

Land Manager's Guide to Cavity-Nesting Bird Habitat and Populations



in Ponderosa Pine Forests
of the Pacific Northwest



Creech slope with snags, Flammulated Owl habitat. Photo: Dan Casey, ABC



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Cover photos courtesy of Dan Casey and Bob Altman, ABC

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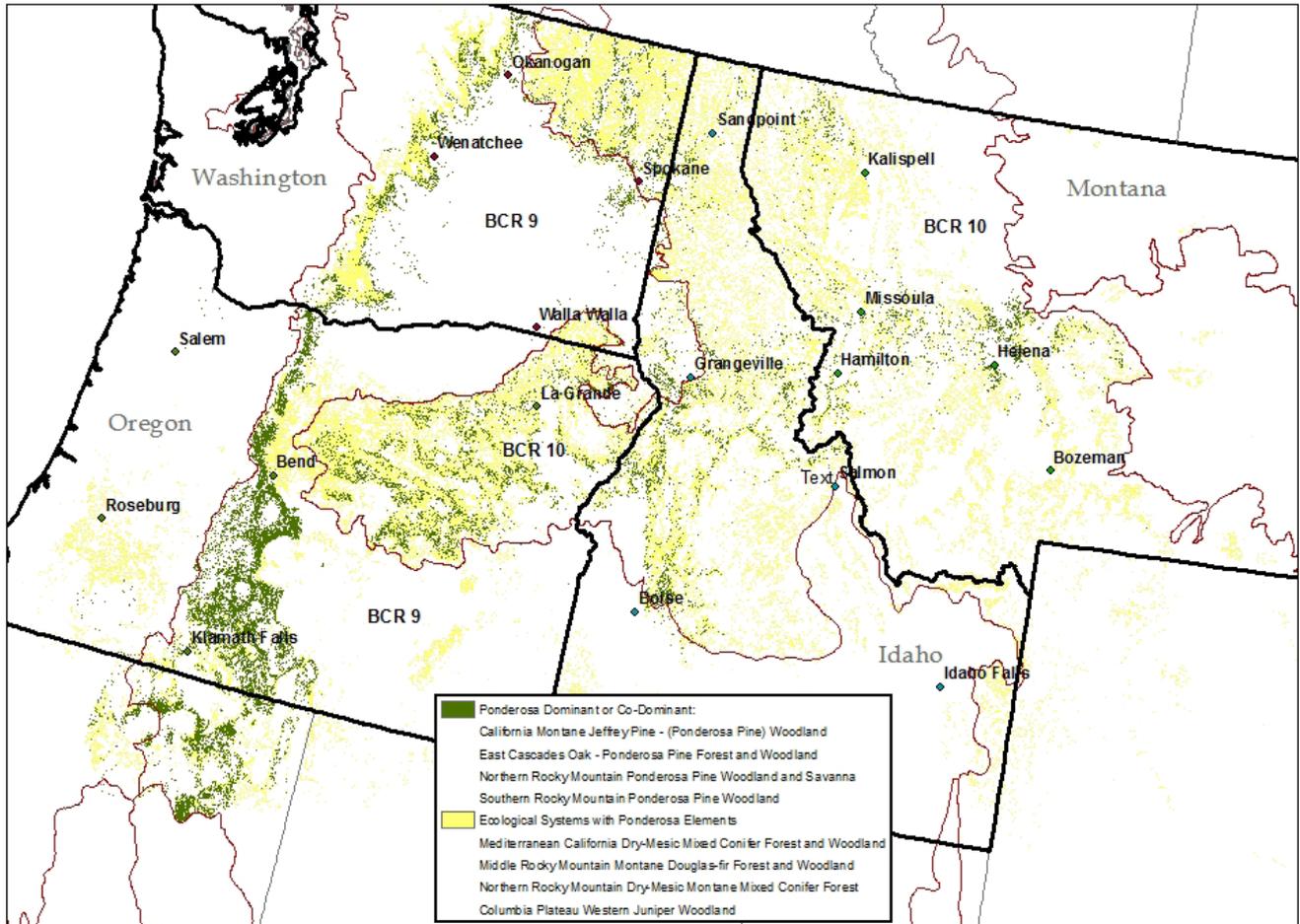
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Antrim Bull Run low snag with nest cavities. Photo: Dan Casey, ABC. TOP OF PAGE Mountain Bluebirds: Greg Homel, Natural Elements Productions

Figure 1. Distribution of ponderosa pine habitats in the four Pacific Northwest states (ID, MT, OR and WA).



Purpose of the Ponderosa Pine Cavity-Nesting Bird Guide

This Ponderosa Pine Cavity-Nesting Bird Guide is intended to provide land managers in ponderosa pine habitats with information on bird species' status, distribution, density, habitat relationships, and potential responses to habitat management or restoration activities. This information can be used to facilitate sound decisions to support bird conservation in the context of protection and management of the threatened ponderosa pine ecosystems of the Pacific Northwest.

Ponderosa Pine Forests in the Pacific Northwest

There are more than 19 million acres of dry forests dominated by ponderosa pine distributed widely in the four states of the Pacific Northwest (Figure 1). More than 40% is on private lands, but often adjacent to large expanses of public land. Ponderosa pine forests typically occur at low- to mid-elevations (2,100-6,500 ft [650-2,000 m]), often representing the first forest zone above lower elevation grasslands and sagebrush.

Historically, ponderosa pine forests, especially lower elevation forests, naturally burned at regular intervals of 5-25 years, promoting an open, uneven-aged forest, dominated by large pines with open, grassy and scattered shrub understories. Because fires were generally low-intensity ground fires, more than 70% of the acres of this forest type were stands of large, mature pines as recently as 100 years ago.

Open, park-like stands composed exclusively of ponderosa pine occurred on the driest low-elevation sites, with higher fire frequencies often on moderate to steep south- or west-facing slopes. On other sites with lower fire frequencies or different elevation, slope, or temperature/moisture regimes, ponderosa pines often occurred with a sub-dominant or co-dominant layer of juniper, Douglas-fir, Jeffrey Pine, or (rarely) grand fir.



Pygmy Nuthatch: Greg Lavaty,
www.texastargetbirds.com

Logging, habitat conversion, and fire suppression have resulted in a dramatic decrease in the quantity, quality, and distribution of mature ponderosa pine forest in the last 50 years. Low-elevation, dry forest types (especially ponderosa pine communities) were among the first trees to be harvested in the late 1800s, throughout much of the Pacific Northwest. The majority of the early logging occurred on private lands in valley bottoms, primarily in support of the railroad and mining industries. Large portions of these valley bottoms were covered with fire-maintained old-growth ponderosa pine forests. Except for small, forested remnants, conversion of these valley-bottom forests to agricultural and residential uses has been complete in most areas. Logging on higher elevation mountain slopes (primarily public lands) continued throughout the 20th Century with a peak in ponderosa pine cutting occurring in the 1960s. As a result of logging, few old-growth structured ponderosa pine stands remain.



Recently burned young ponderosa pine near Sisters, Oregon. Photo: Bob Altman

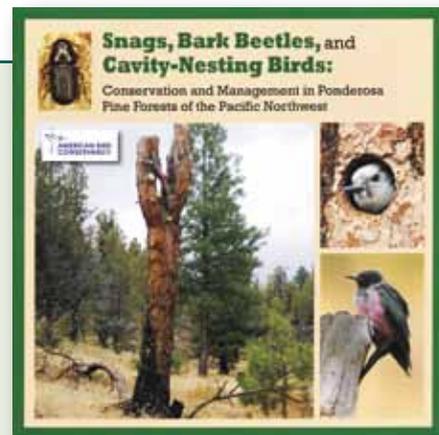
Fire suppression in Pacific Northwest forests started in the late 1800s, and had become organized and effective by the 1930s. Wildfire suppression policies and practices interrupted the natural fire cycle, and resulted in unnaturally high tree densities in ponderosa pine forests, with greater competition and less vigor and growth, more stressed trees that are highly susceptible to beetle infestations, and more flammable material to exacerbate conditions for stand-replacing fires. It also resulted in the replacement of older single- and multiple-layer forests dominated by ponderosa pine with mixed ponderosa pine/Douglas-fir stands in stem exclusion and other young structural stages. Douglas-fir regeneration in the understory creates a fire ladder, greatly increasing the potential of stand-destroying crown fires. The consequence of all these conditions is the severe wildfires and beetle infestations that have occurred in the last 10-15 years.

Much recent funding and forest management has focused on restoring ponderosa pine forests towards historic conditions, thereby improving their resiliency to large-scale mortality from wildfire and beetle infestations. The typical prescription includes thinning out the invasive, non-pine canopy trees and the unhealthy pine trees to open up the canopy. This gives the dominant trees that remain a better chance for enhanced growth and vigor to make them fire and beetle-proof.

Understory slash and debris is removed, and lower branches are pruned to open up the forest floor and reduce ground fuel levels and ladder fuels that would assist in creating conditions for stand-replacing wildfires. However, few of these restoration efforts have been implemented with specific prescriptions for the historic conditions of snag (dead, standing tree) abundance and distribution. The availability of dead or dying ponderosa pine trees for cavity-nesting birds and other wildlife is a broad-scale deficiency where otherwise ecologically-driven restoration is occurring.

American Bird Conservancy and Cavity-nesting Birds in Ponderosa Pine Forests

American Bird Conservancy (ABC), in cooperation with numerous partners, has developed a full-spectrum, regional conservation alliance to improve habitat conditions and stabilize or increase populations of cavity-nesting birds in ponderosa pine forests of the Pacific Northwest. The program emphasizes priority cavity-nesting birds such as Lewis's Woodpecker, White-headed Woodpecker, Flammulated Owl, and Williamson's Sapsucker in Oregon, Washington, Idaho, and Montana. The primary focus has been to assist landowners to incorporate management prescriptions with the specific needs of these bird species into the more general prescriptions of forest management to improve forest health. Accomplishments so far include habitat restoration and management activities on 15 properties of approximately 40,000 acres, including approximately 10,000 acres of ponderosa pine forest, thinning on approximately 200 acres, creation of 115 snags, placement of approximately 60 Lewis's Woodpecker nest boxes on 10 sites, three field demonstration days at five private landowner sites, two webinars to Natural Resources Conservation Service staff broadcast throughout the region, and two outreach booklets on cavity-nesting bird conservation (www.abcbirds.org/newsandreports/specialreports.html). Though the program emphasis is on the four species listed above, concurrent benefits are occurring to numerous other birds and wildlife species in ponderosa pine forests including Mountain and Western Bluebird and Pygmy Nuthatch, bats, and northern flying squirrels.



Bird Conservation Regions (BCRs)

This Guide covers ponderosa pine ecosystems in the four U.S. states of the Pacific Northwest, from their western extent along the east slope of the Cascade Mountains in Oregon and Washington and into the Klamath Mountains of southwestern Oregon, north to the Canadian border, east to the southeastern hills of Montana, and south to the California border with Oregon (Figure 1). This area includes the following three Bird Conservation Regions (BCRs), which are aggregations of ecoregions with similar bird communities, habitats, and resource management issues.

Northern Pacific Rainforest (BCR 5)

The Northern Pacific Rainforest BCR in the Pacific Northwest includes all of Oregon and Washington west of the crest of the Cascade Mountains. Its maritime climate is characterized by heavy precipitation and mild temperatures. The region is dominated by forests of western hemlock and Sitka spruce, except for the Klamath Mountains ecoregion of southwestern Oregon, where drier forest types, including ponderosa pine, are more important. Characteristic ponderosa pine cavity-nesting bird species include Western Bluebird and White-headed Woodpecker.

Great Basin (BCR 9)

The Great Basin BCR in the Pacific Northwest includes the Northern Basin and Range ecoregion in Oregon, and the Columbia Plateau and the East-slope of the Cascade Mountains ecoregion in Oregon and Washington. It is characterized by dry ecosystems due to its position in the rain shadow of the Cascade Mountains, including grassland and sagebrush in the intermountain areas, and dry forests of ponderosa pine in the transition to the montane forests. Characteristic ponderosa pine cavity-nesting bird species include Lewis's Woodpecker, White-breasted Nuthatch, and White-headed Woodpecker.

Northern Rockies (BCR 10)

The Northern Rockies BCR in the Pacific Northwest includes the Northern Rocky Mountains and the intermontane Wyoming Basin ecoregions, and the Blue Mountains ecoregion of eastern Oregon, southeastern Washington,



White-headed Woodpecker: Alan Wilson

northern Idaho, and Montana west of the Continental Divide. It is characterized by a variety of coniferous forest habitats, including ponderosa pine forests in the drier areas. Characteristic ponderosa pine cavity-nesting bird species include Flammulated Owl, Mountain Bluebird, Pygmy Nuthatch, and Williamson's Sapsucker.

Ponderosa Pine Ecosystems and Habitat Types

There are four ecological systems in the Pacific Northwest where ponderosa pine is the dominant landscape element (Figure 1):

California Montane Jeffrey Pine/(Ponderosa Pine) Woodland. This ecological system is found on relatively dry sites in mountains and plateaus in southern Oregon from 1,800-5,000 ft (550-1525 m) in elevation. Stands are pure Jeffrey pine, ponderosa pine, or a mix of the two, with shrub understories including sagebrush, skunkbush sumac, snowberry, ceanothus, and mountain mahogany.

East Cascades Oak/Ponderosa Pine Forest and Woodland. This ecological system appears at or near lower tree line in the foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge. It also occurs in the adjacent Columbia Plateau ecoregion. Elevations range from 1,500-6,300 ft (460-1920 m). Most occurrences of this system are dominated by a mix of Oregon white oak and ponderosa pine or Douglas-fir. The understory may include dense stands of shrubs, including skunkbush sumac, sagebrush, or rabbitbrush. More often, they are dominated by grasses, sedges, or forbs.

Northern Rocky Mountain Ponderosa Pine Woodland and Savanna. This ecological system occurs in the foothills of the northern Rocky Mountains in the Columbia Plateau region and eastern Cascades into southern interior British Columbia. These woodlands and savannas occur at the lower tree line between grasslands or shrublands and coniferous forests typically in warm, dry, exposed sites. Elevations range from 1,650-5,250 ft (500-1,600 m). Ponderosa pine is the predominant conifer, but Douglas-fir is occasionally present in the tree canopy. The understory can include a wide variety of shrub species, from sagebrush to chokecherry and serviceberry. Understory vegetation in the true savanna



Flammulated Owl: Greg Homel, Natural Elements Productions



Western Bluebird: Greg Homel, Natural Elements Productions

occurrences is predominantly fire-resistant grasses and forbs, such as dry sedges and ryegrass, that re-sprout following surface fires.



Ponderosa pine savanna. Bob Altman, ABC

Southern Rocky Mountain Ponderosa Pine Woodland. This widespread ecological system is most common throughout the Rocky Mountains, from the Greater Yellowstone region of Montana and Idaho south. These woodlands occur at the lower tree line between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. Ponderosa pine dominates, but Douglas-fir, lodgepole pine, aspen, and juniper may be present in the tree canopy. The understory is usually a mixture of a

wide variety of grasses, with shrubs such as sagebrush, skunkbush sumac, mountain mahogany, Gambel's oak, snowberry, chokecherry, and rose.

Within these ecological systems, ponderosa pine habitats can be categorized into five general types:

Pine Savannah. The most open habitats where ponderosa pine is the dominant tree species are considered savanna, generally characterized by widely spaced trees whose canopies cover less than 10% of the landscape. These open, park-like stands have an understory dominated by grasses and forbs. They were historically dominated by older (>150 year-old) pines. Characteristic cavity-nesting bird species include Lewis's Woodpecker and Western Bluebird.

Pine Woodland. Ponderosa pine woodlands are defined as those stands with open (10-40%) canopies, and understories with varying mixes of grasses, forbs, and shrubs. Lodgepole pine, juniper, aspen, Douglas-fir, and other tree species

may be intermixed. Like savanna types, these open woodlands were historically dominated by older trees and maintained by frequent, low-intensity fires. Characteristic cavity-nesting bird species include Mountain Bluebird and White-headed Woodpecker.

Pine Forest. Ponderosa pine forests are defined as stands with >40% canopy coverage of >40%. Douglas-fir, oak, larch, aspen, lodgepole pine, or grand fir may comprise a component of the forest. Dominant understory shrubs vary across the region, from snowberry and currant to Ceanothus and manzanita. Characteristic cavity-nesting bird species include Pygmy Nuthatch and White-breasted Nuthatch.

Mixed Pine/Conifer. Mixed pine/conifer forests are dry forests composed of a co-dominant mix of ponderosa pine, Douglas-fir, and occasionally grand fir. They are typically found on more Pacific-influenced sites that are slightly higher, cooler, and wetter than adjacent ponderosa pine habitats, but still too warm and dry for most other conifers. Characteristic cavity-nesting bird species include Flammulated Owl and Williamson's Sapsucker.

Pine/Juniper. Ponderosa pine can occur as a co-dominant species with Rocky Mountain juniper on the driest sites with poor soils. This usually occurs at lower elevations in the forest transition zone, where the understory is often dominated by sagebrush species, and the growth form of the pines can be stunted. Characteristic cavity-nesting bird species include Mountain Bluebird and Western Bluebird.



Ponderosa pine/Juniper woodland habitats can include open areas with suitable nesting snags, but fire risk increases with juniper density (Ochoco National Forest, OR). Photo: Dan Casey, ABC



Lewis's Woodpecker: Tom Grey



Short snag, Antrim Bull Run.
Photo: Dan Casey, ABC

Ponderosa Pine Snags and Cavity-Nesting Birds

Ponderosa pine trees generally produce excellent snags for birds, due in part to their high proportion of sapwood (the outer tree layer). Sapwood decays fast in dead pine trees, and this thick layer provides a deep area of material for cavity excavation. The hollow cores that often develop in older trees are not as common in ponderosa pine as other conifers, but are occasionally caused by heart rot fungi or fires.

Snags are classified for wildlife in a number of ways. One key characteristic is the soundness of the wood, and is described as either “hard” or “soft.” The wood in hard snags is essentially solid, while soft snags are in an advanced state of decay. Some birds only excavate in soft snags. Others, including most woodpeckers, typically require harder snags because of the stability they provide for nest cavities.

Patterns of decay of snags vary based on many factors including fungi in the wood, how the tree died, and the age of the tree. Other characteristics of snags important to cavity-nesting birds include the size (diameter and height), and their location and arrangement within the forest. In ponderosa pine stands and throughout western conifer forests, large snags are valuable habitat elements because they stand longer and provide higher quality foraging and nesting opportunities for more species.

Snags provide essential habitat for approximately one quarter of all breeding birds in western coniferous forests. Dead trees are used by birds for foraging, cavity nesting, perching, food storage and drumming (pecking against the tree to communicate). Some birds, such as sapsuckers and woodpeckers, excavate their own nests in snags (primary cavity nesters). Other birds occupy abandoned or natural cavities (secondary cavity nesters). Primary cavity nesters are considered “keystone species” because of the role they play in providing habitat for many other species, and their declines could have cascading effects in the ecosystem.

In addition to nesting habitat, snags provide food for many of these same species by way of insects beneath the bark. Most cavity-nesting birds consume large quantities of insects each year. Woodpeckers remove the outer bark from infested

Table I. Priority cavity-nesting bird species associated with ponderosa pine forests in the Pacific Northwest

Species	USFWS BCC ¹			State Wildlife Action Plans ²			
	BCR 5 ³	BCR 9 ³	BCR 10 ³	ID	MT	OR	WA
Flammulated Owl		X	X	X	X	EC,BM	OK,BM,RM,CP
Lewis's Woodpecker			X	X	X	CP,EC,KM,BM	OK,BM,RM,CP
Mountain Bluebird							
Pygmy Nuthatch			X				OK,BM,RM
White-breasted Nuthatch							
White-headed Woodpecker		X	X	X		EC,KM,BM	OK,BM,CP
Williamson's Sapsucker		X	X				
Western Bluebird							

¹ USFWS BCC = U.S. Fish and Wildlife Service Birds of Conservation Concern www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008.pdf

² Ecoregions as defined in the State Plans: EC = East-slope Cascades, BM = Blue Mountains, RM = Rocky Mountains, CP = Columbia Plateau, KM = Klamath Mountains, OK = Okanogan

³ BCR 5 = Northern Pacific Rainforest, BCR 9 = Great Basin, BCR 10 = Northern Rockies

trees to feed on the larvae, and can play a significant role in reducing the number of bark beetles within a tree. Additionally, beetle larvae that are not eaten are left with only a thin layer of protective bark, increasing their susceptibility to desiccation and parasitism. This “biological control” by woodpeckers can help stabilize conditions at low beetle population levels, but their action alone cannot control outbreaks.

As a consequence of habitat loss and degradation, and the altered ecology of ponderosa pine forests, several cavity-nesting bird species that are highly

Large Scale Beetle-Kill Tree Mortality and Cavity-Nesting Birds: All Snags are not Created Equal

There are a variety of bark beetles that occur naturally at low levels in western forests, but under particular circumstances (e.g., periods of drought with stressed trees, overstocked forests) can cause infestations that result in significant tree mortality. The large-scale beetle outbreaks in western forests in recent years that have received significant press have occurred predominately in lodgepole pine forests from mountain pine beetles. These forests naturally occur in densely packed stands of relatively small trees that evolved with large-scale mortality.

Unlike lodgepole pine forests, ponderosa pine forests are mostly inhabited by western pine beetles. These forests were historically more open, most of the tree mortality from beetle kill was local and patchy, and large-scale tree mortality was rare compared to lodgepole pine forests. Under current conditions of fire suppression, dense forests of ponderosa pine and mixed conifer species are undergoing more large-scale mortality from beetle infestations or wildfire, either directly or indirectly when mixed or adjacent to lodgepole pine.

When beetle-kill tree mortality does occur in ponderosa pine forests, the potential value of this habitat to priority cavity-nesting bird species can be limited based on the following factors:

- ✓ If the mortality occurs on private industrial or family forest lands, the dead trees are almost always removed.
- ✓ If the mortality occurs on public lands, some level of salvage often occurs.
- ✓ If the dead trees are not removed, their value to priority bird species depends on numerous species-specific factors including tree size, condition, and particularly location or context in the immediate and broader landscape. Most ponderosa pine cavity-nesting bird species evolved to utilize scattered or small clumps of snags that occurred in the natural process of aging or decay within an otherwise intact living forest. Thus, the specific habitat conditions required by these bird species are unlikely to be met by the random and often all-consuming beetle-kill or wildfire.



Western pine beetle damage. Photo: Kenneth E. Gibson,
USDA Forest Service, Bugwood.org

associated with these forests have experienced significant population declines and/or local extirpations. These include four species, Lewis's Woodpecker, White-headed Woodpecker, Flammulated Owl, and Williamson's Sapsucker, that have been identified as priority species for conservation by many conservation organizations and natural resource management agencies (Table 1). Some other ponderosa pine cavity-nesting species include Pygmy Nuthatch, White-breasted Nuthatch, Mountain Bluebird, and Western Bluebird.

Snag Retention and Creation for the Conservation of Ponderosa Pine Cavity-Nesting Birds

Retaining and recruiting snags is the primary approach to maintaining cavity-nesting bird habitat. A range of soft to hard snags should be present. Typically, all soft snags should be retained, as they have little if any commercial value and are hazardous to cut. Hard, sound snags should be retained wherever possible when snag resources are lacking.

If all snags cannot be retained, land managers should try to leave dead or dying trees that have the following characteristics:

- ✓ large diameters, especially those >21 inch (53 cm) diameter at breast height (dbh)
- ✓ existing woodpecker holes or cavities
- ✓ conks of heart rot fungi, wounds or scars from fire, lightning or mechanical damage
- ✓ both sound and decayed wood
- ✓ occur in areas of both low and high tree density, and across a range of topography (ridges, slopes, and bottomland)
- ✓ arranged as solitary dead trees or in small clumps

When conducting forest management such as thinning, it is also important to retain some trees that are likely to be good snags in the future. These snag



Recently broken pine snag, Antrim Bull Run.
Photo: Dan Casey, ABC



Snag on Dovenberg property. Photo: Dan Casey, ABC

recruitment trees should be as large as possible, and may have sections of dead wood, scars, and features that predispose them to dying, such as sparse, declining crowns or broken tops.

In areas where dead trees are deficient, snag creation will create or enhance habitat for cavity-nesting birds. Snag creation may require balancing the needs of cavity-nesting birds with other objectives. Developing a snag management plan will help landowners and managers determine the areas to make snags, selection of individual trees, and the best methods to use. In areas where tree density is too high, snag creation should be done after activities such as thinning and slash removal are completed. Additional considerations include:

- ✓ Most snags should be well-distributed because of the territorial requirements of cavity-nesting birds. However, clumps of snags also can be beneficial for some species, especially for foraging. Consider the position of a snag in the landscape and in relation to other trees relative to the habitat needs of priority or local cavity-nesting birds.
- ✓ Select mostly larger trees to meet the habitat needs of a greater number of bird species.
- ✓ If tree harvest economics is a consideration, select deformed trees or trees of low economic value such as curved trunks.
- ✓ Avoid creating snags near structures or roads and other areas where falling trees pose a safety risk.
- ✓ Avoid creating snags in areas where high tree densities may result in elevated bark beetle mortality.

There are three primary methods for creating ponderosa pine snags. Descriptions of the techniques and trade-offs related to costs, equipment, safety etc. are described in a variety of sources (e.g. <http://wdfw.wa.gov/living/snags/>; <http://www.ingentaconnect.com/content/saf/wjaf/1998/00000013/00000003/art00006>).

Girdling uses a chainsaw to sever the bark and cambium. Two cuts around the full diameter of the trunk are made about 8-10 inches apart and the bark between the two cuts is removed.

Topping involves climbing a tree or using mechanized logging equipment to remove the top at a desired height, followed by disposing of live limbs below the topped section.

Pheromone Attractants is a recently tested method that shows promise as an effective snag-creation technique that uses pheromones of naturally occurring bark beetles to target mortality to specific trees.

The Role of Nest Boxes in the Conservation of Ponderosa Pine Cavity-Nesting Birds

The provision of nest boxes or artificial cavities has played an important role in the conservation of many different cavity-nesting bird species, from “backyard” birds such as the Purple Martin and bluebirds, to Wood Ducks and owls. Nest boxes represent a potential conservation tool that, if used judiciously, may help maintain and perhaps expand populations until sufficient snag abundance and distribution can be achieved at a site. They provide multiple benefits: they are accessible to researchers to assess nesting ecology and reproduction, or to band young for studies of survival and site fidelity; they allow viewing opportunities for landowners where the species might not otherwise nest; and, depending on the species (e.g., swallows and bluebirds), they provide some measure of insect pest control near orchards and homes. They also provide an opportunity for landowners to see firsthand the effect that providing suitable nest sites can have.



Nest boxes can serve as an interim measure to attract Lewis's Woodpeckers or other cavity nesters until created snags (in this case a tree girdled about 30 ft off the ground) become suitable for nesting (Bitterroot Valley, MT) Photo: Dan Casey, ABC

Nest Boxes Aid Lewis's Woodpecker Population in Central Oregon

Lewis's Woodpeckers: www.kevinsmithnaturephotos.com



In 1990, the Aubrey Hall fire burned about 3,000 acres on Forest Service land just outside the city limits of Bend, Oregon. Lewis's Woodpeckers began to use the site as the dead trees provided nesting opportunities. However, after about ten years, many of the snags had fallen and the population of woodpeckers was dropping.

In 2003, volunteers of the East Cascades Bird Conservancy (now East Cascades Audubon Society) put up four experimental nest boxes for Lewis's Woodpeckers based on the knowledge that they are weak excavators and will modify existing partial cavities, and that Northern Flickers are occasionally known to use nest boxes. The first three years were unsuccessful other than one pair laying eggs in 2003, but losing them to predators. However, this provided time to learn about how to deal with starlings (timing of when the boxes are opened), the amount of wood shavings to put in the box as nesting

substrate (six inches), and other factors such as sticking bark on the front of the box. After the modifications, in 2006, eight of the 16 available boxes were used by Lewis's Woodpeckers and all fledged young birds. Since then, 8-12 boxes are regularly used by Lewis's Woodpeckers, and some boxes placed at other sites in the region are also being used. American Bird Conservancy has expanded the effort by placing Lewis's Woodpecker nest boxes at many sites on private lands throughout the Pacific Northwest as part of its Ponderosa Pine Cavity-Nesting Bird Conservation Program.

In cases where habitat structure, vegetation type, and suitable insect prey base exist, but snags are lacking, nest boxes can serve as a useful short-term tool to attract cavity-nesting birds. However, they should not be viewed as a long-term alternative to snag retention, recruitment, and creation, which will provide more sustainable habitat quality over the long term. Nest boxes only provide for one aspect of the function of snags for birds – nesting and roosting cavities. This may be sufficient for cavity-nesting birds that do not forage in association with the snags. However, for most woodpeckers, snags are used not only for nesting, but are also important as a foraging substrate for insects within the decaying bark.

Non-Snag Habitat Requirements for Ponderosa Pine Cavity-Nesting Birds

Snags are an essential habitat feature for cavity-nesting birds, but they are only suitable when they occur in the context of the other habitat elements required by each bird species. These non-snag features are highly variable among species (Appendix A). Therefore, decisions regarding what species to manage for require local knowledge of species' ranges and their conservation priority status, prior to implementing habitat prescriptions. In general, throughout most of the Pacific Northwest, where geographically and ecologically appropriate, White-headed Woodpecker, Lewis's Woodpecker, and Flammulated Owl are usually the highest priority (Table 1).

One of the primary non-snag restoration and management activities for ponderosa pine habitat is thinning the degraded, dense, mixed-conifer forests that were historically ponderosa pine to the historic canopy and understory conditions with which the species evolved. These can be highly variable, from the open savannah conditions preferred by Lewis's Woodpecker and Western and Mountain Bluebirds to the more closed canopies used by Williamson's Sapsucker and Pygmy and White-breasted Nuthatch. Additionally, a species such as the Flammulated Owl requires a mosaic of both open and closed canopies, including meadows for foraging and dense thickets for daytime roosting and cover. Shrub cover in the understory can be important for Lewis's Woodpecker by providing a substrate for insect productivity to support its aerial flycatching, but can be detrimental by also providing small mammal predators cover and access to the low nests of White-headed Woodpeckers if the shrubs are adjacent to nesting snags.



Degraded ponderosa pine stands with high densities of Douglas-fir in the understory and canopy can still represent high fire risk, even when partially thinned (near Council, ID).
Photo: Dan Casey, ABC

Appendix A. Ponderosa Pine Bird Species Accounts

Key to the Species Accounts

Population Status and Trends:

BBS = Breeding Bird Survey www.mbr-pwrc.usgs.gov/bbs/trend/tf10.html

All three Bird Conservation Regions (BCR) include areas outside our definition of the Pacific Northwest, thus BBS trend data for a BCR reflects the entire BCR and not just that portion within the Pacific Northwest.

GB = Great Basin is a BCR in the Pacific Northwest that includes parts of eastern Washington, eastern Oregon and southern Idaho.

NR = Northern Rockies is a BCR in the Pacific Northwest that includes parts of eastern Oregon, eastern and northern Idaho, and western Montana.

NPR = Northern Pacific Rainforest is a BCR in the Pacific Northwest that includes western Oregon (OR) and western Washington (WA). Ponderosa pine habitat primarily only occurs in the Klamath Mountains ecoregion of southwestern Oregon.

All statistically significant trends¹ are in bold. For species that are not obligate to ponderosa pine habitats (most species), trends represent their status in all habitats in which they occur.

Nest Location and Timing:

The locations and dates are those most typical for each species. However, nesting dates also can vary with elevation and latitude – e.g., nesting and finishing earlier in lower elevations and more southerly locations.

Breeding Range in Ponderosa Pine Habitats:

The basic geographic scope of each species breeding range. However, nesting at a particular site or area within the range is based on local and/or landscape factors.

Comments:

Noteworthy observations relative to a species ecology or conservation that might be useful to a land manager.

Ponderosa Pine Habitat Conditions/Relationships:

This summary only included results from studies in ponderosa pine or mixed ponderosa pine types during the breeding season that reported significant correlations between species abundance and habitat variables.

dbh = diameter at breast height

Optimal Ponderosa Pine Habitat:

The habitat conditions (e.g., tree size, canopy cover, shrub cover) most suitable for the species in ponderosa pine habitats. Species may occur outside these conditions in lesser quality ponderosa pine or other habitats.

FLAMMULATED OWL

(*Otus flammeolus*)

Population Status and Trends: No BBS trend data.¹ Flammulated Owls are almost strictly nocturnal, and BBS data are inadequate to establish trends. Its preference for mature open dry forests means it has probably declined in population during this century, although the species is poorly monitored throughout much of its range.

Nest Location and Timing: Nest in natural cavities or those excavated by woodpeckers usually 8-15 meters (25-50 ft) above ground. Nesting occurs primarily from early May into early July.

Breeding Range in Ponderosa Pine Habitats: Distributed throughout ponderosa pine habitat in the Pacific Northwest except the Klamath Mountains ecoregion of southwest Oregon.

Comments: Long-distance Migrant. Ponderosa pine breeding habitat for Flammulated Owls consists primarily of mid-elevation, mature to old-growth pure ponderosa pine or mixed ponderosa pine/Douglas-fir. Consistently select habitat that combines open forest stands with moderate to large trees and snags for nesting and foraging, occasional clusters of thick patches of small understory trees for roosting and calling, and adjacent grassland openings that provide optimum edge habitat for foraging. They feed almost entirely on insects, especially moths and beetles.

Ponderosa Pine Habitat Conditions/Relationships:

Northern Rockies

- in northeastern Oregon, breeding season mean home range 10.3 ac (4.2 ha), but 15.9 ac (6.4 ha) during incubation; roosts averaged 53 m (174 ft) from nests during nestling period; roosted in mixed conifer forest more than expected from availability, and avoided roosting in ponderosa pine forest; high foliage density key component of roost sites; nested primarily in ponderosa pine snags (85%); nest sites characterized by canopy cover <50%, mature trees 30-50 cm dbh (12-20 in dbh), stands with multi-layered cano-

pies within 30 m (100 ft) of a clearing; mean nest tree dbh 56.3 cm (22 in) and height 26.6 m (87 ft)²

- in northeastern Oregon, nested in stands of large-diameter (>50 cm dbh [20 in]) ponderosa pine and Douglas-fir or grand fir with ponderosa pine in the overstory (Bull and Anderson 1978, Bull et al. 1990)
- in central Idaho, occupied relatively open, multi-storied Douglas-fir, ponderosa pine, and mixed conifer stands with some mature trees usually present³
- in Montana's Bitterroot Valley, absent unless the larger landscape consisted of low canopy cover ponderosa pine/Douglas-fir forests, and then only where grassland or xeric shrubland openings were present at a home-range scale; not found on otherwise suitable sites when the surrounding landscape was predominantly moister coniferous forest types, and less abundant in ponderosa pine/Douglas-fir landscapes that were heavily logged (even-aged cuts)⁴
- in British Columbia, nested in mature/old-growth (>100 year-old) Douglas-fir and Douglas-fir/ponderosa pine stands; densities highest in stands 140-200+ years old; restricted to open stands with multi-layered canopies and an abundance of large, well-spaced trees interspersed with grassy openings up to two ha in size; regenerating thickets within stands used for roosting⁵

Optimal Ponderosa Pine Breeding Habitat: Relatively open (20-50% canopy cover) mature forests with >3 snags/ha (>1.2 snags/ac) >46 cm dbh (>18 in dbh), small patches of dense saplings and/or young trees for roosting or calling, 10-30% shrub layer cover substrate for production of insect prey, and small grassy openings <2 ha (>0.40 ac) or adjacent to similar larger grasslands for foraging.



Hugh Ranson

LEWIS'S WOODPECKER

(*Melanerpes lewisii*)

Population Status and Trends: BBS trend data indicates relatively stable trends in the Great Basin, but substantial declining trends elsewhere including a long-term significantly declining trend in the Northern Rockies.¹

Bird Conservation Region	Annual % Change	
	1966-2010	2000-2010
Great Basin	0.08	0.32
Northern Rockies	-4.32	-2.58
Northern Pacific Rainforest	-3.03	-1.99

Nest Location and Timing: Nest in natural cavities or those they excavate in soft wood at variable heights 4-15 m (13-50 ft) above ground. Will use nest boxes. Nesting occurs primarily from late April into early July.

Breeding Range in Ponderosa Pine Habitats: Distributed throughout ponderosa pine habitat in the Pacific Northwest.

Comments: Short-distant Migrant. Lewis's Woodpeckers are most associated with an open forest canopy and sub-canopy that permits flycatching foraging maneuvers, moderate to dense understory shrub cover to generate an abundance of insects, and large snags for nesting cavities. Highly associated with burned forests where they can reach high nesting densities. In unburned forests necessary snag and understory conditions are generally found in older forests. Also occur in oak and oak-pine habitat in the Cascade Mountains of Oregon and Washington, and cottonwood riparian forest throughout the Pacific Northwest. In addition to its unique aerial flycatching behavior among woodpeckers, it also feeds on ripe fruits and acorns outside the breeding season. Proximity to water (especially with riparian shrubs) enhances prey availability.



Bill Hubick

Ponderosa Pine Habitat Conditions/Relationships:

Great Basin

- in north-central Oregon, mean nest height in ponderosa pine trees (pine-oak habitat) 12 m (40 ft) (range 6-20 m [20-62 ft]); mean dbh for nest trees 76 cm (30 in) (range 41-109 cm [16-43 in]); used all stages of ponderosa pine tree decay for nesting; canopy cover around nest tree mostly <30%⁶

Northern Rockies

- in the Bitterroot Valley of Montana, nested in ponderosa pine trees with mean dbh of 105 cm (41.5 in); mean cavity height 12 m (39 ft) in trees averaging 21 m tall (65.9 ft); all nests in snags (moderate decay, class 3-4) or dead-topped live trees⁷
- in burned forest of central Idaho, favored partially logged areas to unlogged areas⁸
- in unlogged ponderosa pine/Douglas-fir burned forest of western Idaho, mean dbh of nest trees 51.4 cm (20 in)⁹

Optimal Ponderosa Pine Breeding Habitat: Open ponderosa pine forest with <30% canopy cover, >50% shrub cover, >3 soft snags/ha (>0.40/soft snags/ac) >53 cm dbh (>21 in dbh) and >9 m (>30 ft) tall with >2.5 soft snags/ha (>1 soft snag/ac) >81 cm dbh (>32 in dbh).

MOUNTAIN BLUEBIRD

(*Sialia currucoides*)

Population Status and Trends: BBS trend data indicates non-significant increasing trends where most of the population occurs in the Great Basin and Northern Rockies, but substantial declining trends, including a significant long-term declining trend in the Northern Pacific Rainforest.¹

Bird Conservation Region	Annual % Change	
	1966-2010	2000-2010
Great Basin	0.89	1.48
Northern Rockies	0.88	1.49
Northern Pacific Rainforest	-5.03	-4.10

Nest Location and Timing: Nest in natural cavities or those excavated by woodpeckers at relatively low heights usually within 3 m (10 ft) above ground. Nesting occurs primarily from late April into early July.

Breeding Range in Ponderosa Pine Habitats: Distributed throughout ponderosa pine habitat in the Pacific Northwest except the Klamath Mountains ecoregion of southwest Oregon.

Comments: Resident. Mountain Bluebird habitat is open woodland and forest edges with exposed substrates for perching, natural or article cavities for nesting, and open understories with short and sparse ground cover for foraging. They are highly associated with burned forest and to a lesser extent logged areas where snags are present and shrub cover is low. They forage from exposed perches where they drop down to ground to capture insect prey.



Dan Casey, ABC

Ponderosa Pine Habitat Conditions/Relationships:

Northern Rockies

- in burned forest of central Idaho, favored unlogged areas to logged areas; used snags with smaller diameters than the average available snags with a woodpecker cavity and used available cavities surrounded by higher than average snag densities for nesting⁸
- in unlogged ponderosa pine/Douglas-fir burned forest of western Idaho, mean dbh of nest trees 39.5 cm (16 in)⁹

Optimal Ponderosa Pine Breeding Habitat: Ponderosa pine savanna and open woodland (<35% canopy cover), low shrub cover (<25%), a short, sparsely vegetated ground cover, and >5 snags/ha (>2 snags/ac) > 40 cm dbh (>16 in dbh).

PYGMY NUTHATCH

(*Sitta pygmaea*)

Population Status and Trends: BBS trend data indicates non-significant and mostly increasing trends throughout the Pacific Northwest except for short-term declining trends in the Great Basin and Northern Rockies.¹

Bird Conservation Region	Annual % Change	
	1966-2010	2000-2010
Great Basin	0.84	-1.23
Northern Rockies	2.82	-0.99
Northern Pacific Rainforest	2.01	1.72

Nest Location and Timing: Nest in natural cavities, those excavated by woodpeckers, or those they excavate in soft wood at variable heights from 3-15 m (10-50 ft) above ground. Will use nest boxes and will nest near or far away from human settlement. Nesting occurs primarily from the end of April through late June.

Breeding Range in Ponderosa Pine Habitats: Distributed throughout ponderosa pine habitat in the Pacific Northwest except the Klamath Mountains ecoregion of southwest Oregon.

Comments: Resident. Near obligate to ponderosa pine habitat in the Pacific Northwest. Prefers mature/old-growth forest where snags and natural cavities are more prevalent, there is heterogeneity in forest structure, and a relatively open canopy although can be found in a wide range of canopy cover. Nests in dead trees, although essentially all foraging is in live canopy. Large, hollow ponderosa pine snags important as winter roost sites, where as many as 150 individuals have been reported roosting in a single tree.



Greg Homel, Natural Elements Productions

Ponderosa Pine Habitat Conditions/Relationships:

Great Basin

- in managed ponderosa pine forests in the Cascade Mountains of southcentral Washington, occurred in low densities (0.01 birds/ha [<0.01 birds/ac]) in pre-commercially thinned stands, but absent in unthinned stands¹⁰

Northern Rockies

- in western Montana, found in mature or old growth pine with $<70\%$ canopy cover¹¹
- in western Montana, eleven of 12 nests in ponderosa pines; mean nest cavity height 3.3 m (10.8 ft) (range = 0.9-6.5 m [3.0 -21.3]) and mean dbh 36.3 cm (14.3 in) (range 14-59 cm [5.5 - 23.2 in])¹²
- in Blue Mountains of northeast Oregon, mean dbh of nest trees 54.6 cm (22 in) (range 18-93 cm dbh [7-37 in dbh]); preferred snags in decay class 2; areas around nests characterized by open forest with large stems¹³

Optimal Ponderosa Pine Breeding Habitat: Moderately open to closed canopy (30-70% canopy cover) in mature or old-growth forest with well-developed live canopies for feeding and >3 snags/ha (1.2 snags/ac) >53 cm dbh (>21 in dbh) including at least one large, hollow pine snag/ha (0.40/ac) for roosting.

WESTERN BLUEBIRD

(*Sialia mexicana*)

Population Status and Trends: BBS trend data indicates relatively stable and non-significant long and short-term trends in the Northern Rockies and Northern Pacific Rainforest, but substantial and significant increasing long- and short-term trends in the Great Basin.¹

Bird Conservation Region	Annual % Change	
	1966-2010	2000-2010
Great Basin	3.87	4.97
Northern Rockies	0.65	2.77
Northern Pacific Rainforest	-0.73	0.04

Nest Location and Timing: Nest in natural cavities or those excavated by woodpeckers at relatively low heights usually within 3 m (10 ft) above ground. Nesting occurs primarily from mid April into early July.

Breeding Range in Ponderosa Pine Habitats: Distributed throughout ponderosa pine habitat in the Pacific Northwest.

Comments: Short-distance Migrant. Western Bluebird habitat is open woodland and forest edges with exposed substrates for perching, natural or article cavities for nesting, and open understories with short and sparse ground cover for foraging. They also occur in burned forest and logged areas where snags are present and shrub cover is low. They forage from exposed perches where they drop down to ground to capture insect prey.



Tom Grey

Ponderosa Pine Habitat Conditions/Relationships:

Northern Rockies

- in burned forest of central Idaho, favored partially salvaged areas over unlogged areas; used snags with smaller diameters than the average available snags with a woodpecker cavity and used available cavities surrounded by higher than average snag densities for nesting; a negative association with snag diameter – used nest cavities in the smaller range of snag diameters⁸

- in unlogged ponderosa pine/Douglas-fir burned forest of western Idaho, mean dbh of nest trees 35.3 cm (14 in)⁹

Optimal Ponderosa Pine Breeding Habitat: Ponderosa pine savanna and open woodland with low canopy cover (<35%), low shrub cover (<25%), a short, sparsely vegetated ground cover, and >5 snags/ha (>2 snags/ac) > 36 cm dbh (>14 in dbh).

WHITE-BREASTED NUTHATCH

(*Sitta carolinensis*)

Population Status and Trends: BBS trend data indicates increasing trends in the Great Basin and Northern Rockies, including significant long and short-term trends in the Great Basin.¹ Populations in the Northern Pacific Rainforest, with significant long-term declines and non-significant short-term increases, are of a different subspecies.

Bird Conservation Region	Annual % Change	
	1966-2010	2000-2010
Great Basin	2.12	3.90
Northern Rockies	0.60	1.47
Northern Pacific Rainforest	-1.78	2.22

Nest Location and Timing: Nest in natural cavities or those excavated by woodpeckers at variable heights 5-18 m (18-55 ft) above ground. Nesting occurs primarily from mid-April through mid-June.

Breeding Range in Ponderosa Pine Habitats: Distributed throughout ponderosa pine habitat in the Pacific Northwest.

Comments: Resident. White-breasted Nuthatches prefer areas of older forest with large trees and low to moderate canopy cover and an abundance of snags, both large and small. They spend the majority of observed foraging time gleaning from the surface of the tree boles in the middle stratum. Time not spent on the bole of the tree was evenly distributed between live and dead branches.

Ponderosa Pine Habitat Conditions/Relationships:

Great Basin

- in managed ponderosa pine forests in the Cascade Mountains of southcentral Washington, occurred in similarly low densities (0.06 birds/ha [0.02 birds/ac]) in both pre-commercially thinned and unthinned stands¹⁰



Alan Wilson

- in ponderosa pine and mixed ponderosa pine forests in the Cascade Mountains of northcentral Washington, mean nest tree dbh 54.3 cm (21.4 in) and nest height 11.8 m (38.7 ft); most nest trees in decay stages 3 and 4 (moderate); all nests located in partial cut and shelterwood managed stands in open forest conditions with low canopy cover (mean 30%) and few large snags (mean 1.5/ha [0.6/ac]) >53 cm dbh (21 in dbh), but many small snags (mean 4.0/ha 15-23 cm dbh [1.6/ac 6-9 in dbh])¹⁴

Northern Rockies

- in western Montana, selected larger trees as foraging substrates; tree diameter was the only variable with a strong influence on selection; encountered almost exclusively in thinned/burned sites¹⁵

Optimal Ponderosa Pine Breeding Habitat: Mature ponderosa pine woodlands (canopy cover 25-65%) with 2.5 large trees/ha (1 tree/ac) >53 cm dbh (21 in dbh) and 10 snags/ha (4 snags/ac) >38 cm dbh (15 in dbh). Understory shrub cover appears to be unimportant.

WHITE-HEADED WOODPECKER

(*Picoides albolarvatus*)

Population Status and Trends: BBS trend data indicates increasing trends where most of the population occurs in the Great Basin and Northern Rockies, including a significantly increasing long-term trend in the Great Basin.¹ Trends in the Northern Pacific Rainforest, where there is a small population, are relatively stable.

Bird Conservation Region	Annual % Change	
	1966-2010	2000-2010
Great Basin	2.57	2.70
Northern Rockies	1.25	0.42
Northern Pacific Rainforest	-0.77	0.01

Nest Location and Timing: Nest in natural cavities or those they excavate at relatively low heights usually <5 m (16 ft) above ground. Only rarely reuse cavities from previous years. Nesting occurs primarily from late April into early July.

Breeding Range in Ponderosa Pine Habitats: Distributed throughout ponderosa pine habitat in the Pacific Northwest except for northern Idaho and western Montana.

Comments: Resident. The White-headed Woodpecker prefers large tracts of open, mature ponderosa pine forest with snags for nesting and large, live trees for foraging on pine seeds. An important consideration is low shrub cover in nesting habitat to reduce small mammal populations (e.g., chipmunks) that can prey on eggs and nestlings in accessible low nest sites. White-headed Woodpeckers are attracted to areas with openings created by silvicultural treatments; however, nesting success at these sites may be reduced.



Greg Homel, Natural Elements Productions

Ponderosa Pine Habitat Conditions/Relationships:

Great Basin

- in the Cascade Mountains of north-central Washington, only detected in thinned stands in mixed ponderosa pine forest¹⁶
- in young forests along east-slope of the Cascade Mountains in central Washington, mean dbh of nest substrates 43.1 cm (17 in) in burned forest, and 38.1 cm (15 in) in unburned forest; 48% of excavated cavities in well-decayed snags with broken tops¹⁷
- along east-slope of the Cascade Mountains in central Washington, characteristics of forests used for nesting were mean live-tree density 182.3 trees/ha (73.8 trees/ac) ≥ 10.16 cm dbh (4 in dbh), mean snag density 11.5 snags/ha (2.5 snags/ac) ≥ 10.16 cm dbh (4 in dbh), mean dbh of ponderosa pines 33.0 cm (13 in) and ranged from 26.1–50.2 cm (10.3 - 19.8 in), mean density of ponderosa pine greatest in 20.3–30.5 cm dbh size class (8-12 in dbh size class), and lowest in the 50.8–61.0 cm dbh size class (20-24 in dbh size class) and >61.0 cm (24 in) dbh size class¹⁸

- in the Cascade Mountains of central Washington, mean dbh of nest trees 36.6 cm (14.4 in); nest sites canopy cover 42.6% and shrub cover 19.3%; 61% of nest snags of highest decay class; 80.6% of nest snags in ponderosa pine¹⁹
- in Cascade Mountains of central Washington, most nests (16 of 21) in ponderosa pine and 17 of 21 in snags; mean nest tree dbh 51.5 cm (20.3 in) and mean height 12.6 m (40 ft); mean height of nest cavity entrance 5.8 m (18 ft); nest sites characterized by a greater abundance, size, and basal area of large trees and snags²⁰
- in managed ponderosa pine forests in Cascade Mountains of southcentral Washington, occurred in low densities (0.02 birds/ha [0.01 birds/ac]) in pre-commercially thinned stands, but absent in unthinned stands¹⁰
- in the Cascades Mountains of central Oregon, fragmented habitat required larger home ranges (mean 320 ha [793 ac]) than continuous tracts of old-growth (mean 104 ha [257 ac]); used large diameter snag classes for nesting and roosting in greater proportion than available; snag density ranged from 1.7-9.9 snags/ha (0.7-3.9 snags/ac); shrub cover >30%^{21,22}
- in ponderosa pine forest of the Cascades Mountains of central Oregon, abundance increased with increasing densities of large (>50.8 cm dbh [20 in dbh]) green trees and hard snags, and with hard snag density (>20.3 cm dbh [8 in dbh])²³
- in the Cascade Mountains of central Oregon, percent shrub cover and number of layers in the canopy were nest-site variables most influencing nesting success; successful nests had lower shrub cover, more overstory layers, higher canopy closure, and higher densities of snags

and large trees (dbh \geq 53 cm [21 in]) than unsuccessful nests; nests at sites with high densities of large-diameter trees (>53 cm [21 in]) had a significantly higher survival than nests in recently cut sites; mean nesting success negatively correlated with classes of percent shrub cover - nests at sites with <5% shrub cover had a mean nesting success of 61.1%, while mean success at nests with higher shrub cover was 41.9% (range 36.7– 47.9); mean density of large snags (>53 cm dbh [21 in dbh]) was 9.2/ha (3.7/ac) at nest sites and mean density of large trees (>53 cm dbh [21 in dbh]) was 37.7/ha (15.2/ac)²⁴

Northern Rockies

- in west-central Idaho, all observations in open canopy forest (mean 56% canopy cover) with relatively low tree density (mean 289 trees/ha [117 trees/ac]); did not nest in forest with canopy cover >26% or tree density >411 trees/ha (166 trees/ac); mean dbh of nest trees 56 cm (22 in); mean dbh of ponderosa pine trees in 17 foraging observations 70 cm (27.6 in)²⁵
- in Blue Mountains of northeast Oregon, 80% of foraging during breeding season on live trees and only on ponderosa pine; mean dbh of 142 foraging trees 44 cm (17.3 in)²⁶

Optimal Ponderosa Pine Breeding Habitat:

Late-successional forest in patches >100 ha (250 ac) with moderately open canopy cover (20-60%), <40% shrub cover, and >4 snags/ha (1.6 snags/ac) >46 cm dbh (18 in dbh) with >2.5 snags/ha (1 snag/ac) >71 cm dbh (28 in dbh).

WILLIAMSON'S SAPSUCKER

(*Sphyrapicus thyroideus*)

Population Status and Trends: BBS trend data indicates non-significant stable to increasing trends in the Great Basin, but substantial non-significant declining trends in the Northern Rockies.¹

Bird Conservation Region	Annual % Change	
	1966-2010	2000-2010
Great Basin	0.91	2.37
Northern Rockies	-1.61	-5.90
Northern Pacific Rainforest	NA	NA

Nest Location and Timing: Nest in cavities they excavate at variable heights 3-18 m (10-55 ft) above ground. Nesting occurs primarily from mid-April through early July.

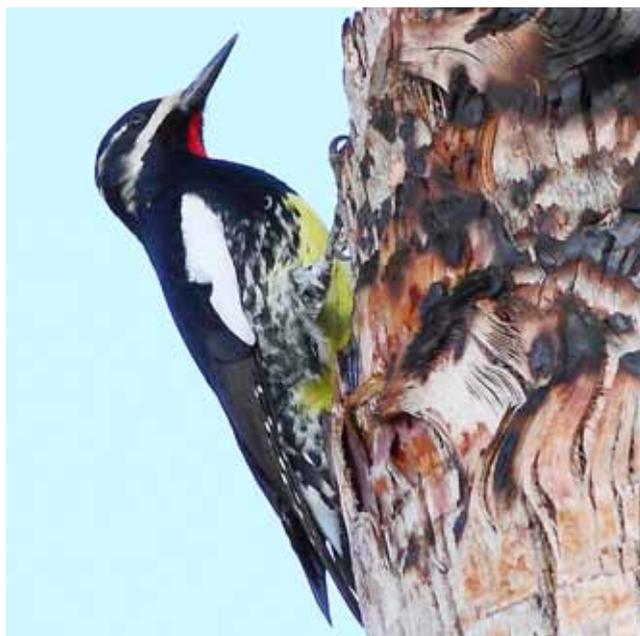
Breeding Range in Ponderosa Pine Habitats: Distributed throughout ponderosa pine habitat in the Pacific Northwest except the Klamath Mountains ecoregion of southwest Oregon and portions of the northern Rockies ecoregion in northeast Washington and northern Idaho.

Comments: Long-distance Migrant. Williamson's Sapsucker uses moderately open to closed canopy ponderosa pine and mixed conifer forest where there are large snags and an open understory with low shrub cover. Populations occur in both unmanaged and partially harvested forest. They feed on the sap and phloem from small holes they drill in trees. Ants are a large part of their diet, though they also consume damaging insects such as the spruce budworm that periodically defoliate Douglas-fir and true firs.

Ponderosa Pine Habitat Conditions/Relationships:

Great Basin

- in ponderosa pine and mixed ponderosa pine/conifer forests in the Cascade Mountains of northcentral Washington, mean nest tree dbh 69.6 cm (27.4 in) and nest height



Greg Homel, Natural Elements Productions

15.6 m (51.1 ft); highest proportion of nest trees (59%) in decay stage 1 (live trees with initial decay), few were ponderosa pine, and mean amount of bark remaining 90%; half of nests in unmanaged stands characterized by dense forest conditions (mean 66% canopy cover) with a large number of snags (mean 5.4/ha [2.2/ac] >53 cm (21 in) dbh¹⁴

Northern Rockies

- in Blue Mountains of northeast Oregon, mean dbh of nest trees 60.9 cm (24 in); preferred snags in decay class ^{2,13}

Optimal Ponderosa Pine Breeding Habitat: Moderately open to closed forest (30-80% canopy cover), <40% shrub cover, with >4 hard snags/ha (>1.6 snags/ac) >46 cm dbh (18 in dbh) with >1 snag/ha (0.40 snag/ac) >71 cm dbh (28 in dbh).

Literature Cited

- ¹Sauer, J.R., J.E. Hines, J.E. Fallon, K.L. Pardieck, D.J. Zolowski, Jr., and W.A. Link. 2011. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2010. Version 12.07.2011* USGS Patuxent Wildlife Research Center, Laurel, MD.
- ²Goggans, R. 1985. Habitat use by flammulated owls in northeastern Oregon. M.S. Thesis, Oregon State University, Corvallis.
- ³Atkinson, E.C., and M.L. Atkinson. 1990. Distribution and status of Flammulated Owls (*Otus flammeolus*) on the Salmon National Forest. Idaho Natural Heritage Program, Idaho Dept. Fish and Game, Salmon National Forest. Unpublished report. 25pp.
- ⁴Wright, V. 1996. Multi-scale analysis of flammulated owl habitat use: owl distribution, habitat management, and conservation. M.S. Thesis, University of Montana, Missoula. 91pp.
- ⁵Howie, R.R., and R. Ritcey. 1987. Distribution, habitat selection, and densities of flammulated owls in British Columbia. P. 249-254 in *Biology and conservation of northern forest owls*. USDA Forest Service, GTR-RM-142, Fort Collins, Colorado.
- ⁶Galen, C. 1989. A preliminary assessment of the status of the Lewis's woodpecker in Wasco County, Oregon. Oregon Department of Fish and Wildlife, Nongame Wildlife Program, Technical Report 88-3-01. 23 pp.
- ⁷Fyelling, M. 2012. Habitat and Nest Requirements for Lewis's Woodpecker: What makes the Bitterroot and Clark Fork Rivers a liveable place? M.S. Thesis, University of Montana, Missoula.
- ⁸Saab, V.A., R.E. Russell, and J.G. Dudley. 2009. Nest-site selection by cavity-nesting birds in relation to postfire salvage logging. *Forest Ecology and Management* 257:151-159.
- ⁹Russell, R.E., V.A. Saab, and J. Dudley. 2007. Habitat suitability models for cavity-nesting birds in a postfire landscape. *The Journal of Wildlife Management* 71(8):2600-2611.
- ¹⁰Putnam, B.J. 1983. Songbird populations of pre-commercially thinned and unthinned stands of ponderosa pine in east-central Washington. M.S. Thesis, Oregon State University, Corvallis. 51 pp.
- ¹¹Hutto, R. L. 1989. Pygmy Nuthatch *Sitta pygmaea*. Pages 92-93 in T.W. Clark, A.H. Harvey, R.D. Dorn, D.L. Genter, and C. Groves (editors), *Rare, sensitive, and threatened species of the Greater Yellowstone Ecosystem*.
- ¹²Storer, B.E. 1977. Aspects of the breeding ecology of the Pygmy Nuthatch (*Sitta pygmaea*) and the foraging ecology of wintering mixed-species flocks in western Montana. M.A. Thesis, University of Montana, Missoula. 114p.
- ¹³Nielsen-Pincus, N. 2005. Nest-site selection, nest success, and density of selected cavity-nesting birds in northeastern Oregon with a method for improving the accuracy off density estimates. M.S. Thesis, University of Idaho, Moscow.
- ¹⁴Madsen, S.J. 1985. Habitat use by cavity-nesting birds in the Okanogan National Forest, Washington. M.S. Thesis, University of Washington, Seattle. 110 pp.
- ¹⁵Pierson, J.C., L.S. Mills, and D.P. Christian. 2010. Foraging patterns of cavity-nesting birds in fire-suppressed and prescribe-burned ponderosa pine forests in Montana. *Open Environmental Sciences Volume 4*:41-52.
- ¹⁶Gaines, W.L., M. Haggard, J.F. Lehmkuhl, A.L. Lyons, and R.J. Harrod. 2007. Short-term response of landbirds to ponderosa pine restoration. *Restoration Ecology* 15:670-678.
- ¹⁷Kozma, J.M. 2012. Nest-site characteristics of three woodpecker species in managed ponderosa pine forests of the eastern Cascade range. *Northwestern Naturalist* 93:111-119.
- ¹⁸Kozma, J.M. 2011. Composition of forest stands used by white-headed woodpeckers for nesting in Washington. *Western North American Naturalist* 71:1-9.
- ¹⁹Kozma, J.M. 2009. Nest-site attributes and reproductive success of white-headed and hairy woodpeckers along the east-slope Cascades of Washington State. Pages 52-61 in T. Rich, C. Arizmendi, D. Demarest, and C. Thompson (editors), *Proceedings of the Fourth International Partners in Flight Conference*.
- ²⁰Buchanan, J.B., R.E. Rogers, D.J. Pierce, and J.E. Jacobson. 2003. Nest-site habitat use by white-headed woodpeckers in the eastern cascade Mountains, Washington. *Northwestern Naturalist* 84:119-128.

²¹Dixon, R.D. 1995a. Density, nest-site and roost-site characteristics, home-range, habitat-use, and behavior of white-headed woodpeckers: Deschutes and Winema National Forests, Oregon. Oregon Department of Fish and Wildlife Nongame Report No. 93-3-01.

²²Dixon, R.D. 1995b. Ecology of the white-headed woodpecker in the central Oregon Cascades. M.S. Thesis, University of Idaho, Moscow.

²³Bate, L.J. 1995. Monitoring woodpecker abundance and habitat in the central Oregon Cascades. M.S. Thesis, University of Idaho, Moscow. 115 pp.

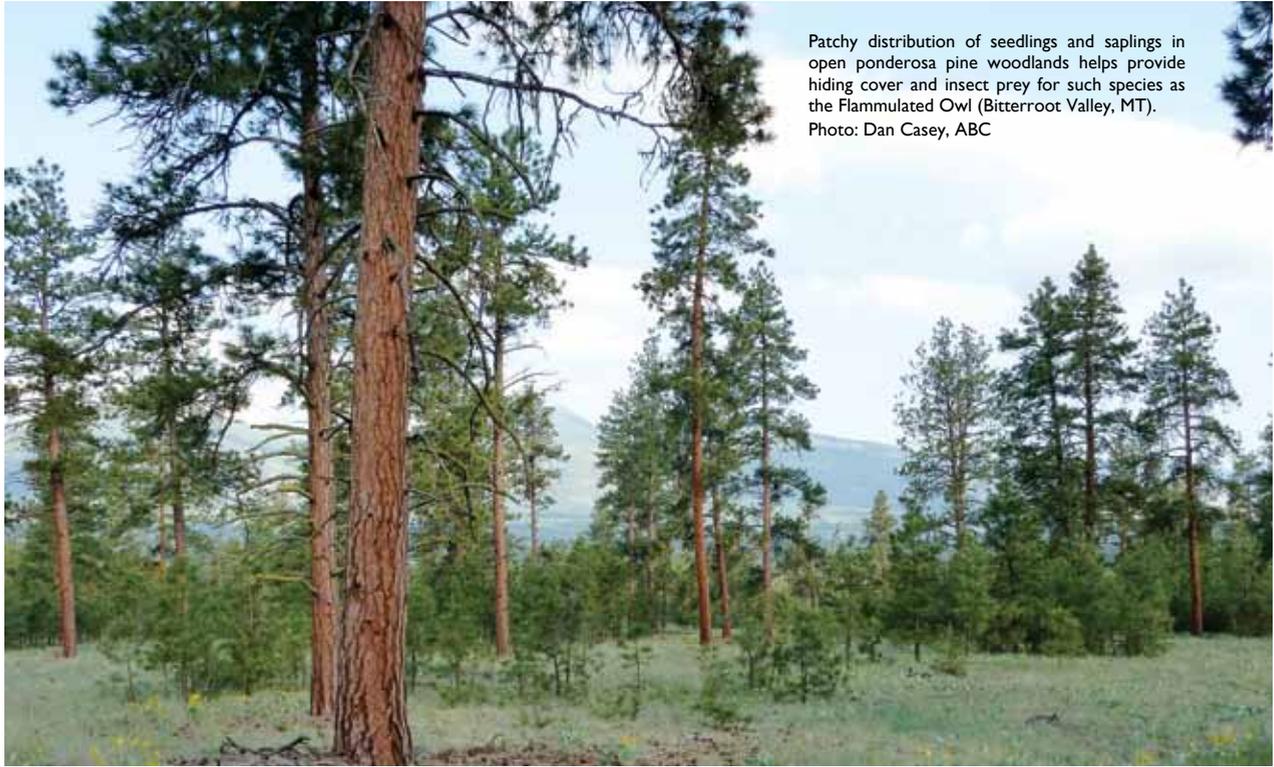
²⁴Frenzel, R.W. 2004. Nest-site occupancy, nesting success, and turnover rates of white-headed woodpeckers in the Oregon Cascade Mountains in 2004. Unpublished report submitted to Audubon Society of Portland, Oregon Department of Fish and Wildlife, Bureau of Land Management, and U.S. Forest Service, Portland, OR. 35 pp.

²⁵Frederick, G.P., and T.L. Moore. 1991. Distribution and habitat of White-headed Woodpeckers (*Picoides albolarvatus*) in west-central Idaho. Conservation Data Center, Idaho Dept. of Fish and Game, Boise, ID.

²⁶Bull, E.L., S.R. Peterson, and J.W. Thomas. 1986. Resource partitioning among woodpeckers in northeastern Oregon. U.S. Forest Service Research Note PNW 444. U.S. Department of Agriculture.



Retention/recruitment of broken-topped dead and dying trees is an important management consideration in ponderosa pine stands. Photo: Dan Casey, ABC



Patchy distribution of seedlings and saplings in open ponderosa pine woodlands helps provide hiding cover and insect prey for such species as the Flammulated Owl (Bitterroot Valley, MT).
Photo: Dan Casey, ABC



American Bird Conservancy (ABC) is a non-profit organization whose mission is to conserve native birds and their habitats throughout the Americas. ABC

acts across the full spectrum of conservation issues to safeguard the rarest bird species, restore habitats, and reduce threats, while unifying and strengthening the bird conservation movement. ABC advances bird conservation through direct action and by finding and engaging the people and groups needed to succeed. www.abcbirds.org



Forest Restoration Partnership

Forest Restoration Partnership is a non-profit organization founded to promote the conservation and restoration of declining forest

habitats on private lands in the western United States. We promote this mission through collaborative projects that emphasize the design and implementation of cutting-edge habitat restoration practices and holistic forest management, and education and outreach to promote innovative forest restoration systems. www.forestpartners.org



The mission of the Natural Resource Conservation Service (NRCS) is to provide national leadership in the conservation of soil, water, and related natural resources. The NRCS provides balanced technical assistance and cooperative conservation programs to landowners and land managers throughout the United States as part of the U.S. Department of Agriculture (USDA).



Pacific Stewardship LLC is an Oregon-based natural resource consultancy established in 2011, specializing in the assessment, design, and implementation of conservation-based forestry and ecological restoration.



Cky-Ber Enterprises is a Sub-S Corporation in Stevensville, Montana specializing in forestry consulting, timber stand restoration/treatment, appraisals and sale administration.