and user comfort/convenience. Examples on National Forest Service lands include, but are not limited to: ski areas, campgrounds, sites with cabins, huts, lodges, recreation residences, visitor centers, and trailheads.

- Dispersed recreation sites have minimal to no agency improvements made out of manmade materials. Dispersed sites may include outfitter camps or other primitive camping spots along a road, trail, water body, or at a road closure.

recurring helicopter use a type of helicopter flight that involves multiple trips/passes each day consisting of low-altitude (< 500 m above-ground-level) flights that continues for a duration longer than 48 consecutive hours.

road a motor vehicle route more than 50 inches wide, unless identified and managed as a trail. (36 CFR 212.1, FSM 7705):

1. decommissioned: The stabilization and restoration of an unneeded road to a more natural state (36 CFR 212.1). Decommissioned roads do not count towards Total Motorized Route Density as long as they meet the definition of impassable.
2. forest road or trail: A route wholly or partly within or adjacent to and serving the National Forest Service (NFS) that is necessary for the protection, administration, and utilization of the NFS and the use and development of its resources (36 CFR 212.1 – Definitions)
3. impassable: A road that has been treated in such a manner that the road is blocked and there is little resource risk if road maintenance is not performed on a regular basis (self-maintaining).These roads are not counted in the total motorized route density as long as the road (generally the first 50 to 300 feet) has been treated to make it inaccessible to wheeled motorized vehicles during the non-denning season. Roads may become impassable as a result of a variety of means, including but not limited to one or more of the following: natural vegetation growth, road entrance obliteration, scarified ground, fallen trees, boulders, culvert or bridge removal, etc. Impassable roads may remain on the inventoried road system if use of the road is anticipated at some point in the future. Some, but not all, roads placed in intermittent stored service may be impassable. [GBCS]
4. intermittent stored service/intermittent service road, closed to traffic: The road is in a condition that there is little resource risk if maintenance is not performed.
5. maintenance level: A term for the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria (Forest Service Handbook 7709.59, 62.32)

   Level 1: These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource

management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns.

Level 2: Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations.

Level 3: Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities

Level 4: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds

Level 5: Assigned to roads that provide a high degree of user comfort and convenience.

6. National Forest System: A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority (36 CFR 212.1)
7. temporary: A road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road and that is not included in a forest transportation atlas (36 CFR 212.1). In the NCDE primary conservation area, temporary roads will meet the definition of impassable when no longer needed. [GBCS]

running average a method for computing the average of a stream of numbers for a specified period. A 10-year running average computes the mean for the values in the current year plus the previous 9 years. A running average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

secure core (grizzly bear) an area of the NCDE primary conservation area 500 meters or more from (1) a route open to public wheeled motorized use during the grizzly bear non-denning season, (2) a gated route, or (3) a route closed only with a sign that is greater than or equal to 2,500 acres in size. Roads restricted with physical barriers (not gates), decommissioned roads, impassable roads, temporary roads, over-the-snow motorized routes/areas, and non-motorized trails are allowed within secure core, unless otherwise restricted (e.g., by other national forest plan direction). Note: for suitability for over-the-snow motorized routes/areas during the non-denning season, see Flathead National Forest revised plan figures B-11 and B-12.

total motorized route density a moving window analysis calculation that applies to the primary conservation area portion of the NCDE and includes Federal, State, and Tribal roads and motorized trails that do not meet the definition of an impassable road. See also **moving window analysis**.

zone 1 an area surrounding the grizzly bear primary conservation area in the NCDE, where the intent is to maintain occupancy by grizzly bears, but at expected lower densities than inside the primary conservation area. Zone 1 also includes two demographic connectivity areas.

zone 2 an area adjacent to the grizzly bear zone 1 and/or zone 3 in the NCDE, where grizzly bears, particularly males, would have the opportunity to move between the NCDE and adjacent ecosystems. The intent of the zone 2 area is to allow for resource management and recreational opportunities while responding to grizzly bear-human conflicts with appropriate management actions.

zone 3 the area that primarily consists of areas where grizzly bears do not have enough suitable habitat to support population growth. The intent is that grizzly bear occupancy is not actively discouraged in zone 3 and the management emphasis is on conflict response.

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Appendix 5: Flathead National Forest Revised Forest Plan Key Components: Canada Lynx

Introduction

The habitat direction from the Northern Rockies Lynx Management Direction (NRLMD) is retained in this forest plan through standard FW-STD-WL-04. The forest plan will carry forward the objectives, standards, and guidelines that were developed to conserve lynx. The use of the terms "goals," "standards," and "guidelines" in the NRLMD is consistent with the definitions of these terms found on pages 4 and 5 of the forest plan. The definition of "objectives" in the NRLMD is consistent with the definition of "desired conditions" in the forest plan. The forest plan thus defines the NRLMD "objectives" as "desired conditions." The NRLMD plan components are being incorporated by reference throughout the forest plan (e.g., in the terrestrial ecosystems and vegetation, wildlife species, recreation, and infrastructure sections).

Forest-specific modifications to VEG S6 (to add an exception category aimed at protecting mature rust-resistant whitebark pine trees) and HU G11 (for areas identified as suitable for over-snow motorized recreational vehicle use) are indicated in bold type in VEG S6 and HU G11 in this appendix. These plan components are also replicated in the plan as FW-STD-TE&V-02 and FW-GDL-REC-03 because they were modified.

The NRLMD record of decision applies to lynx habitat on National Forest System lands presently occupied by Canada lynx, as defined by the Amended Lynx Conservation Agreement between the Forest Service (FS) and the U.S. Fish and Wildlife Service (FWS) (USDA FS and USDI FWS 2006a). The Flathead National Forest is listed as occupied lynx habitat.

Background

The FWS listed Canada lynx as a threatened species in March 2000, saying the main threat was "the lack of guidance for conservation of lynx and snowshoe hare habitat in National Forest Land and Resource Plans and BLM Land Use Plans" (USDI FWS 2000a). Following the listing, the FS signed a Lynx Conservation Agreement with the FWS in 2001. The FS agreed to consider the Lynx Conservation Assessment and Strategy during project analysis and to not proceed with projects that would be "likely to adversely affect" lynx until the forest plans were amended to conserve the lynx. The Lynx Conservation Agreement was renewed in 2005 and again in 2006, when it was extended for 5 years (until 2011) or until all relevant forest plans had been updated (USDA FS and USDI FWS 2000, 2005, 2006a, 2006b).

In 2007, the Northern Rockies Lynx Management Direction amended the existing forest plans of 18 national forests in Montana, Idaho, Wyoming, and Utah, including the Flathead National Forest. The record of decision was signed by the regional foresters of the Northern Region, Intermountain Region, and Rocky Mountain Region on March 23, 2007.[7]

The purpose of the NRLMD was to incorporate management direction in forest plans that conserves and promotes recovery of Canada lynx by reducing or eliminating adverse effects from land management activities on National Forest System lands while preserving the overall multiple use direction in existing forest plans.

The NRLMD relied upon the scientific information and recommendations in:

[7] The NRLMD final environmental impact statement and record of decision are available at https://www.fs.usda.gov/detail/r1/landmanagement/resourcemanagement/?cid=stelprdb5160650.

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- Ecology and Conservation of Lynx in the United States (Ruggiero et al. 2000), which summarized lynx ecology;
- Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000), which recommended conservation measures for activities that could place lynx at risk by altering their habitat or reducing their prey;
- The Canada Lynx Recovery Outline issued by the FWS on Sept. 12, 2005 (USDI Fish and Wildlife Service 2005); and
- Numerous publications cited in the NRLMD final environmental impact statement and record of decision.

Subsequent to adoption of the NRLMD, several key pieces of new information have become available. These include

1. a final rule designating lynx critical habitat prepared by the FWS in 2014[8];
2. an update to the Lynx Conservation Assessment and Strategy prepared by the Interagency Lynx Biology Team in 2013[9]; and
3. additional published scientific information about lynx and lynx habitat.

Monitoring information from the 10 years of implementation of the NRLMD has also been compiled. We considered and addressed this new information in the following ways.

- The revised forest plan includes additional plan components that affect Canada lynx and their critical habitat, consistent with the 2012 planning rule.
- The final environmental impact statement and the biological assessment for the revised forest plan describe critical habitat, which is the primary constituent element identified in the FWS's final rule for critical habitat, and analyze the effects of the alternatives on critical habitat unit #3, including the Flathead National Forest.
- A full revision of the LCAS was completed in 2013. The 2013 LCAS states the intent to provide updated information that may serve to inform updates or refinements of existing land management plans (p. 89). The revised forest plan final environmental impact statement and biological assessment referenced the 2013 LCAS and carefully considered conservation measures that are applicable to core areas.
- New scientific information about lynx and lynx habitat was extensively reviewed and cited in the final environmental impact statement and biological assessment.
- Monitoring information regarding fuels treatment and vegetation management conducted based upon exemptions and exceptions to the standards has been compiled each year since approval of the NRLMD and has been reported to the FWS. Monitoring indicates that the Forest has remained well within the limits required under the terms and conditions of the incidental take statement since the NRLMD was implemented.

[8] USFWS (2014), Final environmental assessment: Revised designation of critical habitat for the contiguous United States distince population segment of the Canada lynx, retrieved from https://www.fws.gov/mountain-prairie/es/canadaLynx.php.

[9] Interagency Lynx Biology Team (2013), Canada lynx conservation assessment and strategy (3rd ed.), USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service, Forest Service Publication R1-13-19, Missoula, MT, retrieved from https://www.fs.fed.us/biology/resources/pubs/wildlife/index.html.

- For the Forest's final environmental impact statement and biological assessment, the estimated acres of vegetation management treatments that may occur in lynx habitat were updated to reflect a 15-year time period following implementation of the revised forest plan. The FWS considered this information in preparing its biological opinion.

The following NRLMD is being incorporated into the Flathead National Forest plan. Changed language in VEG S6 and HU G11 is indicated in bold.

Northern Rockies Lynx Management Direction

This management direction includes a goal, objectives, standards, and guidelines related to all activities (ALL), vegetation management (VEG), grazing management (GRAZ), human uses (HU), and linkage (LINK).

GOAL[14][10]

Conserve the Canada lynx.

All Management Practices and Activities (ALL)

The following objectives, standards, and guidelines apply to all management projects in lynx habitat in lynx analysis units (LAUs) in occupied habitat and in linkage areas, subject to valid existing rights. They do not apply to wildfire suppression, or to wildland fire use.

Objective[30] ALL O1

Maintain[26] or restore[40] lynx habitat[23] connectivity[16] in and between LAUs[21], and in linkage areas[22].

Standard[44] ALL S1

New or expanded permanent development[33] and vegetation management[49] projects[36] must maintain[26] habitat connectivity[16] in an LAU[21] and/or linkage area[22].

Guideline[15] ALL G1

Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways[18] or forest highways[12] across federal land. Methods could include fencing, underpasses, or overpasses.

Standard[44] LAU S1

Changes in LAU[21] boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.

Vegetation Management Activities and Practices (VEG)

The following objectives, standards, and guidelines apply to vegetation management projects[36] in lynx habitat within lynx analysis units (LAUs) in occupied habitat. With the exception of Objective VEG O3 that specifically concerns wildland fire use, the objectives, standards, and guidelines do not apply to wildfire suppression, wildland fire use, or removal of vegetation for

[10] Note: In this section, superscript numbers refer to numbered definitions in the glossary.

permanent developments such as mineral operations, ski runs, roads, and the like. None of the objectives, standards, or guidelines apply to linkage areas.

Objective[30] VEG O1

Manage vegetation[49] to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.

Objective VEG O2

Provide a mosaic of habitat conditions through time that support dense horizontal cover[19], and high densities of snowshoe hare. Provide winter snowshoe hare habitat[51] in both the stand initiation structural stage and in mature, multi-story conifer vegetation.

Objective VEG O3

Conduct fire use[11] activities to restore[40] ecological processes and maintain or improve lynx habitat.

Objective VEG O4

Focus vegetation management[49] in areas that have potential to improve winter snowshoe hare habitat[51] but presently have poorly developed understories that lack dense horizontal cover.

Standard[44] VEG S1

Where and to what this applies: Standard VEG S1 applies to all vegetation management[49] projects[36] that regenerate[38] forests, except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). *In addition, fuel treatment projects may not result in more than three adjacent LAUs exceeding the standard.*

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The standard: Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages[45] limit disturbance in each LAU as follows:

If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects[36].

Standard VEG S2

Where and to what this applies: Standard VEG S2 applies to all timber management[47] projects[36] that regenerate[38] forests, except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The standard: Timber management[47] projects[36] shall not regenerate[38] more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period.

Standard VEG S5

Where and to what this applies: Standard VEG S5 applies to all precommercial thinning[35] projects[36], except for fuel treatment[13] projects36 that use precommercial thinning as a tool within the wildland urban interface50 (WUI) as defined by HFRA17, subject to the following limitation:

Fuel treatment projects[36] within the WUI50 that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The Standard: Precommercial thinning projects[36] that reduce snowshoe hare habitat may occur from the stand initiation structural stage[45] until the stands no longer provide winter snowshoe hare habitat only:

1. Within 200 feet of administrative sites, dwellings, or outbuildings; or
2. For research studies[39] or genetic tree tests evaluating genetically improved reforestation stock; or
3. Based on new information that is peer reviewed and accepted by the regional level of the Forest Service, and state level of FWS, where a written determination states:
   a. that a project[36] is not likely to adversely affect lynx; or
   b. that a project[36] is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat; or
4. For conifer removal in aspen, or daylight thinning[5] around individual aspen trees, where aspen is in decline; or
5. For daylight thinning of planted rust-resistant white pine where 80 % of the winter snowshoe hare habitat[51] is retained; or
6. To restore whitebark pine.

Exceptions 2 through 6 shall only be utilized in LAUs where Standard VEG S1 is met.

Standard VEG S6

Where and to what this applies: Standard VEG S6 applies to all vegetation management[49] projects[36] except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI50 see guideline VEG G10.

The Standard: Vegetation management projects[36] that reduce snowshoe hare habitat in multi-story mature or late successional forests[29] may occur only:

1. Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or
2. For research studies[39] or genetic tree tests evaluating genetically improved reforestation stock; or
3. For incidental removal during salvage harvest[42] (e.g. removal due to location of skid trails).
4. **For noncommercial felling of trees larger than sapling size within 200 feet of whitebark pine trees (in stands that contain trees identified for cone/scion/pollen collection) to make whitebark pine more likely to survive wildfires, more resistant to mountain pine beetle attack, and more likely to persist in future environments.**

Exceptions 2, 3, and 4 shall only be utilized in lynx analysis units where standard VEG S1 is met.

Note: Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover (e.g., uneven-aged or even-aged management systems could be used to create openings in coniferous forests in the stem exclusion structural stage where there is little understory so that new forage can grow).

Guideline VEG G1

Vegetation management[49] projects[36] should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available.

Priority for treatment should be given to stem-exclusion, closed-canopy structural stage[46] stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat[51] should be near denning habitat[6].

Guideline VEG G4

Prescribed fire[34] activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.

Guideline VEG G5

Habitat for alternate prey species, primarily red squirrel[37], should be provided in each LAU.

Guideline VEG G10

Fuel treatment projects[36] within the WUI[50] as defined by HFRA[17] should be designed considering Standards VEG S1, S2, S5, and S6 to promote lynx conservation.

Guideline VEG G11

Denning habitat[6] should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects[36] should be designed to retain some coarse woody debris[4], piles, or residual trees to provide denning habitat[6] in the future.

Livestock Management (GRAZ)

The following objectives and guidelines apply to grazing projects in lynx habitat in lynx analysis units (LAUs) in occupied habitat. They do not apply to linkage areas.

Objective[30] GRAZ O1

Manage livestock grazing to be compatible with improving or maintaining[26] lynx habitat[23].

Guideline[15] GRAZ G1

In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.

Guideline GRAZ G2

In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.

Guideline GRAZ G3

In riparian areas[41] and willow carrs[3], livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.

Guideline GRAZ G4

In shrub-steppe habitats[43], livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs[21], to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.

Human Use Projects (HU)

The following objectives and guidelines apply to human use projects, such as special uses (other than grazing), recreation management, roads, highways, and mineral and energy development, in lynx habitat in lynx analysis units (LAUs) in occupied habitat, subject to valid existing rights. They do not apply to vegetation management projects or grazing projects directly. They do not apply to linkage areas.

Objective[30] HU O1

Maintain[26] the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat[23].

Objective HU O2

Manage recreational activities to maintain lynx habitat and connectivity[16].

Objective HU O3

Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat.

Objective HU O4

Provide for lynx habitat needs and connectivity when developing new or expanding existing developed recreation[9] sites or ski areas.

Objective HU O5

Manage human activities, such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors, to reduce impacts on lynx and lynx habitat.

Objective HU O6

Reduce adverse highway[18] effects on lynx by working cooperatively with other agencies to provide for lynx movement and habitat connectivity[16], and to reduce the potential of lynx mortality.

Guideline[15] HU G1

When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris[4], so winter snowshoe hare habitat[51] is maintained.

Guideline HU G2

When developing or expanding ski areas, lynx foraging habitat should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.

Guideline HU G3

Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat[23].

Guideline HU G4

For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction.

Guideline HU G5

For mineral and energy development sites and facilities that are closed, a reclamation plan that restores[40] lynx habitat should be developed.

Guideline HU G6

Methods to avoid or reduce effects on lynx should be used in lynx habitat[23] when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.

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Guideline HU G7

New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity[16]. New permanent roads and trails should be situated away from forested stringers.

Guideline HU G8

Cutting brush along low-speed[25], low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.

Guideline HU G9

On new roads built for projects[36], public motorized use should be restricted. Effective closures should be provided in road designs. When the project[36] is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.

Guideline HU G10

When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat[10], if it has been identified as a need.

Guideline HU G11

To provide ecological conditions to support Canada lynx on NFS lands at a forestwide scale, there should be no net increase in miles of designated routes for motorized over-snow vehicle use, groomed routes, or areas where motorized over-snow vehicle use is identified as suitable. The "no net increase" is in comparison to the suitability displayed in forest plan figure B-11.

This guideline does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.

Guideline HU G12

Winter access for non-recreation special uses and mineral and energy exploration and development, should be limited to designated routes[8] or designated over-the- snow routes[7].

Linkage Areas (LINK)

The following objective, standard, and guidelines apply to all projects within linkage areas in occupied habitat, subject to valid existing rights.

Objective[30] LINK O1

In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat.

Standard[44] LINK S1

When highway[18] or forest highway[12] construction or reconstruction is proposed in linkage areas[22], identify potential highway crossings.

Guideline[15] LINK G1

NFS lands should be retained in public ownership.

Guideline LINK G2

Livestock grazing in shrub-steppe habitats[43] should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.

Required Monitoring

Map the location and intensity of snow compacting activities and designated and groomed routes that occurred inside LAUs during the period of 1998 to 2000. The mapping is to be completed within one year of this decision, and changes in activities and routes are to be monitored every five years after the decision.

When project decisions are signed report the following:

1. Fuel treatments:

    a) Acres of fuel treatment in lynx habitat by forest and LAU, and whether the treatment is within or outside the WUI as defined by HFRA.

    b) Whether or not the fuel treatment met the vegetation standards or guidelines. If standard(s) are not met, report which standard(s) are not met, why they were not met, and how many acres were affected.

    c) *Whether or not 2 adjacent LAUs exceed standard VEG S1 (30% in a stand initiation structural stage that is too short to provide winter snowshoe hare habitat), and what event(s) or action(s) caused the standard to be exceeded.*

2. *Application of exception in Standard VEG S5*

    a) For areas where any of the exemptions 1 through 6 listed in Standard VEG S5 were applied: Report the type of activity, the number of acres, and the location (by unit, and LAU) and whether or not Standard VEG S1 was within the allowance.

3. *Application of exceptions in Standard VEG S6*

    1. For areas where any of the exemptions 1 through 3 listed in Standard VEG S6 were applied: Report the type of activity, the number of acres, and the location (by unit, and LAU) and whether or not Standard VEG S1 was within the allowance.

    2. Application of guidelines

Document the rationale for deviations to guidelines. Summarize what guideline(s) was not followed and why.

Directions in italics were terms and conditions that were incorporated from the FWS Biological Opinion (USDI FWS 2007).

FS-108408

NRLMD Glossary

[1] *Area of consistent snow compaction* – An area of consistent snow compaction is an area of land or water that during winter is generally covered with snow and gets enough human use that individual tracks are indistinguishable. In such places, compacted snow is evident most of the time, except immediately after (within 48 hours) snowfall.

These can be areas or linear routes, and are generally found in or near snowmobile or cross-country ski routes, in adjacent openings, parks and meadows, near ski huts or plowed roads, or in winter parking areas. Areas of consistent snow compaction will be determined based on the acreage or miles used during the period 1998 to 2000.

[2] *Broad scale assessment* – A broad scale assessment is a synthesis of current scientific knowledge, including a description of uncertainties and assumptions, to provide an understanding of past and present conditions and future trends, and a characterization of the ecological, social, and economic components of an area. (LCAS)

[3] *Carr* – Deciduous woodland or shrub land occurring on permanently wet, organic soil. (LCAS)

[4] *Course woody debris* – Any piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses on the ground or in streams. (LCAS)

[5] *Daylight thinning* – Daylight thinning is a form of precommercial thinning that removes the trees and brush inside a given radius around a tree.

[6] *Denning habitat (lynx)* – Denning habitat is the environment lynx use when giving birth and rearing kittens until they are mobile. The most common component is large amounts of coarse woody debris to provide escape and thermal cover for kittens.

Denning habitat must be within daily travel distance of winter snowshoe hare habitat – the typical maximum daily distance for females is about three to six miles. Denning habitat includes mature and old growth forests with plenty of coarse woody debris. It can also include young regenerating forests with piles of coarse woody debris, or areas where down trees are jack-strawed.

[7] *Designated over-the-snow routes* – Designated over-the-snow routes are routes managed under permit or agreement or by the agency, where use is encouraged, either by on-the- ground marking or by publication in brochures, recreation opportunity guides or maps (other than travel maps), or in electronic media produced or approved by the agency.

The routes identified in outfitter and guide permits are designated by definition; groomed routes also are designated by definition. The determination of baseline snow compaction will be based on the miles of designated over-the-snow routes authorized, promoted or encouraged during the period 1998 to 2000.

[8] *Designated route* – A designated route is a road or trail that has been identified as open for specified travel use.

[9] *Developed recreation* – Developed recreation requires facilities that result in concentrated use. For example, skiing requires lifts, parking lots, buildings, and roads; campgrounds require roads, picnic tables, and toilet facilities.

[10] *Security habitat (lynx)* – Security habitat amounts to places in lynx habitat that provide secure winter bedding sites for lynx in highly disturbed landscapes like ski areas.

Security habitat gives lynx the ability to retreat from human disturbance. Forest structures that make human access difficult generally discourage human activity in security habitats. Security habitats are most effective if big enough to provide visual and acoustic insulation and to let lynx easily move away from any intrusion. They must be close to winter snowshoe hare habitat. (LCAS)

[11] *Fire use* – Fire use is the combination of wildland fire use and using prescribed fire to meet resource objectives. (NIFC) Wildland fire use is the management of naturally ignited wildland fires to accomplish resource management objectives in areas that have a fire management plan. The use of the term wildland fire use replaces the term prescribed natural fire. (Wildland and Prescribed Fire Management Policy, August 1998)

[12] *Forest highway* – A forest highway is a forest road under the jurisdiction of, and maintained by, a public authority and open to public travel (USC: Title 23, Section 101(a)), designated by an agreement with the FS, state transportation agency, and Federal Highway Administration.

[13] *Fuel treatment* – A fuel treatment is a type of vegetation management action that reduces the threat of ignition, fire intensity, or rate of spread, or is used to restore fire- adapted ecosystems.

[14] *Goal* – A goal is a broad description of what an agency is trying to achieve, found in a land management plan. (LCAS)

[15] *Guideline* – A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations may be documented, but amending the plan is not required. (LCAS modified)

[16] *Habitat connectivity (lynx)* – Habitat connectivity consists of an adequate amount of vegetation cover arranged in a way that allows lynx to move around. Narrow forested mountain ridges or shrub-steppe plateaus may serve as a link between more extensive areas of lynx habitat; wooded riparian areas may provide travel cover across open valley floors. (LCAS)

[17] *HFRA (Healthy Forests Restoration Act)* – Public Law 108-148, passed in December 2003. The HFRA provides statutory processes for hazardous fuel reduction projects on certain types of at-risk National Forest System and Bureau of Land Management lands. It also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships. (Modified from Forest Service HFRA web site.)

[18] *Highway* – The word highway includes all roads that are part of the National Highway System. (23 CFR 470.107(b))

[19] *Horizontal cover* – Horizontal cover is the visual obscurity or cover provided by habitat structures that extend to the ground or snow surface primarily provided by tree stems and tree boughs, but also includes herbaceous vegetation, snow, and landscape topography.

[20] *Isolated mountain range* – Isolated mountain ranges are small mountains cut off from other mountains and surrounded by flatlands. On the east side of the Rockies, they are used for analysis instead of sub-basins. Examples are the Little Belts in Montana and the Bighorns in Wyoming.

[21] *LAU (Lynx Analysis Unit)* – An LAU is an area of at least the size used by an individual lynx, from about 25 to 50 square miles (LCAS). An LAU is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

[22] *Linkage area* – A linkage area provides connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas, where basins, valleys, or agricultural lands separate blocks of lynx habitat, or where lynx habitat naturally narrows between blocks. (LCAS updated definition approved by the Steering Committee 10/23/01)

[23] *Lynx habitat* – Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir, and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas-fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas-fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat. (LCAS)

[24] *Lynx habitat in an unsuitable condition* – Lynx habitat in an unsuitable condition consists of lynx habitat in the stand initiation structural stage where the trees are generally less than ten to 30 years old and have not grown tall enough to protrude above the snow during winter. Stand replacing fire or certain vegetation management projects can create unsuitable conditions. Vegetation management projects that can result in unsuitable habitat include clearcuts and seed tree harvest, and sometimes shelterwood cuts and commercial thinning depending on the resulting stand composition and structure. (LCAS)

[25] *Low-speed, low-traffic-volume road* – Low speed is less than 20 miles per hour; low volume is a seasonal average daily traffic load of less than 100 vehicles per day.

[26] *Maintain* – In the context of this decision, maintain means to provide enough lynx habitat to conserve lynx. It does not mean to keep the status quo.

[27] *Maintenance level* – Maintenance levels define the level of service provided by and maintenance required for a road. (FSH 7709.58, Sec 12.3) Maintenance level 4 is assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most level 4 roads have double lanes and an aggregate surface. Some may be single lane; some may be paved or have dust abated. Maintenance level 5 is assigned to roads that provide a high degree of user comfort and convenience. Normally, level 5 roads are have double lanes and are paved, but some may be aggregate surfaced with the dust abated.

[28] *Mid-seral or later* – Mid-seral is the successional stage in a plant community that is the midpoint as it moves from bare ground to climax. For riparian areas, it means willows or other shrubs have become established. For shrub-steppe areas, it means shrubs associated with climax are present and increasing in density.

[29] **Multi-story mature or late successional forest – This stage is similar to the old multistory structural stage (see below). However, trees are generally not as old, and decaying trees may be somewhat less abundant.**

[30] *Objective* – An objective is a statement in a land management plan describing desired resource conditions and intended to promote achieving programmatic goals. (LCAS)

[31] *Old multistory structural stage* – Many age classes and vegetation layers mark the old forest, multistoried stage. It usually contains large old trees. Decaying fallen trees may be present that leave a discontinuous overstory canopy. On cold or moist sites without frequent fires or other

disturbance, multi-layer stands with large trees in the uppermost layer develop. (Oliver and Larson, 1996)

[32] *Old growth* – Old growth forests generally contain trees that are large for their species and the site, and are sometimes decadent with broken tops. Old growth often contains a variety of tree sizes, large snags, and logs, and a developed and often patchy understory.

[33] *Permanent development* – A permanent development is any development that results in a loss of lynx habitat for at least 15 years. Ski trails, parking lots, new permanent roads, structures, campgrounds, and many special use developments would be considered permanent developments.

[34] *Prescribed fire* – A prescribed fire is any fire ignited as a management action to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements met, before ignition. The term prescribed fire replaces the term management ignited prescribed fire. (NWCG)

[35] *Precommercial thinning* – Precommercial thinning is mechanically removing trees to reduce stocking and concentrate growth on the remaining trees, and not resulting in immediate financial return. (Dictionary of Forestry)

[36] *Project* – All, or any part or number of the various activities analyzed in an Environmental Impact Statement, Environmental Analysis, or Decision Memo. For example, the vegetation management in some units or stands analyzed in an EIS could be for fuel reduction, and therefore those units or stands would fall within the term *fuel treatment project* even if the remainder of the activities in the EIS are being conducted for other purposes, and the remainder of those units or stands have other activities prescribed in them. All units in an analysis do not necessarily need to be for fuel reduction purposes for certain units to be considered a *fuel reduction project*.

[37] *Red squirrel habitat* – Red squirrel habitat consists of coniferous forests of seed and cone-producing age that usually contain snags and downed woody debris, generally associated with mature or older forests.

[38] *Regeneration harvest* – The cutting of trees and creating an entire new age class; an even-age harvest. The major methods are clearcutting, seed tree, shelterwood, and group selective cuts. (Helms, 1998)

[39] *Research* – Research consists of studies conducted to increase scientific knowledge or technology. For the purposes of Standards VEG S5 and VEG S6, research applies to studies financed from the forest research budget (FSM 4040) and administrative studies financed from the NF budget.

[40] *Restore, restoration* – To restore is to return or re-establish ecosystems or habitats to their original structure and species composition. (Dictionary of Forestry)

[41] *Riparian area* – An area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation. (LCAS)

[42] *Salvage harvest* – Salvage harvest is a commercial timber sale of dead, damaged, or dying trees. It recovers economic value that would otherwise be lost. Collecting firewood for personal use is not considered salvage harvest.

[43] **Shrub steppe habitat – Shrub steppe habitat consists of dry sites with shrubs and grasslands intermingled.**

[44] *Standard* – A standard is a required action in a land management plan specifying how to achieve an objective or under what circumstances to refrain from taking action. A plan must be amended to deviate from a standard.

[45] *Stand initiation structural stage* – The stand initiation stage generally develops after a stand-replacing disturbance by fire or regeneration timber harvest. A new single-story layer of shrubs, tree seedlings, and saplings establish and develop, reoccupying the site. Trees that need full sun are likely to dominate these even-aged stands. (Oliver and Larson, 1996)

[46] *Stem exclusion structural stage (Closed canopy structural stage)* – In the stem exclusion stage, trees initially grow fast and quickly occupy all of the growing space, creating a closed canopy. Because the trees are tall, little light reaches the forest floor so understory plants (including smaller trees) are shaded and grow more slowly. Species that need full sunlight usually die; shrubs and herbs may become dormant. New trees are precluded by a lack of sunlight or moisture. (Oliver and Larson, 1996)

[47] *Timber management* – Timber management consists of growing, tending, commercially harvesting, and regenerating crops of trees.

[48] *Understory re-initiation structural stage* – In the understory re-initiation stage, a new age class of trees gets established after overstory trees begin to die, are removed, or no longer fully occupy their growing space after tall trees abrade each other in the wind. Understory seedlings then re-grow and the trees begin to stratify into vertical layers. Alow to moderately dense uneven-aged overstory develops, with some small shade- tolerant trees in the understory. (Oliver and Larson, 1996)

[49] *Vegetation management* – Vegetation management changes the composition and structure of vegetation to meet specific objectives, using such means as prescribed fire or timber harvest. For the purposes of this decision, the term does not include removing vegetation for permanent developments like mineral operations, ski runs, roads and the like, and does not apply to fire suppression or to wildland fire use.

[50] *Wildland urban interface (WUI)* – Use the definition of WUI found in the Healthy Forests Restoration Act. The full text can be found at HFRA § 101. Basically, the wildland urban interface is the area adjacent to an at-risk community that is identified in the community wildfire protection plan. If there is no community wildfire protection plan in place, the WUI is the area 0.5 mile from the boundary of an at-risk community; or within 1.5 miles of the boundary of an at-risk community if the terrain is steep, or there is a nearby road or ridgetop that could be incorporated into a fuel break, or the land is in condition class 3, or the area contains an emergency exit route needed for safe evacuations. (Condensed from HFRA. For full text see HFRA § 101.)

[51] *Winter snowshoe hare habitat* – Winter snowshoe hare habitat consists of places where young trees or shrubs grow densely – thousands of woody stems per acre – and tall enough to protrude above the snow during winter, so snowshoe hare can browse on the bark and small twigs (LCAS). Winter snowshoe hare habitat develops primarily in the stand initiation, understory reinitiation and old forest multistoried structural stages.

Lynx and other Meso-Carnivore Monitoring

Note that Northern Rockies Lynx Management Direction plan components are preceded by VEG and can be found above.

Monitoring Question	Plan Component(s)	Potential Indicator(s)
MON-T&E-LYNX-01: How much of lynx critical habitat does not yet provide PCE1a, but is progressing towards providing PCE1a?	**VEGS1, VEGS2**	**IND-WLD-** **17**: Percentage of lynx critical habitat on NFS lands in each lynx analysis unit that is not yet winter snowshoe hare habitat due to wildfire. **18.** Percentage of lynx critical habitat on NFS lands in each lynx analysis unit that is not yet winter snowshoe hare habitat due to vegetation management projects.
MON-T&E-LYNX-02: What is the percentage of lynx critical habitat that has vegetation treatments in stand initiation hare habitat (PCA1a)?	**VEGS5**	**IND-WLD-** **19**. Number of acres of lynx critical habitat on NFS lands in each lynx analysis unit that were precommercially thinned using exceptions to VEGS5 **20**. Number of acres of lynx habitat or critical habitat on NFS lands in each lynx analysis unit that were precommercially thinned using wildland-urban interface exemptions to VEGS5
MON-T&E-LYNX-03: If modified precommercial thinning techniques are used in lynx critical habitat do they increase PCE1a and/or its persistence?	**VEGS5**	**IND-WLD-** **21**. Number of acres of lynx critical habitat that were treated with modified thinning techniques under VEG S5 exception #2 or 3 **22**. The percentage of dense horizontal cover over time in treatment areas in comparison to untreated plots
MON-T&E-LYNX-04: What is the percentage of lynx critical habitat that has vegetation treatments in multistoried hare habitat (PCE1a)?	**VEGS6**	**IND-WLD-** **23**. Number of acres of multistory hare habitat in lynx critical habitat on NFS lands in each lynx analysis unit that were treated using exceptions to VEGS6 **24**. Number of acres of multistory hare habitat in lynx critical habitat on NFS lands in each lynx analysis unit that were treated using wildland-urban interface exemptions to VEGS6
MON-WL- 17: What is the occupancy of forest meso-carnivores (e.g., lynx, wolverine, fisher) on the Flathead National Forest?	**FW-DC-WL SCC-01** **FW-DC-WL DIV-01**	**IND-WLD-** **75.** Number of each meso-carnivore species detected on the Forest in cooperation with other partners.

FS-108414

FS-108415

From:	Jacobs, Amy -FS
To:	Jodi_Bush@fws.gov
Cc:	Katrina Dixon (Katrina_Dixon@fws.gov); ben_conard@fws.gov; Aceituno, Kevin; Allen, Anastasia E -FS; Carlin, Rob -FS; Danczyk, Gary M -FS; Davies, Robert -FS; Snelson, Scott I -FS; Dowling, Chris -FS; Mulholland, Bill -FS; Draggoo, Michele -FS; Kendall, Craig -FS; Delay, Chantelle B -FS; Weber, Chip -FS
Subject:	Update to Consultation for the Flathead National Forest Revised Forest Plan
Date:	Thursday, December 20, 2018 2:52:19 PM
Attachments:	image001.png FNF_RevisedLRMP_UpdateSinceNovember2017.pdf FNF_RevisedLRMP_UpdateSinceNovember2017_Attachment.pdf

Jodi,

Attached please find an update to USFWS Consultation for the Flathead National Forest's revised long-range management plan, which we plan to sign on December 24, 2018.

Thank you,
Amy Jacobs

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File Code: 2670
Date: Dec. 20, 2018

Jodi Bush
Field Supervisor, Ecological Services
USDI-Fish and Wildlife Service
585 Shepard Way
Helena, MT 59901

Dear Jodi,

The Flathead National Forest submits the following information as an update subsequent to the 11/22/2017 issuance of the Biological Opinion for the Revised Land and Resource Management Plan for the Flathead National Forest. Endangered Species Act consultation with the USFWS was completed subsequent to that date for some projects that would affect motorized access parameters and/or Canada lynx exception or exemption acre balances. These projects are Betty Baptiste, Hungry Lion Resource Management, and Weed Lake Landscape Restoration.

Northern Rockies Lynx Management Direction (NRLMD) exception and exemption acres, as reported to the USFWS during project-level consultation for the Betty Baptiste, Hungry Lion Resource Management, and Weed Lake Landscape Restoration Projects, total 657 acres of habitat treated in the Wildland Urban Interface (WUI) where exemptions were applied, and 448 acres of thinning exception outside the WUI.

The attached document presents the updated baseline percentages for Open Motorized Route Density (OMRD), Total Motorized Route Density (TMRD), and secure core for the purposes of implementing Revised Forest Plan Standards FW-STD-IFS-02 and FW-STD-IFS-03. This is an update of Forest Plan Revision Planning Record #00673. As described in this attachment, this procedure treats Management Situation 3 lands, Weyerhaeuser Timber lands, impassable roads, and high-use non-motorized trails consistent with methods and definitions outlined in the final NCDE Grizzly Bear Conservation Strategy. Also note that field surveys and GIS updates subsequent to the 10/13/2017 BA provided better information about conditions on the ground. This baseline includes changes in numbers that were found to be acceptable through consultation with USFWS for the Beaver Creek Landscape Restoration, Betty Baptiste, Chilly James Restoration, East Red Meadow Drive, Firefighter, Glacier Loon Fuels Reduction and Forest Health, Hungry Lion Resource Management, Meadow Smith, and Weed Lake Landscape Restoration Projects. The Crazy Horse II Fire Salvage, Hungry Lion Resource Management, Trail Creek Fire Salvage, and Summit Mountain Pine Beetle Salvage Projects did not change OMRD, TMRD, or secure core percentages. Changes due to implementation of projects maintained or resulted in improved on-the-ground conditions for grizzly bear habitat security in all but the Werner Creek subunit, where the Moose Post Fire Salvage decision open a gated road seasonally.

Sincerely,

CHIP WEBER
Forest Supervisor

cc: Katrina Dixon, Ben Conard, Kevin Aceituno, Anastasia Allen, Rob Carlin, Gary M Danczyk, Robert Davies, Scott Snelson, Chris Dowling, Bill Mullholland, Michele Draggoo, Craig Kendall, Chantelle Delay, Amy Jacobs, Chip Weber

Summary of changes in baseline percentages for OMRD, TMRD, and secure core from 2011 through 2017 (revised forest plan standard FW-STD-IFS-02)

Compiled by Kathy Ake, GIS specialist, updated 2018

Introduction

The Northern Continental Divide Ecosystem (NCDE) Grizzly Bear Conservation Strategy (2018) outlined procedures for calculating and reporting motorized access every two years starting in 2011. The following document shows calculations for OPEN Motorized Route Density (OMRD), TOTAL Motorized Route Density (TMRD), and Secure core based on procedures that would occur once the Revised Forest Plan for the Flathead National Forest and amendments to the Lolo, Helena, Lewis and Clark, and Kootenai National Forest plans are adopted, as outlined in Flathead National Forest standard FW-STD-IFS-02. Percentages that have been reported for subunits under Forest Plan Amendment 19 reporting procedures are not always the same as percentages for those same subunits based upon NCDE Grizzly Bear Conservation Strategy reporting procedures. These are the main differences between the current Amendment 19 reporting procedures and the final NCDE Conservation Strategy reporting procedures:

1. Grizzly Bear Management Situation 3 (MS-3) lands and the route density on those lands are now included in calculations for Open and Total Motorized Route Density.
2. Buffers for high-use trails are no longer deducted from secure core.
3. Weyerhaeuser Timber Company (formerly Plum Creek) lands and roads are now considered private lands for all calculations.
4. Roads that meet the definition of impassable do not count in TMRD calculations (see road definitions in the revised forest plan glossary).

To avoid confusion, the draft GBCS uses the terms “Open Motorized Route Density” (OMRD), “Total Motorized Route Density” (TMRD), and “secure core” to reflect the revised definitions and calculation procedures. We have adopted the same terminology and procedures for discussing the effects of the forest plan revision. The revised Forest Plan direction would apply to all 73 bear management subunits on the Forest. The table below shows OMRD, TMRD, and secure core percentages for all 73 subunits with Flathead National Forest lands; 63 of these now have greater than or equal to 75% NFS lands and 10 (shaded orange in the table) have less than 75% NFS lands. Subunits are listed alphabetically by BMU, then subunit. Some subunits have projects that are nearing completion and others have gone through recent consultation but on-the-ground implementation is not yet near completion.

Application of Flathead National Forest standard FW-STD-IFS-02 will require clear understanding of “baseline” conditions. The Grizzly Bear Conservation Strategy identified the baseline as motorized access conditions in each BMU subunit as of December 31, 2011, but also recognized that under specific conditions the numeric percentage calculations would be updated. As outlined in FW-STD-IFS-02, there may be updates in percentage values with no change in on-the-ground conditions (e.g. due to updates in the data recorded in various databases, spatial re-alignments of GIS layers, a change in a motorized route by another landowner, and/or acquisition of lands by the Forest Service). In these instances, the baseline percentages are updated, but this is not considered a net increase in OMRD or TMRD nor a decrease in secure core. On-the-ground changes that are due to implementation of projects that underwent consultation with the USFWS prior to the signing of the revised Forest Plan also updated the baseline, as specified in FW-STD-IFS-02. Changes due to implementation of these projects resulted in improved on-the-ground conditions for grizzly bear habitat security, in all but one subunit. The

exception is the Werner Creek subunit, where the signed and consulted with USFWS Moose Post-Fire Project decision was made to seasonally open a gated road, increasing the Open Motorized Route Density.

Of the 73 subunits on the Flathead National Forest, 36 have had a whole percent value change since 2011. For each subunit with a percentage change, the difference in the percentage is provided below along with a brief summary of what change occurred. The new baseline values are in **bold**. Table 1, below, lists all 73 subunits and their baseline values, followed by Figure 1, which displays the subunit and unit boundaries as well as land management boundaries and ownership.

Buck Holland (BGSM BMU, Flathead NF). Total Motorized Route Density increased from 41% to **44%**. Secure core decreased from 49% to **47%**. A majority of the changes are due to the acquisition of one whole section containing several gated yearlong roads. Additionally, there have been updates to the spatial GIS layer to more accurately reflect on-the-ground locations. These values are the updated baseline.

Meadow Smith (BGSM BMU, Flathead NF). The Meadow Smith Project resulted in a baseline value of **18%** for Open Motorized Route Density. Current percentage is 20% and will be at 18% once the project is fully implemented. Total Motorized Route Density decreased from 54% to **53%**. Secure core increased from 41% to **42%**. Changes are due to updates to the road management, spatial realignments of the GIS location to more accurately reflect on-the-ground locations, and changes in land ownership, all of which combined to change percentage value. This value is the updated baseline.

Big Bill Shelf (BNKR BMU, Flathead NF). Total Motorized Route Density decreased from 7% to **6%**. The spatial layer had several re-alignments to reflect on-the-ground locations which caused Total Motorized Route Density to decrease from 6.68 to 6.47, rounding from 7% to 6%. This value is the updated baseline. No on-the-ground change.

Jungle Addition (BNKR BMU, Flathead NF). Total Motorized Route Density increased from 17% to **19%**. One road was incorrectly labeled and not included in Total Motorized Route Density in 2011. Flathead NF did a review of roads that had become impassable but not designated as impassable by any management decision and this correction was made by 2012. These roads were then included in the Total Motorized Route Density. This value is the updated baseline. No on-the-ground change.

South Fork Lost Soup (BNKR BMU, Flathead NF). Total Motorized Route Density decreased from 49% to **47%**. Secure core decreased from 40% to **37%**. Changes were due to updated in road management on state roads on state lands as well as one road changing from closed yearlong by physical barrier to closed yearlong by gate. The first 1.5 mile of road is a national forest system road and the remaining 3 miles have DNRC jurisdiction. These values are the updated baseline.

Spotted Bear Mtn (BNKR BMU, Flathead NF). Open Motorized Route Density decreased from 20% (19.53) to **19%** (19.37). Change is due to spatial re-alignments of the GIS layer to more accurately reflect on-the-ground locations. This value is the updated baseline. No on-the-ground change.

Doris Lost Johnny (HGHS BMU, Flathead NF). Total Motorized Route Density increased from 19% to **20%**. Change is a result of spatial realignments to motorized trails to more accurately reflect where the trails are on the ground in the spatial layer. This value is the updated baseline. No on-the-ground changes.

Emery Firefighter (HGHS BMU, Flathead NF). Secure core increased from 53% to 58% due to partial implementation of the Firefighter Project. The Firefighter Project resulted in baseline values of **19%** for Total Motorized Route Density and **68%** for secure core. Current values are 20% and 58%, respectively, and will be 19% and 68% once the project is fully implemented.

Riverside Paint (HGHS BMU, Flathead NF). Open Motorized Route Density decreased from 19% to **18%**. Secure core decreased from 72% to **71%**. Changes are due to spatial re-alignments of the GIS layer to more accurately reflect on-the-ground locations and corrections to the INFRA database on road management (coding errors). These values are the updated baseline. No on-the-ground change.

Wounded Buck Clayton (HGHS BMU, Flathead NF). Secure core increased from 65% to **66%** (65.75). Change is due to implementation of the West-Side Reservoir project. This value is the updated baseline.

Canyon McGinnis (LNFF BMU, Flathead NF). Secure core decreased from 52% to **50%**. Change is due to updates to the INFRA database as well as spatial GIS layer to more accurately reflect on-the-ground conditions. This value is the updated baseline. No on-the-ground changes.

Lower Big Creek (LNFF BMU, Flathead NF). Open Motorized Route Density increased from 18% to 19%. This change is a correction to reflect the signed Robert-Wedge Post-Fire decision in consultation with USFWS. Total Motorized Route Density decreased from 20% to **19%**. Secure core increased from 66% to **71%**. For Total Motorized Route Density and Secure core, changes are due to implementation of the Moose Project. These values are the updated baseline.

Werner Creek (LNFF BMU, Flathead NF). Open Motorized Route Density increased from 19% to **29%**. Total Motorized Route Density decreased from 21% to **20%**. Secure core increased from 42% to **63%**. Changes are due to implementation of the Moose Project. These values are the updated baseline.

Beaver Creek (MSRG BMU, Flathead NF). Together, the Beaver Creek Landscape Restoration Project and the Glacier Loon Fuels Reduction and Forest Health Project resulted in baseline values of **19%** for Total Motorized Route Density and **71%** for secure core. Current values are 26% and 66%, respectively, and will be 19% and 71% once these projects are fully implemented.

Cold Jim (MSRG BMU, Flathead NF). The Chilly James Restoration Project resulted in a baseline value of **54%** for Total Motorized Route Density. Current value is 55% and will be at 54% when the project is fully implemented. Total Motorized Route Density decreased from 57% to 55%. Change is due to spatial realignment of road GIS layer to more accurately reflect on the ground locations as well as implementation of the Chilly James Restoration Project.

Crane Mtn (MSRG BMU, Flathead NF). Total Motorized Route Density decreased from 56% to **55%**. Management actions partially implementing the Crane Mountain Salvage Project decreased the Total Motorized Route Density. Secure core decreased from 26% to **25%**. Changes in secure core are due to additional private roads incorporated into the INFRA database, changes in land ownership. No on-the-ground change in secure core. These values are the updated baseline.

Glacier Loon (MSRG BMU, Flathead NF). Total Motorized Route Density decreased from 43% to **41%**. Secure core increased from 45% to **52%**. Changes are a result of updating the INFRA database with a

new road on lands acquired with the Montana Legacy Project, and implementing the Glacier Loon Fuels Reduction Project. These values are the updated baseline.

Hemlock Elk (MSRG BMU, Flathead NF). Secure core decreased from 64% to **63%**. Change is a result of updates to the spatial GIS layer to more accurately reflect on-the-ground conditions as well as changes in land ownership. This value is the updated baseline.

Piper Creek (MSRG BMU, Flathead NF). Secure core increased from 52% to **55%**. Change is mainly a result of updating the INFRA database with new information on roads on lands acquired with the Montana Legacy Project as well as numerous spatial re-alignments of the GIS layer to more accurately reflect on-the-ground locations. These values are the updated baseline. No on-the-ground change.

Porcupine Woodward (MSRG BMU, Flathead NF). Total Motorized Route Density increased from 73% to **74%** due to new DNRC roads as well as updates to road management of DNRC roads. This value is the updated baseline.

Lazy Creek (STRV BMU, MT DNRC). Subunit is nearly all MT DNRC or private lands. Open Motorized Route Density decreased from 68% to **52%**, Total Motorized Route Density increased from 62% to **78%**, and secure core decreased from 10% to **6%**. Changes are due to changes in MT DNRC road information and land ownership. No changes in NFS lands or roads occurred. These values are the updated baseline.

Stryker (STRV BMU, MT DNRC). Subunit is nearly all MT DNRC or private lands. Open Motorized Route Density decreased from 37% to **34%**, Total Motorized Route Density increased from 33% to **36%**, and secure core increased from 50% to **51%**. Changes are due to changes in MT DNRC road information. No changes in NFS lands or roads occurred. These values are the updated baseline.

Upper Whitefish (STRV BMU, MT DNRC). Subunit is nearly all MT DNRC or private lands. Open Motorized Route Density decreased from 34% to **33%**, Total Motorized Route Density decreased from 57% to **51%**, and secure core decreased from 54% to **53%**. Changes are due to changes in MT DNRC road information and land ownership. No changes in NFS lands or roads occurred. These values are the updated baseline.

Ball Branch (SLVN BMU, Flathead NF). Total Motorized Route Density increased from 7% to **12%**. Three roads were incorrectly labeled and not included in Total Motorized Route Density in 2011. Flathead NF did a review of roads that had become impassable but not designated as impassable by any management decision and this correction was made by 2012. These roads were then included in the Total Motorized Route Density. This value is the updated baseline. No on-the-ground change.

Jewel Basin Graves (SLVN BMU, Flathead NF). The West Side Reservoir Project increased secure core increased from 72% to **75%** by changing one road from a gate to a barrier. This value is the updated baseline.

Logan Dry Park (SLVN BMU, Flathead NF). Total Motorized Route Density increased from 33% to **36%** and secure core decreased from 52% to 51% due to a few updates to the INFRA database and spatial re-alignments of the GIS layer that more accurately reflect on-the-ground locations with no on-the-ground change. The Betty Baptiste Project then resulted in a baseline value of **35%** for Total Motorized Route

Density, and **54%** for Secure core. Current values are 36% and 51% respectively, and will be 35% and 54% when the project is fully implemented.

Lower Twin (SLVN BMU, Flathead NF). Secure core increased from 91% (91.49%) to **92%** (91.50%). Change was from spatial re-alignments of the GIS layer to more accurately reflect on-the-ground locations. This value is the updated baseline. No on-the-ground change.

Noisy Red Owl (SLVN BMU, Flathead NF). Open Motorized Route Density decreased from 22% to **20%**. Changes were due to land ownership changes and spatial re-alignments of the GIS layer to more accurately reflect on-the-ground locations. This value is the updated baseline. No on-the-ground change.

Swan Lake (SLVN BMU, Flathead NF). The Week Lake Landscape Restoration Project resulted in a baseline value of **21%** Total Motorized Route Density. Current value is 23% and will be 21% when the project is fully implemented. Total Motorized Route Density decreased from 24% to **23%**. Changes were due to land ownership changes and spatial re-alignments of the GIS layer to more accurately reflect on-the-ground locations. This value is the updated baseline. No on-the-ground change.

Wheeler Quintonkon (SLVN BMU, Flathead NF). Total Motorized Route Density increased from 18% to **19%**. Secure core increased from 66% to **68%**. Three road segments were incorrectly labeled and not included in Total Motorized Route Density in 2011. Flathead NF did a review of roads that had become impassable but not designated as impassable by any management decision and this correction was made by 2012. These roads were then included in the Total Motorized Route Density. No on-the-ground change. Additionally, one road had a change in closure device from gate to physical barrier (increasing secure core) as part of the West-Side Reservoir Project. These values are the updated baseline.

Skyland Challenge (UMFF BMU, Flathead NF). Secure core increased from 63% to **65%**. Change is due implementation of Granite-Lodgepole roject. This value is the updated baseline.

Coal and South Coal (UNFF BMU, Flathead NF). Total Motorized Route Density decreased from 21% to **19%**. Secure core increased from 72% to **73%**. Changes are due to implementation of the Shorty and Coal Creeks Stream Restoration Project. These values are the updated baseline.

Hay Creek (UNFF BMU, Flathead NF). Open Motorized Route Density increased from 24% to **25%**. Total Motorized Route Density decreased from 16% to 13%. Changes are due to 1) updates to the location of closure devices in the INFRA database; 2) updates to the database on a DNRC state road; and 3) updates to the database to reflect already implemented decisions on impassable roads. This value is the updated baseline. No on-the-ground change.

Ketchikan (UNFF BMU, Flathead NF). Open Motorized Route Density decreased from 16% to **14%**. Secure core increased from 72% to **73%**. Changes are due updates to updates in road management on DNRC roads. This value is the updated baseline. No on-the-ground change.

Red Meadow Moose (UNFF BMU, Flathead NF). The East Red Meadow Drive Project resulted in a baseline value of **24%** for Open Motorized Route Density. Current value is 25% and will be 24% once the project is fully implemented. Secure core increased from 55% to **68%**. Change is due to implementation of the Red Whale Project. These values are the updated baseline.

State Coal Cyclone (UNFF BMU, Flathead NF and MT DNRC). Open Motorized Route Density decreased from 31% to **29%**. Total Motorized Route Density decreased from 27% to **25%**. Secure core decreased from 59% to **58%**. Changes are due to road management updates on DNRC roads. Additionally, there was an update on one FS road, which was not a change on the ground. These values are the updated baseline.

Based upon new procedures for calculations under the revised forest plan, the summary of baseline access conditions across the Forest is as follows:

- 15 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have greater than 19% OMRD. One of those 15 subunits has a signed and unimplemented decision to meet 19% OMRD.
- 10 of 10 subunits where NFS lands are less than or equal to 75% of total subunit acres have greater than 19% OMRD.
- 17 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have greater than 19% TMRD. Two of those 17 subunits have a signed and unimplemented decision to meet 19% TMRD.
- 9 of 10 subunits where NFS lands are less than or equal to 75% of total subunit acres have greater than 19% TMRD.
- 20 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have less than 68% secure core. Two of those 20 subunits have a signed and unimplemented decision to meet 68% secure core.
- 10 of 10 subunits where NFS lands are less than or equal to 75% of total subunit acres have less than 68% secure core.
- 10 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres do not meet all 3 numeric parameters. One of those 10 subunits has a signed and unimplemented decision to meet on parameter.

Based upon new procedures for calculations and temporary increases in the 10-year running average of 5%, 3% and 2% that may occur under the revised forest plan, the summary of subunits that meet 19-19-68 under the baseline but could exceed 19% OMRD, 19% TMRD or have less than 68 percent secure core on a temporary basis are as follows:

- 12 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet 19% OMRD on a temporary basis. One additional subunit has a signed and unimplemented decision that would put it into this category once implemented.
- 10 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet 19% TMRD on a temporary basis. Two additional subunits have a signed and unimplemented decision that would put it into this category once implemented.
- 5 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet 68% secure core on a temporary basis. One additional subunit has a signed and unimplemented decision that would put it into this category once implemented.
- 3 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet all 3 numeric parameters on a temporary basis. One additional subunit has a signed and unimplemented decision that would put it into this category once implemented
- 27 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have over 50% wilderness where it is anticipated that 19-19-68 would continue to be met and there

would be few or minor temporary changes. One additional subunit is both >50% Wilderness and heavily roaded outside Wilderness. This subunit may have substantial temporary changes under forest plan direction.

Table 1. Existing (2017) baseline values of Motorized Access for NCDE BMU Subunits.

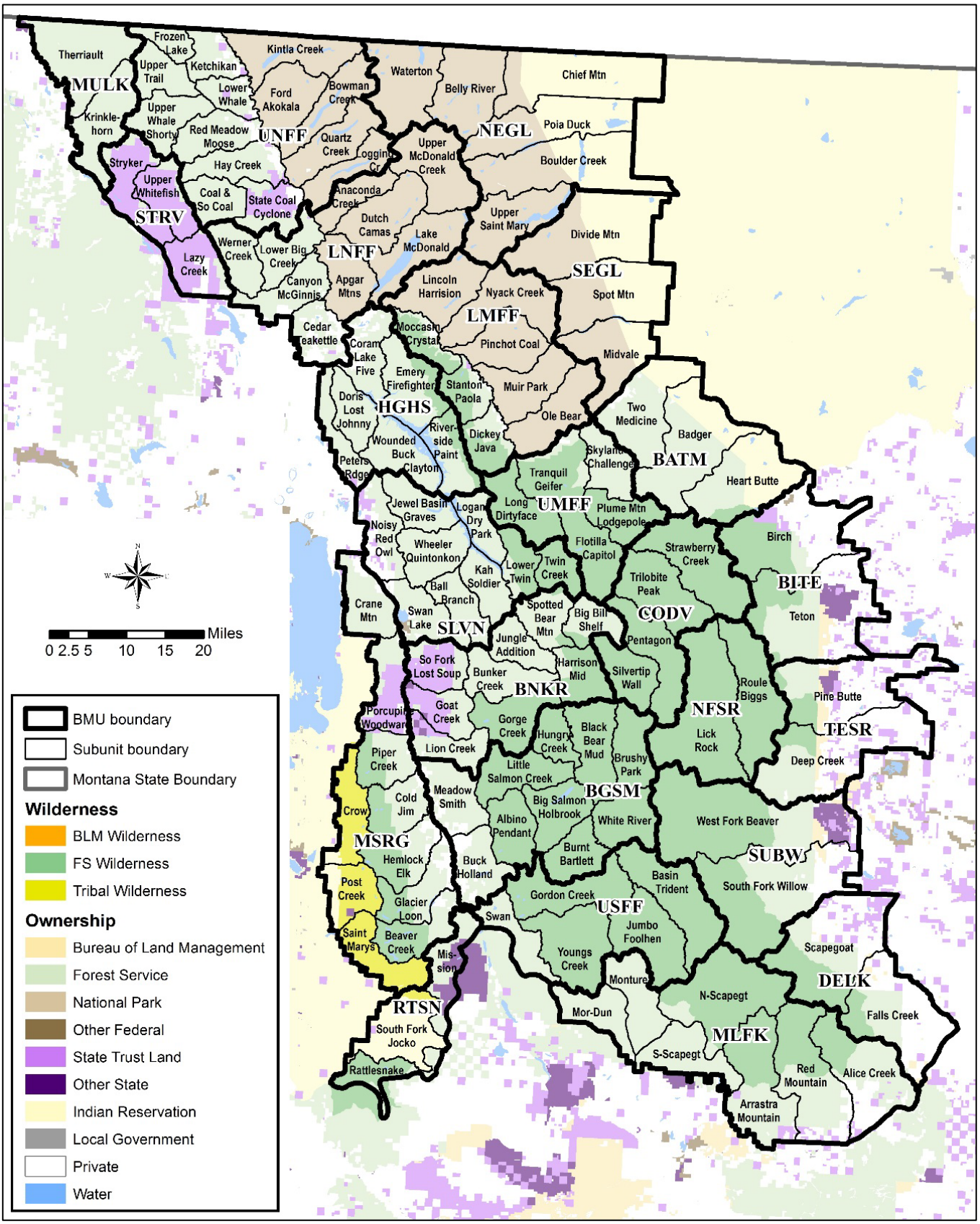
OMRD – percentage of subunit that is ≥1.0 mile/square mile; updated baseline
TMRD – percentage of subunit that is ≥2.0 mile/square mile; updated baseline
CORE – percentage of subunit that is secure core; updated baseline
Percentages in parentheses are current percentage values where signed and/or consulted projects have not yet been completely implemented on the ground.

BMU	Subunit Name	Principal Agency	OMRD	TMRD	CORE
BGSM	Albino Pendant	FNF-Spotted Bear RD	0	0	100
BGSM	Big Salmon Holbrook	FNF-Spotted Bear RD	0	0	100
BGSM	Black Bear Mud	FNF-Spotted Bear RD	0	0	100
BGSM	Brushy Park	FNF-Spotted Bear RD	0	0	100
BGSM	Buck Holland	FNF-Swan Lake RD	24	44	47
BGSM	Burnt Bartlett	FNF-Spotted Bear RD	0	0	100
BGSM	Hungry Creek	FNF-Spotted Bear RD	0	0	100
BGSM	Little Salmon Creek	FNF-Spotted Bear RD	0	0	100
BGSM	Meadow Smith	FNF-Swan Lake RD	18 (20)	53	42
BGSM	White River	FNF-Spotted Bear RD	0	0	100
BNKR	Big Bill Shelf	FNF-Spotted Bear RD	11	6	87
BNKR	Bunker Creek	FNF-Spotted Bear RD	5	3	92
BNKR	Goat Creek	FNF-SLRD & MT DNRC	23	59	39
BNKR	Gorge Creek	FNF-Spotted Bear RD	0	0	100
BNKR	Harrison Mid	FNF-Spotted Bear RD	1	0	99
BNKR	Jungle Addition	FNF-Spotted Bear RD	19	19	68
BNKR	Lion Creek	FNF-SLRD & MT DNRC	19	47	51
BNKR	South Fork Lost Soup	FNF-SLRD & MT DNRC	25	47	37
BNKR	Spotted Bear Mountain	FNF-Spotted Bear RD	19	18	68
CODV	Pentagon	FNF-Spotted Bear RD	0	0	100
CODV	Silvertip Wall	FNF-Spotted Bear RD	0	0	100
CODV	Strawberry Creek	FNF-Spotted Bear RD	0	0	100
CODV	Trilobite Peak	FNF-Spotted Bear RD	0	0	100
HGHS	Coram Lake Five	FNF-Hungry Horse RD	30	46	14
HGHS	Doris Lost Johnny	FNF-Hungry Horse RD	57	20	36
HGHS	Emery Firefighter	FNF-Hungry Horse RD	19	19 (20)	68 (58)
HGHS	Peters Ridge	FNF-HHRD & SLRD	52	25	34
HGHS	Riverside Paint	FNF-Hungry Horse RD	18	16	71
HGHS	Wounded Buck Clayton	FNF-Hungry Horse RD	28	30	66
LMFF	Dickey Java	FNF-Hungry Horse RD	9	0	85
LMFF	Moccasin Crystal	FNF-Hungry Horse RD	8	1	81
LMFF	Stanton Paola	FNF-Hungry Horse RD	8	3	83
LNFF	Canyon McGinnis	FNF-GVRD & FNF-TLRD	18	31	50
LNFF	Cedar Teakettle	FNF-Glacier View RD	35	36	24
LNFF	Lower Big Creek	FNF-Glacier View RD	19	19	71
LNFF	Werner Creek	FNF-Glacier View RD	29	20	63
MSRG	Beaver Creek	FNF-Swan Lake RD	6	19 (26)	71 (66)
MSRG	Cold Jim	FNF-Swan Lake RD	18	54 (55)	44
MSRG	Crane Mountain	FNF-Swan Lake RD	28	55	25

BMU	Subunit Name	Principal Agency	OMRD	TMRD	CORE
MSRG	Glacier Loon	FNF-Swan Lake RD	22	41	52
MSRG	Hemlock Elk	FNF-Swan Lake RD	6	30	63
MSRG	Piper Creek	FNF-SLRD & MT DNRC	19	44	55
MSRG	Porcupine Woodward	FNF-SLRD & MT DNRC	28	74	15
STRV	Lazy Creek	MT DNRC	52	78	6
STRV	Stryker	MT DNRC	34	36	51
STRV	Upper Whitefish	MT DNRC	33	51	53
SLVN	Ball Branch	FNF-Spotted Bear RD	8	12	84
SLVN	Jewel Basin Graves	FNF-Hungry Horse RD	19	19	75
SLVN	Kah Soldier	FNF-Spotted Bear RD	19	19	68
SLVN	Logan Dry Park	FNF-HHRD & FNF-SBRD	30	35 (36)	54 (51)
SLVN	Lower Twin	FNF-Spotted Bear RD	9	2	92
SLVN	Noisy Red Owl	FNF-Swan Lake RD	20	14	59
SLVN	Swan Lake	FNF-Swan Lake RD	40	21 (23)	46
SLVN	Twin Creek	FNF-Spotted Bear RD	0	0	100
SLVN	Wheeler Quintonkon	FNF-HHRD & FNF-SBRD	25	19	68
UMFF	Flotilla Capitol	FNF-HHRD & FNF-SBRD	0	0	100
UMFF	Long Dirtyface	FNF-Hungry Horse RD	0	0	100
UMFF	Plume Mtn Lodgepole	FNF-HHRD & SBRD	0	0	100
UMFF	Skyland Challenge	FNF-Hungry Horse RD	20	17	65
UMFF	Tranquil Geifer	FNF-Hungry Horse RD	0	2	90
UNFF	Coal & South Coal	FNF-Glacier View RD	15	19	73
UNFF	Frozen Lake	FNF-Glacier View RD	10	4	86
UNFF	Hay Creek	FNF-Glacier View RD	25	13	55
UNFF	Ketchikan	FNF-Glacier View RD	14	3	73
UNFF	Lower Whale	FNF-Glacier View RD	36	17	50
UNFF	Red Meadow Moose	FNF-Glacier View RD	24 (25)	17	68
UNFF	State Coal Cyclone	FNF-GVRD & MT DNRC	29	25	58
UNFF	Upper Trail	FNF-Glacier View RD	14	4	88
UNFF	Upper Whale Shorty	FNF-Glacier View RD	12	11	86
USFF	Basin Trident	FNF-Spotted Bear RD	0	0	100
USFF	Gordon Creek	FNF-Spotted Bear RD	0	0	100
USFF	Jumbo Foolhen	FNF-Spotted Bear RD	0	0	100
USFF	Youngs Creek	FNF-Spotted Bear RD	0	0	100

	Indicates of all lands within subunit, federal wilderness is ≥50%
	Indicates NFS lands are <75% of all lands within subunit

Figure 1. NCDE Bear Management Units (BMU) and Subunits



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File: M19 Flathead National Forest (F)
06E11000-2016-F-0370 2018 amended incidental take statement

December 21, 2018

Chip Weber, Forest Supervisor
U.S. Forest Service
Flathead National Forest
650 Wolfpack Way
Kalispell, Montana 59901

Dear Mr. Weber,

This is in response to your December 20, 2018 letter submitting updated information on the Flathead National Forest's (Forest) Revised Land and Resource Management Plan (Revised Plan). On November 22, 2017, the U.S. Fish and Wildlife Service (Service) issued a biological opinion (BO) and incidental take statement (ITS) regarding the effects of the Revised Plan on listed species. However, implementation of the Revised Plan is not anticipated to occur until late December, 2018. Your letter provided information regarding projects that have occurred during the interim period between issuance of the BO and implementation of the Revised Plan. The Service has reviewed the updated information, and our response is detailed below.

Grizzly Bear

In the interim period between issuance of the 2017 BO and the 2018 implementation of the Revised Plan, three projects completed Endangered Species Act consultation with the Service. The temporary effects of these projects were analyzed during project-specific consultation, and some resulted in reduced road densities in some of the NCDE subunits on the Forest. These reductions resulted in more favorable conditions for NCDE grizzly bears. Further, an update to the baseline conditions of NCDE subunits on the Forest has become available and is detailed in the attachment included with your December 20, 2018 letter. In response to this information, an updated version of Table III-15 of the 2017 BO (pages III-61 & III-63) has been attached to this letter (see Attachment #1).

The 2017 BO anticipated that some level of incidental take of female grizzly bears will occur within individual subunits as long as: (1) OMRD exceeds one mile per square mile in more than 19 percent of a subunit; (2) TMRD exceeds two miles per square mile in more than 19 percent of a subunit, and/or (3) secure core area makes up less than 68 percent of a subunit. Given the

updated conditions presented above, a 2018 amended ITS has been included with this letter (see Attachment #2) and serves as an amendment to the 2017 BO. The 2018 amended ITS supersedes 2017 ITS from this point forward.

In summary, the updated calculations related to motorized access are either a result of actions that have undergone project-specific ESA consultation, or are a result of more accurate information that has become available since the 2017 BO (e.g., updated GIS projections). Updated calculations that were a result of more accurate information do not reflect on-the-ground changes in motorized access conditions. In these cases, the actual effects of motorized access on grizzly bears have not changed. Rather, the database is more accurately reflecting access conditions on the landscape. In some cases, project implementation did make in on-the-ground changes, but those changes are resulting in more favorable conditions for grizzly bears due to a reduction in road densities relative to pre-project conditions. Therefore, the Service does not anticipate any different or additional effects to grizzly bears in light of the updated information, and maintains all conclusions and determination presented in the 2017 BO.

Canada Lynx

The 2017 BO regarding the effects of Revised Plan on Canada lynx included an ITS than anticipated that take will occur in the form of harm (modification of habitat that reduces the snowshoe hare prey base for lynx) through vegetation management over the life of the Revised Plan. This included fuels treatment projects that would reduce lynx foraging habitat (i.e., snowshoe hare habitat) in the Wildlife Urban Interface (WUI) under the exemptions from Revised Plan Standards VEG S1, S2, S5 or S6. Using these exemptions, the Forest could treat up to 93,723 acres of lynx foraging habitat in the WUI over the life of the Revised Plan. The ITS also anticipated take by projects using exceptions to Revised Plan Standards VEG S5 and S6. These exceptions allow projects to reduce lynx foraging habitat for other resource benefits. Using these exceptions, the Forest could treat 15,640 acres of lynx foraging habitat for other resource benefits.

In the interim period between issuance of the 2017 BO and the 2018 implementation of the Revised Plan (signed Record of Decision), three projects completed ESA consultation with the Service that treated snowshoe hare habitat using exemption and/or exception acres to standards. These projects treated a total of 657 acres of lynx foraging habitat in the WUI, and 448 acres of lynx foraging habitat outside the WUI for other resource benefits. The attached amended ITS (see Attachment #3) serves as an amendment to the 2017 BO since implementation of these three projects (i.e., signing of Record of Decision) has reduced the number of acres of lynx foraging habitat available for treatment using exemptions and exceptions. The 2018 amended ITS supersedes 2017 ITS from this point forward.

The Service has reviewed the updated information provided in your December 20, 2018 letter and did not identify any actions that have occurred during this interim period that would alter the anticipated effects of the Revised Plan on listed species and/or designated critical habitat. As such, all analyses and conclusions presented in the 2017 BO remain valid.

We appreciate your efforts to ensure the conservation of threatened and endangered species as part of our joint responsibilities under the Endangered Species Act. If you have questions or comments related to this issue, please contact Kevin Aceituno at kevin_aceituno@fws.gov or (406)758-6871.

Sincerely,



for Jodi L. Bush
Office Supervisor

Attachments (3)

Attachment #1

2018 AMENDED Grizzly Bear Subunit Baseline Table for the 2017 Biological Opinion on the Revised Forest Plan for the Flathead National Forest – Chapter III. Biological Opinion on Grizzly Bears.

Table III-15. Status of bear management unit (BMU) subunits on the FNF. Shaded subunits have less than 75 percent NSF lands. These conditions will be considered "baseline" for the purposes of implementing Revised Forest Plan Standards FW-STD-IFS-02 and FW-STD-IFS-03.

Subunit Name	OMRD Percentage	TMRD Percentage	Secure Core Percentage
Albino Pendant	0	0	100
Big Salmon Holbrook	0	0	100
Black Bear Mud	0	0	100
Brushy Park	0	0	100
Buck Holland	24	44	47
Burnt Bartlett	0	0	100
Hungry Creek	0	0	100
Little Salmon Creek	0	0	100
Meadow Smith	18	53	42
White River	0	0	100
Big Bill Shelf	11	6	87
Bunker Creek	5	3	92
Goat Creek	23	59	39
Gorge Creek	0	0	100
Harrison Mid	1	0	99
Jungle Addition	19	19	68
Lion Creek	19	47	51
South Fork Lost Soup	25	47	37
Spotted Bear Mountain	19	18	68
Pentagon	0	0	100
Silvertip Wall	0	0	100
Strawberry Creek	0	0	100
Trilobite Peak	0	0	100
Coram Lake Five	30	46	14
Doris Lost Johnny	57	20	36
Emery Firefighter	19	19	68
Peters Ridge	52	25	34
Riverside Paint	18	16	71
Wounded Buck Clayton	28	30	66
Dickey Java	9	0	85
Moccasin Crystal	8	1	81
Stanton Paola	8	3	83
Canyon McGinnis	18	31	50
Cedar Teakettle	35	36	24
Lower Big Creek	19	19	71
Werner Creek	29	20	63
Beaver Creek	6	19	71
Cold Jim	18	54	44
Crane Mountain	28	55	25
Glacier Loon	22	41	52
Hemlock Elk	6	30	63
Piper Creek	19	44	55

Subunit Name	OMRD Percentage	TMRD Percentage	Secure Core Percentage
Porcupine Woodward	28	74	15
Lazy Creek	52	78	6
Stryker	34	36	51
Upper Whitefish	33	51	53
Ball Branch	8	12	84
Jewel Basin Graves	19	19	75
Kah Soldier	19	19	68
Logan Dry Park	30	35	54
Lower Twin	9	2	92
Noisy Red Owl	20	14	59
Swan Lake	40	21	46
Twin Creek	0	0	100
Wheeler Quintonkon	25	19	68
Flotilla Capitol	0	0	100
Long Dirtyface	0	0	100
Plume Mtn Lodgepole	0	0	100
Skyland Challenge	20	17	65
Tranquil Geifer	0	2	90
Coal & South Coal	15	19	73
Frozen Lake	10	4	86
Hay Creek	25	13	55
Ketchikan	14	3	73
Lower Whale	36	17	50
Red Meadow Moose	24	17	68
State Coal Cyclone	29	25	58
Upper Trail	14	4	88
Upper Whale Shorty	12	11	86
Basin Trident	0	0	100
Gordon Creek	0	0	100
Jumbo Foolhen	0	0	100
Youngs Creek	0	0	100

Attachment #2

2018 AMENDED INCIDENTAL TAKE STATEMENT for the 2017 Biological Opinion on the Revised Forest Plan for the Flathead National Forest – Chapter III. Biological Opinion on Grizzly Bears.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act, and Federal regulations pursuant to section 4(d) of the Act, prohibit the take of endangered and threatened species, respectively without special exemption. "Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined by the Service as an intentional or negligent act or omission that creates the likelihood of injury to listed wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with this Incidental Take Statement.

The measures in an incidental take statement are non-discretionary and must be undertaken by the action agency so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The action agency has a continuing duty to regulate the activity that is covered by this incidental take statement. If the action agency (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the action agency must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

1. Amount or Extent of Take Anticipated

This biological opinion considered the effects to grizzly bears from implementation of the Revised Forest Plan direction as guided by the Revised Forest Plan components (e.g., management area allocation, suitability, desired condition, standards, and guidelines). It includes specific components for the conservation of grizzly bears and grizzly bear habitat, but does not authorize specific actions. Our analysis of the Revised Forest Plan is a broad-scale examination of the types of projects and activities conducted under the Revised Forest Plan that could potentially occur in grizzly bear habitat and result in effects on grizzly bears. The Revised Forest Plan contains sufficient specificity to determine that the extent of adverse effects does not rise to levels that are likely to jeopardize the NCDE grizzly bear population.

In this biological opinion, we documented how the proposed action reduces the potential for adverse effects and incidental take to occur as a result of Forest management. However, the potential remains for specific projects and activities to result in adverse effects and incidental take of grizzly bears. The mere potential for future take from these actions is not a legitimate basis for providing an exemption for take. The FNF is responsible for section 7 consultation on all future projects (conducted under the Revised Forest Plan) that may affect the grizzly bear or its habitat, even if those projects are consistent with Revised Forest Plan. Subsequent consultation, as appropriate, on the specific actions developed pursuant to the Revised Forest Plan will serve as the basis for enumerating the incidental take and determining if an exemption from the section 9 take prohibitions is warranted. If so, the Service will provide Reasonable and Prudent Measures and Terms and Conditions, as appropriate, to minimize the impacts of the taking on the grizzly bear in accordance with 50 CFR 402.14(i).

Two exceptions to this approach are related to the effects of motorized access route densities and over-snow motorized use on grizzly bears. For motorized route densities, the science is clear that above certain densities, bears suffer adverse effects that can lead to significant impairment of the ability to feed, breed, or shelter. The FNF has examined, monitored and reported motorized access route densities in all grizzly bear subunits of the PCA. In the Salish DCA the FNF examined, monitored and reported the linear density of roads and motorized trails open to public use during the non-denning season. In the remainder of zone 1 the FNF has examined, monitored and reported the linear density of roads open to the public during the non-denning season. Hence, we are able to ascertain the level of adverse effects and provide surrogate measures of incidental take of grizzly bears related to road densities in both the PCA and zone 1 (including the Salish DCA).

For over-snow motorized use the FNF analyzed and reported the amount of modeled denning habitat that was impacted by late season over-snow vehicle use. The best available science and information suggests that recently emerged females with cubs could be vulnerable to adverse disturbance effects of snowmobile use near den sites during the den emergence period. The FNF provided both acres of modeled denning habitat and an estimate of late season motorized over-snow vehicle use in denning habitat. Thus, we are able to ascertain the level of adverse effects and provide surrogate measures of incidental take of grizzly bears related to snowmobile use during the den emergence time period.

It should be noted that this biological opinion also considered the effects of increased developed recreation sites on grizzly bears. The Revised Forest Plan will allow one increase in the number or the overnight capacity of developed recreation sites designed and managed for overnight use per bear management unit per decade on NFS lands in the PCA (as specified in FW-STD-REC-01). While we maintain that increases have the potential to adversely affect grizzly bears (primarily through increased risk of conflict with humans), we also discussed how the details in site development and effects to bears can vary. Since this proposed action does not authorize any particular projects, future actions that will affect grizzly bears will be subject to additional section 7 consultation with the Service while the grizzly bear remains listed. We have determined that if increased developed recreation opportunities on any of the FNF were to result in adverse effects to grizzly bears, project-specific consultation (as required) would be the appropriate time to exempt any such take. As a result, incidental take associated with increased developed recreation will not be discussed further in this incidental take statement.

The amount or extent of incidental take resulting from access management and motorized over-snow vehicle use is examined below:

Access Management

As described in the accompanying biological opinion, the effect of roads with high use upon grizzly bear behavior and habitat use has been well documented in the scientific literature. We anticipate that incidental take of grizzly bears is likely to occur in the form of harassment of adult female grizzly bears in highly roaded areas (through displacement caused by road-related disturbance in areas of high open road densities). We also anticipate harm of adult female bears (through significant habitat modification or degradation caused by high open or total road densities). Both harassment and harm can cause actual injury to female grizzly bears by significantly disrupting normal behavioral patterns, including breeding, feeding, or sheltering.

The take we anticipate would be caused by displacement (i.e. significant underuse) of female grizzly bears from key habitat areas in highly roaded areas, which may result in decreased fitness that impairs a female's inherent reproductive potential. In other words, some adult female grizzly bears wary of humans and human-generated disturbance may fail to breed at their potential frequency or they would fail to complete gestation due to decreased fitness. We do not expect all adult female grizzly bears affected by displacement or by alteration of habitat caused by the proposed action to suffer impairment of breeding, feeding and/or sheltering. We do not anticipate incidental take of male and subadult grizzly bears, which are independent and thus more mobile and do not have the physiological or nutritional requirements of pregnant or lactating females.

Currently, the Service is unaware of scientific or commercial information that could be used to quantify the exact level of incidental take of female grizzly bears as a result of such impacts to or degradation of their habitat, or displacement. Reduced reproductive success of females as a result of displacement effects could include grizzly bear cub injury or mortality, but it is more likely to occur through failure to breed or complete gestation. The amount of take is difficult to quantify for the following reasons:

1. The amount of take would depend on the number of adult female grizzly bears impacted by high road densities. We lack specific information on the precise number of adult female grizzly bears that use the action area, but due to the amount of habitat meeting acceptable habitat parameters, we reasonably assume very few adult females would be affected.

2. Individual grizzly bears would react differently to the disturbance. Not all adult female bears that are exposed to disturbances from roaded areas would be adversely impacted to the point of take.

3. Individual female grizzly bears that initially may be sensitive to disturbances may over time become accustomed to the routine disturbances generated by routine forest road use. Therefore, determining the precise amount of take, as defined by impaired reproductive potential, is difficult.

Therefore, as detailed in this biological opinion, the Service anticipates some low level of incidental take of female grizzly bears would occur in the form of harm or harassment from the

displacement effects of road densities. The amount of take would be also difficult to detect for the following reasons:

1. Grizzly bears are not easily detected or observed in the wild.

2. Reproductive rates of individual female grizzly bears vary naturally due to environmental and physiological causes.

3. A reduction in "normal" reproductive success of an individual female is not easily discernible in the wild.

4. The reasons a grizzly bear fails to breed and/or failure to complete gestation are not discernible in the wild.

In instances where incidental take is difficult to quantify or detect, the Service uses surrogate measures of take. Here, we use the research benchmark levels of OMRD, TMRD, and secure core as our surrogate measure of incidental take. These benchmarks were discussed in detail in this biological opinion. Where individual subunit road densities are higher than benchmark levels of OMRD or TMRD, or where core is less, we conservatively anticipate some level of impaired habitat use, resulting in impaired breeding or feeding for some adult female grizzly bears. Based on the best available research and information, we anticipate that some level of incidental take of female grizzly bears will occur within individual subunits as long as: (1) OMRD exceeds one mile per square mile in more than 19 percent of a subunit; (2) TMRD exceeds two miles per square mile in more than 19 percent of a subunit, and/or (3) secure core area makes up less than 68 percent of a subunit.

There are 30 subunits on the FNF that do not meet one or more of the research benchmarks described above (see Table III-15 in Section D.2). Nine subunits meet the research benchmarks, but are close enough that temporary changes to access conditions (as allowed under the proposed action and specified in FW-STD-IFS-03) may result in incidental take of grizzly bears (see Table III-15 in Section D.2). This will occur when temporary changes to access condition cause OMRD or TMRD to increase above the research benchmarks, or when secure core decreases below the research benchmark. Changes are calculated using a 10-year running average as described above and in Appendix 3 of this biological opinion, or Appendix D or the biological assessment. While changes in road density and/or secure core will be temporary, adverse effects and incidental take will occur while these changes are implemented on the ground. Within those subunits achieving the research benchmarks, incidental take of grizzly bears is unlikely to occur. Project resulting in changes to OMRD, TMRD, or secure core beyond those permitted by the Revised Forest Plan and analyzed in this biological opinion will result in levels of take that exceed the amount of incidental take we anticipate here, and reinitiation or project-specific consultation would be required.

Additionally, we use spatial and temporal surrogates for incidental take that will occur in grizzly bear subunits within the PCA. The proposed action indicates that on-the-ground implementation of each project will not exceed five years within any one subunit. Therefore, we use a maximum of five years of on-the-ground project work (as specified in FW-GDL-IFS-01) as a surrogate for take. Further, we assume that on-the-ground project implementation on NFS lands will not concurrently impact OMRD, TMRD, or secure core in more than three adjacent grizzly bear

subunits on the FNF. This will provide grizzly bears within a project subunit the opportunity to move away from activities into undisturbed subunits. If on-the-ground implementation of a project exceeds five years, or if a project concurrently impacts OMRD, TMRD, or secure core in more than three adjacent subunits, the level of take exempted under this biological opinion would be exceeded and reinitiation or project-specific consultation would be required (as appropriate).

In the zone 1 (including the Salish DCA), we anticipate some level of incidental take of female grizzly bears. We base our opinion on the fact that linear densities of road s and motorized trails open to the public during the non-denning season. Thus, we anticipate that road and motorized trail densities in these areas are likely causing incidental take of grizzly bears and this will continue. This is a conservative conclusion since grizzly bears moving into these areas did so under prevailing conditions, it is also possible that incidental take is not occurring for every female. Grizzly bears are known to tolerate a range of conditions; some apparently adjust to high levels of human activity without apparent consequence. Further, because few grizzly bears occupy this area, intraspecific competition is probably not significant. Those grizzly bears using zone 1 and the Salish DCA likely have options related to home range selection and use. Similar to the incidental take likely occurring within subunits inside the PCA, we anticipate a low level of incidental take of female grizzly bears in the form of harassment, and /or harm through significant habitat modification or degradation as a result of high road densities and associated disturbance, which causes actual injury to grizzly bears by significantly disrupting normal behavioral patterns, to the extent that a female's normal reproductive potential is impaired.

In the Salish DCA, we use the linear density of roads and motorized trails open to the public during the non-denning season (as specified in GA-SM-STD-01) as a surrogate measure of take (see Table III-17 in Section D.2). In the remainder of zone 1 (i.e., outside the Salish DCA), we use we use the linear density of roads open to the public during the non-denning season (as specified in GA-SM-STD-01) as the surrogate measure of take (also see Table III-17 in Section D.2). In the Salish DCA and zone 1, permanent increases in linear densities beyond the levels shown in Table III-17 of this biological opinion will result in levels of take that exceed the amount of incidental take we anticipate here, and reinitiation or project-level consultation would be required.

Motorized Over-Snow Vehicle Use During Den Emergence

In Sections C.2 (*Environmental Baseline*) and D.2 (*Effects of the Action*), we discuss the potential impacts of motorized over-snow vehicles on grizzly bears as they emerge from their dens. We anticipate the proposed action to result in incidental take where late season (after March 31) motorized over-snow vehicle uses overlaps with grizzly bear denning habitat. The incidental take is expected to be in the form of harassment to individual female grizzly bears and/or cubs caused by premature displacement from the den site area, resulting in reduced fitness of females and cubs. We expect the amount and extent of take would be very low. Late season motorized over-snow use would affect very few individual females with cubs over the life of the plan, as adult females with cubs occur at very low numbers compared to the amount of denning habitat available. As spring season ends, the amount of motorized over-snow use decreases. Finally, an individual female would not likely be affected for more than one denning season. Grizzly bears typically do not reuse den sites. Thus, if a female grizzly bear suffers significant disturbance at or near her den site, it is probable that she would locate a new site to den in the future and would have options for denning elsewhere.

The difficulty in detecting or quantifying this incidental take is the same as presented above, and just as above we are using a surrogate measure of incidental take. We use the following two surrogates for take: (1) The amount of potential denning habitat within the PCA currently overlapped by known late-season motorized over-snow vehicle use (three percent); and (2) The miles of routes within the PCA open to late-season motorized over snow vehicles (19 miles). If late season motorized over-snow vehicle use (i.e., after March 31) occurs on more than three percent of modeled denning habitat within the PCA on the FNF, or more than 19 miles of routes are open to late season motorized over snow vehicles in modeled denning habitat, then the amount of take we anticipated in this biological opinion would be exceeded, and reinitiation or project-specific consultation would be required.

Effects of Take

In the accompanying biological opinion, the Service determined that the level of anticipated take is not likely to result in jeopardy to grizzly bear within the NCDE recovery zone. The best scientific information indicates a robust NCDE grizzly bear population of more than 1,000 individuals. Further, the latest trend data show that the population is growing at a rate of 2.3 percent annually and now occupies an area of roughly 13.6 million acres, more than twice the size of the original NCDE recovery zone (5.7 million acres). Impacts on the grizzly bear population, including anticipated levels of incidental take as a result of the proposed action will not appreciably reduce survival or the recovery of the species. We anticipate no mortality of adult or subadult grizzly bears, but rather some low level of effect on the normal reproductive potential of a relatively low number of adult female bears inhabiting the FNF. Critical habitat has not been designated for the grizzly bear, therefore none would be affected.

Reasonable and Prudent Measures

Biological opinions provide reasonable and prudent measures that are expected to reduce the amount of incidental take. Reasonable and prudent measures are those measures necessary and appropriate to minimize incidental take resulting from proposed actions. Reasonable and prudent measures are nondiscretionary and must be implemented by the agency in order for the exemption in section 7(o)(2) to apply.

1. Minimize or reduce the potential for mortality and displacement of grizzly bears due to the proposed action.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions that implement the reasonable and prudent measure described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary:

To implement the reasonable and prudent measure:

1. The Forest Service shall comply with standards FW-STD-IFS-01, FW-STD-IFS-02, FW-STD-IFS-03, FW-STD-IFS-04 and FW-STD-REC-05 in the Flathead Forest Plan.

2. The Forest Service shall comply with guideline FW-GDL-IFS-01 and FW-GDL-IFS-02 in the Flathead Forest Plan. If projects will be unable to comply with the above guidelines, the Forest Service shall contact the Service immediately to determine further consultation needs.

3. Concurrent, temporary increases in OMRD or TMRD, or concurrent temporary decreases in secure core for projects (*as described in the glossary in Appendix 3*) on NFS lands shall not occur in more than 3 adjacent bear management subunits on the FNF.

4. The Forest Service shall continue to implement food/attractant storage and handling programs in the action area. This includes ensuring all Forest Service employees and contractors adhere to appropriate protocols, and providing educational material to the public on measures to avoid conflicts and/or food conditioning of grizzly bears.

Reporting Requirements

To remain in compliance with the terms and conditions, and to demonstrate that the USFS is adequately reducing the potential for and minimizing the effect of any incidental take of grizzly bears, the USFS shall adhere to the reporting requirements stipulated in the "Monitoring" components of the proposed action. Specifically, these components are presented as MON-NCDE-01 through MON-NCDE-08 in Appendix 4 of this biological opinion, and in Appendix D of the biological assessment (pages 318-319). The stipulated biennial monitoring reports shall be provided to the Service's Ecological Services Office in Helena, Montana.

If a human-caused grizzly bear mortality is discovered on NFS lands, the Service's Grizzly Bear Recovery Office in Missoula, Montana shall be notified within 24-hours. Reporting human-caused grizzly bear mortalities on NFS lands may be done by MTFWP, but the USFS remains responsible for ensuring that the Service has received all appropriate information.

Attachment #3

2018 AMENDED INCIDENTAL TAKE STATEMENT for the 2017 Biological Opinion on the Revised Forest Plan for the Flathead National Forest – Chapter IV. Biological Opinion on Canada Lynx.

H. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of an incidental take statement.

In general, an incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize the impacts of the take and sets forth terms and conditions which must be complied with in order to implement the reasonable and prudent measures.

1. Amount or Extent or Incidental Take

This biological opinion considered the effects to lynx from implementation of the Revised Forest Plan as guided by the proposed plan elements (goals, objectives, desired condition, standards, and guidelines). It includes specific elements for the conservation of lynx and lynx habitat, but does not authorize specific actions. The Revised Forest Plan (as proposed) contains sufficient specificity through its suite of elements to permit an adequate analysis of the effects of projects and activities on lynx. As a result, the Service was able to make a determination that the extent of adverse effects on lynx as a result of the Revised Plan does not rise to levels that are likely to jeopardize lynx. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

We anticipate that take associated with implementation of the proposed action would occur through vegetation management when projects are conducted in lynx habitat under the exemptions and exceptions to the Revised Forest Plan vegetation standards VEG S1, S2, S5 and S6, as described and analyzed in this biological opinion. We anticipate this take in the form of harm, as the exemptions and exceptions allow modification of lynx habitat that could result in decreased production and density of snowshoe hares, their primary prey. As a result, we anticipate that some, but not all, adult female lynx within home ranges affected by such projects could fail to complete a pregnancy or could be less successful in finding adequate food resources needed to ensure maximum survival potential for kittens. Thus, significant reproductive impairment and kitten survival may be affected.

The Service anticipates that incidental take of lynx will be difficult to quantify and detect for the following reasons:

- Lynx are wide-ranging and not easily detected in the wild.
- Although we have a general understanding of where lynx population centers are within the action area, the distribution of individual lynx across the FNF or at smaller scales within the action area is not known.
- Information required to accurately quantify snowshoe hare and alternate prey needed for the survival of adult lynx or kittens is not available.
- Snowshoe hare populations exhibit population cycles in Canada and although not well understood, populations likely fluctuate in the United States as well. This variation could cloud our ability to demonstrate a direct cause and effect relationship. It may be difficult in many cases to determine whether mortality or injury of lynx is attributable to incidental take of lynx as a result of the proposed action, or whether it was natural mortality or injury of lynx due to natural declines in snowshoe hares.
- We lack information to predict with precision the densities of hares in various habitat and forest stands, before and after specific treatments, especially in relationship to the host of naturally occurring environmental variables that may affect hare densities.
- Thus, we lack information to predict with precision the densities of hares in various habitat and forest stands within the home range of individual females, before and after specific treatments.
- Discovery or detection of lynx injury or mortality attributed to habitat alteration is very unlikely.

In addition to the difficulties outlined above, monitoring lynx is difficult and very expensive. For example, because individual lynx are sparsely distributed over tens of square miles often in snowy terrain, specialized equipment is necessary to safely access their habitat for capturing and collaring. Also, in order to capture and collar enough lynx for an adequate sample size for scientifically valid trends, hundreds of square miles of this habitat must be surveyed and monitored over multiple years. These circumstances would drive the yearly cost of monitoring

into hundreds of thousands of dollars and require a commitment of several biologists to the monitoring for several years. For these reasons, direct monitoring is not practical or reasonable.

In cases such as these, Service policy, as stated in the Endangered Species Consultation Handbook (USFWS and NMFS 1998) (Handbook), is to provide some detectable measure of effect, such as the relative occurrence of the species or a surrogate species in the local community, or amount of habitat used by the species, to serve as a measure for take. Take also may be expressed as a change in habitat characteristics affecting the species. Because of the difficulty of estimating the precise number of lynx that would experience take in the manner described above, we have developed a surrogate measure to estimate the amount of anticipated take. Here we will use the number of acres of snowshoe hare habitat treated through the exceptions and exemptions of vegetation management standards as a surrogate measure of the anticipated incidental take of lynx.

The FNF has provided explicit estimates on the number of acres of snowshoe hare habitat that may be impacted by vegetation management under the Revised Forest Plan. As a result, we are able to accurately assess take from these activities. In the biological assessment, the FNF provided estimates of the number of acres that could treated through (a) fuels treatment projects within the WUI conducted under the exemptions from vegetation standards VEG S1, S2, S5 and S6, and (b) precommercial thinning and non-commercial felling projects for "resource benefit" (detailed earlier in this biological opinion) allowed under exceptions to VEG S5 and S6. Projects conducted under the exceptions and exemptions may reduce the quality of habitat that produces snowshoe hares. We have determined that many, but likely not all, of the projects conducted under the exemptions or exceptions could significantly reduce the capacity of affected snowshoe hare habitat to produce hares, and so could result in take in the form of harm. Therefore, we are using the number of acres treated under these exemptions and exceptions under the proposed action as a detectable surrogate for the number of lynx taken in the form of harm, through significant degradation or modification of habitat. This approach is consistent with Service policy (USFWS and NMFS 1998), which endorses the use of acres of species' habitat destroyed or disturbed as a reasonable surrogate measure for the number of a species harmed.

The FNF has proposed to carry forward existing direction of the NRLMD, using the 2007 projections for acres of WUI to be treated for fuel reduction under exemptions. Further, the FNF is proposing additional acres for pre-commercial thinning and non-commercial felling for other resource benefits under exceptions. In 2007, the NRLMD decision projected the number of acres on the FNF that may need to be treated using (a) exemptions to the vegetation standards for fuels treatment to protect life and property in the WUI: 103,800 acres; and (b) exceptions to the vegetation standards for other resource benefits: 1,460 acres, over a period of 10 years (USFWS 2007). Since 2007, the FNF consulted on treatment of 10,734 acres under WUI exemptions, and 1388 acres under exceptions for other resource benefits. Including the acres already treated since 2007, the FNF anticipates treating no more than the total numbers of acres identified in 2007 under WUI exemptions (103,800) over the life of the Revised Plan. The FNF anticipates treating no more than 15,460 acres under exceptions for other recourse benefits for the life of the Revised Plan (anticipated to be 15 years).

In this biological opinion, we analyzed the effects of treating the total number of acres projected for the proposed action under the exceptions and exemptions to vegetation standards. This was the uppermost estimate as being necessary for fuels reduction in the WUI to protect human

safety and property, or for other resource benefits. Thus, we are using the total number of acres that could potentially be treated under these exemptions and exceptions as our anticipated amount of incidental take. The acres treated under exemptions and exceptions on the FNF since 2007 are well below those anticipated in our 2007 biological opinion. Further, of the 10,734 acres treated through fuel reduction projects, not all treatments resulted in adverse effects to lynx; however, we do not expect, but cannot rule out that: (1) the total number of acres identified above would be treated over the life of the plan, or that (2) all treatments in the WUI or for other resource benefit may result in adverse effects on lynx. Therefore, this biological opinion analyzed the greatest level of adverse effects on lynx allowed under the proposed action.

This biological opinion anticipates the following amounts of take in the form of harm (modification of habitat that will significantly reduce the snowshoe hare prey base for lynx, resulting in significant impairment of lynx breeding (i.e. reproduction) and feeding): treatment of up to 93,066 acres of lynx habitat over the life of the Revised Forest Plan due to fuels management in the WUI, and up to 15,012 acres of lynx habitat due to pre-commercial thinning and non-commercial felling for vegetation management for other resource benefits. Because the exemptions and exceptions are limited to a total of no more than about six percent of lynx habitat on the FNF, the decrease in prey base would translate to a low amount of impairment of reproduction and feeding during some years. Specifically, we anticipate that some adult female lynx within home ranges affected by such projects may fail to complete a pregnancy or could be less successful in finding adequate food resources needed to ensure maximum survival potential for kittens. Thus, reproductive impairment and/or kitten survival may be affected.

At any time during the course of the action (i.e. beginning on the date of the signed ROD for this proposed action to 15 years later, or during the life of the Revised Forest Plan, whichever comes first) the level of take anticipated in this incidental take statement would be exceeded if:

- more than 93,066 acres of lynx habitat in the WUI is treated under the exemptions from VEG S1, S2, S5 or S6 for fuel treatment projects; or

- more than 15,012 acres on the FNF is treated under the exceptions to VEG S5 and S6 for other resource benefits.

2. Effect of Take

In this biological opinion we determined that the level of anticipated take is not likely to result in jeopardy to the species. To provide perspective on what these impacts on habitat mean to lynx, the average lynx territory in the action area is 53,375 acres for males and 21,745 acres for females (Squires et al. 2004). The proposed action limits adverse effects on lynx (through reductions in snowshoe hare habitat) to projects conducted in the WUI and for resource benefits, which would affect no more than six percent (109,183 acres) of lynx habitat on the FNF over the anticipated life of the Revised Forest Plan (15 years).

Therefore, the number of individual lynx home ranges that would be affected would be low, or if the acres treated were widely distributed, the acres treated within any one home range would be low. In areas treated through exemptions and exceptions, the level of reduction in snowshoe hare prey base and its specific impact on female lynx will vary. This variation is caused by differences in the scale of the project, site specific snowshoe hare habitat conditions within the

project area, and the existing prey base, as well as the habits of the individual lynx. Without the details on the actual project site and the variations mentioned, the Service has made assumptions regarding the condition and distribution of the habitat that leads to an overestimate of the amount and quality habitat impacted. Our assumptions therefore lead to an overestimate of the effect and the associated level of take, because not all treated acres would intersect with snowshoe hare and lynx habitat in a way that represents harm to the lynx.

As discussed above, this biological opinion considers the effects of implementation of the the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

3. Reasonable and Prudent Measures

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of lynx:

- **RPM #1:** The Forest shall minimize harm of lynx from fuels management by ensuring that the acres impacted are not concentrated in several adjacent LAUs.

- **RPM #2:** The Forest shall minimize harm of lynx from pre-commercial thinning and other vegetation management projects by ensuring that female lynx home ranges, as represented by LAUs, either retain sufficient foraging habitat (when sufficient foraging habitat already exists in an LAU) or does not substantially reduce foraging habitat (when sufficient foraging habitat does not already exist in an LAU).

- **RPM #3:** The Forest shall monitor and report the progress of the action and the impact on the species.

These reasonable and prudent measures, with their implementing terms and conditions (detailed below), are designed to minimize the impact of incidental take that might otherwise result from the proposed action, and to ensure that the level of take exempted in this incidental take statement is not exceeded.

4. Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, the Forest must comply with the following terms and conditions, which implement the reasonable and prudent measures described

above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

The following terms and conditions implement reasonable and prudent measure #1:

The Forest Service shall ensure that new or future projects conducted under the exemptions from standards VEG S1, S2, S5 and S6 on the FNF:

1. Do not occur in greater than 93,066 acres in the WUI.

2. Do not result in more than 3 adjacent LAUs that do not meet the standard VEG S1 of no more than 30 percent of an LAU that is not yet snowshoe hare habitat.

3. Projects allowed per the exemptions or exceptions to VEG S5 and S6, shall not occur in any LAU exceeding VEG S1, except for protection of structures.

The following term and conditions implement reasonable and prudent measure #2:

The Forest Service shall ensure that vegetation management projects conducted under exceptions to VEG S5 and S6 on the FNF adhere to the following:

4. Timber management projects (*as defined in Appendix 5*) shall not regenerate more than 15 percent of lynx habitat on FNF lands within a LAU in a ten-year period.

5. Do not occur in greater than 15,012 acres.

The following term and conditions implement reasonable and prudent measure #3:

5. In support of the monitoring and reporting requirements of the NRLMD, the FNF shall provide to the Service and the Forest Service Northern Region (Region 1) Office in Missoula, summaries of the reporting requirements listed below. The summaries shall be submitted to the Service's Montana Ecological Services Office in Helena, Montana by April 1 of each year, or other date through mutual agreement. The summaries shall document the following information related to fuel treatment and vegetation management projects occurring in lynx habitat:

    a. Individual fuels treatment and vegetation management projects conducted in lynx habitat under the exemptions and exceptions to the vegetation standards VEG S1, S2, S5 and S6 may reduce the quality or quantity of snowshoe hare habitat. Some projects are likely to result in detectable and measurable effects to lynx (and our biological opinion's analysis found may rise to the level of take) while other projects will not result in a detectable, measurable effect to lynx (i.e. may affect, but not likely to adversely affect). The acreages of all projects will be tracked and aggregated to ensure that over the life of the Revised Forest Plan, the number of acres impacted does not exceed the acres projected to be treated and the effects analyzed in our biological opinion. This approach to tracking and monitoring ensures that the proposed action is implemented as proposed and is consistent with our analysis. In addition, given the long timespan of the proposed action, this

process provides information that can help determine whether consultation reinitiation ever becomes necessary.

Thus report as follows:

The BA prepared for each site-specific project shall include a report of the acres to be treated under the exemptions and/or exceptions from the vegetation management standards VEG S1, S2, S5, and S6. The report shall also include the total acres treated to date on the FNF as a whole, a map indicating the spatial distribution of past treatments, and acres treated by LAU. This total shall include the acres in the proposed project, other projects that have signed decisions (including those that have been completed since implementation of NRLMD in 2007), and those projects that have completed section 7 consultation.

b. In addition, each BA shall report whether or not the site-specific project meets all applicable Revised Forest Plan guidelines for lynx. If guidelines were not met, provide rationale as to why they could not be met.

c. To ensure that term and condition # 2 is met, each project level biological assessment shall report any three adjacent LAUs within the action area that have more than 30 percent of lynx habitat in a stand initiation structural state that does not yet provide winter snowshoe hare habitat, either because of natural events, vegetation management or fuel treatment projects, or any combination of these or other causes.

d. To ensure that term and condition # 4 is met, report by LAU the amount of lynx habitat treated through vegetation management projects as allowed by exceptions to VEG S5 and S6; record the type of exception, acres, location (LAU) and whether or not standard VEG S1 was adhered to.

e. The FNF shall report this project level monitoring information at the time a site-specific decision is signed to the designated Forest Service office with responsibility for maintaining an accurate accounting of reports. These data will be provided in a biennial report to the Service's Montana Ecological Services Office by April 1st.