Joint Fire Science Program

Fire Science Brief

RESEARCH SUPPORTING SOUND DECISIONS

Fires of 2000 in the Bitterroot Valley, Montana. Credit: John McColgan, BLM Alaska.

Listening to the Message of the Black-backed Woodpecker, a Hot Fire Specialist

Summary

The Black-backed Woodpecker is an uncommon bird of the northern coniferous forests of North America. It is one of several species of fauna that are considered fire specialists. This woodpecker nests in cavities it creates in dead standing trees and feeds on wood-boring beetles and their larvae, which are also attracted to stressed or burned trees. Because the bird can be seen and heard from a distance, its population dynamics can be used to estimate the suitability of habitat to support both flora and fauna that have evolved in a natural regime of severe fire. In the effort to return the forests to a condition more in tune with historical norms, resource managers will need to embrace the concept that severe, stand-replacing fires that do not threaten life or property are not all bad. They are, in fact, essential for the survival of a variety of fire-dependent species.

Key Findings

- Wildfire is the primary disturbance that has shaped the landscape historically in forests in the northern Rockies.
- Mixed-severity fire, including stand-replacing and moderate events, has been the dominant type of wildfire in northern coniferous forests.
- Evidence is mounting that extreme fire events are not unnatural occurrences.
- Research by wildlife biologists confirms that a number of species, in particular the Black-backed Woodpecker, have evolved along with recurrent, very hot fires.
- Salvage logging after fire can have negative effects on habitat, including nesting and feeding sites, of species such as the Black-backed that are dependent on dead standing trees.

It's only natural

In the western United States, fire ecology research has generally focused on low or medium severity, frequent fires, which were historically the rule and stand replacing fire an exception. The goal of many land managers has been to reduce the fuel load, and thus the risk of severe wildfire, using a variety of treatments—including logging, thinning, and prescribed fire—to mimic the natural fire regime. This approach, however, is not necessarily suited to coniferous forests that support fire specialist birds such as the Black-backed Woodpecker (*Picoides arcticus*), says Richard Hutto, director of the Avian Science Center and professor in the Division of Biological Sciences at the University of Montana. "There is a continuous gradient of fire severity in the southwestern states where stand replacement events were rare," says Hutto. "Once you get into the Northern Rockies, the area with severe fires gets big enough to support a specialist like the Black-backed."

Wildlife like this woodpecker can tell us a lot about historic conditions. "In understanding fire ecology, we haven't paid enough attention to plant and animal species to gain insight into what is natural," says Hutto. Historical evidence gathered from the relatively recent past, such as that provided by tree-ring studies, doesn't always tell a story untainted by human alteration of the natural fire regime. We need to supplement those studies with other approaches that reach farther back in time.

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A hot fire specialist speaks out

The Black-backed Woodpecker is a post-fire specialist in coniferous forests from Alaska to eastern Canada. Its coloration helps it blend in with the charred aftermath of severe fire. If it has been around long enough to adopt this camouflage outfit, what is it saying about the place of intense wildfire in the higher latitude conifer and mixed-conifer forests where it evolved?

The Black-backed is a small bird, about 9 inches long (23 cm), that occupies a very small niche on the ecological landscape, one characterized by intense wildfire. It has a solid black back, white stripes on its sides, and white and gray mustaches. The male also sports a small yellow cap at a rakish angle on its forehead.

The Black-backed Woodpecker depends on severely burned trees for both nesting and feeding. Credit: Richard Hutto.

While this woodpecker may not be as charismatic as the panda or the grizzly bear, its almost complete dependence on hot fire earns it a place as an indicator species. "It's not just about the Black-backed, it's about listening to this woodpecker telling about something bigger than itself, a whole system that depends on fire," says Hutto.

The morel mushroom, for example, a culinary treat prized by wild pickers, likewise thrives after intense fire. Certain insects also love a good hot fire. Fire-dependent beetles, themselves a delicacy for the Black-backed, can sense fire up to 50 miles away, Hutto says, using infrared heat to guide them to their next snack. These insects are so adapted to hot fire that they lay eggs in trees that are still smoldering. Understanding these fire dependent species can help guide our efforts to be good stewards of the landscape, especially on lands that provide a wide variety of ecosystem services such as water quality, air quality, and diversity of wildlife.

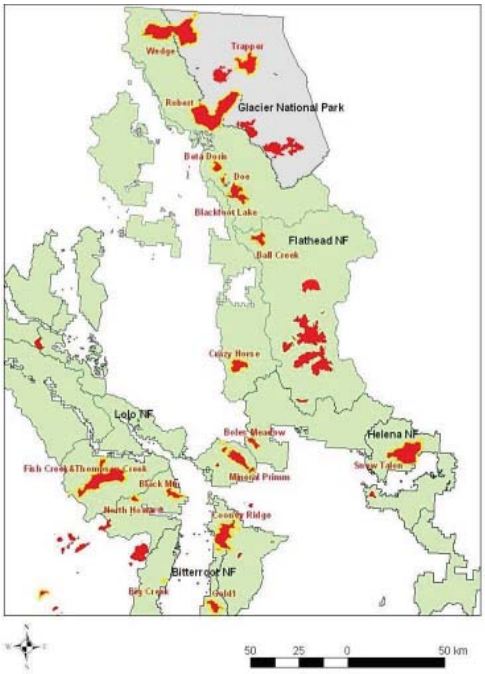
After the fires

Summer of 2003 was an active fire season in western Montana and Alberta, Canada. Nearly 380,000 acres in Montana burned. Though news reports tended to underscore

the catastrophic severity of the fires, researchers seized the opportunity to monitor the presence and abundance after fire of Black-backed Woodpeckers.

Evidence of woodpecker feeding on beetle larvae in ponderosa pine and Douglas-fir forest after a severe fire. Credit: Richard Hutto.

A research project supported by the Joint Fire Science Program (JFSP) with additional funding from the USDA Forest Service began the spring following the fires and continued through 2007. Hutto and colleagues with the Forest Service and Glacier National Park wanted to determine the influence of local and landscape conditions on the occurrence and abundance of Black-backed Woodpeckers in burned forest patches.



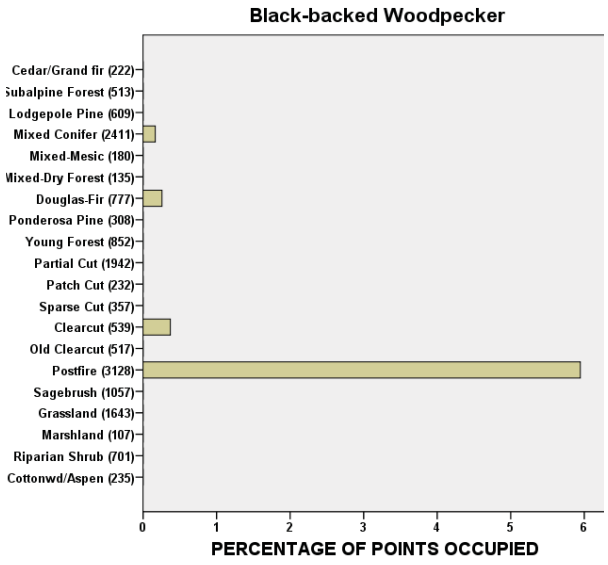
The study area covered 17 sites in western Montana. Credit: JFSP Final Report.

Their study was conducted on 17 fire sites in four National Forests in western Montana—Bitterroot, Flathead, Helena, and Lolo—and in Glacier National Park. The experimental sites consisted of mid-elevation (4,000 feet) conifer and mixed-conifer forest types that had been subjected to two pre-fire treatments, logging with the goal of reducing fuel load or no pre-fire logging. The researchers measured three levels of fire intensity and two regimens of post-fire activity, salvage logging or no salvage logging.

The sampling protocol used, the habitat-based point-count protocol, is the standard adopted by the Northern Region Landbird Monitoring Program (NRLMP) for tallying all landbird species seen or heard at established sites over a period of time. NRLMP is a cooperative effort between the Forest Service and the University of Montana. The protocol has been used to document avian population trends in the Northern Rockies and to correlate those trends with the wide range of habitats in the region, from grassland to subalpine forest. In addition, the program gathers information on the ecological effects of a range of land-use activity. The NRLMP represents one of the largest comparative databases of landbirds in the world. Combining information on the Black-backed Woodpecker with the NRLMP database gathered from more than 50,000 point counts, Hutto found that of more than 100 avian species, the Black-backed Woodpecker is the most fire dependent.

Fire intensity

Results of point counts at more than 1,000 survey sites confirmed that the Black-backed Woodpecker fared better with increasing burn severity. None were observed on unburned sites or low-severity sites in the first two years of the study, though their numbers did increase slightly in years three and four. Their presence on severely burned sites spiked dramatically in the second, third, and fourth years of the study.



Results from more than 13,000 point-count surveys across 20 different vegetation types reveal a remarkable degree of specialization in Black-backed Woodpeckers. Credit: Richard Hutto.

Post-fire salvage logging

Results on the effects of post-fire salvage logging on Black-backed Woodpecker populations over the four-year

period were also dramatic. The probability of Black-backed occurrence drops from 6 percent in unharvested sites to about 4 percent in moderately harvested sites and then to about 3 percent in more intensely harvested sites. "If you do cut the trees out, there goes the Black-backed," says Hutto.

Pre-fire timber harvest

The study also explored the effect of timber harvest on burn sites within a decade or two before the fires. Treatments such as seed tree cuts and shelterwood cuts are standard forestry techniques that have been applied with the goal of forest restoration. In a pattern similar to that found with post-fire harvesting, Hutto found that Black-backed Woodpeckers fared best on sites unharvested before fire and poorest in the heavily harvested sites, raising a concern about logging for forest restoration that has not yet been addressed—how does pre-fire logging affect the future suitability of these forests to post-disturbance specialists.

Glacier National Park

Within the extensive geographic area of the JFSP project, only one study site, Glacier National Park (GNP), is located on land managed by the National Park Service, whose mission is "to promote and regulate the use of the… national parks…which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

"Glacier National Park is the only reference condition we have for comparison with managed forests," Hutto says. Outside the park, the probability of detecting this woodpecker is 4.5 percent on average, while inside the park the probability rises to 10 percent. Clearly, a more hands-off management approach before wildfire affects the suitability of habitat for this fire-dependent species.

Plea for documentation

Across a wide range of forests, from heavily timbered or clear cut to lightly managed or managed not at all, there is an urgent need for careful documentation of past land-use activities. Lack of documentation has resulted in the loss of a gold mine of knowledge that could inform ongoing research on the effects of fire on the landscape. "Most managers, 99 percent, don't keep historical records," Hutto says. In gathering information, according to the JFSP final report, these are the questions land managers need to ask: When was the forest cut? How was it cut? Were trees planted afterward? Was the soil scarified? Was the slash burned? What forms of recreation have been allowed since the fire?

Hitting a snag

The Black-backed Woodpecker is not the only species that depends on a severe fire regime for survival, but its habits and requirements differ from many other species in that it is almost entirely reliant on these events.

In North American conifer forests, fire and other natural disturbances such as insect infestation, tree disease, and decay contribute to the creation of snags. In burned forests, standing dead trees exist along a continuum of decay, and the Black-backed Woodpecker profits from the entire spectrum. It dines on wood-boring beetle larvae that attack weakened trees, and it drills cavities in snags for its nests. After a few years, the beetles move on to newly disturbed patches, giving the bird a narrow window of opportunity to find suitable habitat for nesting and feeding.

The American Robin also thrives after severe fire. This nest demonstrates the value of broken-top snags after fire. Credit: Richard Hutto.

To benefit wildlife, current Forest Service guidelines call for snag retention at a rate of six to 10 trees per hectare (2.5 acres). This recommendation was based on research conducted in managed forests with frequent fire return rates and moderate to low fire intensity. The current guideline does not take into account a number of variables, such as successional age and forest type, which are crucial in maintaining good habitat for the Black-backed.

Hutto's research clearly documents evidence of the negative effects of salvage logging on the Black-backed Woodpecker. Even light salvage logging in burned forests decreases nesting opportunities for this snag-nesting species.

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Hutto recommends, whenever possible, that the natural regime of severe canopy fire in western conifer forests particularly, and in moderate to mild severity fire in other forest types, should be allowed to run its course.

Gleaning information through research

Though the Black-backed Woodpecker (Picoides arcticus) is not endangered, the USDA Forest Service ranks it as a sensitive species, and in certain states it is considered a species of special concern. It is a primary cavity nester and a member of the bark-gleaning guild.

The Black-backed is a non-migratory bird that relies on a nearby food source during its nesting season. Though no one knows for certain its natural life span, banded birds have been followed for up to eight years. "They probably disperse a couple of times in a lifetime," says Jennifer Woolf, a Ph.D. candidate in the Department of Ecosystem and Conservation Services at the University of Montana. These movements are in response to its quest for sites that

offer suitable nesting opportunities during the breeding season and feeding habitat the rest of the year. Occasional forays outside the normal range, termed irruptions, are likely responses to feeding opportunities.

Woolf's Master's thesis explored the short-term effect on the responses of birds and small mammals such as voles and chipmunks of fuel reduction treatments aimed at restoring Ponderosa pine forests. A history of fire exclusion on the experimental sites has led to an increase in Douglas fir.

Woolf gathered data on birds during the nesting seasons, May-June, of 2001 and 2002 on the University of Montana's Lubrecht Experimental Forest and adjacent land managed by the Montana Department of Natural Resources and Conservation (MDNRC). The research was conducted as part of the JFSP National Fire/Fire Surrogates study at Lubrecht.


Credit: Richard Hutto.

The area had been logged in the early 1900s and subsequently no fires had occurred. MDNRC is implementing a standard fuel reduction/forest restoration plan that involves commercial thinning followed by prescribed fire. Woolf compared sites that had been treated to control sites that did not receive a treatment.

Woolf did find evidence of bark-gleaning by the Black-backed in these experimental sites. "They were there and they were foraging, but we don't know if they were nesting," she says.

For her doctoral dissertation, Woolf is using genetic analysis to help determine the population structure and dispersal of the Black-backed Woodpecker from Oregon to Quebec. Using blood samples from the birds' brachial veins, she is probing the messages its mitochondrial DNA (mtDNA) can send us about the bird's history from the Ice Age to the 21st century. "With DNA we can see what families of birds are clustered together and related to the others," Woolf says.

The evolutionary clues pinpointed by mtDNA analysis promise a glimpse into the ancient history of this species that colonized the forests as the glaciers melted.

Further Information: Publications and Web Resources

Hutto, Richard L. "Understanding the influence of local and landscape conditions on the occurrence and abundance of Black-backed Woodpeckers in burned forest patches." Final Report – Joint Fire Science Program, 30 October 2007. http://avianscience.dbs.umt.edu/documents/finalreport2007_000.pdf

Hutto, Richard L. Portraits in Black Video available through the Avian Fire Research Program site: http://avianscience.dbs.umt.edu/research_avianfire.htm

Management Implications

- Refuges such as Glacier National Park provide good habitat for fire-dependent species from the bottom to the top of the food chain. A Wildland Fire Use policy that allows stand-replacing fire there can be beneficial to the Black-backed Woodpecker.
- With a better understanding of the fire cycle and of wildlife, land managers can learn to mimic natural fire disturbance regimes in managed forests to achieve a balance of economic and ecosystem services.
- Wood boring beetles may be detrimental to commercial timber operations, but they are a critical source of forage for the Black-backed and other birds.
- Resource managers need to document to the extent possible pre-fire forest conditions including harvest history, use of prescribed fire, or other management scenarios. Historical information is crucial to inform new research and give an accurate assessment of the effects of various strategies
- Severe fires are necessary for species such as the Black-backed Woodpecker.
- Thinning, moderate severity prescribed burning, or a combination may provide foraging opportunities, but may not provide nesting opportunities for the Black-backed Woodpecker.
- There is an urgent need for careful documentation of past land-use activities.

Hutto, Richard L. 2006. "Toward Meaningful Snag-Management Guidelines for Postfire Salvage Logging in North American Conifer Forests." *Conservation Biology* 20 (4). http://avianscience.dbs.umt.edu/documents/hutto_conbio_2006.pdf

Hutto, Richard L. 2008. The importance of severe wildfire: some like it hot. *Ecological Applications* 18:1827-1834.

Cornell Lab of Ornithology, All about Birds, (includes a link to its calls): http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/Black-backed_Woodpecker.html

Reel, Sue. Web page, Life after a Fire: How Wildfires Affect Plants and Animals on the Lolo National Forest. http://www.fs.fed.us/r1/lolo/resources-natural/wildlife/after-fire/index.htm

Scientist Profiles

Richard L. Hutto is the Director of the Avian Science Center and Professor in the Division of Biological Sciences at the University of Montana. He specializes in research on local and landscape level conditions as they relate to the suitability of habitat for avian species and in the role of human-caused disturbances and of wildfire on conifer forests.

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