Crown of the Continent

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The beauty of a burned forest

The only thing that's constant in the Crown is change.

story and photos by **RICHARD HUTTO**

In the Northern Rockies, forests that have escaped fire are rare. In the Crown, fire is just as important as rainfall and sunlight are to plants and animals. For the vast majority of forest types within the region, the predominant fire regime is one of infrequent, intense, stand-replacement fires—not one of frequent, low-intensity, understory burns. With ever-present fire in the system, we might expect that plants and animals have, over evolutionary time, not only come to survive severe fire, but to depend on severe fire for their persistence and success. That is the story I want to tell here.

Despite widespread death associated with fire, severely burned forest systems are neither "destroyed" nor "lifeless." As an ecologist and teacher who frequently speaks to public audiences, I have become more and more sensitive to the fact that most people have never heard that there are some plant and animal species that are hard to find anywhere outside a forest that was severely burned fewer than 10 years before. Indeed, the biological magic associated with severe disturbance events is apparently one of nature's best-kept secrets!

Following the widespread fires of 1988, I was curious to see whether the forests of Yellowstone, Glacier and elsewhere between the two parks had become transformed into lifeless biological deserts, as implied by press reports at the time

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(and as implied still by similar reports that follow major fire events even today), or whether the actual story is something different. During the two summer seasons immediately following the 1988 fires, a number of field assistants and I visited 34 different burned-forest sites in western Montana and northern Wyoming and we recorded the bird community composition in each. Contrary to what one might expect to find immediately following a major disturbance event like wildfire, we detected a surprisingly large number of species in forests that had undergone stand-replacement fires.

More specifically, we detected an average of 45 species per site, and a total of 87 species in the sites combined. Some of the most commonly detected species included the Hairy Woodpecker, American Robin, Mountain Bluebird, and Dark-eyed Junco (Figure 1, blue bird photo on right). Further analysis showed that 15 of the 87 bird species were more abundant in the early post-fire communities than they were reported to be in any other major vegetation type within the northern Rockies. Thus, birds were not only present, but the bird communities in recently burned forests were interestingly different in composition from those that characterize other Rocky Mountain cover types (including early-successional clearcuts, which are not at all similar in bird community composition).

The most amazing finding was that one bird species, the Black-backed Woodpecker, Picoides arcticus, seemed to be nearly restricted in its habitat distribution to forests that had been burned in the recent past. How did I determine that Black-backs were relatively restricted to recently burned forests? I compiled bird survey data that were available from published studies associated with a dozen different vegetation types. The Black-backed Woodpecker was detected less than 10% of the time in unburned vegetation types, but was detected about 80% of the time in studies conducted in burned forests (Figure 2, photo on left). Because these data were derived from a literature-based meta-analysis of studies that differed in duration and survey methodology and were drawn from a relatively small number of vegetation types, I encountered some skepticism—the pattern could have been an artifact of the incomplete range of vegetation types surveyed, or an artifact of combining results from studies that used different methods used to survey birds. At about the same time, I began working with the USFS Northern Region to develop a bird monitoring program that would involve use of the identical field methods across as large a range of vegetation types as possible. Now, 20 years later, the USFS Northern Region Landbird Monitoring Program stands as one of the largest bird point-count databases of its kind in the world, with sample locations drawn from a wide range of vegetation types across northern Idaho and western Montana. By combining those data with data collected from locations distributed within more than 50 fires that had burned in western Montana during the past 20 years, I am now able to ask, once and for all, whether the Black-backed Woodpecker is relatively restricted to burned forest conditions.

After summarizing information from more than 50,000 survey locations distributed across nearly every vegetation type occurring in the northern Rockies, it is clear that the restricted distribution pattern is not an artifact of problems associated with my earlier meta-analysis. The Black-backed Woodpecker is, as my ear-

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lier study suggested, nearly restricted in its habitat distribution to burned forest conditions.

Just take the time to look carefully at a Black-backed Woodpecker—everything about it, including its jet-black coloration, seems to reflect a long evolutionary history with burned forests. As I like to point out, the black coloration against a blackened tree is no less impressive than the white coloration of a ptarmigan against snow—both coloration patterns have undoubtedly evolved over long time periods in association with their respective environmental backdrops! The Black-backed Woodpecker capitalizes on the population explosion of wood-boring beetle larvae in burned forests, as do several other woodpecker species. Because many burned trees die, they can no longer defend themselves against beetles by swamping the eggs and larvae with pitch exuded into their burrows. Consequently, the adult beetles have evolved to fly in immediately after fire to lay their eggs on now-defenseless trees that still have plenty of good wood beneath that scorched bark. Some beetle species are so specialized to live in fire-dominated systems like those here in the Crown, that they have evolved infrared sensors that allow them to detect heat from miles and miles away so that they can colonize recently burned forests as rapidly as possible.

Although the Black-backed Woodpecker is the most extreme species in terms of its restriction to, and evolutionary history with, burned forests, many additional bird species reach their greatest abundance in burned forests (15 of 87 species detected in burned forests, as I noted above). These include the Three-toed Woodpecker, Hairy Woodpecker, Olive-sided Flycatcher, Clark's Nutcracker, Mountain Bluebird, American Robin, Townsend's Solitaire, Cassin's Finch, Dark-eyed Junco, Chipping Sparrow, and Red Crossbill. All the woodpeckers feed on the abundant beetle larvae beneath the bark of standing, fire-killed trees, while flycatchers and bluebirds take advantage of the open conditions for pouncing on or sallying after flying insects, and seedeaters capitalize on the increased availability of seeds from both cone-bearing trees, some of which wait for more than 150 years for fire to heat and open their cones, thereby releasing their seeds.

The story doesn't end with birds, of course. I have barely scratched the surface of the amazing biological story behind severe fire. In addition to the specialized beetles, there are cone-bearing tree species that require severe fire for the heat needed to open their cones, and there's the fire morel, which is also relatively restricted to severely burned forests. It's no wonder that we enjoy a boom year for morel mushrooms at the local farmer's market following a severe forest fire season in western Montana. The seeds of Bicknell's geranium can wait in the soil for more than 100 years until a severe fire allows them to break from that dormancy, germinate, and complete their life cycle.

By definition, fire specialists such as the Black-backed Woodpecker or the lodgepole pine depend heavily on very specific conditions to realize their own success. Therefore, if we study the patterns of distribution and success of these fire-dependent species across the variety of burn severities within burned-for-

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> Richard Hutto, professor and director of the Avian Science Center University of Montana

est perimeters, we can gain insight into the kinds of fires that constitute the naturally occurring fire regime in areas that were historically occupied by the specialists. Very specific kinds of fires must have provided the environmental backdrop against which these specialized native species evolved; so what kinds of historical fires were they? Amazingly, within burned forest perimeters, Black-backed Woodpeckers are almost entirely absent from unburned patches within those fire perimeters, and they become more common as fire severity increases! The same pattern is true of a number of other species, including the American Three-toed Woodpecker, Hairy Woodpecker, Mountain Bluebird, and Tree Swallow. As I expressed in a recent publication—some like it hot! These results are profound because they imply that the very fires often regarded as “unnatural” and “destructive” are the very fires that provide the best conditions for the most fire-dependent plant and animal species.

Land managers can’t create the magic through severe cutting—fire is critical.

One could argue that any loss of burned forest acreage due to past fire suppression activity has been compensated for, at least in part, by timber harvesting activities. As evidenced by letters submitted to the editors of local newspapers after any major fire event, many people believe that the conditions present after a clearcut or following one of the newer green-tree retention or forest restoration cuts are basically the same as those present after a severe fire. They are wrong. Conditions created by a stand-replacement forest fire are biologically unique at the very least in terms of the biomass of standing dead trees that remain, and to a much greater extent, in terms of ecosystem structure and function. While timber harvesting is a form of ecological disturbance, it is a poor substitute for fire-based disturbance because it does not result in numerous, burned, standing-dead trees. Such trees are the most critical component of a biologically diverse post-fire ecosystem and that single component contributes significantly to the production of unique successional pathways and unique wildlife communities that we see after fire.

“NATURAL” FIRE REGIMES IN THE CROWN

People have slowly come to accept the fact that low-severity fires burned historically, but they still view severe events as “unnatural” events. How often have you read the following? “Dry, ponderosa pine-dominated forests of the western United States are widely believed to have experienced a buildup of fuels in the past century due to a combination of over-aggressive fire suppression efforts, overgrazing, and overharvesting. As a result, those western forests suffer from more extreme fire behavior because they burn with unnatural or unprecedented intensity.” Unfortunately, we may be inappropriately extrapolating results from ponderosa pine systems that are quite common the Southwest, to the more mesic ponderosa pine systems and the mixed-conifer forest types that make up the vast majority (about 85%) of forested area in the Crown.

Indeed, severe fires are routinely referred to as “catastrophic” events in the popular press regardless of forest type, and such terminology even appears in proposed congressional legislation drafted to deal with severe fire’s aftermath. Given the current rate at which land managers are implementing forest restoration projects specifically designed to prevent severe fire sometimes well outside the dry, ponderosa pine system, one would hope that generalizations about the state of our forests are broadly applicable.

The ecology and life history adaptations of living organisms are greatly underused as sources of reliable information in the debate about what constitutes “natural” forest conditions and fire regimes in any forest type. This is surprising, given that the goal of forest restoration is to return forests to conditions that reflect their evolutionary past. Through their precise selection of suitable habitat, plant and animal species carry an abundance of historical information about the environments within which they evolved. Moreover, that evolutionary history is valuable because it runs much deeper than the 100- to 500-year reach of most historical (e.g., fire-scarred tree-ring) studies. The plants and animals featured here are talking through their adaptations about the importance of severe fire on our landscapes; are we listening?

Because most have not heard this story, there is considerable public pressure to “salvage” what little remains after severe fire

One of the most common management activities following forest fires is salvage logging (Figure 8). Perhaps we need to change our thinking when it comes to logging after forest fires. With respect to birds, no species that is relatively restricted to burned-forest conditions has ever been shown to benefit from salvage harvesting. In fact, most timber-drilling and timber-gleaning bird species disappear altogether if a forest is salvage-logged. Therefore, if we want our land-use decisions to be based, at least in part, on whether a proposed activity affects the ecological integrity of our forest systems, burned forests should be the LAST, rather than the first places we should be going for our wood.

For birds, standing dead trees are one of the most special biological attributes of burned forests. They house equally unique beetle larvae that become abundant because they feast on the wood beneath the bark of trees that have died and are, therefore, defenseless against attack. If we value and want to maintain the full variety of organisms with which we share this Earth, we must not only recognize that burned forests are quite “healthy,” but must also begin to recognize that post-fire logging removes the very element — standing dead trees — upon which each of those special bird species depend for nest sites and food resources.

WHY DO WE FIND IT SO HARD TO CELEBRATE SEVERE-FIRE EVENTS?

The biological facts are unambiguous and readily apparent to anyone who wants to venture out and look for him or herself, so why do we so often fail to embrace the early successional stages—burned trees and all—that follow stand-replacement fires? There are a number of reasons, but the most important is that the public continues to be told that all fires are bad, which, as I have outlined here, is patently false. Even if the public were to become convinced that severe fires are natural and necessary for ecosystem health, we now have a problem because humans have settled nearly everywhere. That human presence requires fire suppression to be a priority nearly everywhere. Wilderness, parks, and roadless areas are really our primary hope for the maintenance of naturally severe fire regimes, and we are lucky in the Crown of the Continent to have an abundance of such areas along with an abundance of non-wilderness areas far enough removed from the urban interface to allow severe fire to burn naturally.

SEVERE DISTURBANCE MAKES THE WORLD A DANGEROUS BUT INTERESTING PLACE

Burned forest habitat is one of nature’s best-kept secrets because the public really hasn’t been told about the magical transformation a forest undergoes after severe fire. And I barely touched on some of the more fascinating stories about plants and animals that are restricted to burned-forest conditions. Being unaware of these stories, people naturally want to harvest trees after fire because the only thing they can see is wastefulness. But there is no waste in nature. Burned forests, even severely burned forests, are forests that have been “restored” in the eyes of numerous plant and animal species and in the eyes of an informed public. The burned trees are essential for maintaining an important part of the biological diversity we value today, and are the foundation for the forests of the future. Fire (and its aftermath) should be seen for what it is: a natural process that creates and maintains much of the variety and biological diversity that we see in the Northern Rockies. The next time you are lucky enough to walk through an intact, severely burned forest, I hope you can now properly recognize it as a beauty mark rather than a scar on our magnificent Crown of the Continent landscape.

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