

# Science

## FINDINGS

## INSIDE

Winners and Losers .....	2
A Regional Network .....	3
Forest Structure Is Key .....	3
Fuel Dynamics .....	4

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*"Science affects the way we think together."*

Lewis Thomas

## BURN AND THEY WILL COME! THE WESTERN REGIONAL BIRDS AND BURNS STUDY EXAMINES BIRD RESPONSES TO PRESCRIBED FIRE

Art by Shelley Watters



The Birds and Burns Network covers eight Western States with study sites in dry forests dominated by ponderosa pine.

*"I never for a day gave up listening to the songs of our birds, or watching their peculiar habits, or delineating them in the best way I could."*

—John James Audubon

A staccato of raucous hammering followed by a shrill "peeek" breaks open the Idaho pre-dawn silence. It's a fresh sound in this forest and Vicki Saab immediately recognizes

the source. Hundreds of miles away, in eastern Washington's Methow Valley, John Lehmkuhl hears it too. Not the same bird, of course, but the same species: the black-backed woodpecker. For him, too, it is a call not previously heard in these parts.

Black-backed woodpeckers favor recently burned forests, where scorched trees are more easily excavated and bark and wood-boring beetles abound. For the past 5 years, as part of the Western Regional Birds and Burns Network, Saab, Lehmkuhl, and many

## IN SUMMARY

Although prescribed fire is increasingly being used in ponderosa pine forests as a management tool to reduce the risk of future high-severity wildfire, its effects on wildlife habitat have rarely been examined. The Birds and Burns Network was created to assist managers in planning prescribed fire projects that will reduce fuels and enhance bird habitat. Researchers have established a network of study sites across eight Western States to analyze changes in fuels, downed wood, forest structure, bird habitat and populations of birds within 1 to 2 years of prescribed fires. Additionally, studies conducted on the Birds and Burns Network evaluate some of the ecological tradeoffs associated with managing for wildland fire, prescribed fire, or fire exclusion.

Researchers have documented varied responses to the burns. For example, migratory songbird populations tended to decline during the year of the burn, whereas residents generally had positive or neutral responses. Overall, many bird species that initially responded negatively, rebounded to postfire levels the following year, suggesting that the influence of prescribed fire on these birds may be short term. The density of standing dead trees, which are a critical component of cavity-nesting bird habitat, increased after the burns, whereas large downed logs were reduced. These findings should help managers identify potential resolutions for conflicts that arise from prescribed burning in western dry forests.

colleagues across the intermountain West have been surveying bird populations before and immediately after prescribed fires.

Years of fire suppression combined with a prolonged drought and hotter and longer summers have many ponderosa pine forests poised for unusually large and severe fires. Not surprisingly, the Forest Service is working furiously to find ways to reduce the wildfire risk. Prescribed fire is a preferred tool for reducing the quantity of flammable vegetation. Fire managers conducting prescribed burns are typically charged only with the task of reducing the hazard of future wildfires, with little consideration given to wildlife or other resources. The Birds and Burns Network seeks to broaden that perspective.

The seeds of the study were first sown in 1993, when Saab, a research wildlife biologist at the Rocky Mountain Station in Boise, Idaho, was invited to the Boise National Forest to examine how bird habitat and populations were affected by a giant wildfire that burned the previous year. Over the following decade, Saab and her colleagues applied a similar research protocol on wild and prescribed fires in Idaho and Oregon. In 2000, when Lehmkuhl, a research wildlife biologist at the PNW Station in Wenatchee,

KEY FINDINGS	
•	Birds exhibit variable responses to fire depending on the severity of the burn and life history strategy of the bird. Generally, cavity-nesting and beetle-foraging birds benefited from high-severity fires that created snags. In contrast, birds that forage for insects in foliage tended to decline after fire.
•	The negative effects of prescribed fire on many bird populations appear to be limited to the year in which the burn occurred. Many populations studied rebounded to prefire levels the following year; however, populations of a few species declined the year after burning. The long-term extent of prescribed fire effects is unknown.
•	Prescribed fires created far more snags of all sizes than they destroyed. These snags function as important habitat elements for cavity-nesting birds and other wildlife that use tree cavities.

Washington, received a grant to study wildlife responses to fires in Washington, he and Saab proposed that they combine forces for a regional meta-study, which would build on her existing work and apply consistent objectives and experimental design to postfire, ponderosa-pine-dominated forests across the region.

“Our goal is to understand the effectiveness of prescribed fire for fuel reduction and its consequences for cavity-nesting birds and migratory songbirds throughout the range

of ponderosa pine in the United States,” says Lehmkuhl. They have now measured changes in forest structure and bird populations within 11 study areas located in seven states: Washington, Oregon, Idaho, Montana, Colorado, Arizona, and New Mexico.

“The results are intended to assist managers in planning scientifically sound and legally defensible prescribed fire projects that will reduce fuels and also maintain or enhance wildlife habitat,” says Saab.

## WINNERS AND LOSERS

**T**he relationship between birds and fire is complex but strong, and tends to defy generalization. From a forest manager’s perspective, any decision regarding fire, including fire exclusion, is going to result in some winners and some losers.

“Bird responses to fire differ. Some benefit, some don’t,” says Saab. One way to keep score and to predict how a given species might respond to fire is to consider their guilds, which describe their strategy for nesting and foraging. For example, many, but not all, birds in the cavity-nesting guild benefit from severe fires that kill large trees, which can then be excavated for nest sites. Fire-injured and dead trees also attract bark and wood-boring beetles, which are important prey for the bark-gleaning guild.

The foliage-gleaning and shrub-nesting guilds, in contrast, tend to decline after fire; these include many warblers and other Neotropical migrants. “In fact, concern that prescribed fires may be harming some of the migratory songbirds—many of which are species of concern—was part of the impetus for this research, particularly in the

Northwest, where burning often takes place in the spring just as songbirds arrive to nest,” says Lehmkuhl.

“Although some patterns exist in guild responses to fire, members of any guild can respond differently to fire severity classes; therefore, we caution against a one-severity-fits-all approach for any particular guild,” says Saab.

Fire’s impact on forest habitat is long lasting, and birds respond differently to each stage of recovery. “Species that prey on insects in wood, such as the black-backed woodpecker, rapidly colonize postfire forests and then decline after 3 or 4 years due to the reduction in bark and wood-boring beetles,” explains Saab. Many bird species that catch insects on the wing—the so-called aerial insectivores—use postfire environments 10 to 20 years after fire, presumably in response to increases in flying insects associated with shrub regeneration.

With such varied bird responses to wildfire, a mosaic of postfire habitat conditions is needed to maintain the full suite of species.

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## A REGIONAL NETWORK

The current state of knowledge regarding bird responses to fire has been built from many disparate studies conducted independently over the years. And though much has been learned, the Birds and Burns Network is the first large-scale study that uses consistent methods to understand the effects of prescribed burning and wildfire on birds.

At each location, prescribed fire treatments—roughly 600 to 1,000 acres—are paired with unburned control units. Researchers conduct a series of predawn and midmorning bird surveys to estimate populations, monitor the nests of cavity-nesting birds, and measure vegetation to determine its role as habitat and as potential fuel for a fire. These data are collected 1 to 2 years before and after prescribed fire.

Results from the first five locations to receive fire treatment have recently been published. “In the combined study areas, all but one of the eight resident species had a positive or neutral response to prescribed fire,” explains Saab. “The one exception, the pygmy nuthatch in the southwestern study area, showed a negative response the year of burning but a



Victoria Saab

*Burned trees are easier to excavate than live trees, which is one reason cavity-nesting birds are often found in the aftermath of wildfires.*

neutral response the following year. The story was less clear for migratory birds. Some western bluebirds, for example, experienced positive changes in density, whereas others, such as yellow-rumped warblers, showed declines, although their abundances went back to prefire levels 1 year later in the southwest study areas.”

“It may be that the residents are simply more adapted to fire, since they have had more time to adjust to its impact on the landscape. The migrants, on the other hand, have just a short window of opportunity to find a suitable nest site,” says Lehmkuhl. “In some cases, the prescribed burning was occurring during the breeding season when they arrived to nest, so they may have been displaced by the fire itself. In other cases, the understory impacts may have been significant enough to deter nesting during the first year, but then use rebounded quickly.”

In most cases observed thus far, results suggest that bird responses to prescribed fire may be short lived. If this finding passes the scrutiny of time, it will be an important and encouraging piece of information for fire managers. However, the researchers are quick to point out that monitoring for several more years would be necessary to know for sure. “We did observe some migratory species that showed no response during the year of the prescribed fire, but showed a decline the following year,” says Saab, “so continued monitoring is critical.”

## FOREST STRUCTURE IS KEY

According to Saab, from a bird’s point of view, the major difference between wild and prescribed fires is their severity. Prescribed fires tend to be less severe, primarily consuming dead wood, rather than creating it. Wildfire, in contrast, tends to have larger patches of high-severity fire that kill most trees and leave standing snags in its wake.

Snags are among the most important habitat component for cavity-nesting birds and other wildlife species that use tree cavities. Accordingly, the researchers were initially concerned that prescribed fire would consume snags and reduce their role as habitat, which has been found on other studies unrelated to the Birds and Burns Study.

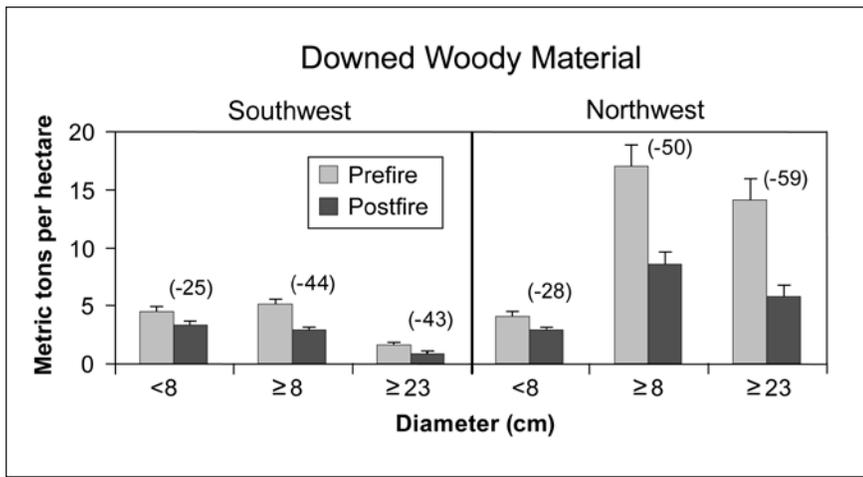
“We were surprised to find that most prescribed fires actually created more snags than they consumed,” says Saab. “Even in the large-diameter classes, snag density increased after burning, which is particularly important because large snags have greater longevity and provide wildlife habitat for a longer time than smaller snags. We also expect additional tree mortality over the next 2 to 3 years, as time allows for crown scorch and consumption to cause further tree death.” Snags created by recent fire may not be immediately available for nesting, but as the decay process proceeds, snags will be more easily excavated by woodpeckers.

In fact, the reason that black-backed woodpeckers and three-toed woodpeckers were observed nesting within the

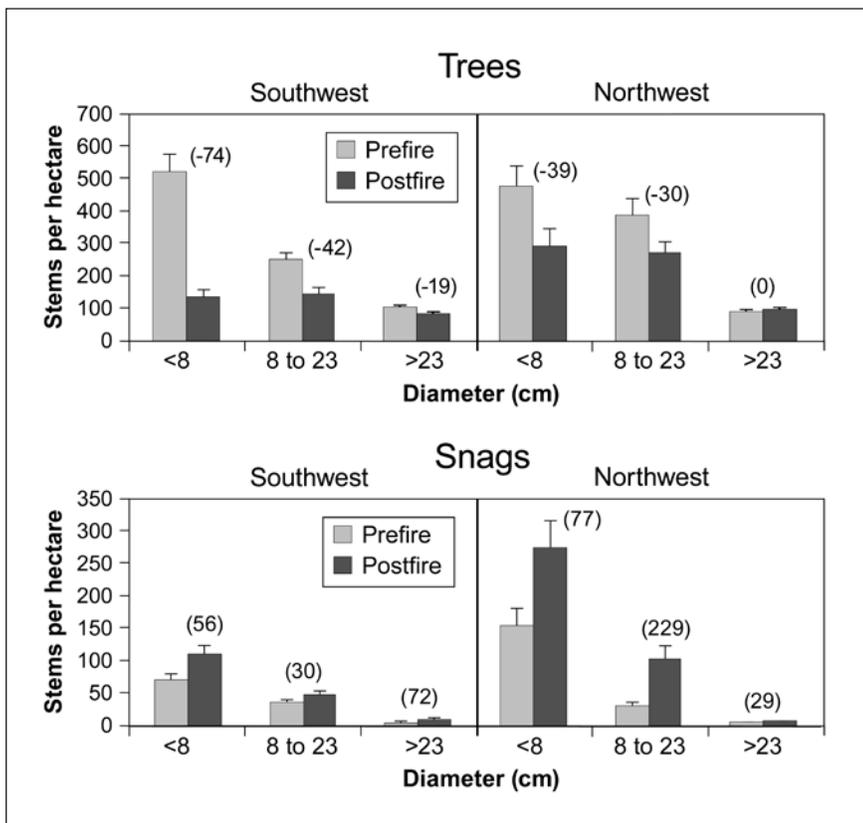


Victoria Saab

*The black-backed woodpeckers prey on insects in wood. They rapidly colonize postfire forests and then the population declines after 3 or 4 years owing to the reduction in bark and wood-boring beetles.*



In addition to measuring bird responses to burning, researchers in the Birds and Burns Network measure changes in down woody material resulting from prescribed fire treatments. Researchers were surprised to find such high levels of consumption within the large diameter classes, and suggest that managers may need to adjust the timing of burns if they hope to retain these habitat features. (Numbers in parentheses are the percentage of change in measurements taken after prescribed fire.)

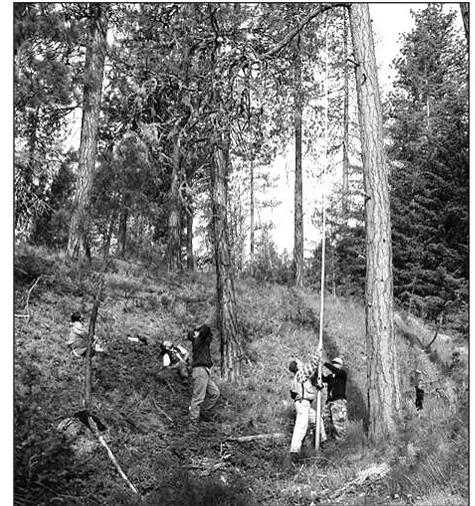


Prescribed fires created snags in every size class. Researchers were pleased to see recruitment of larger snags because they have greater longevity and provide wildlife habitat for a longer time than smaller snags. (Numbers in parentheses are the percentage of change in measurements taken after prescribed fire.)

### WRITER'S PROFILE

Jonathan Thompson is an ecologist and science writer based in Corvallis, Oregon.

prescribed burns is likely due to increases in snag density followed by increases in bark and wood-boring beetles. "Nesting after prescribed fire by these two species is an ecologically significant finding; both are designated as sensitive species by state and federal agencies and both are strongly associated with fire-maintained habitat," says Saab.



Kent Woodruff

Researchers use cameras affixed to poles to examine nest cavities in trees.

### FUEL DYNAMICS

Lehmkuhl and Saab are, first and foremost, wildlife biologists. When they measure live trees, snags, and downed wood, they tend to be interested in its role as habitat. But there's value in those data unrelated to birds, and they're using them to help fuel managers gauge their success.

"Apart from our analysis of birds and bird habitat, we are quantifying the effectiveness of prescribed fires at achieving its primary objective: reducing future fire risk," says Lehmkuhl. "In a lot of cases, fire managers take a visual appraisal of how well a prescribed burn accomplished its goals of reducing fuels, but they don't have any formal effectiveness monitoring. We've been providing them with detailed quantitative data about how fuel patterns changed."

For example, they observed the greatest reduction of tree densities in the smaller size classes, which is good news for fire and fuel managers, because these are the so-called ladder fuels that elevate surface fires to crown fires. As was intended, the number of large trees per acre was not significantly affected by the prescribed burns.

"Nearly half of the large pieces of down wood were consumed by prescribed fire," says Lehmkuhl. This result was surprising because large logs don't typically carry fire and are not a target of prescribed burns. However, they are important components of wildlife habitat and their loss can affect bird populations. Pileated woodpeckers, for instance, rely heavily on carpenter ants that live in down wood.

The researchers believe that drought conditions prior to the burns may have lowered fuel moisture, which may have contributed to the loss of down logs. “Efforts to retain large wood as habitat may require seasonal adjustments so as to burn when fuel moisture contents are higher and fire severity effects are lower,” Lehmkuhl says. “However, the decline in large down wood may be offset in the long-term as snags fall.”

Overall, findings from the Birds and Burns Study have reinforced the hypothesis that fire is critical for structuring bird habitat, but that species respond quite differently depending on their life histories. Prescribed fire seems to be an effective tool for reducing the risk of future severe burns, without having long-term impacts on bird populations.

**LAND MANAGEMENT IMPLICATIONS**

- Both wildfire and prescribed fire may be beneficial to the long-term persistence of bird populations, which suggests the importance of maintaining a mosaic of conditions across the landscape.

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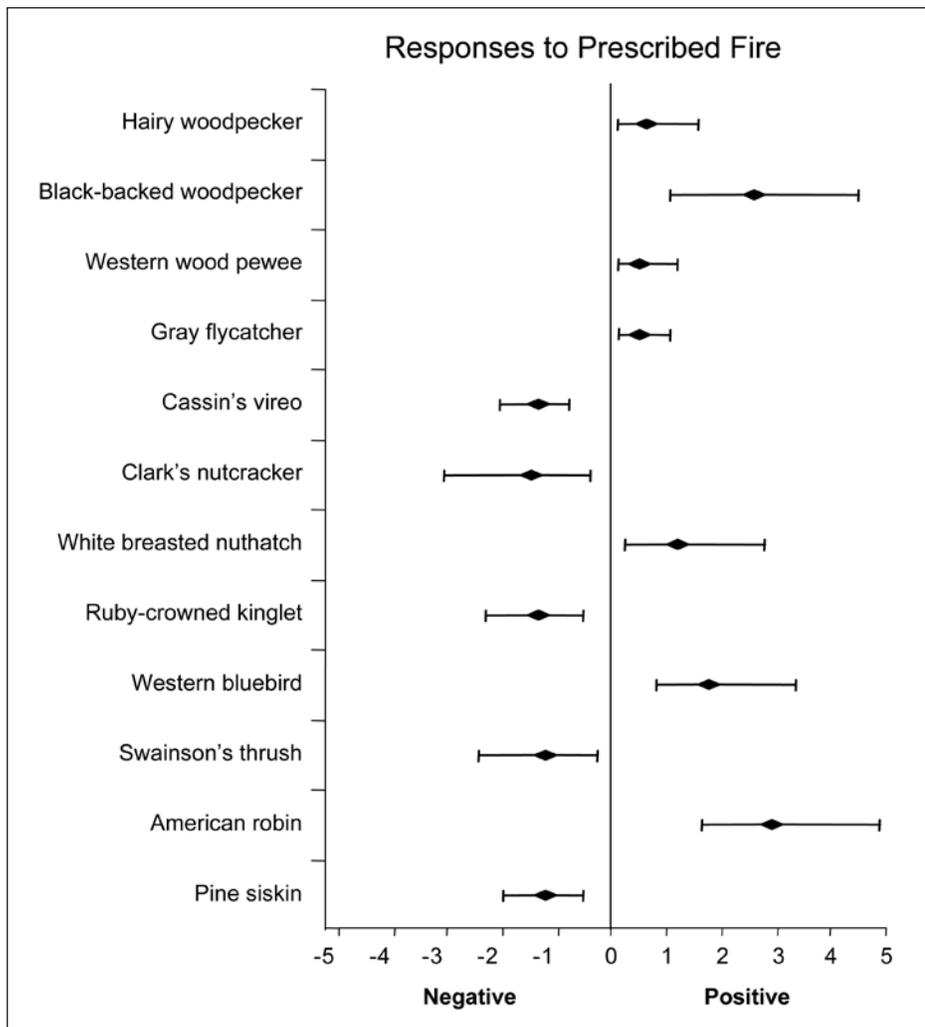
- Down wood was significantly reduced during prescribed burning. Therefore, if retaining down wood for wildlife habitat is an objective, managers may need to adjust the timing of burns to seasons when moisture content is higher.

“Of course, there will be ecological tradeoffs for selected wildlife species when managing for different fire conditions,” says Saab. “Hopefully, our data can help managers weigh the relative merits of fire exclusion,

wildfire, and prescribed fire, at least from a bird conservation perspective.”

*“There is nothing in which the birds differ more from man than the way in which they can build and yet leave a landscape as it was before.”*

—Robert Lynd



Birds have varied responses to prescribed burning. At study sites on the Okanogan-Wenatchee National Forest, species whose abundances declined after burning are indicated as negative responses, whereas species whose abundances increased after burning are indicated as positive responses. The bars indicate the nature (positive or negative) and strength (higher numbers represent stronger responses) of the relationships between species' abundances and prescribed fire.

### FOR FURTHER READING

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For more information, visit the Birds and Burns Network Web site at <http://www.rmrs.nau.edu/wildlife/birdsnburns/>.

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