BEFORE THE SECRETARY OF THE INTERIOR

PETITION TO LIST THE BLACK-BACKED WOODPECKER (*PICOIDES ARCTICUS*) AS THREATENED OR ENDANGERED UNDER THE FEDERAL ENDANGERED SPECIES ACT

The Black-backed Woodpecker (*Picoides arcticus*)

Photo by Monica Bond

2 May 2012

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Mr. Ken Salazar, Secretary
U.S. Department of the Interior
1849 C Street, NW
Washington, D.C. 20240

Mr. Dan Ashe, Director
U.S. Fish and Wildlife Service
1849 C Street, NW
Washington, D.C. 20240

RE: PETITION TO LIST THE OREGON/CALIFORNIA AND BLACK HILLS POPULATIONS OF THE BLACK-BACKED WOODPECKER (*Picoides arcticus*) AS THREATENED OR ENDANGERED SPECIES AND TO DESIGNATE CRITICAL HABITAT CONCURRENT WITH LISTING

Dear Mr. Salazar and Mr. Ashe:

Pursuant to Section 4(b) of the Endangered Species Act ("ESA"), 16 U.S.C. §1533(b), Section 553(3) of the Administrative Procedure Act, 5 U.S.C. § 553(e), and 50 C.F.R. § 424.14(a), the John Muir Project of the Earth Island Institute, the Center for Biological Diversity, the Blue Mountains Biodiversity Project, and the Biodiversity Conservation Alliance hereby petition the Secretary of the Interior, through the United States Fish and Wildlife Service ("USFWS"), to list the Oregon-Cascades/California and Black Hills (South Dakota, and a portion of Wyoming) populations of the Black-backed Woodpecker (*Picoides arcticus*) as a threatened or endangered species and to designate critical habitat to ensure its survival and recovery.

USFWS has jurisdiction over this petition. This petition sets in motion a specific process, placing definite response requirements on USFWS. Specifically, USFWS must issue an initial finding as to whether the petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted." 16 U.S.C. §1533(b)(3)(A). USFWS must make this initial finding "[t]o the maximum extent practicable, within 90 days after receiving the petition." Id. Petitioners need not demonstrate that listing is warranted, rather, Petitioners must only present information demonstrating that such listing may be warranted. While Petitioner believes that the best available science demonstrates that listing the two populations of the Black-backed Woodpecker as endangered is in fact warranted, there can be no reasonable dispute that the available information indicates that listing the species as either threatened or endangered may be warranted. As such, USFWS must promptly make a positive initial finding on the petition and commence a status review as required by 16 U.S.C. § 1533(b)(3)(B).

The term "species" is defined broadly under the ESA to include "any subspecies of fish or wildlife or plants and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." 16 U.S.C. § 1532 (16). A Distinct Population Segment ("DPS") of a vertebrate species can be protected as a "species" under the ESA even though it has not formally been described as a separate "species" or "subspecies" in the scientific literature. A species may be composed of several DPSs, some or all of which warrant listing under the ESA. As described in this petition, the small, isolated Oregon-Cascades/California and Black Hills populations of the Black-backed Woodpecker were each recently recognized in the scientific literature as genetically distinct from the larger, contiguous, northern boreal population, and in both cases this genetic distinction is sufficiently large that it is consistent with distinction at the level of subspecies (Pierson et al. 2010). Therefore, we request that the Oregon-Cascades/California and Black Hills populations be considered subspecies eligible for listing under the ESA. In the event USFWS does not recognize the taxonomic validity of these Black-backed Woodpecker subspecies as described in this petition, we request that USFWS evaluate whether the Oregon-Cascades/California and Black Hills populations of the Black-backed Woodpecker constitute DPSs of the Black-backed Woodpecker species.

This petition demonstrates that the Oregon-Cascades/California and Black Hills populations of Black-backed Woodpeckers clearly warrant listing under the ESA based on the factors specified in the statute. As discussed in this petition, the Oregon-Cascades/California (hereafter "Oregon/California") and Black Hills populations are small—less than 1,000 pairs and about 400 pairs, respectively—and both are threatened by aggressive landscape-level thinning and post-fire logging, fire suppression, habitat loss and population declines since the 19^{th} century, an utter lack of protection for suitable habitat under federal and state laws and regulations, and other factors. In both populations, most of the suitable habitat created by natural disturbance exists outside of protected lands (e.g., Wilderness, Inventoried Roadless Areas, and National Parks), where it is subject to removal through logging. We look forward to the Service's response to this petition and processing of it pursuant to the procedures and timelines established under the ESA.

Petitioners:

The Center for Biological Diversity works through science, law, and policy to secure a future for all species, great or small, hovering on the brink of extinction. The Center has over 42,000 members throughout California and the United States. The Center and its members are concerned with the conservation of endangered species, including the Black-backed Woodpecker, and the effective implementation of the ESA. The John Muir Project of Earth Island Institute, Blue Mountains Biodiversity Project, and Biodiversity Conservation Alliance, and their members, have worked to protect the Black-backed Woodpecker and its habitat, and are also concerned with the effective implementation of the ESA. Failure to grant the requested petition will adversely affect the aesthetic, recreational, research and scientific interests of petitioning organizations and their members.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY AND INTRODUCTION

"*I believe it would be difficult to find a forest-bird species more restricted to a single vegetation cover type… than the Black-backed Woodpecker is to early post-fire conditions*…"

Dr. Richard Hutto (1995 at p. 1050)

"*The dramatic positive response of so many plant and animal species to severe fire and the absence of such responses to low-severity fire in conifer forests throughout the US West argue strongly against the idea that severe fires are unnatural. The biological uniqueness associated with severe fires could emerge only from a long evolutionary history between a severe-fire environment and the organisms that have become relatively restricted in distribution to such fires. The retention of those unique qualities associated with severely burned forest should, therefore, be of highest importance in management circles.*"

Dr. Richard Hutto (2006 at p. 987)

"It is clear from our first year of monitoring three burned areas that post-fire habitat, especially high severity areas, are an important component of the Sierra Nevada ecosystem…post-fire areas are not black slates or catastrophic wastelands; they are a unique component of the ecosystem that supports a diverse and abundant avian community…"

U.S. Forest Plumas Lassen Study 2009 Annual Report, p. 34
(research conducted by PRBO Conservation Science; report available at www.fs.fed.us/psw/programs/snrc/)

An intensely[1] burned forest of dense, fire-killed trees (snags), or a similar condition created by large areas of very high beetle mortality, known as "snag forest habitat", is perhaps the most maligned, misunderstood, and imperiled habitat type in North America. The public's perception of a snag forest is one of devastation, when actually it is an ecological treasure trove. Thousands of native beetles burrow into and lay their eggs inside the recently-killed trees, which in turn attracts large numbers of insect-feeding birds. Some birds drill holes in the trees to create nesting cavities, and when they are finished, other birds and even mammals will use the holes for nesting, too. Large, fallen logs shelter woodrats, mice, and voles that feast on the seeds of regenerating shrubs, while mule deer browse on the shrubs' fresh leaves. Hawks and owls hunt for prey. Far from being "dead," a snag forest harbors extraordinarily rich biological diversity.

For the past half-century, Smokey the Bear has implored us to prevent fires before they "destroy" forest and kill animals. The U.S. Forest Service has been given *carte blanche* to suppress nearly every fire on our public forest lands, regardless of where it starts and how it burns, and the agency has been doing so quite effectively for decades. Moreover, the Forest Service and timber companies promptly cut trees that do die from fire or

[1] In this petition, we use the term "fire intensity", or "high-intensity" fire, rather than "fire severity" or "high-severity" fire because the term "severity" has a negative, pejorative connotation that is not consistent with the current state of ecological knowledge in fire ecology. Thus, we chose to use the more value-neutral term "intensity".

beetles to capitalize on their economic value, justifying their actions on the erroneous assertion that these trees have no ecological value. The result is a disturbing scarcity of unlogged snag forest habitat, and the loss of the tremendous biological diversity it supports.

In recent years, mounting scientific evidence regarding the importance of fire to the health of the forest has led the Forest Service and the public to accept low-intensity burning in order to lower "fuel loading," with the biggest benefit seen as a reduction in future high-intensity fires. However, scientific data show that high-intensity fires are not only natural in our forests, but create critically important habitat for a wide variety of species. Government agencies, politicians, and the media have not kept pace with this science, and to this day refuse to recognize the ecological benefits of high-intensity fire, or patches of high tree mortality from beetles, and the subsequent snag forest habitat that such natural disturbances creates. This refusal has led to the inevitable decline and imperilment of the Black-backed Woodpecker (*Picoides arcticus*) throughout its range.

No other vertebrate species so exemplifies a snag-forest specialist like the Black-backed Woodpecker. Black-backed Woodpeckers are one of the most specialized birds for digging out beetle larvae from recently killed trees. *P. arcticus* is a "keystone species" in snag forests, acting as an important primary excavator that provides nesting holes for itself and other cavity-nesting birds and mammals. They also are one of the most highly selective bird species not only with respect to using burned or otherwise naturally disturbed forests, but also targeting specific nesting and foraging snags within a stand – their optimal habitat is dense, mature and old-growth conifer forest that has been intensely burned, or which has experienced high mortality from beetles, and has been protected from salvage-logging. But Black-backed Woodpeckers can only effectively use a snag forest for several years after it is created – thus, they depend upon the future occurrence of high-intensity natural disturbance to constantly replenish their habitat. Unfortunately, due to lack of habitat protection, Black-backed Woodpeckers have become increasingly rare. For example, these birds in the Sierra Nevada were once described as "numerous" but are now considered "rare," and their habitat there has shrunk to a fraction of what it once was. Based on analysis of currently suitable habitat and woodpecker density estimates using the best available scientific data, we estimate that extant populations of the Oregon/California population (eastern Oregon Cascades, and Sierra Nevada of California) and Black Hills population (the eastern edge of Wyoming and the western edge of South Dakota) number less than 1,000 pairs and about 411 pairs, respectively—considerably below the extinction-risk thresholds of approximately 4,000 individuals (approximately equivalent to 2,000 pairs) identified by current science (Traill et al. 2007, 2010). Other research concludes that 7,000 adult individuals are necessary in a population to ensure 99% probability of population persistence over the course of 40 generations—and finds that the risk of extinction increases dramatically at such threshold population levels if the population is being subjected to "strong deterministic (anthropogenic) factors and habitat destruction" (Reed et al. 2003). Moreover, those remaining pairs have little or no protection on most of the area that they inhabit, and are under mounting pressure from aggressive forest management policies designed to prevent high-quality Black-backed Woodpecker habitat from being created on the landscape, or to remove it once created.

Historical and current post-fire salvage logging is the greatest threat facing the Black-backed Woodpecker. The U.S. Forest Service and state agencies have failed completely to provide any regulatory protection for snag forest habitat on private and public lands. Snag forest habitat not only has no legal protection, but the *modus operandi* on private and public lands is to actively eliminate it. Moreover, widespread fire suppression and fire/beetle prevention thinning projects are aimed at decreasing the potential for new optimal black-backed habitat to be created. Finally, fire/beetle prevention projects that lower the density of larger trees (which most do) also degrade the older unburned forests required by the Black-backed Woodpecker for persistence when burned forest is temporarily unavailable. The great majority of the suitable Black-backed Woodpecker habitat that is created occurs outside of Wilderness Areas and National Parks—i.e., in areas where it is open to elimination through post-disturbance salvage logging on public and private lands.

The John Muir Project, the Center for Biological Diversity, the Blue Mountains Biodiversity Project, and the Biodiversity Conservation Alliance submit this petition to list the Oregon/California and Black Hills populations of the Black-backed Woodpecker as endangered or threatened species under the federal Endangered Species Act. This petition demonstrates that Black-backed Woodpecker populations in these areas are small and have experienced consistent, systematic, long-term elimination and degradation of the snag forest habitat upon which they depend for survival, and that current regulatory and statutory provisions are profoundly inadequate to protect this species. Without a continuous supply of snag forest habitat comprised of densely packed, recently-killed trees in mature and old forest, and the protection of such snag forests when they are created, the Black-backed Woodpecker in Oregon/California, and the Black Hills, simply will not survive. The Petition demonstrates that these two isolated populations warrant listing as threatened or endangered species under the Endangered Species Act according to the Act's five listing factors. The Petition also demonstrates that the two populations are genetically distinct at the level of subspecies, and each more than satisfies the criteria for Distinct Population Segments.

NATURAL HISTORY AND ECOLOGY OF THE BLACK-BACKED WOODPECKER

Description

Appearance—The Black-backed Woodpecker (*Picoides arcticus*) is a towhee- to robin-sized three-toed woodpecker inhabiting montane and boreal conifer forests of North America. *P. arcticus* is heavily barred black and white on the sides and flanks with nearly solid black upperparts, as compared with *Dryobates*, and has a white throat, as compared with *Sphyrapicus* (Dawson 1923). Males and young sport a yellow crown-patch, while the female crown is entirely black. The bird's sooty black dorsal plumage serves to camouflage it against the deeply black, charred bark of the burned trees upon which it preferentially forages (Murphy and Lehnhausen 1998, Dixon and Saab 2000). The Black-backed Woodpecker has only three toes on each foot as part of an adaptive complex, including skull modifications, which makes it among the most specialized of birds for digging out wood-boring insect larvae (Bock and Bock 1974).

Figure 1. Male (left) and female (right) Black-backed Woodpecker.
Left photo Monica Bond; right photo Flickr commons/ Kestrel360.

Adult Male: Glossy blue-black upperparts continuous onto wings, tail, crown, and sides with a few white tips on black rump feathers; duller on flight-feathers; primaries and outer secondaries black with paired spots of white on edges of outer and inner webs (Dawson 1923, Dixon and Saab 2000). Four middle rectrices of tail black, next pair mostly black with distal portion brownish white or pale rusty brown, usually tipped with black; three outermost pairs graduated, mostly white, tinged terminally with brownish

(Dixon and Saab 2000) and white on exposed (under) portions (Dawson 1923). A distinct squarish crown-patch of yellow (mustard-yellow, or light cadmium to orange); a transverse white cheek-stripe meeting fellow on forehead and cut off by black malar-stripe from white of throat and remaining underparts; nasal tufts and gular feathers long, covering base of bill (Dawson 1923, Dixon and Saab 2000). Bill plumbeous slaty, the mandible lighter; feet and legs grayish dusky or bluish gray, foot with only three toes, one directed backward and two directed forward; iris reddish brown in juvenile, deep reddish in adult (Dawson 1923, Dixon and Saab 2000).

Adult Female: Like male, but crown entirely black without yellow crown-patch.

Young male: Like adult male, but black of upperparts duller, white of underparts less pure, tinged more or less with dingy gray; barring of sides more blended; the yellow of crown-patch reduced, streaky.

Young female: Like young male, but yellow of crown still further reduced, sometimes barely perceptible.

Males are approximately 6–7% heavier than females; a small sample indicates that adults weigh between 61 and 88 grams (Dixon and Saab 2000). Males have slightly longer wings and tails than females, with bills 5–10% longer. Table 1 shows linear measurements of male and female Black-backed Woodpecker bill, wing, tail, and tarsus lengths, including average length and range (from Dixon and Saab 2000).

Table 1: Linear measurements (mm) of 39 Adult Male and 34 Adult Female Black-backed Woodpeckers.
From Dixon and Saab 2000.

Bill Length	
Male	33.0 (31.0–35.0)
Female	30.7 (28.5–34.5)
Wing Length	
Male	129.5 (125.0–134.0)
Female	126.8 (123.0–133.5)
Tail Length	
Male	77.9 (74.0–85.0)
Female	78.8 (73.5–85.5)
Tarsus Length	
Male	22.9 (21.5–24.0)
Female	22.0 (21.0–23.0)

Methods of Communication—Black-backed Woodpecker vocalizations include a 'kyik' call note that functions mostly as an alarm-threat or to express excitement, or a contact call between members of a pair (Kilham 1966, Dixon and Saab 2000). It has been described variously as a kyik, chet, chuck, or click sound. This call is a fast, double click that sounds more like a sharp, single click when heard in the field, and is given by both sexes throughout the year (Dixon and Saab 2000). A fast series of kyik calls also accompanies copulation (Dixon and Saab 2000).

One of the more interesting and complex of *Picoides* calls is the Black-backed Woodpecker's 'scream, rattle, and snarl.' This call is given during agonistic encounters between Black-backed Woodpeckers as well as with other species; it is also used in establishing territories (Dixon and Saab 2000). A short rattle call, or kyik-ek call, summons the mate for either defending territory or feeding young (Dixon and Saab 2000).

Various 'chirp calls' are given by nestlings during feeding (Kilham 1966, Dixon and Saab 2000). Kilham (1966) noted that nestlings made chittery vocalizations that increased when a parent approached, then diminished after the parent had left. The nestlings also made a steady click-click-click begging note.

Non-vocal methods of communication are evident in Black-backed Woodpeckers as well, including displays or drumming and tapping with the bill against a tree trunk. Displays include bill-positioning postures, with bill lowering as a threatening posture and bill raising as an indication of fleeing; crest-raising displays, in which males elevate crown feathers in the presence of a female or to threaten another bird; head-swinging or bill-waving, where the head swings in a narrow arc from side to side; and flutter aerial displays, to threaten whereby a mothlike flight with wings held in a spread or downward position dramatizes the presence of a bird (Dixon and Saab 2000). Members of a pair will greet each other by raising their wings horizontally, but when confronting rivals will raise their wings up over their backs in full extension (Kilham 1966). This latter wing-spreading display incorporates crest-raising, bill-lowering, head-swinging, and a scream, rattle, and snarl call. Black-backed Woodpeckers will occasionally spread their tail feathers to an opponent, and sometimes directly attack by hopping or flying at an antagonist (Dixon and Saab 2000).

Black-backed Woodpeckers will rap or tap their bill against a tree trunk when anxious or just before roosting (Kilham 1966). Both males and females drum to broadcast a territory or attract a mate (Dixon and Saab 2000). Black-backed drums are faster in tempo than drums of American Three-toed Woodpeckers (*P. dorsalis*), and are less variable than drums of Three-toed, Hairy (*P. villosus*), and Strickland's (*P. stricklandi*) woodpeckers (Dixon and Saab 2000). Females average more beats in a roll than males; morning is the most common time for drumming, but individuals also drum just before sunset (Dixon and Saab 2000). Kilham (1966) noted that the two females he observed drummed far more often than their mates.

Taxonomy

The Black-backed Woodpecker, *Picoides arcticus*, falls within the order Piciformes, Family Picidae, and subfamily Picinae (DeSante and Pyle 1986). Also variously known as the Arctic Three-toed Woodpecker, the Black-backed Three-toed Woodpecker, and the Sierra Three-toed Woodpecker, the species was first described by Swainson and Richardson in 1832, with the type locality near the sources of the Athabasca River on the eastern declivity of the Rocky Mountains (AOU 1983). The species is most likely to be confused with the closely related American Three-toed Woodpecker, which has similar plumage and some overlapping distribution to the Black-backed Woodpecker (Bock and Bock 1974). The American Three-toed Woodpecker has variable amounts of white on the back and a broad white stripe below the eye, as opposed to the Black-backed Woodpecker with uniformly dark upperparts and a thin white stripe below the eye (Dixon and Saab 2000). Three-toed Woodpeckers are smaller than Black-backed Woodpeckers (Bock and Bock 1974). Black-backed Woodpeckers also have lower-pitched, shorter, and more metallic call notes with faster bursts and more beats than American Three-toed Woodpeckers (Dixon and Saab 2000).

While American Three-toed Woodpeckers and Black-backed Woodpeckers are sympatric throughout much of their ranges, American Three-toed Woodpeckers range as far south as Arizona and New Mexico (unlike Black-backed Woodpeckers, which do not live in the southwestern U.S. or central Rocky Mountains), and thus are more wide-ranging than Black-backed Woodpeckers, which occur in dense montane forests only as far south as the Black Hills of South Dakota, north-western Wyoming, and the southern/central Sierra Nevada (the southernmost portion of its range). Bock and Bock (1974) concluded that the American Three-toed Woodpecker is strongly tied to spruce trees and associated bark beetles, with an affinity for smaller deciduous trees, while the Black-backed Woodpecker is adapted to dense boreal and montane coniferous forests consisting of larger trees. Both species respond to insect outbreaks following fires, windfall, and large-scale drought- or beetle-induced mortality events. Black-backed Woodpeckers probably evolved in North America from an ancestor in common with the Three-toed Woodpecker, which secondarily invaded the Nearctic from Eurasia via the Bering land bridge (Bock and Bock 1974).

Genetically Distinct Populations—Pierson et al. (2010) identified a minimum of three genetic groups of Black-backed Woodpeckers. These include a large, genetically continuous population that spans from the Rocky Mountains to Quebec; a small, isolated population in Black Hills, South Dakota, and another separate population in the eastern Oregon Cascades and California (Fig. 2).

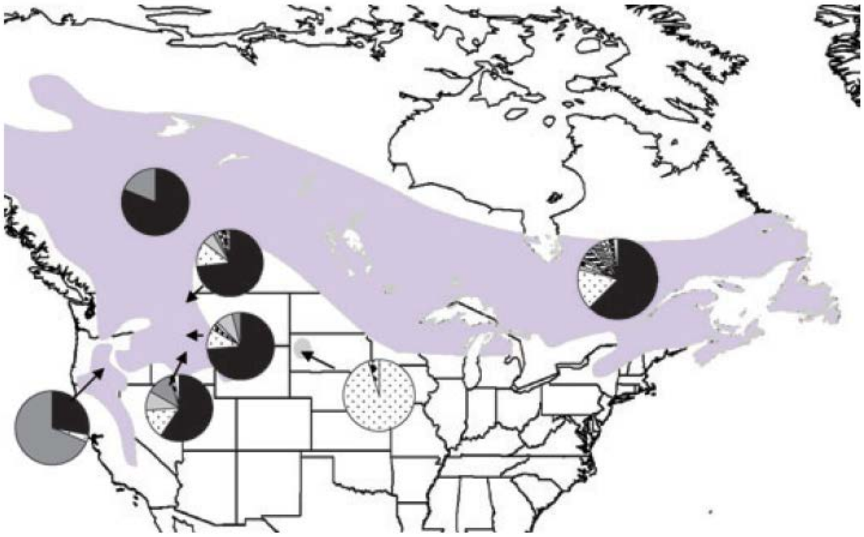

Figure 2. The distribution of Black-backed Woodpeckers (Natureserve) with 7 sampling locations: Oregon, Idaho, Missoula, Glacier, Alberta, and Quebec. The frequency of observed mtDNA cytochrome *b* haplotypes at each sampling location is represented by pie charts at each location. From Pierson et al. (2010) at p. 3.

Haplotype diversity and nucleotide diversity were highest in the large contiguous boreal forest population (Idaho) and lowest in South Dakota. Allelic richness and average number of alleles per locus also were lowest in South Dakota and highest in the large boreal population (Pierson et al. 2010). However, both the Oregon/California and South Dakota populations showed lower genetic diversity. Pierson et al. (2010 at p. 10) noted that "lower genetic diversity within both fragmented populations (Oregon, $h = 0.462$; S. Dakota, $h = 0.074$) based on a subset of haplotypes found in the boreal forest suggest shared ancestry without much current gene flow."

The level of genetic distinctiveness between the Rockies/boreal population, the Oregon/California population, and Black Hills population, was found to be at a level consistent with "those documented among subspecies" (Pierson et al. 2010, p. 11). The authors (at p. 12) noted, in particular, that the Black Hills population of Black-backed Woodpeckers "is likely quite small", given the small area of forest occupied by the population (about 15,500 square kilometers, or a little over 600,000 acres), and given the bird's large territories of dense forest with very high tree mortality (generally one pair requires at least 40-100 hectares of such habitat, or often 200 hectares or more, as discussed below). Pierson et al. (2010, p. 13) concluded that, due to the small and isolated nature of the Black Hills population, it is in need of protection, noting the particular threat of "salvage logging", and warning that such logging practices could cause population declines, and that "recolonization of the area by females is unlikely" given that females were found to disperse far less frequently, or less far, than males.

Pierson et al. (2010) found that when forests are continuously distributed, both males and females appear to be dispersing equally. However, large areas of non-forest reduce dispersal. Male-mediated gene flow is the main form of connectivity between the continuously distributed group and smaller populations that are separated by non-forested habitat, with non-forest habitat being a barrier to movement by females. Overall, large gaps among forest sites apparently act as complete barriers to the movement of female Black-backed Woodpeckers and create a higher resistance to movement for male Black-backed Woodpeckers. Pierson et al. (2010 at page 11) stated that "sharp discontinuities in gene flow match the break in large forested areas between the Rocky Mountains and Oregon and the Rocky Mountains and South Dakota."

Based upon the foregoing information, the Oregon/California population and the Black Hills population each form distinct subspecies of the Black-backed Woodpecker.

In addition, the Oregon/California and Black Hills populations are Distinct Population Segments (DPSs) under the Policy Regarding Recognition of Distinct Vertebrate Population Segments under the ESA. 61 Federal Register 4725 (1996). Under this policy, three elements are considered in a decision regarding the status of a possible DPS as endangered or threatened under the Act:

1) Discreteness of the population segment in relation to the remainder of the species to which it belongs;
2) The significance of the population segment to the species to which it belongs;
3) The population segment's conservation status in relation to the Act's standards for listing.

For a population segment to be considered discrete, it must satisfy either one of the following conditions:

1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.
2) It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

Both the Oregon/California and Black Hills populations meet the first discreteness criterion because they are genetically distinct from one another and from the Northern Rockies/boreal population, as discussed above, and are separated from one another, and from the Rockies/boreal population, as a result of physical, physiological, ecological, or behavioral factors. As noted in Pierson et al. (2010), these two populations "are separated by large areas of unforested habitat, which apparently serves as a barrier to movement of female woodpeckers" and the "data suggest that…large gaps in habitat act as a higher resistance landscape to long-distance dispersal for males…"

For a population to be considered significant, the Service's consideration includes, but is not limited to, the following:

1) Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon;
2) Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon;
3) Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range; or
4) Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

Both the Oregon/California and Black Hills populations of the Black-backed Woodpecker satisfy the significance criterion because the loss of either population would result in a significant gap in the range of the taxon (see Fig. 2 above), and because they differ markedly from each other and from the other population (Northern Rockies/boreal) of the species in their genetic characteristics.

As the Service has noted, “a gap in a taxon's range caused by the potential loss of a population would be significant based on any relevant considerations.” 71 Fed.Reg. 56228, 56233. The Service has also explained that “species at the edge of their range may be important in maintaining opportunities for speciation and future biodiversity (Fraser 1999, p. 50), allowing adaptation to future environmental changes (Lesica & Allendorf 1995, p. 756). Furthermore, peripheral populations may represent refugia for species as their range is reduced, as described by Lomolino and Channell (1995, p. 339), who found range collapses in mammal species to be directed towards the periphery. Genetically divergent peripheral populations . . . are often of disproportionate importance to the species in terms of maintaining genetic diversity and therefore the capacity for evolutionary adaptation (Lesica & Allendorf 1995, p. 756).” 76 Fed.Reg. 63720, 63732.

The Service has further noted that “peripheral populations can be important in species conservation if they are genetically divergent from populations in the central portion of the species' range”. That is clearly the case with regard to the Oregon/California and Black Hills populations of the Black-backed Woodpecker (Pierson et al. 2010). 76 Fed.Reg. 61321, 61327.

Furthermore, with regard to genetic distinctiveness, it is the current state of scientific knowledge, not the present taxonomic categorization, which is relevant to the “significance” criterion of the DPS determination. *Center for Biological Diversity v. Lohn*, 296 F.Supp.2d 1223, 1238-40 (W.D. Wash. 2003). This is because taxonomic re-classification is very slow, and lags—often for many years—behind the current state of scientific knowledge. *Id*. Thus, the fact that the Oregon/California and Black Hills populations have not yet been given new Latin subspecies names is irrelevant to the determination of significance.

Finally, both populations meet the ESA’s criteria for listing, described below in the “Threats” section. The courts have noted that a 1% probability of extinction in 100 years is sufficient to satisfy the “conservation status” criterion of the DPS determination. *Center for Biological Diversity v. Lohn*, 296 F.Supp.2d 1223, 1232 (W.D. Wash. 2003).

Current scientific knowledge indicates that, even without the added risk of habitat loss and destruction from human causes (which substantially increases extinction risk), a population of 4,000 to 7,000 adult individuals in size (approximately equivalent to 2,000 to 3,500 pairs) has a risk of extinction of approximately 1% over 40 generations or one century (Reed et al. 2003, Traill et al. 2007, 2010). At lower populations, the risk of extinction over this time period increases substantially above 1% (Reed et al. 2003, Traill et al. 2007, 2010). As discussed below, the scientific evidence indicates populations of only 700-1000 pairs of Black-backed Woodpeckers in the Oregon/California population, and only about 411 pairs in the Black Hills, equating to a high risk of extinction over the next century, especially when the ongoing threats of habitat loss from aggressive landscape-level logging are considered (as discussed in the Threats section below).

In sum, the Oregon/California population and the Black Hills population are genetically distinct at the level of subspecies (Pierson et al. 2010) and, therefore, both meet the definition of "species" under the ESA and should be listed as such. In addition, in light of the foregoing discussion regarding DPSs, these two populations qualify as DPSs under the ESA and warrant protection as such.

Range

The Black-backed Woodpecker is a resident from western and central Alaska, southern Yukon, west-central and southern Mackenzie, northern Saskatchewan, northern Manitoba, northern Ontario, central Quebec, central Labrador and Newfoundland south to southeastern British Columbia, through the Cascade Mountains of Washington and Oregon, to the Siskiyou and Warner mountains and Sierra Nevada of California and west-central Nevada, through Montana to northwestern Wyoming and southwestern South Dakota, and to southwestern and central Alberta, central Saskatchewan, central and southeastern Manitoba, northern Minnesota, northeastern Wisconsin, north-central Michigan, southeastern Ontario, northern New York, northern Vermont, northern New Hampshire and northern Maine (AOU 1983; Figure 3 below). The woodpecker's range roughly corresponds to the range of the northwestern forested mountains, the northern forests, and the taiga (Figure 3), all characterized by relatively dense conifer forests. The species wanders irregularly south to Nebraska, Illinois, Indiana, Ohio, Pennsylvania, Western Virginia, New Jersey, and Delaware during irruptions (AOU 1983).

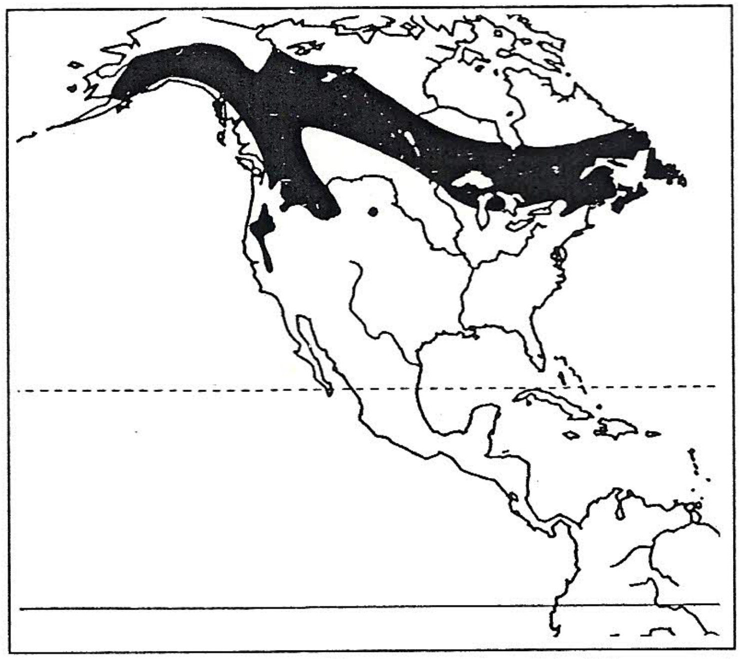

Figure 3. Map of the Range of the Black-backed Woodpecker across North America from Winkler et al. (1995), showing the three distinct populations.

Bock and Bock (1974) noted that the distribution of *P. arcticus* is related to the closed boreal and montane coniferous forest regions of North America, and that the northern limit of this continuous forest type coincides with the northern limits of the Black-backed Woodpecker. Overall, the Black-backed Woodpecker is associated with denser forests containing a diverse mixture of conifer species, no particular species of which is essential to the woodpecker.

While relatively widespread in range, the Black-backed Woodpecker is locally rare in abundance (AOU 1983) with low densities and large home ranges (Dudley and Saab 2007).

Land Management

As discussed in the "Status and Trend" section below, most of the Black-backed Woodpecker habitat in Oregon/California, and nearly all of it in the Black Hills, is on U.S. Forest Service lands, and most of the suitable habitat on U.S. Forest Service lands is within the general forest landscape (as opposed to Wilderness and Inventoried Roadless Areas) where it has no protections. There are no protections for suitable Black-backed Woodpecker habitat on the portion of this habitat that is created by fire or beetles on private lands, as discussed in the "Threats" section below.

Habitat

Black-backed Woodpeckers occur in a wide variety of conifer-forest types, but the greatest densities typically occur in unlogged, intensely burned conifer forests, followed by areas of high tree mortality from beetles. At the landscape scale, while not tied to any particular tree species, Black-backed Woodpeckers generally are found in older conifer forests comprised of high densities of larger snags (Russell et al. 2007, Hanson and North 2008, Nappi and Drapeau 2009, Siegel et al. 2012).

As part of a long-term study, Hutto (2008) analyzed 48,155 point counts conducted in 20 different vegetation types throughout northern Idaho and Montana in the USFS Northern Region Landbird Monitoring Program from 1994–2007 to determine habitat correlations of the Black-backed Woodpecker. Points were >250 m from any other points and dispersed along 10-point transects that were distributed in a geographically stratified manner across the region. Hutto (2008) used only single visits to a given point, utilizing data from the first year a point was visited for his analysis, resulting in 13,337 independent sample points. Samples within post-fire vegetation were collected from an additional 3,128 points distributed along 50 different recently burned (1–4 years post-fire) forests. Hutto (2008) concluded that the species is relatively restricted to burned forest conditions because 96% of all Black-backed Woodpecker detections were in burned forest conditions, and because the distribution of playback detections reflected well the distribution of point-count detections (playback locations were separated by 500 m).

Black-backed Woodpeckers are associated with more recently burned forests. Saracco et al. (2011) surveyed for Black-backed Woodpeckers in 51 fires throughout the Sierra Nevada, California. The fires ranged from 1–10 years old. Overall mean occupancy probability in the average fire area was 0.097 (95% credible interval = 0.049–0.162) but the proportion of surveyed points occupied was higher (0.252, 95% credible interval = 0.219–0.299), indicating that most occurrences were clustered within a few sites or extreme covariate values. The probability of Black-backed Woodpeckers occurring in a given fire was greater in more recent fires and with increasing latitude and elevation.

Generally, the Black-backed Woodpecker depends upon large areas of dense mature forest in which fire or beetles have recently killed most or all of the trees (or have killed a substantial minority of trees in those rare stands with exceptionally high basal area), creating stands with, generally, at least 18-20 square meters per hectare of snag basal area, or at least 200-300 snags per hectare over 23 cm in diameter, and preferably even higher snag basal area, and an even higher density of larger snags (Goggans et al. 1989, Hutto and Gallo 2006, Russell et al. 2007, Bonnot et al. 2008, Hanson and North 2008, Hutto 2008, Saab et al. 2009, Cahall and Hayes 2009, Bonnot et al. 2009, Siegel et al. 2012). The tree mortality must be relatively recent (generally within 7 years or so after tree mortality; longer occupancy does occur, but at very low and decreasing levels) in order to provide adequate habitat for the Black-backed Woodpecker’s prey: beetle larvae (Saab et al. 2007, Siegel et al. 2010). The Black-backed Woodpecker is highly vulnerable to even partial salvage logging (Hanson and North 2008, Cahall and Hayes 2009).

In a radiotelemetry study of Black-backed Woodpeckers in 2011 in recently burned forests within the northern portion of the Sierra Nevada management region (Lassen National Forest in the southern Cascades of California), Siegel et al. (2012) reported on the results of the first year of a two-year study, finding: a) Black-backed Woodpecker home range size averaged 134 to 400 hectares, depending upon the estimation method used; b) the average overlap in home ranges was 27%; c) the mean snag basal area in home ranges was 22 square meters per hectare (about 96 square feet per acre); d) there was a strong inverse relationship between snag basal area and home range size (i.e., indicating that, in territories with lower snag basal area, Black-backed Woodpeckers had to range much farther, and work much harder, to gather enough food to survive, and, conversely, in areas with very high snag basal areas, Black-backeds could have smaller than average home ranges, and relatively greater concentrations); e) the most important variables determining where Black-backed Woodpeckers foraged were small snag density, medium snag density, and large snag density (with medium and large snag densities being the most important); f) Black-backeds preferentially selected larger individual snags for foraging; and g) there was a strong negative effect of post-fire salvage logging (Black-backeds showed almost complete avoidance of salvage logged areas—see Fig. 10 of Siegel et al. 2012). These results provide strong additional support to previous research showing that Black-backed Woodpeckers rely upon dense mature and old forest that has recently experienced moderate/high-intensity fire and has not been subjected to salvage logging.

Nesting Habitat

Black-backed Woodpeckers are one of the most highly selective bird species not only with respect to using burned or otherwise naturally disturbed forests, but also with specific nesting and foraging trees used within a stand (Hutto 1995, Raphael and White 1984). Black-backed Woodpeckers nest in a variety of tree species, both live and dead, but exhibit patterns of selection at a local scale dependent upon forest type and condition. In general, Black-backed Woodpeckers excavate nests in the sapwood of relatively hard dead trees with little decay. Black-backed Woodpeckers tend to select nesting stands with higher tree densities than available sites, and strongly prefer to nest in unlogged burned forests over logged burned forests. Nest sites in burned forests are strongly correlated with areas of high pre-fire canopy cover and high wood-boring insect abundance.

Nest Tree Selection—Dawson (1923) noted that Black-backed Woodpecker nests are typically located in a hole in a stump or stub up to 2.4 m above the ground. Dixon and Saab (2000) reported the species nesting in live and dead trees of various species including lodgepole pine (*Pinus contorta*), ponderosa pine (*P. ponderosa*), Douglas-fir, red fir (*Abies magnifica*), quaking aspen (*Populus tremuloides*), subalpine fir (*A. lasiocarpa*), western larch, red maple (*Acer rubrum*), paper birch (*Betula papyrifera*), jack pine (*Pinus banksiana*), red pine (*P. resinosa*), tamarack (*L. laricina*), black spruce (*Picea mariana*), white spruce (*P. glauca*), balsam fir (*A. balsamea*), noble fir (*A. procera*), and silver fir (*A. alba*).

Goggans et al. (1989) studied Black-backed Woodpeckers nesting in beetle-killed lodgepole pine-dominated mixed conifer forests and pure lodgepole pine forests in central Oregon. All 35 nests located were in lodgepole pine trees. In beetle-killed forests in the Black Hills, South Dakota, most of 42 Black-backed Woodpecker nests were in aspen trees or pine snags >3 years old (Bonnot et al. 2009). Table 2 below shows the species and condition of 61 nest trees utilized by Black-backed Woodpeckers in three different areas of the Rocky Mountains, two burned and one undescribed. Most nests (95%) were in snags.

Table 2: Species and Condition (Snag or Live) of Nest Trees Used by Black-backed Woodpeckers from 3 studies.

Study	Site description	N	PIPO[1] snag	PSME[2] snag	PSME live	PICO[3] snag	PICO live	ABLA[4] live	LAOC[5] snag
Caton 1996	NW MT, burned	11		2					9
Hoffman 1997	NW WY, undescribed	15			1	12	1	1	
Dixon and Saab 2000	SW ID, burned	35	19	16					

[1] Ponderosa pine, [2] Douglas-fir, [3] Lodgepole pine, [4] Subalpine fir, [5] Western larch

In a study of burned forests of western Idaho, Black-backed Woodpeckers selected larger trees for nesting (average = 39.7 ± 2.1 cm, *n* = 35), but trees that were smaller than nest trees selected by five other woodpecker species (Saab et al. 2002). Black-backed Woodpeckers typically nested in trees with light to medium decay and often with intact tops, possibly because the species is a strong excavator and is able to excavate hard snags and live trees (Raphael and White 1984, Saab and Dudley 1998). Raphael and White (1984) also reported that harder snags were used for nesting more than expected based on their availability in unburned forest adjacent to intensely burned forest in the Sierra Nevada, California. Five of seven nests were in snags, while the other two nests were in dead portions of live trees (Raphael and White 1984).

Nest tree sizes of 210 Black-backed Woodpecker nests in burned forests of central Oregon were similar the first three years after fire but then increased the fourth year (Forristal 2009). Lodgepole pine and ponderosa pine snags comprised 90% of all selected nest-tree species, and woodpeckers gradually switched from nesting mostly in lodgepole pine to ponderosa pine with time since fire.

While nest trees selected by Black-backed Woodpeckers were smaller than those selected by some other cavity nesters (Saab and Dudley 1998, Raphael and White 1984), average sizes of nest trees still were larger than the average available snag. Saab and Dudley (1998) reported that the mean diameter of Black-backed nest trees was 32.3 ± 2.8 cm.

Nest Stand Selection— Black-backed Woodpeckers strongly select nest stands in burned, unlogged forests over burned, logged forests. Hutto and Gallo (2006) located 10 nests in unlogged plots and none in salvage-logged plots in burned mixed-conifer forest in Montana. Saab and Dudley (1998) monitored 17 Black-backed Woodpecker nests from 1994 to 1996 in forests in western Idaho that had burned in 1992 and 1994. Among all cavity-nesting bird species studied, Black-backed Woodpeckers selected nest sites with the highest tree densities (average = 122.5 ± 28.3 trees ≥23 cm dbh) per hectare. Moreover, nest densities were nearly four times higher in unlogged high-intensity burn areas versus "wildlife salvage" and were more than five times higher than in "standard salvage" areas, despite 32–52% retention of snags 23–53 cm dbh, and ~ 40% retention of snags > 53 cm dbh (Dudley and Saab 1998). In the small number of nests found in salvage-logged areas, Black-backed Woodpeckers selected stands with snag densities about 2.6 to 4.3 times higher than snag densities at random sites (Dudley and Saab 1998). Hutto and Gallo (2006) found 0.9 Black-backed nests/40ha in unlogged heavily burned forest and 0/ha in salvage logged areas. Numbers of nesting Black-backed Woodpeckers were significantly reduced in burned, logged stands compared to burned, unlogged stands in Montana and Wyoming as well (Harris 1982 and Caton 1996 as cited in Dixon and Saab 2000). Cahall and Hayes (2009) found that, consistent with the "salvage-effect hypothesis," Black-backed Woodpeckers were significantly more abundant in unlogged burned forest than in areas subjected to any salvage logging, and salvage logging of reduced intensity "did not mitigate differences in bird density or abundance." Thus, the Black-backed Woodpecker is adversely impacted by even partial salvage logging.

After continued nest monitoring in the western Idaho study described above, Saab et al. (2002) reported 29 Black-backed Woodpecker nests in unlogged burned forests and only 6 nests in partially logged burned forests. Of all 7 cavity nesting species monitored by the authors, snag densities were highest at Black-backed nest sites (n = 4 sites in logged; 13 in unlogged), and lowest at random sites (n = 49 sites in logged and 40 in unlogged). The authors also modeled habitat variables for predicting Black-backed nests and found that stand area of high-intensity burned Douglas-fir with high pre-fire crown closure was the most important variable in predicting presence of nests. Probability of nest occurrence was highest when nest stand area of Douglas-fir with pre-fire high crown closure (>70% crown closure pre-fire) was over 30 hectares. The nest stand is a subset of the overall home range, which is much larger (see below). In landscapes where nest stand area was outside of this range, other landscape features necessary for nesting Black-backed Woodpeckers were likely reduced in availability or absent. Nests were not present where nest stand area of dense, heavily-burned forest was less than 12 ha, and nesting probability was highly variable when nest stand area was between 12 and 25 ha. The authors do not report whether any nests were located in high-intensity burned, high pre-fire crown closure stands >70 ha, or if there were not any nest stands this large, or if any surveys were conducted in these large stands. Other data indicate Black-backed Woodpeckers use large high-intensity patches hundreds of hectares in size (Dixon and Saab 2000).

Russell et al. (2007) compared the ability of models using remote-sensed data only, with models derived from field-collected data plus remote-sensed data, to identify potential Black-backed Woodpecker nesting habitat in post-fire landscapes in western Idaho. The authors measured microhabitat characteristics in a 0.04-ha circular plot around a nest, and landscape characteristics in a 1-km radius circle around a nest. The best model describing Black-backed Woodpecker nest locations included higher pre-fire crown closure on pixel and landscape scales, as well as higher burn intensity, and larger tree diameter, higher densities of large snags, and larger patch area. Only 11% of Black-backed nests were located in pixels with 0–40% pre-fire crown closure versus 48% of non-nest comparison plots. Within a 1-km radius of Black-backed nests (on a landscape-level), an average of 55% of the area was characterized by pre-fire crown closure >40%, compared to 47% of landscape in non-nest random locations. Mean fire intensity within a 1-km radius of nests was dNBR=513, while it was only dNBR=358 at non-nest random locations (dNBR=367 is a threshold used by the Forest Service to separate moderate intensity from high intensity [Miller and Thode 2007]). The authors concluded that both field-collected microhabitat data and remotely sensed landscape data were necessary to correctly identify nest locations because remote-sensed data alone performed poorly in predicting nest locations. The authors suggested that models were able to distinguish between nest and non-nest locations because the species is a habitat specialist. The results of Russell et al. (2007) and Saab et al. (2002) offer compelling evidence that Black-backed Woodpeckers depend upon large patches of dense, old closed-canopy forests that burn at high intensity for nesting. Results from studies on foraging requirements support the same conclusions (see "Foraging Habitat," below).

Vierling et al. (2008) examined post-fire nest density, reproductive success, and nest-site selection in the context of pre-fire conditions and post-fire effects in the Black Hills, western South Dakota, for 1–4 years after fire. Mean diameter at breast height (dbh) of nest trees was 25.7 $\pm$ 1.09 cm (n = 20) compared to mean dbh at random sites of 19.8 $\pm$ 0.73 cm (n = 151); mean distance to an unburned edge from the nest tree was 605.95 $\pm$ 61.0 m compared to random distance of 168.7 $\pm$ 10.8 m; mean percent of low-intensity fire within 1 km of nest tree was 20.8 $\pm$ 1.90% compared to random 24.9 $\pm$ 0.54%, and mean snag density within 11.3 m of nest tree was 26.8 $\pm$ 4.17 m compared to random 13.3 $\pm$ 0.94 m. In other words, for nesting, Black-backed Woodpeckers selected larger than average trees that were farther into the interior of fire areas (and away from the unburned edges) in areas with higher than average levels of higher-intensity fire effects and greater snag densities.

Vierling et al. (2008) also documented that the number of Black-backed Woodpecker nests was highest in sites with the highest pre-fire canopy, with 95% of nests in areas where pre-fire canopy cover was medium (40–70% pre-fire canopy cover) or high (70–100% pre-fire canopy cover) (Table 3). Nest sites that burned at the highest intensity also had the greatest percent reproductive success compared with moderate- and low-intensity burned nest sites (Table 4). Russell et al. (2007) found that 89% of black-backed nests were in areas where pre-fire canopy cover was 40–100%, while only 52% of non-nest random locations had 40–100% canopy cover. Nappi and Drapeau (2009) found that Black-backed nest density and reproductive success were highest where high-intensity fire occurred in old forest, rather than in young forest.

Table 3: Average density of nests/100 ha ($\pm$SE) of Black-backed Woodpeckers nesting in the Jasper Fire in the Black Hills, South Dakota.

	High prefire canopy cover (n = 2 sites)	Moderate prefire canopy cover (n = 2 sites)	Low prefire canopy cover (n = 2 sites)	Overall density
No. of nests	11	8	1	20
Mean density	0.28	0.31	0.03	0.24
SE	0.08	0.08	0.02	0.05

Table 4: Reproductive variables of Black-backed Woodpeckers between 2002 and 2004 in the Jasper Fire in the Black Hills, South Dakota, in nests located within burned patches of high, moderate, or low intensity.

	High intensity	Moderate intensity	Low intensity
No. of nests monitored	10	6	5
Daily survival rate	0.995	0.982	0.986
SE	0.005	0.12	0.014
% reproductive success	80.0	50.0	60.0

In burned forests of western Idaho, Saab et al. (2009) found that Black-backed Woodpeckers selected nest sites with the highest mean snag densities among cavity-nesting birds (316 snags/ha >23 cm dbh). Similarly, Forristal (2009) found a significantly greater number of snags per hectare, and significantly higher burn severity, at 210 Black-backed Woodpecker nest sites (cumulative number of nest sites found over four years in the study area) compared with random sites. The odds of nest occurrence nearly doubled for every 50 additional snags over 23 cm within the stand. Black-backeds selected nest sites in areas with higher snag densities and larger burned areas; tree density increased odds of nesting only if it coincided with increasing areas of moderate-high burn severity.

Bonnot et al. (2009) examined habitat attributes around 42 Black-backed Woodpecker nests in beetle-killed forests in the Black Hills, South Dakota. Important predictors of nest-site selection were wood-boring insect abundance in a 20 ha plot around the nest, density of all pine and aspen snags in a 12.5 m plot around the nest, and the diameter of the nest tree. Site selection was most strongly associated with a high abundance of wood-boring insects. Bonnot et al. (2009) found that Black-backed Woodpeckers used areas with an average of 268 snags per hectare, or 109 per acre, for nest areas (see p. 224 of Bonnot et al. 2009). The birds used areas of somewhat older beetle kill (3–5 years old), mixed with aspen, for nesting, and selected such areas where they were within 50-100 meters of large patches of even *higher* levels of beetle kill (Bonnot et al. 2009, p. 226 and Fig. 4). If patches of very high beetle mortality were more than 150–200 meters away from a given potential nest site, territory selection probability dropped to near zero, due to lack of available and accessible food, indicating that Black-backed Woodpeckers need well-distributed large patches of very high beetle mortality to establish successful territories and maintain viable populations (Bonnot et al. 2009, p. 225, Fig. 2). Exhaustive analysis of historic U.S. government surveys circa 1900 found that large expanses of high beetle mortality, and high-severity fire, are a natural part of the ecology in the Black Hills National Forest (Shinneman and Baker 1997, Bonnot et al. 2009).

Black-backed Woodpeckers are important primary cavity excavators in intensely burned snag forests, providing nesting sites for other cavity-nesting bird and mammal species. Saab et al. (2004) reported that 27% of Black-backed Woodpecker cavities subsequently were re-used by other weak-excavator and non-excavator bird species. In burned forests of Montana, Hutto and Gallo (2006) documented 6 cavities made by Black-backed Woodpeckers that were re-used 7 times by other species including Northern Flicker

(*Colaptes auratus*; 2 nests), White-breasted Nuthatch (*Sitta carolinensis*; 2 nests), House Wren (*Troglodytes aedon*; 2 nests), and Mountain Bluebird (*Sialia currucoides*: 1 nest). All the Black-backed Woodpecker cavities were reused by another species.

Foraging Habitat

In general, Black-backed Woodpeckers tend to forage on the trunks of larger-sized standing dead trees within dense old stands and in moderate- and high-intensity burned conifer forests, or dense old conifer forests with very high levels of tree mortality from beetles. Dead forage trees that are used tend to be in a less-deteriorated condition than available dead trees. In burned forests, Black-backed Woodpeckers forage mostly in stands that have not been subject to salvage logging, similar to results from studies on nesting-habitat selection. Trees used for foraging were linked to high densities of wood-boring beetle larva excavation holes. In Idaho, in a 314-ha area around Black-backed Woodpecker nests (1-km radius), which represented the likely foraging habitat, pre-fire canopy cover was high and the mean dNBR fire severity value was 513 (Russell et al. 2007), equating to very high intensity (Miller and Thode 2007). In the Sierra Nevada, Black-backed Woodpeckers were found foraging only in dense mature/old-growth forest that burned at high intensity and were not salvage logged (Hanson and North 2008). Recent (2011) radiotelemetry data from Black-backed Woodpeckers on Lassen National Forest, in the northern portion of the Sierra Nevada management region, indicated almost complete avoidance of salvage logged areas for foraging in burned forests, and a strong association with dense, mature/old forest, recently burned, with high levels of snag basal area, especially in the larger snag size classes (Siegel et al. 2012).

Black-backed Woodpeckers forage almost exclusively on heavily charred hard snags and fallen logs. Nearly all sightings of foraging Black-backed Woodpeckers were on moderately to heavily scorched standing white spruces in burned boreal forest of interior Alaska (Murphy and Lehnhausen 1998). The birds were observed less frequently in the interior of the burn where the spruces were killed immediately and heavily scorched by the fire; the authors attributed the lack of foraging Black-backed Woodpeckers in the interior of the burn to potentially low larval survival there due to rapid desiccation of sapwood in boreal forest trees with very thin bark. Indeed, abundance of cerambycid eggs was initially low on those heavily scorched spruces (Murphy and Lehnhausen 1998). Kreisel and Stein (1999) found that Black-backed Woodpeckers in burned forests foraged upon standing dead trees 99% of the time and only 1% of the time on logs during winter in the Kettle River Range in northeastern Washington. The birds foraged primarily on western larch and Douglas-fir on middle and lower trunks of trees. For all woodpecker species in the Kettle River Range study, trees >23 cm dbh were used significantly more than the proportion available (84% used versus 36% available).

Nappi et al. (2003) studied foraging ecology of Black-backed Woodpeckers and correlations to density of wood-boring beetle larva in unlogged eastern black spruce boreal forest in Quebec, Canada one year after a fire. Modeling demonstrated that tree diameter and crown condition were significant predictors of snag use for foraging: the probability that a snag was used increased with a higher tree diameter and a lower deterioration value. The model predicted use of high-quality snags during 20 of 26 foraging observations. Snags of high predicted quality contained higher densities (mean per snag) of larval entrance holes, larval emergence holes, and foraging excavations of woodpeckers than snags of low predicted quality. Among snags of high predicted quality, entrance hole density was significantly higher for the 1–3 m height section of the tree than for the 0–1 m section, whereas among snags of low predicted quality, entrance larval hole density was significantly higher in the 0–1 m and the 1–3 m sections. Thus, selection of larger and less-deteriorated snags is linked to higher availability of insect prey. The authors also found that larger snags had higher densities of wood-boring beetle larva entrance holes than smaller snags (see also Hutto 1995), and that for the same diameter, a less-deteriorated snag had a higher probability of use by Black-backed Woodpeckers than did a more deteriorated one. Snag deterioration combined with diameter influenced the density of wood-boring beetle larvae. Overall, Black-backed Woodpeckers avoided more degraded snags (e.g., pre-fire snags) in which wood-borers probably oviposited less and where larvae were more susceptible to desiccation. The authors concluded (at p. 509) that "[t]he importance of post-fire forests as a foraging habitat for Black-backed Woodpeckers may vary in regards to pre-fire characteristics of trees and conditions induced by fire."

Hutto and Gallo (2006) found that the number of snags needed for foraging Black-backed Woodpeckers was higher than the number needed for nesting. The authors stated at p. 828 that "[t]hese results highlight the fact that we need to appreciate snags as food resources as well as nest-site resources and that, for timber-drilling woodpecker species in particular, the number of snags needed to meet food resource needs appears to be much greater than the number needed to meet nesting requirements." Within dense stands, Black-backed Woodpeckers in California foraged on the larger-sized snags. Hanson (2007) found that Black-backed Woodpeckers foraged more on large snags (≥50 cm) than would be expected based on availability in several burned sites throughout the Sierra Nevada, California. All 4 of the instances where Black-backed Woodpeckers were located in the medium-sized (25–49 cm dbh) class, the birds foraged on snags 40–49 cm dbh, indicating that the birds may select snags ≥40 cm within stands dominated by smaller-sized trees. In addition, the Black-backed Woodpeckers were found foraging exclusively in high-intensity burned stands that were unlogged, and not in unburned, moderate intensity, or salvage logged areas (Hanson 2007, Hanson and North 2008). The unlogged high-severity stands had 92–100% tree mortality, and an average of 252 snags/ha > 25 cm dbh, about half of which were > 50 cm dbh (Hanson and North 2008). Hanson and North (2008) avoided point counts within 100 m of another fire intensity category, so there were no point counts in moderate-intensity areas at the edge of high-intensity areas.

Hutto (2006 at pp. 985–986) provided a succinct and articulate explanation for the possible reasons why Black-backed Woodpeckers are so strongly tied to recently burned, dense snag-forest habitats containing large burned trees:

> "At least one-fourth of all bird species in western forests and perhaps even as much as 45 percent of native North American bird populations are snag-dependent; that is, they require the use of snags at some point in their life cycle. In burned conifer forests, the most valuable wildlife snags are

> also significantly larger than expected owing to chance, and are more likely to be thick-barked, such as ponderosa pine, western larch, and Douglas-fir, than thin-barked such as Englemann spruce, true firs (*Abies*) and lodgepole pine tree species. The high value of large, thick-barked snags in severely burned forests has as much to do with the feeding opportunities as it does the nesting opportunities they provide birds. The phenomenal numerical response of woodpeckers of numerous species that occupy recently burned conifer forests during both the breeding and nonbreeding seasons is most certainly associated with the dramatic increase in availability of wood-boring beetle larvae that serve as a superabundant food resource for woodpeckers. This helps explain why, in contrast with snags in green-tree forests, valuable wildlife snags in burned conifer forests include not only relatively soft snags (used for nesting by both cavity-nesting and open-cup-nesting species) but also snags that are at the sounder end of the snag decay continuum because the latter are what both beetles and birds require for feeding purposes and what many bird species use for nesting purposes. Consequently, burn specialists such as the Black-backed Woodpecker, which depends on snags for both feeding and nesting, settle in areas with higher snag densities than expected owing to chance."

Black-backed Woodpeckers also forage successfully in large patches of dense mature/older forest with very high tree mortality from beetles, as found by Bonnot et al. (2009). While Black-backeds selected nest stands with a mean snag density of 268/hectare (p. 224 of Bonnot et al. 2009), they required such nest stands to be within close proximity (generally 50-100 meters) to areas of even higher beetle mortality (Bonnot et al. 2009, p. 226 and Fig. 4), and nesting potential was essentially eliminated if these patches of extremely high tree mortality, which function as foraging grounds, were more than 150–200 meters away from the potential nest stand (Bonnot et al. 2009, p. 225, Fig. 2).

Black-backed Woodpecker foraging in salvage logged areas often drops to near zero, based upon radiotelemetry data (Goggans et al. 1989). Specifically, Goggans et al. (1989) conducted a radiotelemetry study of Black-backed Woodpeckers in an area with about 160 square meters per hectare of basal area (total) in which 28% of trees were killed by beetles, i.e., about 20-25 square meters per hectare of recent beetle mortality basal area (Goggans et al. 1989, pp. 33-34), similar to the findings of Siegel et al. (2012) in burned forests of the Sierra Nevada management region. They found that home range size in these areas averaged 174 hectares per pair (see p. 25, Table 7), and salvage logged areas essentially eliminated foraging habitat for this species, with 99% of all radiotelemetry locations found in unlogged areas (Goggans et al., p. 26, Table 8)—also very similar to the radiotelemetry findings of salvage logged areas in burned forests of the Lassen National Forest in the Sierra Nevada management region (Siegel et al. 2012 [Fig. 10]).

Home-range Size

Dudley and Saab (2007) report that home-range sizes of Black-backed Woodpeckers have been estimated from observational data (e.g., 61 ha in Vermont; Lisi 1988, and 40 ha in Alberta; Hoyt 2000 as cited in Dudley and Saab 2007) and nesting densities (4 pairs per 500 ha in western Idaho [Dixon and Saab 2000]; 9 pairs per 200 ha in Idaho and Montana [Powell 2000 as cited in Dudley and Saab 2007]; 15 nests per 100 ha in Quebec [Nappi et al. 2003]). However, these estimates do not incorporate actual locations of foraging individuals, which can only be determined from radio-telemetry. Four studies have reported home-range size of Black-backed Woodpeckers using radio-telemetry, all of which yielded much larger home-range sizes than estimates from observational data alone.

Goggans et al. (1989) reported median home-range size for 3 individual woodpeckers from radio-telemetry was 124 ha (range 72–328 ha) in beetle-killed lodgepole pine forests of central Oregon. Home-range sizes of 7 Black-backed Woodpeckers in unburned boreal forests in Quebec, Canada averaged 151.5 + 18.8 ha (range = 100.4–256.4 ha), with the home-range size of 358.8 ha for a female that made a non-successful breeding attempt (Tremblay et al. 2009). In southwest Idaho, 1 adult male Black-backed Woodpecker was radio-tracked during June and July in unlogged, intensely burned ponderosa pine-Douglas-fir forest 4 years post-fire; home-range size was 72 ha (Dixon and Saab 2000). Dudley and Saab (2007) radio-tracked 2 males 6 years post-fire, and 2 males 8 years post-fire in burned ponderosa pine/Douglas-fir forests in southwestern Idaho. Average home-range size was 322 ha (range 123.5–573.4 ha) using 95 percent minimum convex polygon and 207 ha (range 115.6–420.9 ha) using fixed-kernel estimates (Table 5).

Table 5: Home-range size (ha) for 4 radio-tagged Black-backed Woodpeckers in ponderosa pine / Douglas-fir forests of southwestern Idaho, 6 and 8 years following fire. From Dudley and Saab (2007).

			MCP [c]			
Time since fire[a]	*N*	Distance (m) [b]	95%	100%	95% FK [d]	95% bootstrap [e]
6 years						
Male 1	42	673.8 (91.6)	233.6	354.6	115.6	130.0 (118.2-141.8)
Male 2	66	646.1 (65.8)	359.0	445.9	130.7	139.2 (131.1-147.4)
8 years						
Male 3	48	644.8 (84.4)	123.5	150.4	161.3	174.7 (158.4-191.0)
Male 4	53	860.8 (115.5)	573.4	766.1	420.9	521.9 (470.9-572.9) [a]

[a] Males 1-3 radio-tracked in 2000, male 4 in 2002

[b] Mean distance between successive radiotelemetry relocations. Standard error in parentheses.

[c] Minimum convex polygon

[d] Fixed-kernel

[e] Smoothed bootstrap mean area (95% confidence interval)

Larger areas may be required during the post-breeding period, and as time elapses since fire (Dudley and Saab 2007). Home-range sizes were significantly larger at 8 years post-fire than 6 years post-fire (Table 5), indicating that Black-backed Woodpeckers may have expanded their home ranges as time progressed after fire to meet foraging requirements (though sample sizes were small). The authors suggest that birds may have had to move greater distances to find food as beetle populations dwindled. All the males moved to adjacent unburned areas, suggesting that these older burned forests (6–8 years post-fire) may have been less suitable as foraging habitat than recently burned forests. One male had a home range 2–3 times larger than other males (male 4; Table 5). The authors noted that this male was often located at distances >1.4 km into the adjacent unburned forest where he foraged in stands with scattered dead and dying trees (similar to use of burn perimeters by foraging Black-backed Woodpeckers in Alaska; Murphy and Lenhausen 1998).

Results from radio-telemetry studies of Black-backed Woodpeckers provide important insights into population dynamics. Because all 4 individuals utilized adjacent unburned areas in older post-fire forests, Dudley and Saab (2007) postulated on p. 597 that "[d]uring periods of infrequent forest fires, green forests adjacent to old burns may play a role in maintaining local populations of Black-backed Woodpeckers until new forest burns are created," as some beetle mortality radiates outward from the burn area, a hypothesis proposed earlier by Hutto (1995, 2006).

Dudley and Saab (2007) documented large variation in home-range size among individuals (Table 5). Home-range estimates for Black-backed Woodpeckers also exhibited high variation in beetle-killed forests, ranging from 72 to 328 ha for 3 birds (100 percent MCP, Goggans et al. 1989).

Importantly, Dudley and Saab (2007) documented 2–8 centers of activity of relatively high-quality habitats for each radio-tagged male, with "high-quality" defined as areas where sightings were clumped. These high-quality habitats were patchily distributed. The authors cautioned that using fixed-kernel estimates alone could seriously underestimate the extent of required habitat if high-quality habitats are isolated and vary greatly in size; using MCP (minimum convex polygon) estimates would help incorporate these patchily distributed habitats when quality is unknown. The authors suggested that MCP and fixed-kernel home-range estimates be used together, thus allowing the manager to delineate enough high-quality habitat within an overall landscape to support Black-backed Woodpeckers during the post-fledging period.

Dudley and Saab (2007) also suggested that a potential home range be estimated by adding together all the areas of all high-quality habitats (patches) for one individual until approximately the size of the 95 percent fixed-kernel home range estimate is obtained (in their study, this area was 207 hectares [ha]). The extent of the areas, determined by encircling all the selected high-quality patches, should approximate the mean of the 100 percent MCP estimates from all home ranges [in this study, the mean of MCP estimates was 429 ha]. It would then be possible to estimate the total number of potential home ranges within the overall fire area.

In a radiotelemetry study of Black-backed Woodpeckers in burned forests of the Sierra Nevada region, Siegel et al. (2012) found that average home range size varied from 134 to 400 hectares, depending upon the method of estimation used, and that the two home ranges that were only partially within the fire area (nest stands were within the fire), home range sizes were much larger, and home range size increased significantly if snag basal area was lower (either as a result of some patches of salvage logging within home ranges, or due to some unburned forest within the home range).

Diet

Diet—Black-backed Woodpeckers feed largely on larvae of wood-boring beetles (Cerambycidae and Buprestidae; Dixon and Saab 2000). Bull et al. (1986) documented that the larvae of wood-boring beetles make up three-fourths of the Black-backed's diet. Dixon and Saab (2000) report engraver beetles (Scolytidae) taken in New Hampshire; mountain pine beetles (*Dendroctonus ponderosae*) eaten in central Oregon lodgepole pine forests; and cerambycid *Monachamus oregonensis* eaten in northeastern California. Villard and Beninger (1993) observed that insects collected in Quebec, Canada were almost exclusively the larvae of the whitespotted sawyer, *Monachamus scutellatus*, a long-horned beetle. Black-backed Woodpeckers also feed to a small extent upon weevils and other beetles, ants, insects, spiders, vegetable food, wild fruits, mast, and cambium (Dixon and Saab 2000).

Murphy and Lehnhausen (1998) analyzed stomach contents of 13 Black-backed Woodpeckers in a burned forest in interior Alaska, and found they were feeding primarily on wood-boring beetle larvae (Cerambycidae) with a very small prevalence of Scolytidae. The larvae of wood-boring beetles are best extracted from sapwood by excavating, which explained the prevalence of excavation as a method of foraging. The authors did not observe a secondary outbreak of egg-laying by wood-boring beetles when adults from a 1983 cohort emerged in 1985 and 1986.

Feeding Behavior—Black-backed Woodpeckers fed on snags, as opposed to live trees, 97% of the time in burned forests in the Sierra Nevada, and preferentially selected the largest snags (50–100 cm and >100 cm dbh) (Hanson 2007). Black-backed Woodpeckers scaled (systematically flaking off bark) 72% of the time and pecked and gleaned the remainder of the time in beetle-killed forests of northeastern Oregon (Bull et al. 1986). Villard (1994) also reported woodpeckers mostly foraged by scaling bark and excavating in unburned forests with beetle mortality in Manitoba, Canada. Villard and Beninger (1993) found that Black-backed Woodpeckers searched for food 97% of the time on fire-killed white pine and 3% of the time on eastern hemlock in a burned forest in Quebec, Canada. Villard and Beninger (1993) also documented that the woodpeckers foraged 100% of the time on the trunks of trees in winter, and 94% of the time on the trunk in spring, and were never observed foraging on the ground. Black-backed Woodpeckers foraged on the largest limb size classes (>15 cm) in the winter. In the spring, the birds foraged on limbs >7.5 cm, and rarely (e.g., 5% of the time) on limbs smaller than 7.5 cm.

Villard (1994) studied 156 male and 15 female foraging Black-backed Woodpeckers in unburned boreal forests with beetle mortality in Manitoba, Canada. Dead trees or tree substrates were used 88% of the time, and the birds always foraged on trunks. Black-backed Woodpeckers spent 41% of the time foraging on dead wood on the ground, and foraged significantly more often on lower portions of tree trunks. No differences were found in foraging behavior between the sexes. Overall, Black-backed Woodpeckers foraged mainly on fallen logs and at the base of tree trunks, digging deeper in larger trees.

Kreisel and Stein (1999) documented Black-backed Woodpeckers in burned forests foraging upon standing dead trees 99% of the time and 1% of the time on logs during winter in the Kettle River Range in northeastern Washington. These birds foraged primarily on western larch (*Larix occidentalis*) and Douglas-fir (*Pseudotsuga menziesii*), on middle and lower trunks of trees. Trees >23 cm dbh were used significantly more than the proportion available (84% used versus 36% available).

Murphy and Lehnhausen (1998) studied foraging Black-backed Woodpeckers in a burned boreal forest in interior Alaska. Nearly all sightings were on moderately to heavily burned standing white spruces. The authors reported no sexual differences in foraging mode, but females foraged higher on trees and upon more heavily burned trees than males. These Black-backed Woodpeckers excavated 64.5% of the time in 1984–1985 and 57.8% of the time in 1985–1986. Pecking constituted 33% of observations in 1985–86 and 25.7% of observations in 1984–85. The birds almost always foraged on portions of fire-damaged spruces where the bark was charred and closely matched their sooty-black dorsal plumage. Overall, the Black-backed Woodpecker is highly specialized in its foraging ecology and diet.

Life History and Demography

Black-backed Woodpeckers are primary cavity excavators, whereby individuals create a hole in a selected tree in which to lay and incubate their eggs. Females can lay a second clutch if the first is lost. The species can nest in live or dead trees, but most nests are found in medium-sized dead pines (Dixon and Saab 2000). Breeding Black-backed Woodpeckers have been documented in both green (i.e., relatively undisturbed) and black/brown (i.e., recently disturbed) forests, but densities of nesting pairs are by far greatest in newly burned forests that had high pre-fire canopy closure and contain high densities of medium and large trees (Russell et al. 2007, Hanson and North 2008), or forests with very high levels of recent tree mortality from beetles (Goggans et al. 1989, Bonnot et al. 2008, 2009).

Nest Excavation—Black-backed Woodpeckers typically excavate and occupy a new nest cavity every year (Dixon and Saab 2000). Nest excavation usually occurs in April and May, with the completion of excavation ranging from end of May in Michigan to as late as mid-June in Oregon (Dixon and Saab 2000). Both sexes excavate nests, but the male apparently does most of the work, with both excavating intermittently over the course of the day (Dixon and Saab 2000). Raphael and White (1984) report mean dimensions of 8 Black-backed Woodpecker nests in the northern Sierra Nevada, California: mean nest tree height was 16.8 m and mean nest tree diameter at breast height ("dbh") was 44.5 cm. Mean hole height was 2.8 m (SE = 0.59), mean tree diameter at the hole was 38.3 cm (SE = 3.12), mean minimum diameter of hole entrance was 44.3 mm (SE = 1.53), mean cavity depth was 20.6 cm (SE = 1.46), mean internal diameter of cavity was 11.1 cm (SE = 0.69), and mean sill width was 4.4 cm (SE = 0.71).

Incubation, Brooding, and Parental Care—Eggs are laid approximately the third week of April in Idaho, and mid-May to mid-June in Wisconsin (Dixon and Saab 2000). Females lay from 2 to 6, but typically 3 or 4, glossy white eggs that measure 21–25 mm in length and 18.2–18.9 mm in breadth (Dixon and Saab 2000). If eggs are destroyed, females will lay a second set of eggs, often in the same nest (Dixon and Saab 2000, Bonnot et al. 2008). Both sexes will incubate eggs, but the female seems to take shorter shifts during the day, and the male always incubates at night (Dixon and Saab 2000). At hatching, young are altricial and naked, but no data are available on size or mass (Dixon and Saab 2000).

Both sexes also brood the young, with the male brooding at night until late in the nestling phase when young begin to act aggressively (Dixon and Saab 2000). Little brooding is done during the day once young are moderately developed, but adults sometimes remain in the nest to brood for 4–17 minutes at a time (Dixon and Saab 2000). Adults approach the nest cavity from all directions and often glide the last 10 m. The adult will typically turn its head laterally and place its bill perpendicular to and within the bill of its nestlings (Kilham 1966, Dixon and Saab 2000). The nestlings will eat food directly from the parent's bill, but males also have been observed regurgitating food to the young, indicating that food may also be carried in the esophagus (Dixon and Saab 2000). In his observations of two Black-backed Woodpecker nests, Kilham (1966) found that females feed the young more frequently but carry relatively small amounts of prey with each visit, while males visited less often but with larger or more insects in their bills. Moreover, males performed all or nearly all of the sanitation of the nest. Kilham (1966) also noted extremely aggressive behavior of the nestlings, describing "the almost ferocious energy with which they attacked their surroundings" (p. 309).

In southwestern Idaho, young Black-backed Woodpeckers typically fledged early June through early July, at about 24 days of age (range 21.5–25.0, n = 11 nests; Dixon and Saab 2000). Bull et al. (1986) documented that young fledged from the nest after 6 July at 63% of nests in northeastern Oregon, while in central Oregon young fledged as early as 20 May, with the average in mid-June (Forristal 2009). In Oregon and California, fledging can occur as late as late July (Dixon and Saab 2000, M. Bond pers. comm. 2011). Adults often urged the fledglings from the nest cavity (Dixon and Saab 2000), after which each adult would attend 1 or 2 of the fledglings, with the fledglings often switching between the adult male and the adult female as they copied the adults' foraging behaviors (Dixon and Saab 2000).

Nest Success—Nest success of Black-backed Woodpeckers in heavily burned forests of the Rocky Mountains region was 87% in Idaho, 100% in Wyoming, and 71% in Montana (Dixon and Saab 2000). Vierling et al. (2008) reported overall nest success was >70% in heavily burned forests in the Black Hills, South Dakota, but decreased with each successive year after fire, with 78% successful nests (n = 73 nests) 2 years post-fire and decreasing to 73% (n = 57 nests) 3 years after fire and 67% (n = 9) 4 years after fire. Nest success also varied by burn intensity, with overall reproductive success 80% in high-intensity patches, and only 50% in moderately burned and 60% in low-intensity burned patches. Nest success also decreases the later the nest was initiated within a year. Forristal (2009) found that nest success decreased from 90.5% for nests initiated April 30 to 47.5% for those initiated the first week of June. Similarly Bonnot et al. (2008) evaluated factors correlated with the nest success of Black-backed Woodpeckers in forests with outbreaks of mountain pine beetles in the Black Hills, South Dakota, and found nest age and date were the most important predictors of nest survival. The odds of daily nest survival decreased 2% per day over the course of the nesting period, but increased 3% for each 1-day increase in nest age. Estimated nest success was above 80% for nests started early in the season (late April and early May) and decreased as a function of later nest-initiation date. The authors determined that availability of food is important for nest-site selection but not nest success in areas where overall food abundance is high, such as in a fire or beetle outbreak.

Migration—Black-backed Woodpeckers may sometimes migrate to relatively lower slopes in winter (Dixon and Saab 2000). The species periodically irrupts from its usual habitat in boreal forests in the northeastern and north-central United States, temporarily inhabiting forests just south of its normal range (AOU 1983). Yunick (1985) documented periods of irruptive activity that lasted several years and were interspersed with long lapses of no records. Irruptions in the north-central and northeastern United States have occurred in the early 1920s, the mid-1950s, the mid-1960s, and the early 1970s, and appeared to be linked to large-scale forest mortality such as forest fires, windthrow, and insect outbreaks (Yunick 1985). Others have attributed irruptions to successful breeding promulgated by high abundance of wood-boring insects following extensive fires, or to birds seeking new food sources after insect mortality outbreaks declined in the woodpecker's resident range (Dixon and Saab 2000).

Murphy and Lehnhausen (1998) suggested that immigration of Black-backed Woodpeckers to a new burn depends not only on the habitat suitability of the new burn relative to the present habitat but also the ability of the birds to detect and move to the new burn. Hoyt and Hannon (2002) found that the ability of Black-backed Woodpeckers to detect and occupy a new burn area appeared to diminish at a distance of more than 75 km, suggesting that substantial habitat linkages would likely be necessary for this species to travel significant distances (Hutto 1995).

Demography—Because no studies have documented age-specific mortality rates, demographic structure, longevity, or sex ratios within the Oregon/California or Black Hills populations of the Black-backed Woodpecker, little is known about the demographics of these populations (see Dixon and Saab 2000).

Status and Trend

Current Designations—The Black-backed Woodpecker is listed as a "Sensitive Species" in Oregon by the Oregon Biodiversity Information Center (formerly Oregon Natural Heritage Information Center), which is a program of the Oregon University System and the state of Oregon (see also Cahall and Hayes 2009). Within California, in December of 2011 the California Fish and Game Commission designated the Black-backed Woodpecker as a "Candidate" species for listing as threatened or endangered under the California Endangered Species Act. In the Black Hills, the Black-backed Woodpecker is listed as a "Sensitive Species" by the U.S. Forest Service, Region 2.

Factors Influencing Abundance and Population Trends—Black-backed Woodpeckers are strongly associated with changes in forest structure induced by fire and insect outbreaks (Dixon and Saab 2000). The species depends upon an environment that is unpredictable and ephemeral, which may remain suitable for only 6-10 years and often less, depending upon local conditions (Hutto 1995, Murphy and Lehnhausen 1998, Hoyt and Hannon 2002, Saab et al. 2004, Saab et al. 2007, Hutto 2008, Saracco et al. 2011). Thus, Black-backed Woodpecker populations are subject to significant fluctuations—numbers are very low in forests without significant natural disturbance, but densities can increase due to demographic bursts or recruitment related to temporarily super-abundant foods, such as wood-boring bark beetles attracted to recently burned forests (Dixon and Saab 2000). Populations of Black-backed Woodpeckers are clearly regulated by the extent of fires and insect outbreaks (Dixon and Saab 2000) and by the management actions conducted within the disturbed forest habitat, such as salvage logging (Hutto and Gallo 2006).

The Black-backed Woodpecker inhabits and breeds successfully in unburned mature coniferous forests (Setterington et al. 2000, Tremblay et al. 2009), but throughout its range it is far more abundant in—and clearly recruits to—forests recently burned at high intensity (Hutto 1995, Hoyt and Hannon 2002, Smucker et al. 2005, Hutto 2008). Setterington et al. (2000) found Black-backed Woodpeckers to be uncommon in all unburned balsam fir forests age classes in Newfoundland, and were absent entirely from their study area in 1994.

Where the species does occur in unburned forests, it appears to depend upon older forests for persistence. Hoyt and Hannon (2002) documented that extremely dense (over 5,600 trees/ha) unburned old coniferous forests (>110 years) are important to this species during times when suitable recently burned forest is unavailable. During foraging activities, radio-marked Black-backed Woodpeckers in unburned forests preferentially selected stands dominated by older conifer trees in forests with high tree mortality from beetles (Goggans et al. 1989, Tremblay et al. 2009). Moreover, once a forest burns or experiences large-scale insect mortality (with tree mortality levels mirroring higher intensity fire), Black-backed Woodpeckers select stands with larger-sized dead trees than randomly available on the landscape, and that contain high pre-disturbance crown closure, for nesting and foraging (Saab et al. 2002, Russell et al. 2007, Hanson 2007, Vierling et al. 2008, Siegel et al. 2012). Thus, Black-backed Woodpeckers depend upon naturally disturbed mature and old forests for population persistence (Goggans et al. 1989).

Variation in survey methodology, reporting units, size of study patches, and salvage logging complicates comparisons of abundance and population trends among studies of Blacked-backed Woodpeckers, but when a common variable is used and units are standardized (i.e., number of pairs or nests per 100 ha) it is possible to detect broad patterns, the influence of time since disturbance, and regional variation in densities. Table 6 summarizes data from studies estimating pair/nest densities in generally unlogged landscapes affected by fire or insect mortality throughout the range of the species (nest density studies conducted in unlogged remnant patches in an otherwise heavily logged landscape can present misleading results because woodpeckers displaced by logging may temporarily crowd into the only remaining habitat). Densities of Black-backed Woodpeckers in ponderosa pine and Douglas-fir forests of the Rockies ranged from about 0.8 nests per 100 ha (about one nest for every 300 acres of burned forest) in the first several years post-fire, and decreased to 0.25 nests per 100 ha by 7–10 years post-fire (about one nest for every 1,000 acres of burned forest). Furthermore, nest densities in the Black Hills of South Dakota in both burned and beetle-killed stands were lower overall than in the Rocky Mountains, suggesting regional differences in abundance.

Table 6. Number of Black-backed Woodpecker nests located per 100 ha in burned and beetle-killed forests.

Study	Location	Years since disturbance	Number of nests per 100 ha	
			Burned	*Insect kill*
Saab et al. (2007)	Rocky Mts, ID	1-6	0.85	-
Saab et al. (2007)	Rocky Mts, ID	7-10	0.25	-
Dixon and Saab (2000)	Rocky Mts, ID	1-5	0.80	-
Vierling et al. (2008)	Black Hills, SD	1-4	0.30	-
Bonnot et al. (2008)	Black Hills, SD	1-7 yr	-	0.33 nests
Powell (2000)	Rocky Mts, MT	> 1 yr	-	0 nests
Burnett et al. (2011)	Sierra Nevada, CA	1-3	1.28	-
Burnett et al. (2011)	Sierra Nevada, CA	9-10	0 nests	-

Black-backed Woodpecker nest density data are now available in California, based upon a large number (50) of large plots (20 ha each) over multiple years, indicating an average of one pair per 78 ha (hectares) in unlogged mature/old burned forest at peak densities 1–3 years post-fire, but no nests at 9–10 years post-fire (Burnett et al. 2011). Bock and Lynch (1970) reported figures on density, but this was based upon inferred density derived from detections in only one small (8.5 ha) burned plot in a heavily logged landscape, and one small (8.5 ha) unburned plot adjacent to the fire area. Density cannot be extrapolated from two individual plots, wherein no actual nests were located, and where the two plots were much smaller than the home range of the species. Data from Apfelbaum and Haney (1981), pertaining to one single 6.25 ha plot, and Raphael and White (1984), pertaining to only two small burned plots (8.5 ha and 6.7 ha) and two adjacent unburned plots (8.5 ha) in a heavily salvage logged landscape, cannot be used to determine Black-backed Woodpecker nest density for the same reason.

Occupancy rates differ greatly between burned and unburned sites. For example, Hoyt and Hannon (2002) found that between 30 and 50 percent of 1- to 8-year-old burned stands were occupied by Black-backed Woodpeckers. In contrast, only 13 percent of unburned stands were occupied in one year and 0 percent in another, and the woodpeckers were not detected at all in 16- and 17-year-old burns. The unburned stands were extremely dense old-growth boreal forest in Canada, with 5,650 trees/ha, including both live trees and snags (Hoyt and Hannon 2002). Recent post-fire habitats harbor the greatest numbers of Black-backed Woodpeckers, while older burns become unsuitable.

Moreover, a recent study on Black-backed Woodpecker nest densities in burned versus unburned forests used the playback method (through which recorded calls of Black-backed Woodpeckers are played to reliably attract Black-backeds within hundreds of meters around) to detect Black-backeds along 200-meter-wide transects, and then spent up to 90 minutes following the detected birds throughout the forested landscape (not just in the transects) to locate nests (Russell et al. 2009). The study found 21 Black-backed Woodpecker nests in a large burned forest area with substantial high-intensity fire and zero in unburned forest dominated by lodgepole pine and white fir at 1,500–2,000 meters in elevation in the Fremont-Winema National Forest, and on a Nature Conservancy preserve, just north of the California/Oregon border (Russell et al. 2009). Hanson and North (2008), conducted in the Sierra Nevada, found Black-backed Woodpeckers only in high-intensity/unlogged old forest, and found none in unburned forest. Similarly, Burnett et al. (2011 [Table 1]), in the northern Sierra Nevada, found Black-backed Woodpeckers only in large fire areas, and found zero in unburned forest, despite surveying for Black-backeds at several hundred detection stations across a vast area of unburned forest (covering much of the northern Sierra Nevada) over two consecutive years. In Hutto (2008), one of the largest data sets ever gathered for any wildlife species in ecological history, "[o]nly six of 194 [Black-backed] woodpecker detections occurred in something other than a burned forest." The 188 detections in burned forest were out of 3,218 sample points, i.e., Black-backed Woodpecker was present at 6.0% of burned points, while the 6 detections in unburned forest were out of a total of 13,337 points, i.e., Black-backed Woodpecker was present at only 0.045% of unburned points. In other words, in the most comprehensive data base, Hutto (2008) found Black-backed Woodpecker abundance in unburned forest to be 1/133th of their abundance in burned forest.
The U.S. Forest Service, in 2009 and 2010, conducted the first two years of a Management Indicator Species study throughout the Sierra Nevada management region. All data on detections is available at http://data.prbo.org/partners/usfs/snmis/, and the Study Plan is available at http://data.prbo.org/cadc2/index.php (click the link for "Sierra Nevada Avian Monitoring Information", and then click the link that says Study Plan "downloaded here"). As the Study Plan states, each point count station is visited twice in a given year (page 53 of Study Plan), and all bird species detected are recorded (Study Plan, pp. 54-55). In 2009, 3,020 stations were visited, and 2,852 stations were visited in 2010 (http://data.prbo.org/partners/usfs/snmis/), for a total of 11,744 point counts (since each station had two point counts per year). In 2009 and 2010 combined, a total of 9 Black-backed Woodpeckers were detected within 50 meters of observers at point counts (http://data.prbo.org/partners/usfs/snmis/). We eliminated the points within or immediately adjacent to (within the diameter of a home range of a recent fire boundary, with home range diameter estimates taken from Dudley and Saab 2007 and Hoyt and Hannon 2002) recent fire areas, which reduced the total point counts to 10,518, and only 7 Black-backed Woodpecker detections remained—i.e., detections at about 0.066% of point counts. In unlogged *burned* forest, within 50 meters of point counts, Black-backed

Woodpeckers were detected on average at about 5–6% of point counts in the Sierra Nevada (Hanson and North 2008), and Hutto (2008 [Fig. 3b]) detected Black-backeds at about 6% of point counts (within 50 meters of observers) on average. Siegel et al. (2010 [Table 5]) reported very similar results in fire areas in the Sierra Nevada. Therefore, Black-backed Woodpecker abundance, as measured by the frequency of detections at point counts, is about 83 times higher in burned forest than it is in unburned forest (i.e., 0.055, or 5.5%, is 83 times larger than 0.00066).

Post-fire occupancy by Black-backed Woodpeckers also is correlated to fire intensity. Hutto (2008) concluded that Black-backed Woodpeckers were highly specialized in their use of highly burned conifer forests in northern Idaho and western Montana. Probability of detecting Black-backed Woodpeckers increased with fire intensity (Figures 4 and 5) (note: the medium "severity" in Figure 4 includes up to 100% canopy mortality [Hutto 2008]), and the birds occurred with increasing likelihood as proximity to fire or fire intensity increased (Figure 5). Hutto concluded on p. 1,831 that "[n]o other bird that occupies conifer forests is as specialized on such a small subset of forest types or conditions…This bird species was also relatively restricted in its distribution…to the severely burned end of the fire severity spectrum."

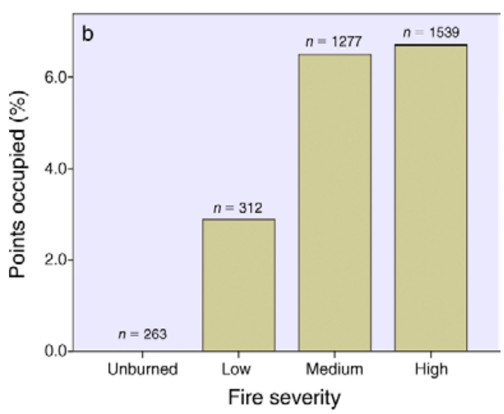

Figure 4. The probability of detecting a Black-backed Woodpecker increases (χ^2 = 36.07, df = 3, P < 0.0001) with fire severity. From Hutto (2008 at p. 1830).

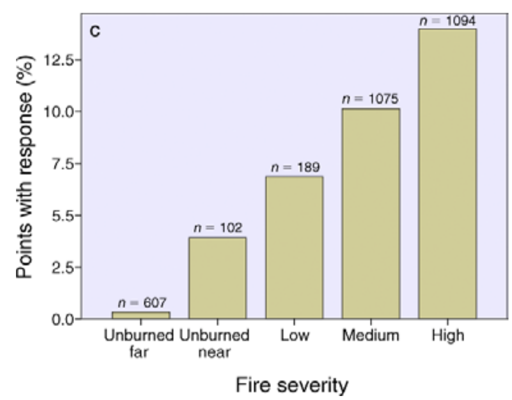

Figure 5. The probability of detecting a Black-backed Woodpecker increased (χ^2 = 132.40, df = 4, P < 0.0001) with fire severity. From Hutto (2008 at p. 1830).

Spatial patterns of fire are also critical to Black-backed Woodpecker populations. Hoyt and Hannon (2002) postulated that small fires (<2,000 ha) may represent stepping stones between large patches of recently burned habitat. Their results in burned boreal forests in Alberta, Canada also indicated a possible effect of distance from recent burn on occupancy of unburned old-growth forests by Black-backed Woodpeckers, as none were found in unburned stands within 50 km from the burn. Apparently, the fire attracted all Black-backed Woodpeckers inhabiting suitable unburned forests within 50 km from the fire perimeter.

The fact that not every fire necessarily induces significant wood-boring beetle colonization (Murphy and Lehnhausen 1998) may explain why not all recently burned forests are occupied by Black-backed Woodpeckers. Hutto (2008) reported that Black-backed Woodpeckers were detected at fewer than 6% of 3,128 point counts conducted in recently burned coniferous forests throughout northern Idaho and western Montana. Where the playback method was used, even in high-intensity fire areas (*n* = 1,094), Black-backed Woodpeckers were found at only 14% of locations (Hutto 2008). Siegel et al. (2010 [Fig. 15]), in a study of 51 fire areas 1–10 years old in the Sierra Nevada, also found that the probability of occupancy by Black-backed Woodpeckers was only about 14% even in the highest intensity fire areas with the highest levels of large snags. Since the majority of the burned area was dominated by low- and moderate-intensity fire effects, the average probability of Black-backed Woodpecker occupancy in fire areas in the Sierra Nevada was only about 8–9%, across all fire intensities and snag densities (Siegel et al. 2010 [Fig. 15]). Russell et al. (2007) found that abundance of Black-backed Woodpeckers in burned forests of the northern Rocky Mountains was positively associated with patch size, burn intensity, snag density, snag diameter, and pre-fire canopy cover. Thus, while small burns may act as stepping stones (*sensu* Hoyt and Hannon 2002), there may be a size and tree-density threshold: very small patches of intensely burned forests containing low densities of burned trees are not likely to be suitable habitat for Black-backed Woodpeckers.

In addition to overall population densities, nesting success of Black-backed Woodpeckers is correlated to fire intensity. Vierling et al. (2008) reported that nest density declined rapidly between year 2 and year 4 post-fire. Also, reproductive success was 80% in high-intensity patches, and was only 50% in moderately burned and 60% in low-intensity burned patches. In intensely burned boreal forests in Canada, Black-backed Woodpecker occupancy was more than twice as high in burned old forests than in burned young forests, and reproductive success was 84% and 73% in the first and second years post-fire, respectively, then declined to only 25% by the third year post-fire (Nappi and Drapeau 2009). Post-fire occupancy of Black-backed Woodpeckers is shorter in duration in the boreal forests of Canada, where trees are generally smaller, than it is in the conifer forests of the lower 48 states of the United States. Generally, post-fire occupancy of Black-backed Woodpeckers declines steeply in boreal forests after the second year post-fire (Murphy and Lehnhausen 1998, Nappi and Drapeau 2009), while post-fire occupancy declines steeply after the fifth year post-fire in conifer forests in Idaho (Saab et al. 2007), and after the third or fourth year post-fire in the Sierra Nevada (Siegel et al. 2010 [Fig. 15]). Therefore, not only do the number of Black-backed Woodpecker territories decline substantially within a few years post-fire, but also the reproductive success of the Black-backed Woodpeckers that do remain several years post-fire declines dramatically relative to the earlier post-fire years.

Saab et al. (2004) found that time since fire had a strong influence on occupancy of nest cavities for the Black-backed Woodpecker and other strong excavator bird species in two large fire sites in southwestern Idaho. Microhabitat features such as cavity orientation and location in the tree, tree height, and tree decay class were important determinants of nest cavity occupancy. From 2–3 years post-fire to 6 years post-fire, nest density declined by about 50%, and declined by about 75–80% by year 7 post-fire (Saab et al. 2004). From 4–5 years post-fire to 8 years post-fire, Black-backed Woodpecker occupancy declines by about 75% (Saab et al. 2007). In the Sierra Nevada, Black-backed Woodpecker occupancy in fire areas declines by about 75% by year 6 post-fire (Siegel et al. 2010 [Fig. 15]). At the survey station level (there were multiple survey stations within each fire area), for the most recent survey year for which data are available (2010), Siegel et al. found Black-backed Woodpecker occupancy at only 21% of survey stations 1–4 years post-fire and at only about 8% of stations 5–10 years post-fire (see http://www.birdpop.org/DownloadDocuments/bbwo_maps/2010_point_locations.pdf for detection/non-detection at each station; and see http://www.birdpop.org/Sierra/bbwo_results.htm for links to each fire area surveyed in 2010, with year of fire shown on the map for each fire) (survey stations were spaced 250 meters from each other). Hutto (1995) described Black-backed habitat as becoming unsuitable or marginal after 6 years post-fire.

Unlike unburned forest in general, in which Black-backed Woodpeckers are nearly absent, very dense mature and old forest with very high levels of recent tree mortality from beetles (creating generally at least 250, or more, snags per hectare, or over 18-20 square meters per hectare of recent snag basal area) also creates suitable habitat for Black-backed Woodpeckers, and occupancy levels in such habitat can be similar to some burned forests (Goggans et al. 1989, Bonnot et al. 2008, 2009). Similar patterns are found in burned forest, with successful occupancy generally occurring in areas with over 275 snags per hectare over 23 cm in diameter at breast height (Saab et al. 2009), indicating dependence upon very dense, mature forest in which most or all trees are killed.

In sum, results from studies throughout the range of *P. arcticus* conclude that densities (abundance per unit area) of nesting and foraging woodpeckers are greatest in mature and old-growth forests with high pre-disturbance canopy cover that were recently burned by high-intensity fire, or recently experienced very high tree mortality from beetles; densities decrease over time since disturbance; and nesting success varies by natural disturbance intensity and time since natural disturbance, with the highest nest success in forests very recently burned by high-intensity fire. Moreover, the presence of highly dense unburned old-growth forest may temporarily aid the persistence of Black-backed Woodpeckers during times of fire deficit, likely due to high numbers of snags in such forests.

Global Abundance and Population Trends—The Black-backed Woodpecker is rare even within its preferred habitat. In Breeding Bird Survey (BBS) data, the relative abundance ("R.A.") of the Black-backed Woodpecker is among the lowest of all bird species, and is so low, in fact, that there are far too little data to estimate population trend (http://www.mbr-pwrc.usgs.gov/cgi-bin/atlasa09.pl?SUR&2&09). The same is true for BBS data for Black-backed Woodpeckers in the states at issue in this Petition (CA, OR, and SD) (see http://www.mbr-pwrc.usgs.gov/bbs/reglist09.html). The fact that there are so very few Black-backed Woodpeckers that no statistical analysis of their population trends is possible is, in and of itself, a major cause of conservation concern for the genetically isolated Oregon/California and Black Hills populations.

Abundance and Population Trends in Oregon/California, and the Black Hills— Black-backed Woodpeckers exhibit lower genetic diversity within the fragmented populations of Oregon/California and South Dakota, with likely very little current gene flow between these populations and the larger, contiguous, and more genetically diverse population in the northern boreal forest (Pierson et al. 2010). These two (and possibly three) isolated and genetically distinct populations are therefore of greater concern, and herein we provide a focused discussion of abundance and population trends in these regions.

Oregon/California: While a lack of reliable, long-term, range-wide surveys and banding studies has resulted in a dearth of information on abundance and population trend of the Black-backed Woodpecker in California and Oregon, comparison of historical accounts of greater abundance with recent observations, as well as analyses of loss of suitable habitat, indicate the species has likely declined substantially over the past century in these states.

Observational data indicate that *P. arcticus* was once relatively common in the 19th century in the state, prior to widespread fire suppression and post-fire salvage logging. Early accounts of the species report the bird to be "numerous" in the Sierra Nevada and in the eastern Oregon Cascades. In 1870, Dr. Cooper reported in his "Ornithology of California" (at p. 348):

> "I found the bird quite numerous about Lake Tahoe, and the summits of the Sierra Nevada above six thousand feet altitude, in September, and it extends thence northward, chiefly on the east side of these and the Cascade Mountains, as I never saw it near the Lower Columbia…."

Just over 50 years later, Dawson (1923) noted (at p. 1,006) that "I have never seen the bird myself, though I have searched diligently for him in the Warner Mountains, on Shasta, and in various localities of the central southern Sierras." Similarly, Grinnell and Miller (1944, at p. 248) noted that the Black-backed Woodpecker was "[s]carce generally; fairly common in but a few places." By the 1970s, the Black-backed Woodpecker was considered rare. Small (1974, at p. 98) described the species as an "[u]ncommon to rare resident." These descriptions were in stark contrast to Cooper's observations in the previous century. The Black-backed Woodpecker was the rarest bird species for which data was reported by Burnett et al. (2011 [Table 1]) in an extensive study of the northern Sierra Nevada over two years.

Siegel et al. (2008) designed and tested field methods for developing a monitoring program for Black-backed Woodpecker occupancy on Sierra Nevada national forests. The authors used passive point counts followed by playback of Black-backed vocalizations at survey stations within 17 randomly selected fire areas (n = 371 surveys) throughout the Sierra Nevada. Stations where Black-backed Woodpeckers were located were distributed from the Lassen National Forest to the Sequoia National Forest, as well as at sites west and east of the Sierra crest, but Black-backeds were found in only about 50% of recent fire areas overall. In an expanded version of the study, Siegel et al. (2010) surveyed 51 fire areas that had high-intensity fire patches, 1–10 years post-fire, throughout the Sierra Nevada management region (including the Warner Mountains in the Modoc National Forest), and found Black-backed Woodpeckers in only 28 of these

51 fire areas. This indicates that, while Black-backed Woodpeckers persist in the southern, central, and northern portions of the Sierra Nevada management area (Siegel et al. 2008), the species is poorly distributed *within* its range, given current low Black-backed Woodpecker populations levels, dramatic declines in the spatial abundance and distribution of suitable habitat since the onset of fire suppression and logging, current significant spatial gaps between habitat areas due to ongoing fire suppression and post-fire logging, and limited Black-backed Woodpecker dispersal distances (Hoyt and Hannon 2002), as discussed below. It is a significant conservation concern that so few patches of occupied Black-backed Woodpecker habitat exist in the entire Sierra Nevada management region, which includes nearly all of the Black-backed Woodpecker's range in California.

In Siegel et al. (2008), Black-backed Woodpeckers were detected in burned areas within major conifer forest types, including eastside pine, Jeffrey pine, Jeffrey pine/red fir, and Sierra mixed conifer (Siegel et al. 2008 and **Appendix A**, attached hereto). Occupied sites ranged from small fires such as the Vista Fire (170 ha burned) and Rock Creek fire (187 ha burned) to very large fires such as the Moonlight Fire (26,159 ha burned). Black-backed Woodpeckers were detected in 27% of burned area survey stations (55 of 202) at 1–5 years post-fire, but were found in only 8% of burned area survey stations (13 of 169) by 6–7 years post-fire (Siegel et al. 2008, see Appendix A attached). Black-backed Woodpeckers were detected with the callback (or "playback") method at 7.8% of stations classified as low-severity burned, 17.2% classified as mid-severity burned, and 25.2% classified as "high-severity" burned (Figure 6). Thus, while occupancy was not correlated to conifer forest type or fire size (170–>26,000 ha), Black-backed Woodpeckers were detected most often in stands that experienced higher-intensity fire.

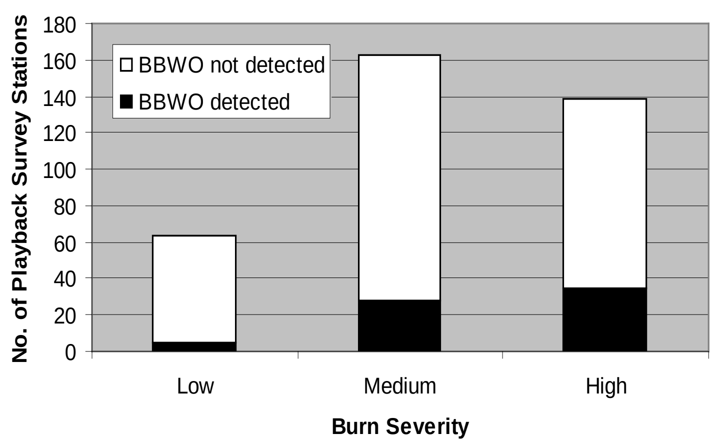

Figure 6. Number of fire areas of each age where Black-backed Woodpeckers were detected or not detected during playback surveys in 17 fires on Sierra Nevada national forests in 2008. From Siegel et al. (2008 at p. 32).

Appendix A documents the national forest, name, age, size, and dominant pre-fire habitat of the fires surveyed by Siegel et al. in 2008, the number of stations at which playback surveys were conducted, and the number of Black-backed Woodpeckers detected at each station.

Siegel et al. (2010 [Fig. 15]), surveyed 51 fire areas 1–10 years post-fire, representing the great majority of all burned conifer forest in the Sierra Nevada management region in fires with at least one large high-intensity fire area. Based upon the statistical analysis of occupancy conducted by Siegel et al. (2010), the authors determined that the probability of Black-backed Woodpecker occupancy is very low in the southernmost portion of the Sierra Nevada, and at lower elevations (Siegel et al. 2010 [Fig. 15]). Siegel et al. (2010 [Fig. 15]) determined that, even in the areas of highest fire intensity and highest levels of snags, the probability of Black-backed Woodpecker occupancy in the Sierra Nevada is relatively low. These results from the Sierra Nevada were similar to studies in other regions (e.g., Hutto 2008 in the Rocky Mountains) indicating that the species is rare even in its favored habitat.

In 36 study sites across three fire areas in the Sierra Nevada, Hanson and North (2008) found Black-backed Woodpeckers only in dense, mature/old-growth forest that burned at high intensity and had not been salvage logged. None were found in unburned, moderate intensity, or salvage logged sites (Hanson and North 2008). The detection of Black-backed Woodpeckers in some moderate intensity areas in studies using the playback method (in which a recording of a black-backed call is played loudly to attract the birds) may in part be the result of attracting the birds from adjacent high-intensity areas. For example, Siegel et al. (2008) noted that, because the "playback methodology lured birds towards the observers" from hundreds of meters away, their data "do not permit a definitive assessment of the species' affinity for habitat burned at various severities."

Russell et al. (2009) found Black-backed Woodpeckers only in a large fire area with substantial levels of high-intensity fire, and none in unburned forest of the eastside of the Cascades in south-central Oregon. Post-fire logging significantly reduces Black-backed Woodpecker occupancy in burned forests of the eastern Cascades in Oregon (Cahall and Hayes 2009). Siegel et al. (2012), in post-fire areas of the Lassen National Forest in the Sierra Nevada management region, found that Black-backed Woodpeckers were strongly associated with high levels of recent tree mortality in relatively dense mature/older forest (average snag basal area was 22 square meters per hectare, or about 96 square feet per acre), with higher densities (smaller home ranges) in areas with higher than average snag basal area, and that Black-backed Woodpeckers almost completely avoided salvage logged areas.

There are some factors to consider in estimating abundance and population trend of Black-backed Woodpeckers. The first is the ephemeral and unpredictable nature of its habitat. Post-disturbance habitat remains suitable for only a limited period of time, as the abundant food resources (wood-boring bark beetles) attracted to the natural disturbance first peak and then begin to wane in the years following fire or insect infestation. High-quality burned forest habitat remains suitable for a limited number of years post-fire, and declines rapidly in suitability thereafter. The second is the spatial extent of the areas of recent high tree mortality within the forest types and areas inhabited by Black-backeds.

For the purposes of this Petition, we estimated the current abundance of Black-backed Woodpeckers in suitable habitat for the Oregon/California population based upon the best available science. We used U.S. Geological Survey GIS layers of forest type (http://water.usgs.gov/GIS/dsdl/ds240/), and U.S. Forest Service satellite imagery data bases on fire boundaries (www.mtbs.gov/ for 2002 through 2008; www.fs.fed.us/r5/rsl/ and www.fs.fed.us/postfirevegcondition/ for 2009 through 2011; and http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=52190 to identify the forested portions of the High Cascades Complex fires in the eastern Oregon Cascades in 2011), along with Black-backed Woodpecker range boundaries (broadly delineated to exceed current range maps in spatial extent and forest coverage) to determine the amount of wildland fire within the forest types used by Black-backed Woodpeckers (mid/upper-montane conifer forests and subalpine forest types) over the past 1–4 and 5–10 years for the Oregon/California population. We did not include the relatively small acreage of private lands within the fire perimeters since post-fire habitat with any significant mortality levels are rapidly subjected to intensive post-fire logging (clearcutting high-intensity fire areas, and removing all or nearly all medium and large snags from other burn areas), as allowed under statutes and regulations of California, Oregon, and South Dakota, as discussed in detail below in "The Inadequacy of Existing Regulatory Mechanisms." We determined that, within the Oregon/California range of the Black-backed Woodpecker, and within the conifer forest types inhabited by the Black-backed Woodpecker, current areas 1–4 years post-fire comprise a total of 100,669 hectares—over half of which was low-intensity fire. For 5–10 years post-fire, there were a total of 149,203 hectares—nearly half of which was low-intensity fire. However, these figures include all fire intensities (including the very lowest), as well as at least 5,000 hectares of previously high-quality Black-backed Woodpecker habitat on national forest lands that has been subjected to intensive post-fire logging and clearcutting, but for which no reliable GIS data bases exist (we nevertheless describe estimates of such post-fire logging, based upon various U.S. Forest Service documents and site surveys, in the "The Inadequacy of Existing Regulatory Mechanisms" section below). These figures also include many fire areas where surveys have not detected Black-backed Woodpeckers, as discussed above (Siegel et al. 2008, 2010).

Based upon extensive, multi-year callback surveys, which reliably draw Black-backed Woodpeckers to observers if any are present within several hundred meters, Siegel et al. (2008, 2010) found that in nearly half of fire areas within the range of the Black-backed Woodpecker, within forest types used by this species, Black-backed Woodpeckers were not detected. Even in fire areas occupied by Black-backeds, the birds often used only a small portion of the fire area, such that most or nearly all survey stations within the fire had non-detections (Siegel et al. 2008, 2010; see also Appendix A of this Petition). Specifically, Siegel et al. (2010) found that, in years 1–4 post-fire, on average about 30% of the total cumulative area in the fire perimeters is occupied by Black-backed Woodpeckers, and the percentage of the fire area confirmed to be occupied by Black-backeds drops to an average of about 10% for 5–10 years post-fire, after which occupancy drops to near zero (Siegel et al. 2010 [Fig. 15]). Thus, following the method of Siegel et al. (2010) (which was sponsored and overseen by the U.S. Forest Service), we estimate that approximately 30% of the 1–4-year post-fire area, or 30,201 hectares, and 10% of the 5–10-year post-fire area, or 14,920 hectares, is occupied by Black-backed Woodpeckers in Oregon/California currently. Even if we use the most unrealistically optimistic assumptions, such as the smallest home-range sizes reported in the literature (see "Home-Range Size" subsection in the "Habitat" section above), i.e., about 40–60 hectares per pair, consistent with the approach of Siegel et al. (2010) or, similarly, if we use the highest nest density figures reported in Table 6 above (i.e., 1.28 pairs per 100 hectares, or about one pair per 78 hectares) and assume that 20% of nests are missed by surveyors (Burnett, pers. comm. 2010), the total occupied post-fire area of 45,121 ha represents only about 900 pairs in Oregon/California. If realistic, and supportable, assumptions are used, the extant population estimate is less than about 500 pairs. While a very small number of pairs persist in a very small percentage of older fires (e.g., 11–15 years post-fire), occupancy is extremely low this long after fires. At 10 years post-fire, occupancy is only about 3%, and declining (Siegel et al. 2010 [Fig. 15]). So, even if we include the 81,700 hectares of forest that experienced wildland fire in the range of the Oregon/California population of Black-backeds 11–15 years ago, less than 2,500 hectares of this would be expected to be occupied, adding less than 30 additional pairs, even if we assume unrealistically small home-range sizes for such a long time period post-fire (as discussed above, even by 8 years post-fire, home range sizes become very large—hundreds of hectares in size each [Dudley and Saab 2007]).

Further, with regard to unburned forests, as discussed above in this section, the data show that density of Black-backed Woodpeckers in unburned forests overall are about 1/83rd of those in burned forests, indicating just how rare significant patches of high tree mortality from beetles are in this region within unburned forests. Therefore, since the average occupancy for 1–10 years post-fire in burned forests is about 20% (Siegel et al. 2010 [Fig. 15]), the occupancy in unburned forests of Oregon/California is about 0.24% of the 6,368,646 hectares of conifer forest within the range of the Oregon/California population, or about 15,285 hectares of unburned forest occupied by Black-backed Woodpeckers. This adds less than 150 additional pairs, even if we make optimistic assumptions about home-range size in unburned forests.

Therefore, even when we include very marginal habitat, the data indicates a population of less than 1,000 pairs of Black-backed Woodpeckers in Oregon/California, and possibly fewer than 700 pairs. As discussed below, this small population exists mostly in the unprotected forest landscape where there are essentially no restrictions on post-fire logging—even on clearcutting of nest stands in the nesting season with chicks in the nest.

Black Hills: Using the same methods as those described above for Oregon/California, there are approximately 6,438 hectares of 1–4-year post-fire habitat on the Black Hills National Forest, and approximately 13,475 hectares of 5–10-year post-fire habitat. Approximately 40,923 hectares of 11–15-year post-fire areas exist but, as discussed above, occupancy declines to near zero on such areas because it has been too long since the fire occurred, and the Black-backed's food source has already declined dramatically. The Black Hills National Forest reports that, over the past three years, there are 27,126 hectares (about 67,000 acres) of forest with significant tree mortality from beetles in the Black Hills National Forest (http://www.fs.fes.usda.gov/detail/r2/forestgrasslandhealth/?cid=stelprdb5348787). As presented above in Table 6, the current data indicate that there is approximately one pair of Black-backed Woodpeckers per 333 hectares of burned forest, and one pair per 300 hectares of high-mortality areas from beetles, in areas occupied by Black-backed Woodpeckers (Vierling et al. 2008, Bonnot et al. 2008). Data similar to the probability of occupancy data in Sierra Nevada (i.e., the data indicating the portion of the natural disturbance area that is confirmed to be occupied by Black-backed Woodpeckers at any point in time since disturbance) are not yet available for the Black Hills. However, even if we make the unrealistic assumption that 100% of fire areas and beetle-mortality patches are occupied by Black-backed Woodpeckers, the 19,913 hectares of 1–10-year post-fire habitat equates to only about 60 pairs of Black-backed Woodpeckers (it is possible that the proportion of suitable habitat that is actually occupied is higher in the Black Hills than in Oregon/California, given that the entire Black Hills population exists in a single national forest, within only 485,000 hectares of forest, thus dispersal to new habitat areas would be less difficult than in Oregon/California). Some occupancy undoubtedly exists still in the 40,923 hectares of 11–15-year post-fire forests, but would be expected to be much lower than recent burns. If we make the unrealistically optimistic assumption that 50% of this area is occupied still, and if we make the additionally unrealistic assumption that density in these older burns is the same as density found in recent burns by Vierling et al. (2008), then this would add an additional 61 pairs.

The 27,126 hectares of current beetle mortality equates to about 90 pairs of Black-backed Woodpeckers. Some older beetle-mortality areas likely continue to support some Black-backed Woodpeckers as well. U.S. Forest Service surveys determined that about 60,000 hectares of some level of tree mortality from beetles occurred 2002–2008 (http://www.fs.fed.us/foresthealth/fhm/posters/posters11/SiegINT-EM-F-09-01BBFuelsFinal.pdf). It must be noted, however, that, while this acreage of beetle-affected forest includes significant areas of very high tree mortality (wherein most trees were killed), much of the area only experienced slight tree mortality levels. U.S. Forest Service surveys through 2004, for example, found that, of the 23,482 hectares of forest experiencing tree mortality from beetles at that time, on average there were only about 150,000 beetle-killed trees across this area, or only about 6–7 beetle-killed trees per hectare; thus the great majority of the trees on these acres were not dead, on average (Piva et al. 2005 [p. 6, and Table 5]). Nevertheless, if we optimistically assume that all of these 23,482 hectares created suitable Black-backed Woodpecker habitat, and if we assume the same densities of Black-backed Woodpeckers as those found in more recent beetle mortality areas, then this equates to about 200 pairs.

Therefore, together we estimate about 411 pairs of Black-backed Woodpeckers in the Black Hills population, though, as discussed above, this may be an overestimate of numbers. As discussed below, this very small population exists overwhelmingly in the unprotected forest landscape where there are essentially no restrictions on post-disturbance logging. And, as discussed below, currently a massive 131,579-hectare intensive logging project, known as the MPB [Mountain Pine Beetle] Response Project, is being proposed by the Black Hills National Forest explicitly in order to remove trees with beetle activity, and substantially reduce stand density, in order to greatly reduce future occurrence of, and potential for, snag recruitment from beetles and wildland fire across most of the Black Hills National Forest for decades.

THE OREGON/CALIFORNIA AND BLACK HILLS POPULATIONS OF THE BLACK-BACKED WOODPECKER WARRANT LISTING UNDER THE ESA

Under the ESA, 16 U.S.C. § 1533(a)(1), USFWS is required to list the Oregon/California and Black Hills populations of the Black-backed Woodpecker if they are in danger of extinction or likely to become threatened or endangered in all or a significant portion of these ranges. In making such a determination, USFWS must analyze the woodpecker's status in light of any of the five statutory listing factors:

1) The present or threatened destruction, modification, or curtailment of habitat or range;
2) Overutilization for commercial, recreational, scientific, or educational purposes;
3) Disease or predation;
4) The inadequacy of existing regulatory mechanisms;
5) Other natural or anthropogenic factors affecting its continued existence.

16 U.S.C. § 1533(a)(1)(A)-(E); 50 C.F.R. § 424.11(c)(1)-(5).

All five of these factors threaten these Black-backed Woodpecker populations, as discussed below.

THREATS

Destruction, Modification, or Curtailment of Habitat or Range

Black-backed Woodpecker habitat is directly eliminated and indirectly reduced or degraded by management actions that are widely conducted on public and private forests throughout the range of the species. Habitat is systematically lost through post-disturbance salvage logging, active fire suppression, and pre-disturbance thinning to reduce fire risk or beetle mortality. Saab et al. (2007) pointed out that while migrant species evolved under highly variable conditions, residents such as Black-backed Woodpeckers are more vulnerable to habitat changes created by salvage logging. Therefore, Black-backed Woodpeckers are especially vulnerable to population declines from logging projects that remove the habitat upon which they depend for survival (Hutto 1995, Dixon and Saab 2000, Hoyt and Hannon 2002, Saab et al. 2007, Hutto 2008, Hanson and North 2008). Unfortunately, current management prescriptions in Black-backed Woodpecker habitat do not offer sufficient protection to prevent further declines of the species (Hanson 2007, Hanson and North 2008), and future climate changes may further reduce habitat availability.

For the Black-backed Woodpecker, there are several different range maps found in different field guides, each of which varies somewhat from the others. To illustrate just how scarce current moderate/high-quality Black-backed Woodpecker habitat is in California and Oregon, we used the range map from National Geographic's field guide for birds in the western U.S. to show: a) the current distribution of conifer forest types that could potentially be used by the Black-backed Woodpecker; b) fires since 1984 on federal lands within those forest types on federal lands; c) fires since 1984 with higher intensity fire effects (RdNBR >574 from satellite imagery, corresponding to >50% mortality in trees over 30 cm in diameter [Hanson et al. 2010]) within relevant forest types on federal lands; d) moderate/high-intensity fire since 2001 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green; and e) moderate/high-intensity fire since 2006 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green. The results of this analysis for California and Oregon, respectively, are shown below, with the final maps representing current moderate/high-quality habitat (**Note**: because there is no reliable GIS data base for salvage logged areas, the final maps do not exclude the many thousands of acres on federal lands that have been salvage logged; thus the actual current moderate/high-quality habitat is significantly less than shown in the final maps for California and Oregon below—i.e., substantial portions of the area in light green has been clearcut):

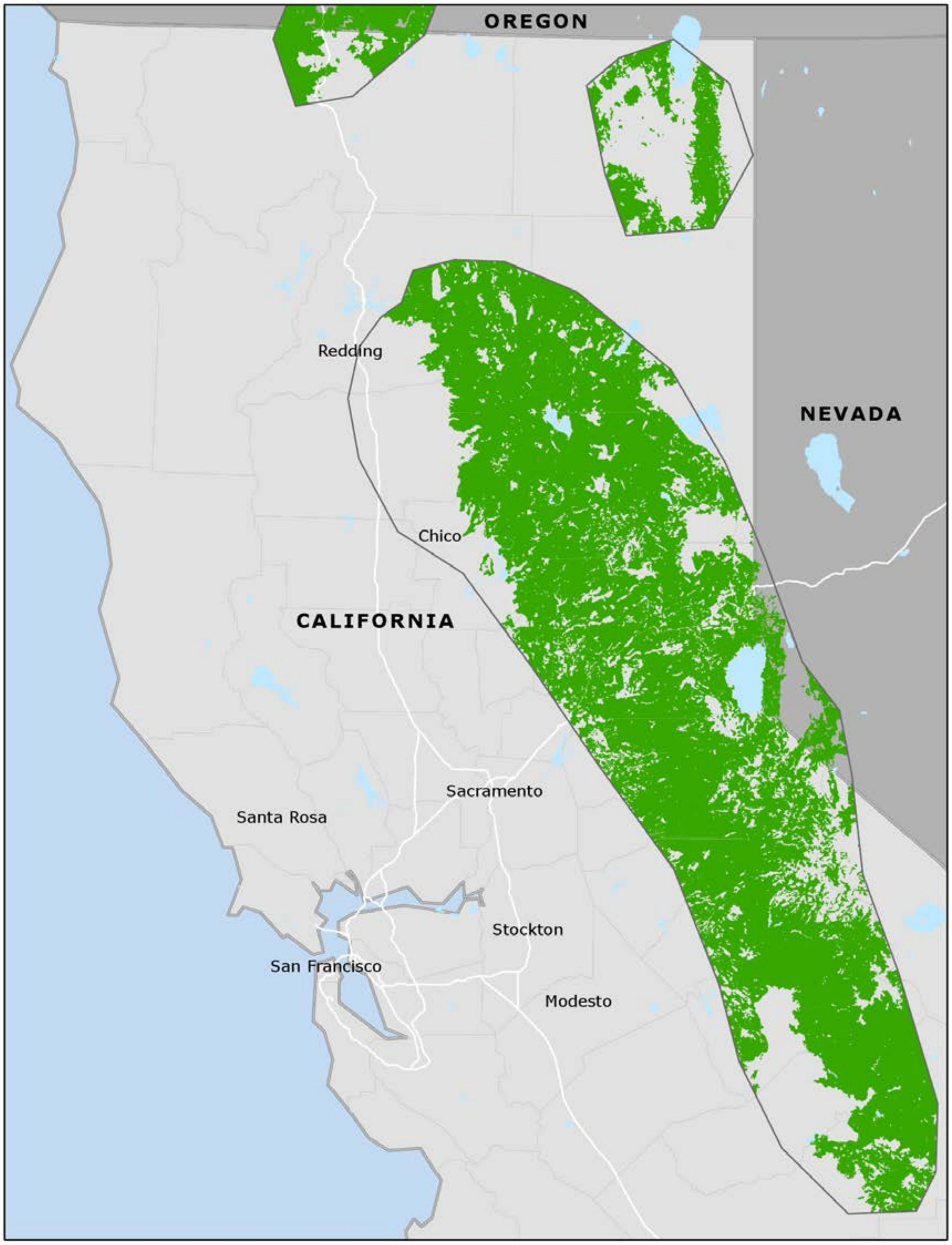

Figure 7a. The current distribution of conifer forest types that could potentially be used by the Black-backed Woodpecker in California.

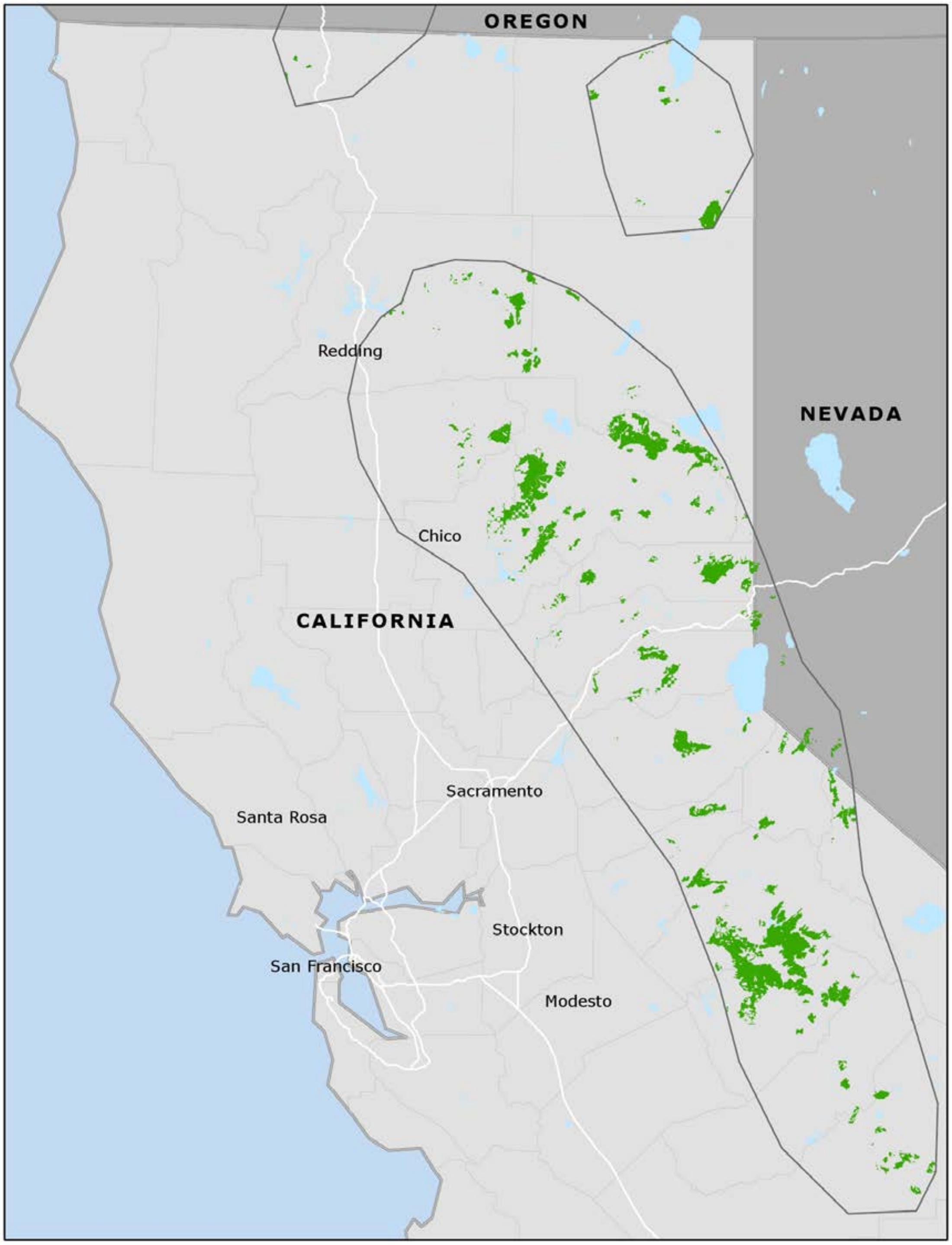

Figure 7b. Fires since 1984 on federal lands within relevant forest types on federal lands in California.

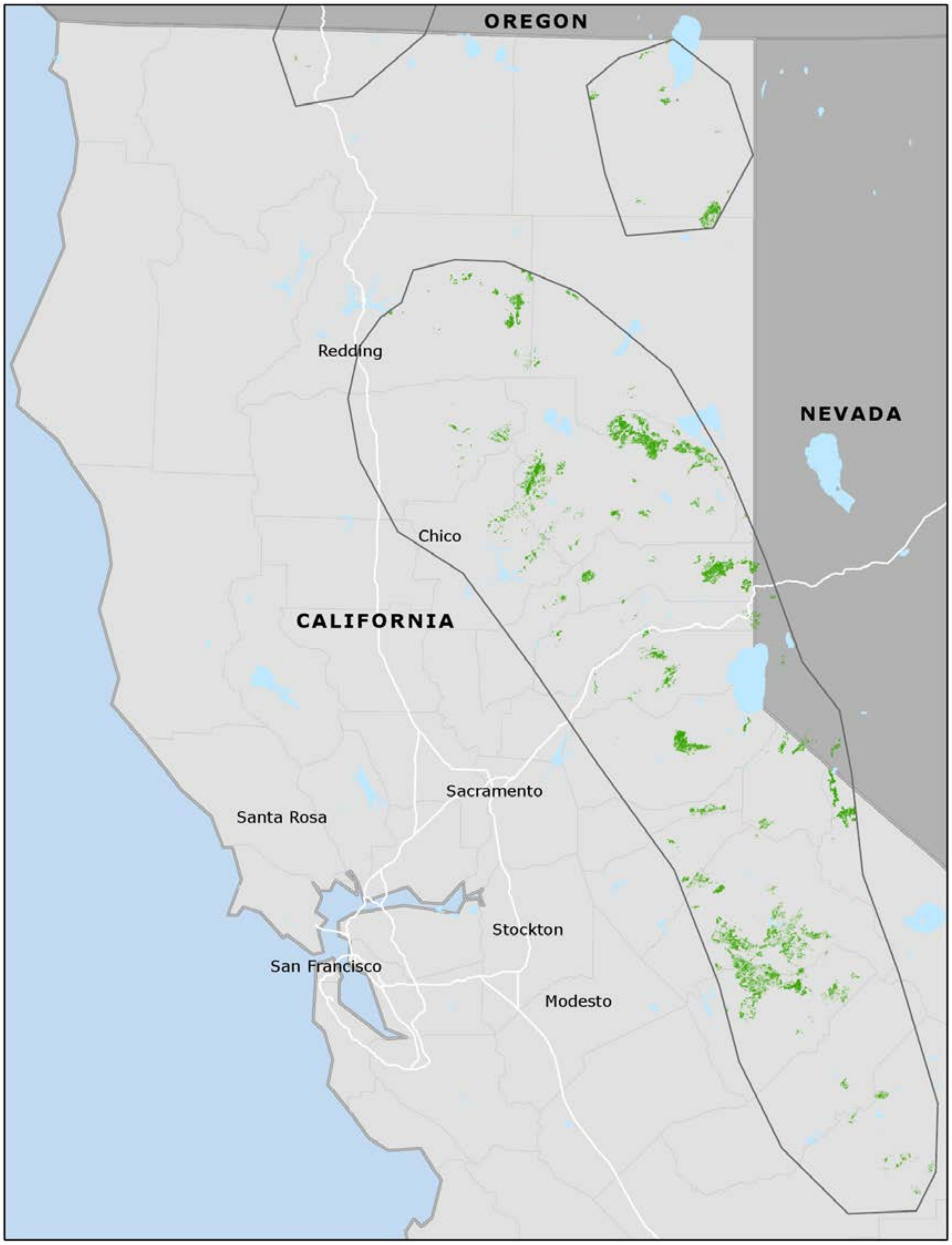

Figure 7c. Fires since 1984 with higher intensity fire effects (RdNBR >574 from satellite imagery, corresponding to >50% mortality in trees over 30 cm in diameter [Hanson et al. 2010]) within relevant forest types on federal lands in California.

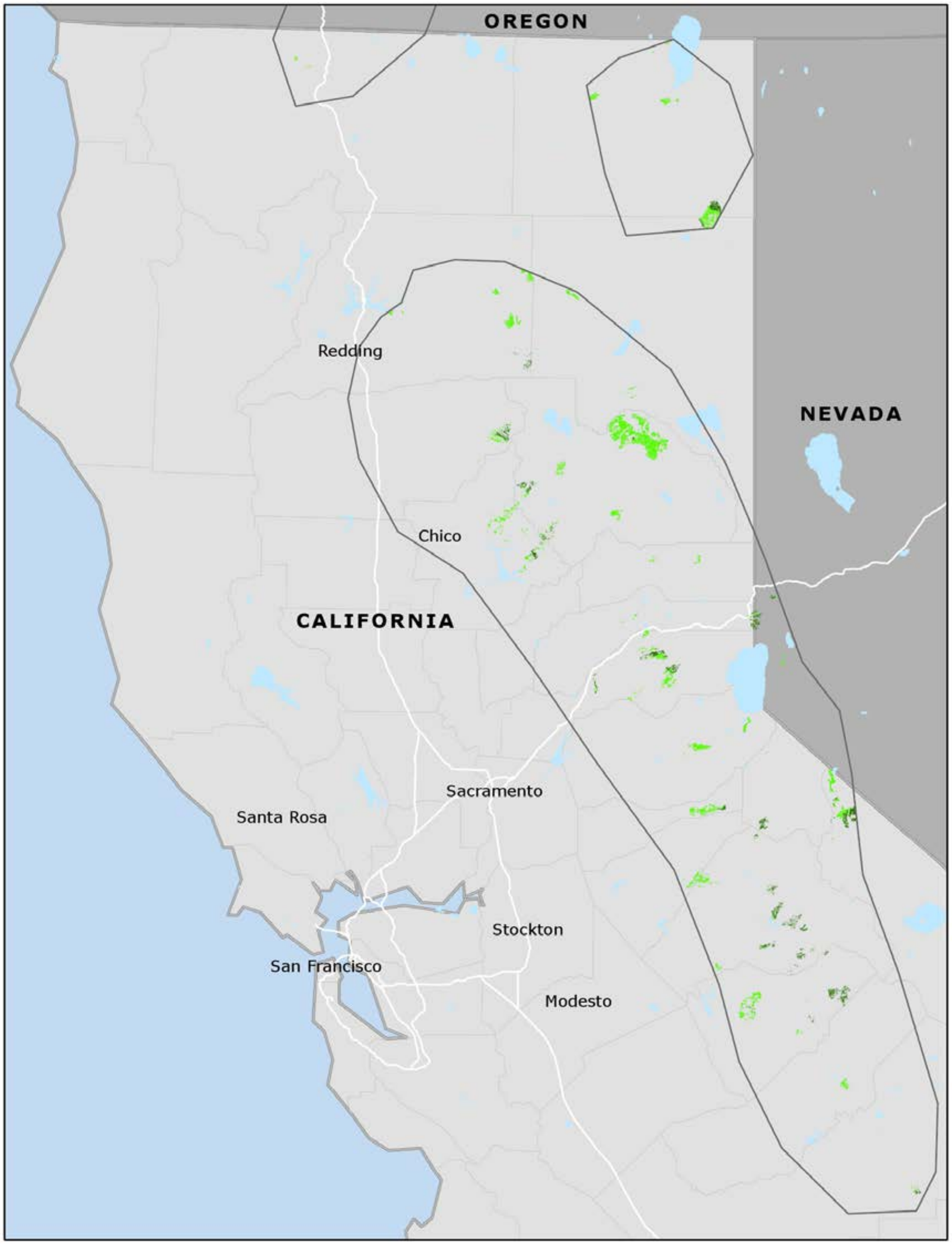

Figure 7d. Moderate/high-intensity fire since 2001 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green in California.

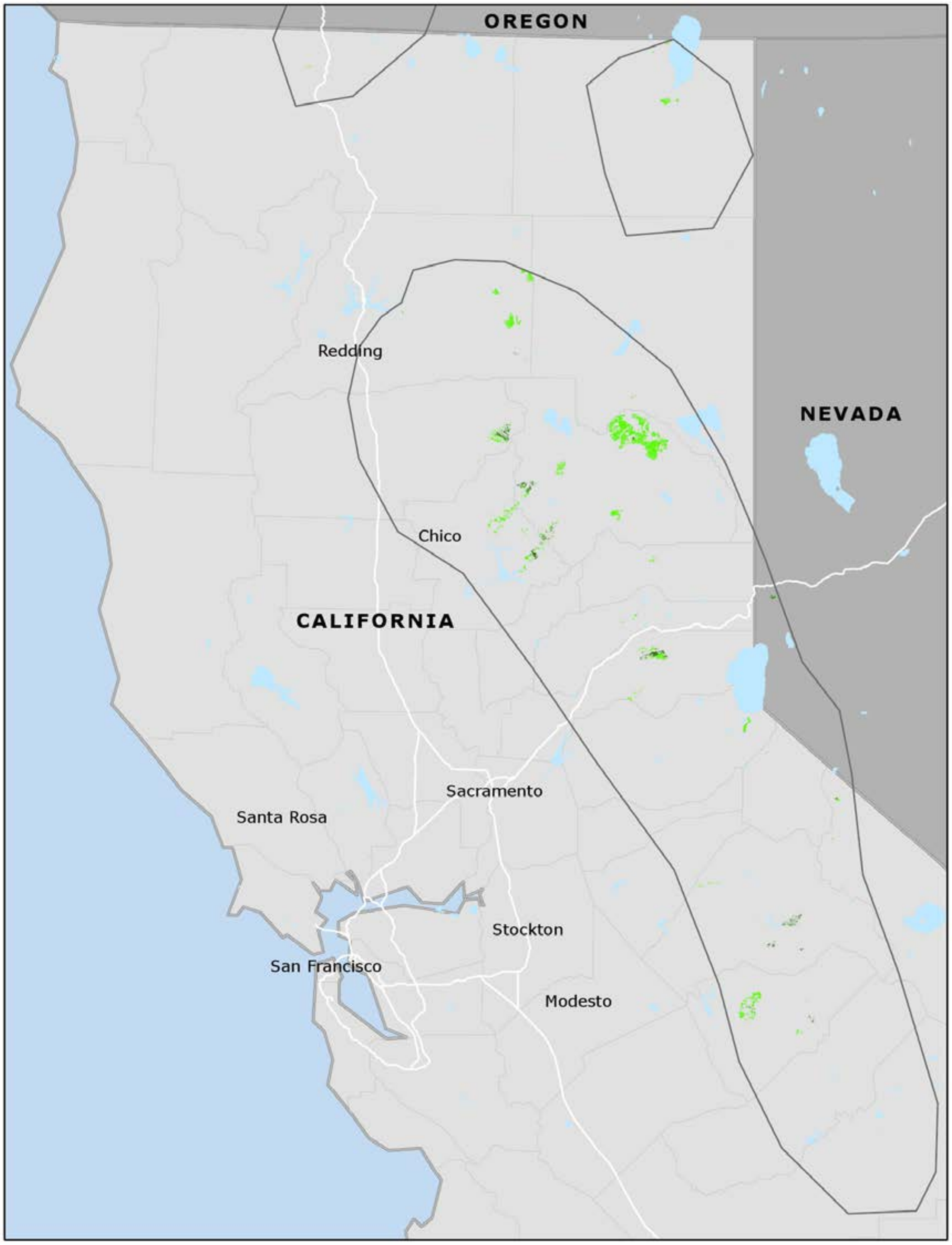

Figure 7e. Moderate/high-intensity fire since 2006 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green in California.

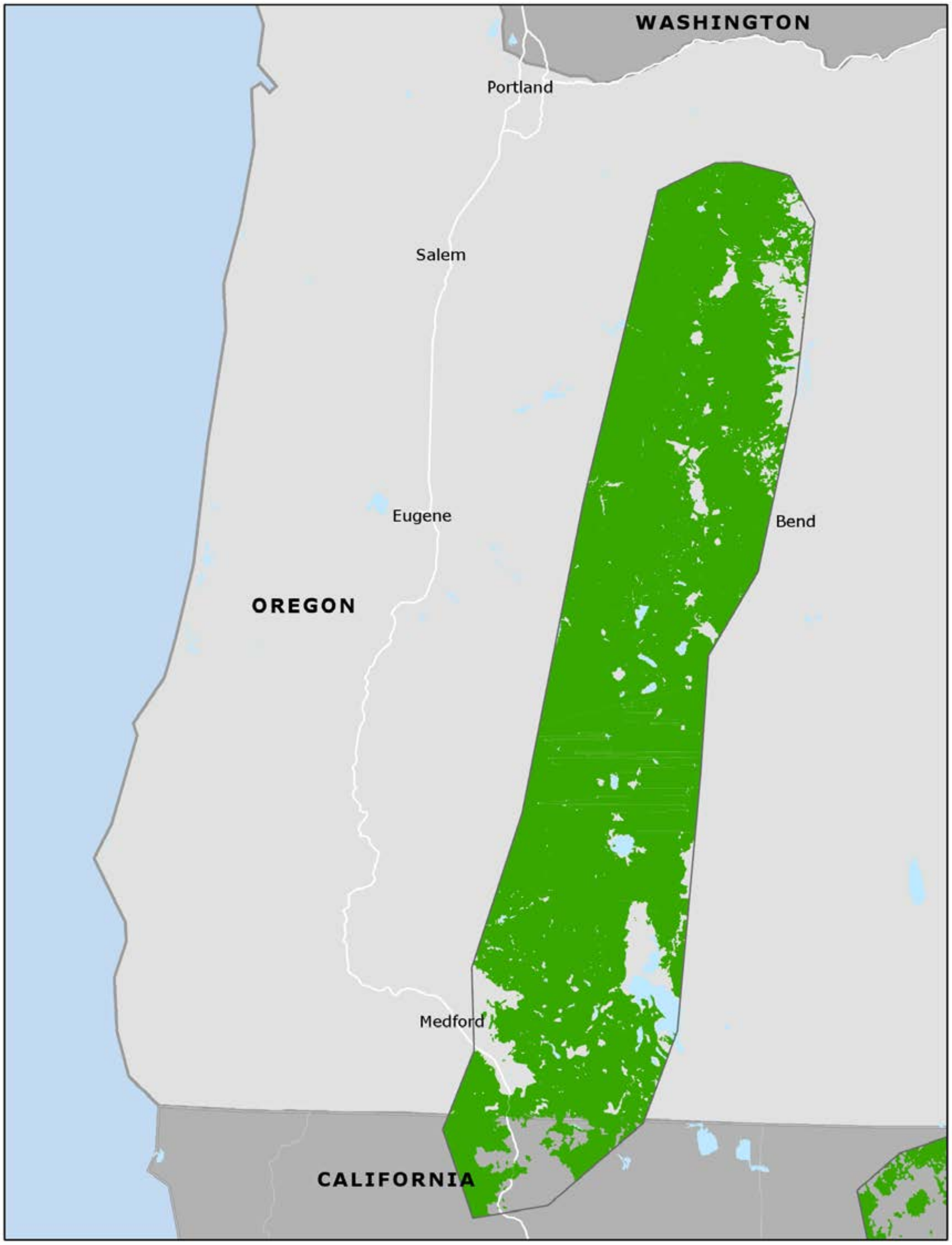

Figure 8a. The current distribution of conifer forest types that could potentially be used by the Black-backed Woodpecker in the eastern Oregon Cascades.

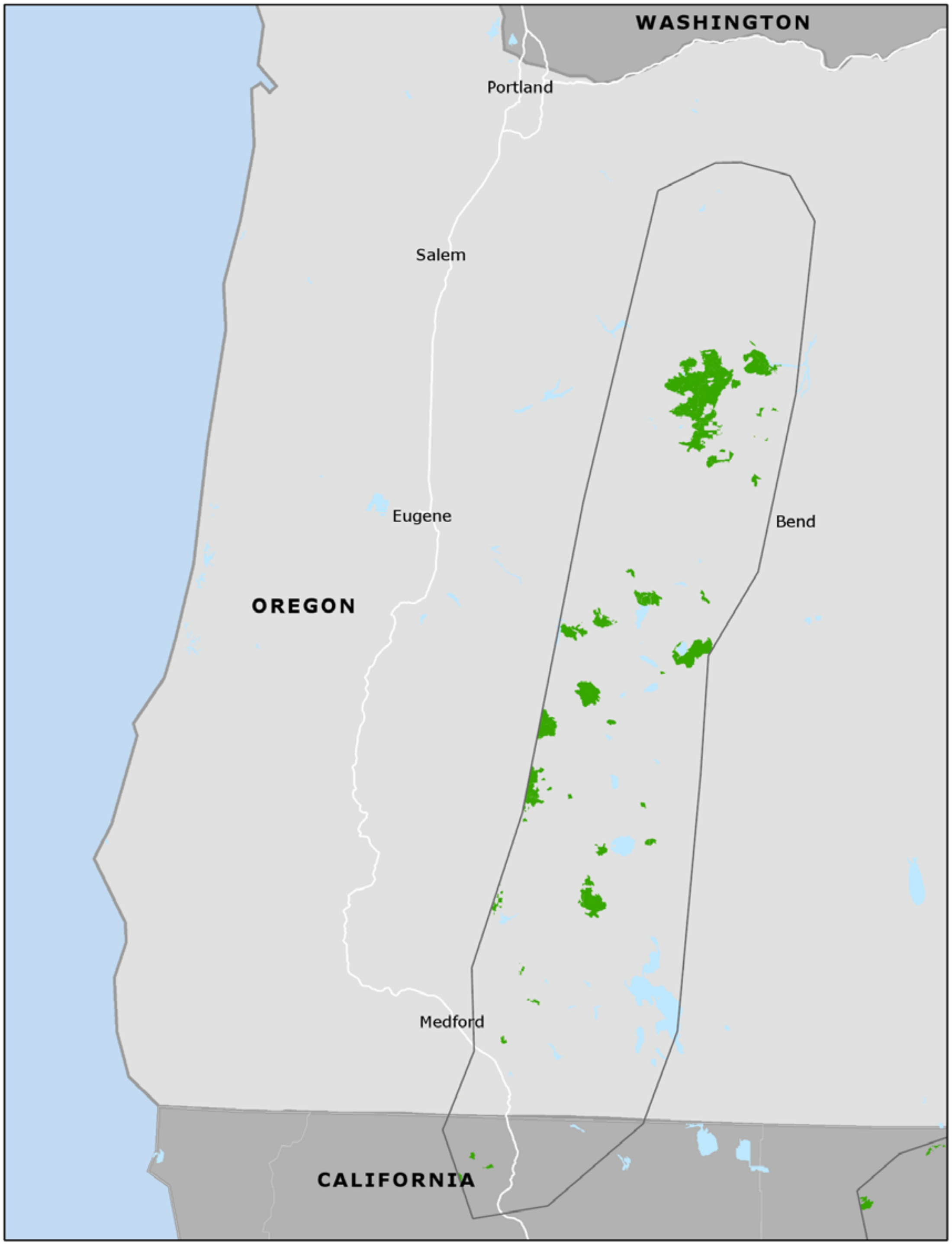

Figure 8b. Fires since 1984 on federal lands within relevant forest types on federal lands in the eastern Oregon Cascades.

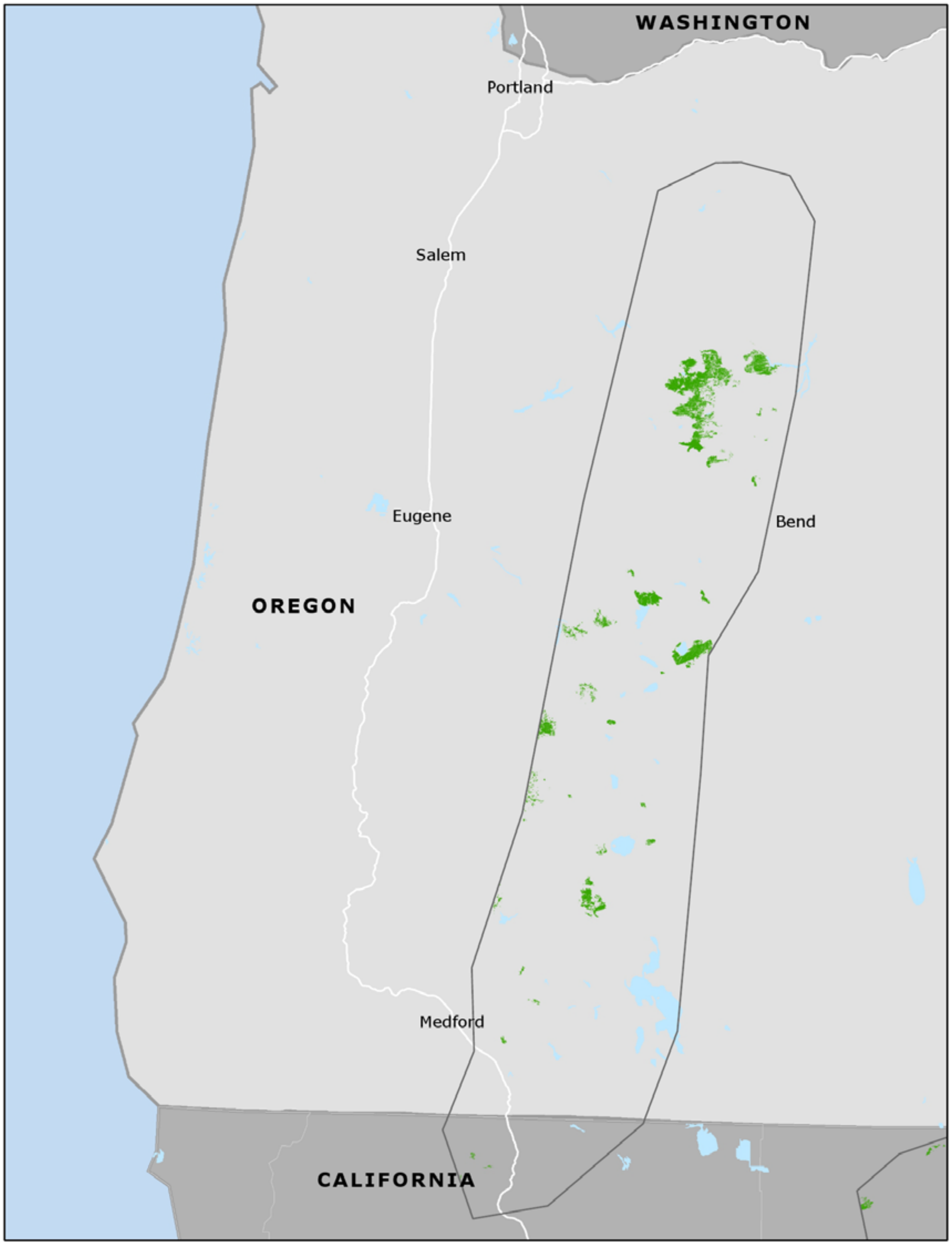

Figure 8c. Fires since 1984 with higher intensity fire effects (RdNBR >574 from satellite imagery, corresponding to >50% mortality in trees over 30 cm in diameter [Hanson et al. 2010]) within relevant forest types on federal lands in the eastern Oregon Cascades.

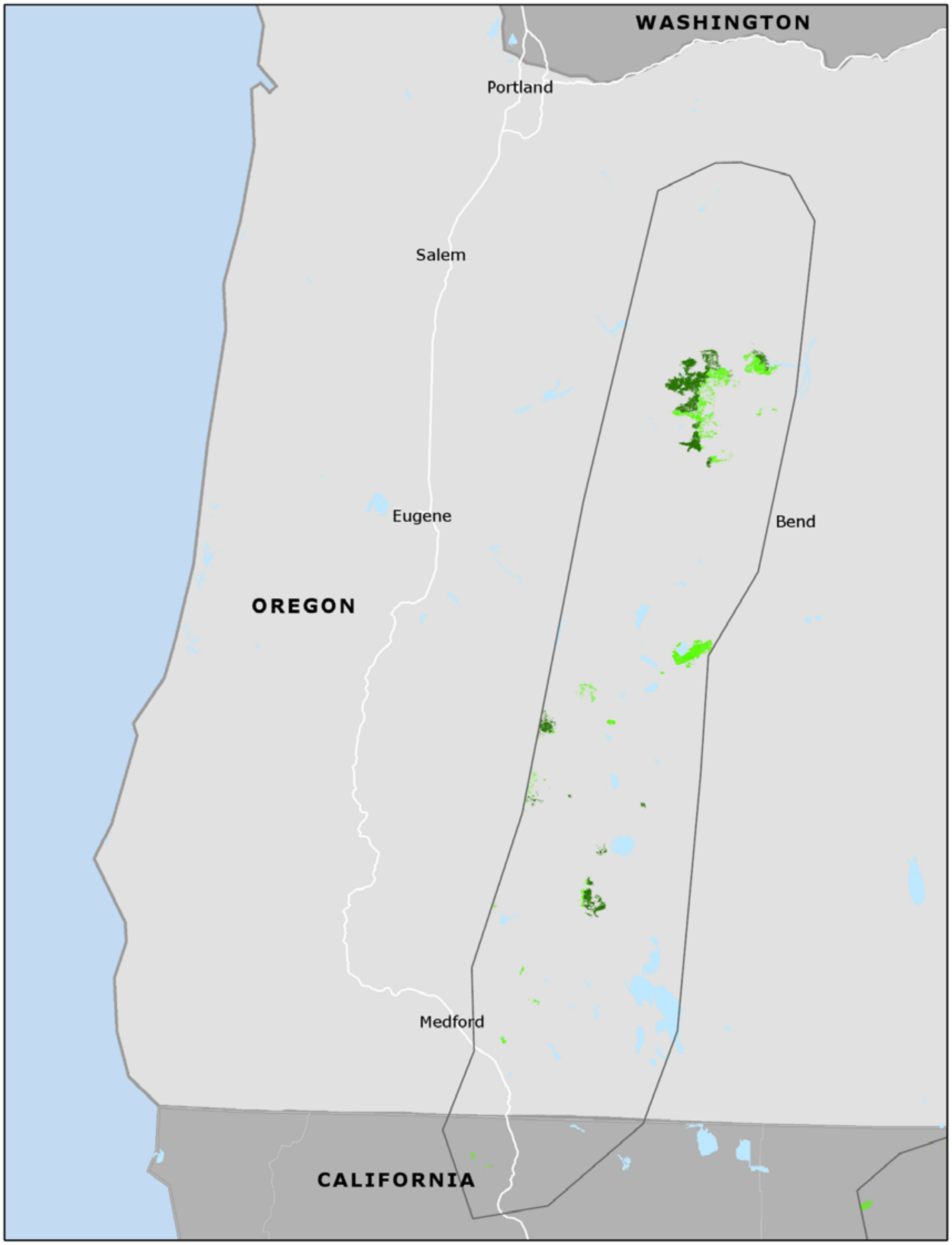

Figure 8d. Moderate/high-intensity fire since 2001 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green in the eastern Oregon Cascades.

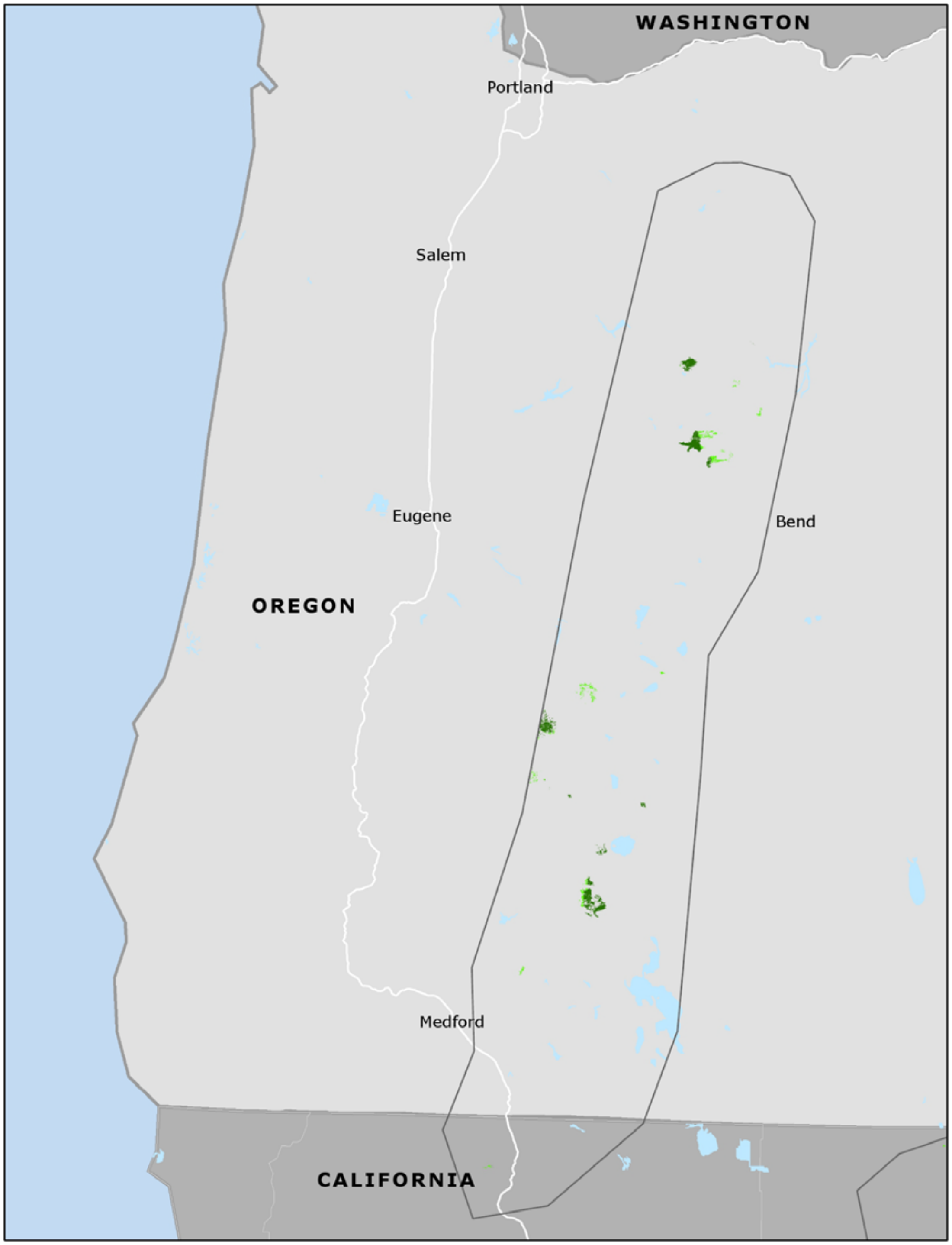

Figure 8e. Moderate/high-intensity fire since 2006 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green in the eastern Oregon Cascades.

Post-disturbance Salvage Logging:

Black-backed Woodpeckers are vulnerable to local and regional extinction as a result of post-fire salvage logging (Dixon and Saab 2000). Post-fire logging of recently killed trees (from fire or beetles) is perhaps the most important and most well-documented threat to the persistence of Black-backed Woodpeckers throughout the range of the species. Every study ever conducted examining the effects of salvage logging on Black-backed Woodpeckers has documented significant declines in abundance and nest densities in salvage logged forests as compared to unlogged post-disturbance forests. Nearly 15 years ago, scientists began warning that post-disturbance salvage logging was eliminating crucial habitat not only for Black-backed Woodpeckers but also for a number of other wildlife species. In 1995, Dr. Richard Hutto of the University of Montana and the Rocky Mountain Research Station of the U.S. Forest Service (1995 at p. 1,053) pointed out that logging methods that "tend to 'homogenize' the stand structure (such as selective removal of all trees of a certain size and/or species) will probably not maintain the variety of microhabitats and, therefore, bird species that would otherwise use the site. Selective tree removal also generally results in removal of the very tree species and sizes preferred by the more fire-dependent birds."

Dr. Hutto further stated at p. 1,054 that "[f]ire (and its aftermath) should be seen for what it is: a natural process that creates and maintains much of the variety and biological diversity…Most current cutting practices neither create large amounts of standing dead timber nor allow forests to cycle through stages of early succession that are physiognomically similar to those that follow stand-replacement fires." In other words, post-fire salvage logging does not mimic natural processes that create the burned habitat critical for Black-backed Woodpeckers. Murphy and Lehnhausen (1998) also noted that salvage logging is particularly detrimental to Black-backed Woodpeckers because it forces the birds to persist in undisturbed forests where their densities are much lower. The authors stated at p. 1,370 that "[b]oth fire suppression and salvage logging after fires will prolong periods of use of unburned [spruce] forests by Black-backed Woodpeckers and likely will cause Black-backed Woodpeckers to decline."

Nest densities as well as overall abundance of Black-backed Woodpeckers are adversely impacted by post-fire salvage logging. Saab and Dudley (1998) followed 17 Black-backed Woodpecker nests from 1994 to 1996 in forests of western Idaho that burned in 1992 and 1994. Nest densities were more than quadrupled in unlogged stands versus both "standard salvage" and "wildlife salvage" treatments, despite significant snag retention. Additional nest monitoring was conducted over subsequent years in the same study site. Saab et al. (2007) reported that nest densities were more than 5 times lower in partially logged burns: 43 nests (29 early, 14 late) were detected in unlogged stands and 8 nests (5 early, 3 late) were detected in partially logged stands. In the logged treatment, pre-logging snag densities were 73.4 ± 9.3 snags >23cm/ha, and after logging were 45 ± 5.1 snags >23cm/ha and 129.6 ± 19.8 snags ≤ 23cm/ha. The unlogged burned stands had

67.8 ± 11.5 snags >23cm/ha and 100.4 ± 19.7 snags <23cm/ha. Numbers of nesting Black-backed Woodpeckers were significantly reduced in burned, logged stands compared to burned, unlogged stands elsewhere in the Rocky Mountains as well (Harris 1982 and Caton 1996 as cited in Dixon and Saab 2000). In the eastern Oregon Cascades, Cahall and Hayes (2009) found that partial salvage logging did not mitigate adverse effects to Black-backed Woodpeckers.

Hutto and Gallo (2006) examined nest densities in burned mixed-conifer forest in Montana and found numerous Black-backed nests in unlogged moderate- and high-intensity burned areas but 0 nests per 275 ha in salvage-logged stands. Other cavity-nesting avian species are negatively impacted by the decrease in Black-backed Woodpecker abundance due to salvage logging because Black-backed Woodpeckers are primary cavity excavators. Hutto and Gallo (2006) found that the frequency of cavity re-use by cavity nesters was higher in salvage-logged than in unlogged plots, possibly reflecting a greater level of nest-site limitation in the salvage-logged areas. The authors noted at p. 829 that "[i]n unlogged areas, the continuous creation of roosting and nesting cavities by primary cavity-nesting species may provide abundant new cavities for secondary cavity-nesting birds to use. In contrast, fewer breeding primary cavity-nesters in salvage-logged areas create fewer new cavities, and this may force secondary cavity-nesting birds to reuse a smaller number of older cavities, which could also affect their nest success in salvage-logged forests."

Hanson and North (2008) investigated whether current management prescriptions for salvage logging in the Sierra Nevada, involving removal of all but 7.5–15 large (≥50 cm) snags/ha in intensely burned forest, could reduce foraging habitat quality for Black-backed Woodpeckers. The authors surveyed for the species in 3 large fire sites using point counts in unburned (n = 9), moderate-intensity/unlogged (n = 8), high-intensity/unlogged (n = 10), and high-intensity/logged (n = 9) plots, including only patches >12 ha within a given burn category. The density of smaller-sized snags (25–49 cm) was greatest in high-intensity/logged and high-intensity/unlogged plots, and the density of large (≥50 cm) snags was greatest in high-intensity/unlogged and lowest in high-intensity/logged plots and unburned plots. Some additional snags beyond the minimum retention levels were deemed unmerchantable and retained. Black-backed Woodpeckers were found foraging *exclusively* in high-intensity/unlogged patches in this study, and they selectively foraged on large snags more than would be expected based upon availability (Hanson 2007). The fire-affected stands surveyed by Hanson and North (2008) were all heavily burned and thus it is likely that detectability was similar between all burned plots.

Most (97%) of foraging observations by Hanson and North (2008) occurred on snags as opposed to live trees. Even with above-minimum levels of large-snag retention due to the unmerchantability of some snags, foraging was significantly reduced for the Black-backed Woodpecker in logged plots. Hanson and North (2008) did not find Black-backed Woodpeckers foraging in the high-intensity/logged condition despite high density of small snags—a characteristic that has been used to describe habitat in the immediate vicinity of Black-backed nest trees in the Rocky Mountains (Saab et al. 2002). The authors concurred with Dr. Richard Hutto that the Black-backed Woodpecker's preference for foraging in high-density, intensely burned forest, and historical records indicating that this now-rare species was once common, suggests that high-intensity burns occurred with enough frequency for this species to evolve a strong association with them.

Hutto (2006) explained that post-fire snag-management guidelines currently in use by the U.S. Forest Service and other government agencies have failed to embrace the science on the value of intensely burned forest habitat. Dr. Hutto's eloquent words best describe the dire situation faced by fire-dependent species today:

> "The naturalness and importance of crown fires is reinforced by the fact that the bird species that are always more common in burned than in unburned forests are also more common in the more severely than in the less severely burned portions of those forests. The dramatic positive response of so many plant and animal species to severe fire and the absence of such responses to low-severity fire in conifer forests throughout the US West argue strongly against the idea that severe fires are unnatural. The biological uniqueness associated with severe fires could emerge only from a long evolutionary history between a severe-fire environment and the organisms that have become relatively restricted in distribution to such fires. The retention of those unique qualities associated with severely burned forest should, therefore, be of highest importance in management circles. Yet, everything from the system of fire-regime classification, to a preoccupation with the destructive aspects of fire, to the misapplication of snag-management guidelines have led us to ignore the obvious: we need to retain the very elements that give rise to much of the biological uniqueness of a burned forest – the standing dead trees." p. 987.
>
> "Unfortunately, we have generally failed to adjust snag-retention recommendations to specific forest age, and nowhere is that failure more serious than for those special plant community types that were ignored in the development of the generic guidelines – recently burned conifer forests. Such forests are characterized by uniquely high densities of snags, and snag use by most woodpeckers in burned forests requires high snag densities because they nest in and feed from burned snags." p. 989.
>
> "The numbers of standing dead trees per hectare immediately following stand-replacement fire number in the hundreds, of course, so snag guidelines should recommend perhaps 50 times the number currently recommended in the most commonly used guidelines. On top of that, the densities of snags in patches used by birds for cavity nesting are significantly higher than what is randomly available in early postfire forests, so even if guidelines were built on 'average' snag densities

> associated with recently burned forests, they might still fall short of the densities actually needed by these birds." p. 990.
>
> "Existing science-based data suggest that there is little or no biological or ecological justification for salvage logging. McIver and Starr (2000) note that because of this, the justification for salvage logging has begun to shift toward arguments related to rehabilitation or restoration, but those sorts of justifications also reflect a lack of appreciation that severe fires are themselves restorative events and that rehabilitation occurs naturally as part of plant succession (Lindenmayer et al. 2004). … All things that characterize a severe disturbance event, including soil erosion and sometimes insufferably slow plant recovery, are precisely the things that constitute 'rehabilitation' for those organisms that need those aspects of disturbance events at infrequent intervals to sustain their populations." p. 991.

Similarly, in areas of high tree mortality from beetles, post-disturbance salvage logging results in a loss of suitable Black-backed Woodpecker habitat. In a radiotelemetry study in the eastern Cascades of Oregon, Goggans et al. (1989 [Table 8, p. 26]) found that 99% of all foraging instances of Black-backed Woodpeckers were in forests with high levels of beetle mortality that had not been subjected to salvage logging, while the birds showed near complete avoidance of such areas that had been salvage logged—a finding that closely mirrors the findings in salvage logged areas of burned forests in California (Siegel et al. 2012 [see Fig. 10]).

Bonnot et al. (2009) (see Abstract) noted, with regard to the Black Hills, the same thing that Hutto (2006) noted generally—i.e., that, "given the relatively infrequent occurrence of large-scale fire in the Black Hills, management should recognize the importance of beetle-killed forests to the long-term viability of the black-backed woodpecker population in the Black Hills." Similar to Hutto (2006), the authors observed that current snag-retention guidelines only account for snag densities sufficient for the individual nest trees themselves, but do not account for the snag densities necessary for foraging—i.e., to provide enough food for the survival of the Black-backed Woodpeckers, and the authors stated that guidelines "need to be revisited" (Bonnot et al. 2009, p. 226). Therefore, the current snag retention standards for the Black Hills National Forest, which only require retention of 3–4, or fewer, snags per acre, are not capable of maintaining viable populations of the Black-backed Woodpecker, based upon current science.

Fire Suppression:

Fire extent in general remains heavily suppressed in western U.S. forests such that historical annual extent of burning was several times greater than the annual extent of burning under current conditions (Stephens et al. 2007). Western U.S. conifer forests remain in a serious fire deficit. Even high-intensity effects are currently deficient, relative to the extent of high-intensity fire prior to fire suppression and logging.

High-intensity fire was previously assumed to have been rare and of limited extent in most western U.S. conifer forests, largely because fire-scar studies documented frequent fire occurrence in most historical conifer forests, and it was assumed that frequent fire would have kept surface fuel levels low, preventing high-intensity fire. The problem, however, is that fire-scar records cannot detect occurrence of past high-intensity effects, wherein most trees were killed (Baker and Ehle 2001).

Oregon/California—Wildland fire is in significant deficit currently relative to pre-suppression times (Stephens et al. 2007). This applies to high-intensity fire as well. In the Lake Tahoe Basin, for example, montane chaparral has declined by 62% since the 19th century due to the reduction in high-intensity fire occurrence, creating a significant concern about the plant and animal communities that depend upon post-fire montane chaparral (Nagel and Taylor 2005). Though smaller high-intensity patches would have outnumbered large patches, the larger patches would have comprised more area spatially, and numerous high-intensity patches prior to fire suppression were hundreds or thousands of hectares in size in California's forests historically (Hanson 2007 [Fig. 3.1], Bekker and Taylor 2010).

The scientific evidence is clear that, historically, prior to fire suppression and logging, Californian mixed-conifer and ponderosa/Jeffrey-pine forests experienced a mix of low, moderate, and high-intensity fire effects (Stephenson et al. 1991, Minnich et al. 2000, Beaty and Taylor 2001, Bekker and Taylor 2001, Nagel and Taylor 2005, Hanson 2007 [Fig. 3.1], Bekker and Taylor 2010, Collins and Stephens 2010), and high-intensity fire was always a natural part of historical fire regimes.

A recent study using historic General Land Office (GLO) field data from the 19th century, prior to fire suppression and logging, found that historic forests were more than twice as dense as previously assumed from fire-scar records (which, as discussed above, cannot measure higher-intensity fire [Baker and Ehle 2001]), and were dominated by mixed/high-intensity fire, not by low-intensity fire (Baker 2012). These findings are robust, as indicated by similar findings in other regions of the western U.S. using the same methods (Williams and Baker 2012), and similar findings in the same region (eastern Cascades) using different methods (Hessburg et al. 2007).

With regard to high-intensity fire proportion (the average percentage of high-intensity effects, relative to low- and moderate-intensity), Stephens et al. (2007) assumed high-intensity fire comprised an average of about 5% of historic fires, and estimated an average overall fire rotation (including low-intensity fire) of about 20–30 years, in the majority of the Sierra Nevada forests prior to fire suppression and settlement, which equates to a high-intensity fire rotation of about 450 years, though this was simply a guess, rather than an estimate based upon empirical data. The actual scientific data on this subject indicates a substantially higher historic proportion of high-intensity fire in the most common Sierra Nevada forest types, leading to a considerably more frequent occurrence of high-intensity fire than assumed by Stephens et al. (2007). In middle-elevation mixed-conifer forests dominated by ponderosa pine on the western slope of the Lassen National Forest, Beaty and Taylor (2001 [Table 7]) found an historical high-intensity fire proportion of 23% over a 43-year period. Bekker and Taylor (2001 [Fig. 2f]), in a different unmanaged mixed-conifer and fir forest on the Lassen National Forest, found historical high-intensity fire proportions of more than 50% over a 75-year period. Bekker and Taylor (2010) found that, in an unmanaged area of the Lassen National Forest within both mixed-conifer/ponderosa-pine and mixed-conifer/fir forests, the fires burned mostly at high-intensity historically, with some high-intensity fire patches being thousands of acres in size. Bekker and Taylor (2010) concluded that "high-severity fire was important in shaping stand structure" historically. One recent study investigated fire history in a 5,248-acre patch of old-growth forest that was found in Yosemite National Park (Scholl and Taylor 2010). Since the study area was specifically selected *because* it was all old-growth forest, it was understood from the outset that this particular area had not experienced any significant amount of high-intensity fire for hundreds of years (Scholl and Taylor 2010). The authors, of course, did not find any clear evidence of high-intensity fire in recent centuries within the boundaries of this particular old-growth forest patch (Scholl and Taylor 2010), which indicates the spatial heterogeneity of historical high-intensity fire (i.e., at any given point in time, historically, there would always have been some localized areas that had not experienced high-intensity fire in more than 200 or 300 years, just as there would have been areas that experienced high-intensity fire with greater-than-average frequency, as is always the case with natural events subject to randomness).

Moreover, these studies indicate that, historically, the rotation intervals for high-intensity fire in mixed-conifer and ponderosa/Jeffrey-pine forests were about 150-350 years in length (high-intensity fire rotation interval basically refers to how often a given stand would, on average, experience high-intensity fire), if the proportion of high-intensity fire effects and the overall fire rotation, or the proportion of the area affected by high-intensity fire over time, are used to calculate high-intensity fire rotations (Minnich et al. 2000, Beaty and Taylor 2001, Bekker and Taylor 2001, Bekker and Taylor 2010).

The current high-intensity fire rotation in the Sierra Nevada, over the past decade, is over 700 years, which we determined using a GIS (Geographic Information Systems) analysis of all fires in the Sierra Nevada 2002–2011, using the Forest Service's own suggested high-intensity fire threshold value of 641 in the remote sensing satellite imagery system, "RdNBR" (Relative differenced Normalized Burn Ratio), used by the Forest Service (Miller and Thode 2007). The main factor that is "uncharacteristic" about current high-intensity fire in the Sierra Nevada relative to natural, historical fire, is that high-intensity fire, and the ecologically-rich habitat it creates, is in significant deficit.

Further, contrary to popular misconception, Sierra Nevada fires today are, on average, dominated by low- and moderate-intensity fire effects, not high-intensity effects (Odion and Hanson 2006, Miller and Safford 2008, Odion and Hanson 2008), and this is also true in forests that have missed several "fire return intervals" since the beginning of fire suppression (Odion and Hanson 2006, Odion and Hanson 2008, Odion et al. 2010).

Similarly, in the historical forests of the eastern Oregon Cascades, U.S. Geological Survey data gathered more than a century ago by Leiberg (1900) provides further evidence of an active role for high-intensity fire prior to fire suppression. Leiberg (1900) gathered comprehensive data on high-intensity fire occurrence for the period 1855–1900 in the eastern Oregon Cascades, presenting data on high-intensity (75–100% timber volume mortality) burned acres and acres logged for each township. Excluding the townships with any evidence of logging (in order to eliminate any confounding effects of logging), the high-intensity rotation within the Eastern Oregon Cascades (extending south to the California/Oregon border) physiographic province (Moeur et al. 2005) prior to fire suppression and logging was 165 years overall (Leiberg 1900), indicating far more high-intensity fire than is occurring currently (469-year high-intensity rotation in mature forests) (Hanson et al. 2009).

Based upon the foregoing, it is clear that there was 3-4 times more high-intensity fire historically in the range of the Black-backed Woodpecker in Oregon/California than there is currently—*and this is without taking into account the loss of high-intensity post-fire habitat from salvage logging*. Due to the combined effects of post-fire logging and fire suppression, large snag densities in all of California's forests are currently critically low, with less than 2 large snags per acre in all forested regions of the state (Christensen et al. 2008). The same severe deficit in large snags exists in Oregon (Donnegan et al. 2008).

In order to further explore the issue of the extent to which higher-intensity fire has been reduced by fire suppression, relative to its historic extent within the Black-backed Woodpecker's range in the eastern Cascades of Oregon and California, we assessed the rate of initiation of new stands of trees over time, using U.S. Forest Service stand age data from the agency's Forest Inventory and Analysis (FIA) data base (http://www.fia.fs.fed.us/tools-data/). We restricted this analysis to unmanaged forests (Inventoried Roadless Areas, Wilderness Areas, National Parks, and Wild and Scenic River Corridors) to restrict stand initiation to natural disturbance, and eliminate stand initiation from logging from the analysis. We found that the rate of new stand initiation within the Oregon/California population has declined by about fourfold since the 19th century, equating to a lengthening of the rotation interval for stand-initiating natural disturbance (e.g., fire sufficiently intense to kill most or all of the overstory trees, thus initiating a new stand, and re-setting the stand age to zero) (see Fig. 9 below). For comparison purposes, we included data from the eastern Washington Cascades and Northern Rockies, which are part of the boreal population of the Black-backed Woodpecker (Pierson et al. 2010). In this boreal population, high-intensity natural disturbance has also declined, but the decline is about twice as large in Oregon/California as it is in the boreal population (Fig. 9).

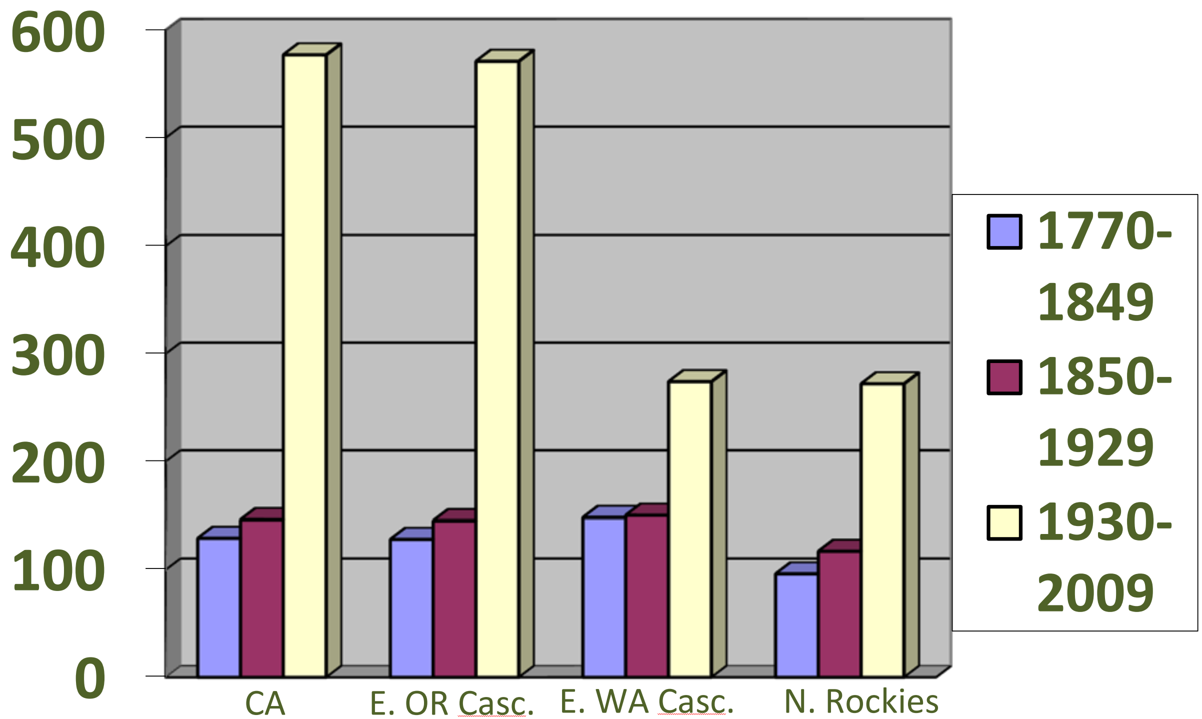

Figure 9. Rotation interval of high-intensity natural disturbance in years (y-axis) since the 19th century in unmanaged conifer forests within the range of the California and eastern Oregon Cascades population of Black-backed Woodpeckers relative to the eastern Washington Cascades and northern Rockies areas of the boreal population.

In summary, because of the extremely close association between Black-backed Woodpeckers and higher-intensity fire, as discussed above, the large decline in high-intensity fire since the 19th century can be expected to correspond to a similar decline in Black-backed Woodpecker populations within their range in Oregon/California. This decline in habitat created by fire is greatly exacerbated by post-fire logging, which further widens the gap between historic and current amounts of Black-backed Woodpecker habitat, and populations.

Black Hills—Exhaustive analysis of historic U.S. government surveys circa 1900 found that large expanses of high beetle mortality, and high-intensity fire, are a natural part of the ecology in the Black Hills National Forest (Shinneman and Baker 1997, Bonnot et al. 2009), with high-intensity fire typically occurring in intervals of less than 100 years in a given area (Shinneman and Baker 1997). Current rates of high-intensity fire are substantially lower than this, as the current "occurrence of large scale fires is infrequent compared with natural disturbance regimes" and, in the relative "absence of fire", the "beetle outbreaks might serve as the only substantial source" of food for the Black-backed Woodpecker in the Black Hills (Bonnot et al. 2009, p. 227). Bonnot et al. (2009) (see Abstract) concluded that, "given the relatively infrequent occurrence of large-scale fire in the Black Hills, management should recognize the importance of beetle-killed forests to the long-term viability of the black-backed woodpecker population in the Black Hills". The 225,554 acres of fire since 1980 in the Black Hills National Forest represents a rotation interval for all fire intensities of about 90–100 years. However, even in the most severe of these fires, the majority of this has been low-intensity and moderate-intensity effects (see, e.g., Lentile et al. 2006). Thus, the high-intensity fire rotation interval is at least 300 years currently—i.e., corresponding to substantially less high-intensity fire (and, therefore, less Black-backed Woodpecker habitat from fire) than these forests experienced historically (Shinneman and Baker 1997, Bonnot et al. 2009) which corresponds to a reduction in populations since the 19th century.

Thinning—Suppression of Natural Tree Mortality:

Post-disturbance salvage logging represents an important negative impact to Black-backed Woodpecker populations. However, fire suppression also actively prevents the woodpeckers' preferred habitat from being created, and the prevention of significant natural disturbance in the form of "thinning" projects detrimentally affects the species in multiple ways. If the thinning projects meet their desired objectives, then high-intensity fire, or significant beetle mortality, is prevented and Black-backed Woodpecker habitat that otherwise would have been created is also prevented. In addition to the extent to which the thinning reduces fire intensity (by reducing understory trees, and by removing mature trees, thereby increasing spacing between tree crowns) or significant beetle mortality (by removing small and mature trees to reduce competition between trees, thereby reducing tree mortality), thinning also adversely affects Black-backed habitat by reducing pre-disturbance tree densities and canopy cover which are correlated to high post-disturbance occupancy rates and nest densities after fire (Russell et al. 2007, Vierling et al. 2008, Saab et al. 2009), and after high beetle mortality (Bonnot et al. 2009) (see also discussion of this study above in "Habitat—Nesting Habitat," and "Habitat—

Foraging Habitat”). Hutto (2008) showed that the probability of detecting a Black-backed Woodpecker decreased substantially with intensity of recent pre-fire timber harvesting consistent with commercial thinning (Hutto pers. comm. 2009). Even with light pre-fire forest thinning, Black-backed Woodpecker occupancy is reduced by about 50% when the area burns relative to unthinned burned areas (Hutto 2008) (see also Fig. 8 below).

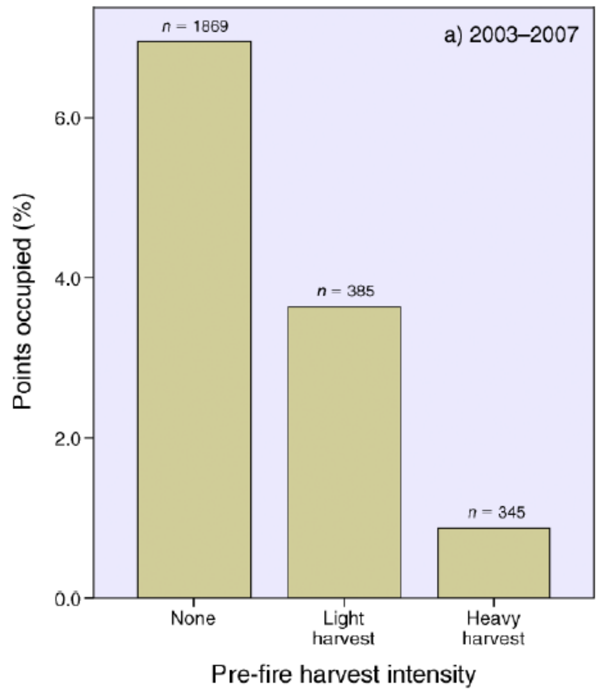

Figure 10. The probability of detecting a Black-backed Woodpecker decreases substantially with intensity of recent pre-fire thinning. From Hutto (2008 at p. 1,830).

Black-backed Woodpeckers use burned forests that have high pre-fire canopy cover and are densely stocked with large thick-barked trees favored by wood-boring beetles (Hutto 1995, Murphy and Lehnhausen 1998, Saab and Dudley 1998, Saab et al. 2002; Nappi et al. 2003; Russell et al. 2007, Hanson and North 2008, Vierling et al. 2008). Forests that are treated to reduce the risk of high-intensity fire, or the risk of high mortality from beetles, and to “restore” a lower-density structure, are unlikely to retain characteristics needed by Black-backed Woodpeckers even if these stands later burn intensely or experience significant beetle mortality. As pre-disturbance thinning of smaller and mature trees to reduce canopy cover, and to lower tree densities, is conducted at a greater scale (see “The Inadequacy of Existing Regulatory Mechanisms” below), less suitable habitat will exist for the species once fire burns through the treated stands. This will be especially true where thinning occurs in potential Black-backed Woodpecker habitat: dense, mature/old conifer forest with high canopy cover and high basal area of trees (basal area is the cumulative total of the horizontal area of the trees per hectare, measured at breast height).

Because thinning is designed to greatly reduce or preclude the potential for higher-intensity fire for at least 20 years (Martinson and Omi 2003, Strom and Fule 2007) after which areas are generally re-thinned, or to greatly reduce or preclude the potential for significant levels of beetle mortality for several decades (USDA 2004) or more than a century (USDA 2010b), thinning not only prevents higher-intensity fire (or high levels of beetle mortality) from occurring in the first place, which prevents the occurrence of Black-backed Woodpecker habitat, but also greatly reduces or eliminates habitat suitability for Black-backed Woodpeckers even if a thinned area does burn. This is especially true where thinning reduces stand basal area to less than 18-20 square meters per hectare, due to the fact that successful Black-backed Woodpecker nesting and foraging is associated with snag basal areas of at least 18-20 square meters per hectare, as discussed above in the "Habitat" section (e.g., if thinning reduces a stand to 18-20 square meters per hectare of basal area, the stand would have to experience close to 100% tree mortality from fire in order to provide even moderately suitable Black-backed Woodpecker habitat; and, if thinning reduces stand basal area to significantly less than 18 square meters per hectare, then Black-backed Woodpecker suitable habitat creation is largely precluded even if the area experiences complete mortality from fire).

Overutilization

There are no specific regulations prohibiting the hunting or killing of Black-backed Woodpeckers in Oregon/California or the Black Hills; nor are there any available records of the numbers of Black-backed Woodpeckers that are killed annually through hunting, research, or for other reasons.

Predation and Disease

Predation—Predation was the leading cause of nest loss (89%) of Black-backed Woodpecker nestlings in 44 nests in beetle-killed forests in the Black Hills, South Dakota (Bonnot et al. 2008). Vierling et al. (2008) examined post-fire reproductive success in burned forests in the Black Hills for 1–4 years after fire. Predation was the major cause of nest failure of all 7 species of woodpecker and increased between 2–4 years post-fire, to the end of the study. Predation caused 27% of nest failures 2 years post-fire, 61% the third year, and 67% 4 years after fire. Saab et al. (2004) report that small mammalian and reptilian nest predators commonly observed in or near their study site in southwestern Idaho included red squirrels (*Tamiasciurus hudsonicus*), weasels (*Mustela* spp.) and bullsnakes (*Pituophis melanoleucus*). Chickarees (*Tamiasciurus douglasi*), another small mammal species, were suspected predators of eggs and nestlings in unlogged forests of Oregon (Goggans et al. 1988). Time-since-fire, fire size, and fire intensity, are key factors in determining nesting success of Black-backed Woodpeckers and other woodpecker species. Higher fire intensities in larger fires were associated with facilitating higher nesting success for longer periods of time post-fire, since it takes mammalian and reptilian nest predators longer to effectively recolonize larger and more intense fires (Saab et al. 2004).

Little information is available regarding predation of adult Black-backed Woodpeckers. One adult male with a backpack radio was found killed by a Cooper's Hawk (*Accipiter cooperii*; Dixon and Saab 2000).

Disease—Non-predatory interspecific interactions have been observed around Black-backed Woodpecker nest sites, particularly between Black-backed Woodpeckers and other cavity nesters (Dixon and Saab 2000). Mountain Bluebirds, Western Bluebirds (*S. mexicana*), White-headed Woodpeckers (*P. albolarvatus*), and Hairy Woodpeckers showed aggression towards Black-backed Woodpeckers (Dixon and Saab 2000). Black-backed Woodpeckers were displaced on 4 observed occasions by a White-headed Woodpecker, a Hairy Woodpecker, a Western Bluebird, and a Mountain Bluebird. On one occasion, a newly excavated Black-backed cavity was taken over by a Lewis's Woodpecker (*Melanerpes lewis*). Villard and Beninger (1993) found that of 22 interspecific contacts, individual Black-backed Woodpeckers always moved to a new tree when individual Hairy Woodpeckers approached. Hairy Woodpeckers were then seen foraging at or near the same place Black-backed Woodpeckers had been foraging.

Little information is currently available regarding disease or parasites of Black-backed Woodpeckers (Dixon and Saab 2000). However, recent data from a 2011 radio-telemetry study of Black-backed Woodpeckers documented a death due to a *Procyrnea* nematode infection, which generally results from the gleaning of arthropod prey on the outer surface of the tree bark (9.4% of foraging instances), rather than from excavating beetle larvae from the sapwood of snags or dying trees (Siegel et al. 2012). More information is needed to determine the extent of such nematode infections in Black-backed Woodpeckers, and to determine the extent to which Black-backed Woodpeckers may be more vulnerable to such lethal infections when areas of recent significant tree mortality, and therefore beetle larvae in dead and dying trees, are scarce.

The Inadequacy of Existing Regulatory Mechanisms

National Forest Management Act Planning Rule, and Current Forest Service Direction:

In January of 2012, the Obama Administration issued a Final Programmatic Environmental Impact Statement (PEIS) for a system-wide national forest planning rule that would govern all national forests in the U.S. under the National Forest Management Act (NFMA). The PEIS identified the 1982 NFMA planning rule as the baseline regulation, or "no action" scenario. One of the most central features of the 1982 NFMA rule was that it *required* the U.S. Forest Service to maintain viable populations of *all* native vertebrate species, including the Black-backed Woodpecker, where those species are found on national forest lands (http://www.fs.usda.gov/planningrule [see link to PEIS]). This is one of the most important wildlife protection measures ever created in the U.S. (e.g., this "wildlife viability requirement" and not the Endangered Species Act, was the basis for the entire Northwest Forest Plan to protect the Northern Spotted Owl, *Strix occidentalis caurina*). In the PEIS, the Obama Administration selected an alternative, Modified Alternative A, that would eliminate the wildlife viability requirement and turn it into a purely optional provision that would apply if and only if a given forest supervisor (for a given individual national forest) *chooses* to designate the Black-backed Woodpecker (or any other species) as a "Species of Conservation Concern" (http://www.fs.usda.gov/planningrule). Thus, the Obama Administration's NFMA planning rule has eliminated the most important wildlife protection measure for forest species in the nation (a measure that was promulgated by the Reagan Administration in 1982)—a wildlife protection measure that was the only meaningful substantive protection afforded to the Black-backed Woodpecker, since current forest plans do not provide meaningful or adequate protection currently, as discussed below. The PEIS for the new NFMA planning rule, in fact, did not contain a single action alternative containing the wildlife viability requirement. The U.S. Forest Service indicates that the Record of Decision officially choosing Modified Alternative A will be issued in March of 2012 (http://www.fs.usda.gov/planningrule). By eliminating the wildlife viability requirement, the Administration has removed the most important "safety net" for the conservation of Black-backed Woodpecker populations, creating a vacuum in substantive protection that can only be filled by the Endangered Species Act.

This development represents a fundamental threat to the conservation of Black-backed Woodpecker populations in Oregon/California and the Black Hills, especially given that most of the Black-backed Woodpecker habitat created by natural disturbance in these areas is on national forest lands, and given that most of the Black-backed Woodpecker habitat on national forest lands is in the *unprotected* landscape—outside of Wilderness, Inventoried Roadless Areas, and National Parks—where it is subject to intensive salvage logging and thinning. For example, out of a total of 21,451 square kilometers (2,145,100 hectares) of mid/upper-montane and subalpine conifer forest in the Sierra Nevada management region, 3,314 square kilometers (331,400 hectares), or 15.4%, are on private lands, with nearly all of the remainder on federal lands (Davis and Stoms 1996 [Table 23.1—see figures for East-side ponderosa pine through limber pine]). On federal lands, our GIS analysis of current suitable habitat (described above in "Abundance and Population Trend—Abundance and Population Trends in Oregon/California, and South Dakota") found that only 22% of current suitable Black-backed Woodpecker habitat is within the protected landscape (Wilderness, Inventoried Roadless Areas, and National Parks), and 78% is unprotected, in the Sierra Nevada. In the eastern Oregon Cascades, within the elevational band and forest types potentially inhabited by Black-backed Woodpeckers (middle/upper-montane and subalpine forests), out of 928,381 hectares, 300,121 hectares, or 32%, is on non-federal lands (Moeur et al. 2005 [Table 4]). Of the federal lands, 43% is in the unprotected landscape. On the Black Hills National Forest, nearly all land is federal, and very few private inholdings exist, in terms of a proportion of the total; or private inholdings are in grassland, not forest (http://www.fs.usda.gov/blackhills [see forest map]). Moreover, over 98% of the forest is within the unprotected landscape (USDA 2000 [see Appendix A, Region 2]), which is open to very intensive thinning and salvage logging, as discussed below.

Based upon the analysis of current suitable Black-backed Woodpecker habitat above in the "Status and Trend" section above, the existing suitable habitat comprises less than 2%

of the Black-backed Woodpecker's range in Oregon/California (and less than 1% with regard to current moderate/high-quality habitat, i.e., areas less than 5 years post-disturbance), and less than 8% of the Black Hills (likely considerably less, and almost certainly under 5%, given that much of the area mapped as having recent beetle mortality has relatively few snags per hectare, as discussed above)—and most of this is unprotected and is open to salvage logging.

In light of the foregoing, the elimination of the mandatory regulatory requirement to ensure viable populations of native wildlife species poses a major threat to Black-backed Woodpecker populations. Greatly exacerbating this threat is the fact that, as of the summer of 2011, the Forest Service is now claiming that its existing forest plans in the Sierra Nevada do not require the agency to maintain viable populations of native vertebrate species—even Management Indicator Species like the Black-backed Woodpecker. The Forest Service is arguing that it can, through its logging projects, remove suitable habitat without determining whether the amount of habitat retained is enough to maintain viable populations and, even if it is not, the Forest Service claims that it can log the habitat anyway. In short, the Forest Service is now refusing to uphold this vital safety net to prevent extinction of wildlife species. The Forest Service argued this new legal position in the summer of 2011 and received a district court ruling in its favor. *Earth Island Institute v. Gibson*, 2011 WL 2746115 (E.D. Cal. 2011). However, the court did *not* find that the Forest Service was maintaining a viable population but, rather, *deferred* to the Forest Service's new argument that it is *not required to do so*, despite a clear forest plan mandate that: "The Forest Service must manage habitat to, at the least, maintain viable populations of existing native…species". *Id*. (the court found that "the Forest Service did not make a clear error in judgment in concluding that the LTBMU Forest Plan did not require it to assess the viability of the BBWP in accordance with the 1982 rule's viability requirement", and noted that "the Forest Service further argues that the provisions of the LTBMU Forest Plan cited by Plaintiffs are 'descriptive rather than prescriptive'" and, therefore, are not enforceable—an interpretation to which the court deferred). The Forest Service made this argument with regard to the Angora post-fire logging project on the Lake Tahoe Basin Management Unit (LTBMU) National Forest. The agency admitted that: a) only about 1% of the LTBMU National Forest was comprised of suitable Black-backed Woodpecker habitat before the post-fire logging in the Angora fire area; b) their proposed post-fire logging project would remove the majority of the little remaining Black-backed Woodpecker habitat on the entire LTBMU National Forest, and would remove 70% of all remaining high-quality Black-backed habitat; c) the post-fire logging would not effectively reduce future fire severity relative to taking no action, but would produce thousands of tons of commercial product for biomass energy plants, as well as large sawtimber; d) the Forest Service had not determined whether the remaining Black-backed habitat on the LTBMU would be sufficient to maintain viable populations; and e) argued that, even if remaining habitat is not enough to prevent extirpation of Black-backeds, the agency can and will nevertheless move forward with the logging project. The Forest Service is now making the same argument, as of October 2011, with regard to Black-backed Woodpecker habitat on the Plumas National Forest, claiming that, under its new interpretation, there is no longer any requirement to ensure viable populations of wildlife species, even indicator species, on national forests, and thus that there is no limit to how much of a given species' habitat the agency can log and destroy. *Earth Island Institute v. Carlton*, 2:09-cv-02020-MCE-EFB (Dkt. 94) (Forest Service Brief in Support of its Motion for Summary Judgement); *see also Earth Island Institute v. Carlton*, 2:09-cv-02020-MCE-EFB (Dkt. 105) (district court decision deferring to the Forest Service's new interpretation of their forest plan). Moreover, the Forest Service has now announced, in 2011, its "Region 5 Ecological Restoration Leadership Intent" management blueprint, which it states will guide all national forest management for at least the next two decades, including all upcoming forest plan revisions. The "Leadership Intent" document from the Regional Forester states emphatically that the Forest Service does not recognize any ecological value for high-intensity fire areas, describing it only in extreme negative terms (p. 2), and states that the Forest Service will embark upon an intensive landscape-level management program of an "unprecedented scale" to further decrease the occurrence of high-intensity fire (p. 3). *See* www.fs.fed.us/r5/EcologicalRestoration/pdfs/LeadershipIntent.pdf.

In the Black Hills, the U.S. Forest Service's most recent (2005) forest plan amendment also eliminated the previous requirement to ensure viable populations of all native wildlife species, including Black-backed Woodpeckers (Black Hills National Forest Standards and Guidelines, from Appendix D to 2005 Final EIS, LRMP Amendment, Alternative 6 (chosen alternative) (see http://www.fs.usda.gov/blackhills, follow link to "Land and Resources Management", then to "Planning").

California:

Sierra Nevada Forest Plan Amendment 2001 and 2004: In the early 1990s, concerns about the conservation status of the California Spotted Owl (*Strix occidentalis occidentalis*) and the inadequacy of existing regulatory mechanisms to protect the owl instigated a technical review of the owl's status and recommendations for management (Verner et al. 1992). This report suggested interim guidelines for conservation of spotted owls in the Sierra Nevada, conditioned upon additional research to refine and improve protective measures. In 1993, the Forest Service issued a decision which amended the forest plans in the Sierra Nevada to incorporate the interim guidelines, and circulated a draft EIS for an updated California spotted owl management plan. In 1996, the Sierra Nevada Ecosystem Project ("SNEP Report:" Centers for Water and Wildland Resources 1996) was submitted to Congress, which contained a wealth of information about historical and current forest conditions and threats to the natural resources of the Sierra Nevada ecosystem. A federal advisory committee was convened to review the draft EIS for spotted owl management that also took into account the SNEP report. This advisory committee determined that the draft EIS was inadequate, and recommended that the scope of the EIS be expanded to include management guidelines for a host of other issues beyond the spotted owl, including riparian ecosystems and old-growth forests. In 1998, the Forest Service initiated a process that culminated in the 2001 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (signed in January of 2001) and FEIS, also known as the "2001 Framework" (USDA 2001 [Appendix A, Standards &

Guidelines), which governs national forest lands in the Sierra Nevada and southern Cascades from the Sequoia National Forest north to the California/Oregon boundary.

The 2001 Framework was designed to "significantly improve the conservation strategy for California spotted owls and all forest resources." The multi-year process included dozens of public meetings and involved many scientists both inside and outside the Forest Service. Some of the provisions of the Framework (USDA 2001 [see Record of Decision]) designed to protect and manage old forests and associated wildlife species included:

(1) the designation of 4.25 million acres of Old Forest Emphasis Areas (OFEAs) and the promotion of old-forest conditions in OFEAs by restricting harvest of trees above 30.5 cm and prohibiting reduction of forest canopy by more than 10%;

(2) the protection of all old-forest stands 1 acre or larger by managing them as OFEAs; and

(3) the implementation of standards and guidelines prohibiting removal of medium and large trees (>51 cm) outside of OFEAs, and prohibiting reduction of canopy cover by more than 20% outside of OFEAs.

(4) the prohibition of post-fire salvage logging (removal of snags over 38.1 cm dbh) in any OFEAs except in rare circumstances in which removal of one or more large snags was established to be necessary by the Forest Service to benefit old-forest structure and function.

The 2001 Framework provided some minimum protection for Black-backed Woodpeckers not only by greatly restricting post-fire logging of Black-backed Woodpecker habitat (old forest that experiences high-intensity fire) but also by retaining medium and large diameter trees in OFEAs and smaller old-forest stands and by maintaining canopy cover at a minimum of 50% and limiting reductions in canopy cover to 10–20%, thus protecting *potential* Black-backed Woodpecker habitat. However, almost immediately following the adoption of the 2001 Framework Record of Decision, the newly installed Bush Administration pushed to weaken its conservation measures to allow more logging, under the guise of "increasing flexibility and efficiency in fuels management as well as providing more economically feasible approaches of implementing the fuels reduction provisions of the decision" (Sierra Nevada Plan Amendment Review Team Meeting with Owl Scientists, June 27–28, 2002). At the direction of the Chief of the Forest Service, the Regional Forester and the Sierra Nevada Forest Plan Amendment Review Team circulated a revised Supplemental EIS (SEIS) that significantly increased logging throughout the Sierra Nevada. The revised Sierra Nevada Forest Plan Amendment Record of Decision was signed in January of 2004 (2004 SNFPA).

The 2004 SNFPA (see USDA 2004 [Appendix A, Standards and Guidelines]) eliminated the previous requirement to retain large snags (over 38.1 cm dbh) in OFEAs, eliminated the requirement to retain portions of fires unlogged (turning this into a mere option, rather than a requirement), and also eliminated or greatly weakened retention standards for structural elements such as large trees and canopy cover in all land allocations throughout the Sierra Nevada. With respect to large trees, the original Framework included a logging upper diameter limit of 30.5 cm within OFEAs and 51 cm in general forest and threat zones. The 2004 SNFPA replaced these standards with a harvest diameter limit of 76.2 cm applicable in all land allocations. Moreover, the 2004 SNFPA also allows canopy cover to be reduced by as much as 30%, to a minimum of 40%, in CWHR 5M, 5D, and 6 areas (areas dominated by large trees >60.1 cm dbh, and with 40-60%, or >60%, canopy cover), and requires no canopy cover retention in CWHR 4M and 4D areas (areas dominated by mature, medium-sized trees 28-60 cm dbh, and with 40-60%, or >60%, canopy cover, respectively).

The 2004 SNFPA eliminated meaningful protection of OFEAs and smaller old-growth stands by allowing harvest of large trees up to 76.2 cm dbh and managing them similar to general forest. The weakening of habitat protections under the 2004 SNFPA significantly reduces the likelihood of Black-backed Woodpecker persistence in the Sierra Nevada.

Finally, the 2004 SNFPA significantly weakened protection for eastside forests in the Sierra Nevada. It eliminated any retention standards for canopy cover in eastside forests, even in CWHR 5M, 5D, and 6 areas. This omission of any protection whatsoever for canopy cover in eastside forests is yet another significant failure of existing regulatory mechanisms to ensure the conservation the Black-backed Woodpeckers.

The revisions to the original 2001 Framework were ostensibly implemented to increase flexibility in fuels management, the result of which would decrease the incidence of high-intensity fire in the Sierra Nevada. Indeed, the 2004 SNFPA explicitly stated that its goal was to essentially eliminate high-intensity fire from the forested landscape (USDA 2004). The decrease in high-intensity fire, together with the removal of trees of various sizes in unburned forests from pre-fire thinning projects, would result in an additive loss of available habitat for Black-backed Woodpeckers in California.

The 2004 SNFPA's elimination of previous protections for old forest that experienced high-intensity fire has profound consequences for the Black-backed Woodpecker because it allows 100% removal of Black-backed habitat 100% of the time on national forest lands outside of statutorily designated Wilderness Areas. Hanson (2007) investigated foraging ecology of Black-backed Woodpeckers in logged and unlogged burned forests in the Sierra Nevada. No Black-backed Woodpeckers were found in salvage-logged stands. Moreover, Hanson documented that the species may be selecting snags at least 40 cm dbh for foraging – the very snags targeted for removal in salvage logging projects. Dr. Hanson concluded (at p. 12) that:

> "[t]he results of this study indicate that current Forest Service salvage prescriptions leaving 2–6 large (generally > 50 cm dbh) snags/acre (5–15/ha) do not provide sufficient snag densities to support significantly greater foraging for Black-backed…woodpeckers. In this study, large

> snag retention (18/ha) in the high severity/logged strata was higher than minimum prescriptions, due to the fact that some additional snags, generally in the 50–60 cm dbh size range, were retained because they were deemed to be unmerchantable, yet foraging time was significantly reduced for [Black-backed Woodpeckers.] Recent revisions to post-fire management on National Forests of the Sierra Nevada allow minimum retention levels of large snags to be achieved by averaging snags in moderate and low severity patches across the entire fire area, while removing all snags >25 cm dbh in high severity patches (USDA 2004), which would further adversely impact foraging for these species."

Because there are no requirements that *any* Black-backed Woodpecker habitat be retained on national forests lands under the 2004 SNFPA (outside of designated Wilderness), existing rules/laws are clearly inadequate. Moreover, only 22% of the small amount of Black-backed Woodpecker suitable habitat that currently exists is within protected lands (mostly Inventoried Roadless Areas) where post-fire logging is generally not allowed (e.g., National Parks, Wilderness Areas, and Inventoried Roadless Areas). It must be noted, however, that Inventoried Roadless Areas are not specifically protected in the 2004 SNFPA forest plan, and numerous post-fire logging projects have been recently proposed, and often implemented, in Inventoried Roadless Areas on national forest lands in California, so even these areas are not reliably protected from post-fire logging, further threatening the Black-backed Woodpecker.

On November 4, 2009, the Federal District Court for the Eastern District of California ruled that a new Environmental Impact Statement must be prepared, since the 2004 SNFPA was ruled to be illegal under NEPA by the Ninth Circuit Court of Appeals. *Sierra Forest Legacy v. Rey*, 2009 WL 3698507 (E.D. Cal., November 4, 2009). However, the Ninth Circuit Court of Appeals remanded the case to the federal district court to determine the remedy (including an injunction), and the district court has not done so; thus, the Forest Service continues to manage the national forests of the Sierra Nevada under the 2004 SNFPA.

In early February of 2010, the Forest Service released the Draft Supplemental EIS for the new SNFPA ("2010 SNFPA") in accordance with the district court's order (USDA 2010a). The 2010 SNFPA proposed action is to simply continue implementation of the 2004 SNFPA, which overtly states a goal of eliminating high-intensity wildland fire (mislabeled "catastrophic wildfire" by the U.S. Forest Service) from the forested landscape in the Sierra Nevada management region, which includes the southern Cascades up to the California/Oregon border (USDA 2004). Indeed, to promote the 2004 SNFPA, the Forest Service produced and disseminated a 2004 public outreach brochure, entitled, "Forests With A Future: A Campaign Against Catastrophic Wildfire," which made clear the agency's goal of eliminating high-intensity wildland fire from Sierra Nevada forests. Further, the 2010 SNFPA DSEIS (pp. 23–36) evaluates alternatives as being positive to the greatest extent that they promote forest management in order to: reduce snag density and snag recruitment (which the 2010 SNFPA DSEIS defines as advancing "forest health"); reduce overall annual fire extent; prevent moderate- and high-intensity fire effects on the landscape (and facilitate only low-intensity effects that do not change stand structure); and facilitate increased post-fire salvage logging (e.g., the alternatives that are described most favorably [2010 SNFPA DSEIS, p. 35] are those that allow the greatest amount of post-fire salvage logging [2010 SNFPA DSEIS, Table 2.4.5d]). Thus, on federal public lands, the 2010 SNFPA overtly seeks to eliminate the creation of Black-backed Woodpecker habitat in the first place, as well as eliminate any Black-backed Woodpecker habitat that is created by fire (the only place in which this would not be true is designated Wilderness Areas, where logging is prohibited by federal statute, though relatively little Black-backed Woodpecker habitat exists in Wilderness within California, as discussed above).

To date, no final EIS has been issued for the 2010 SNFPA DSEIS and, despite court rulings against the 2004 SNFPA, the Forest Service continues to manage national forests, including post-fire habitat, under the 2004 SNFPA's prescriptions.

California Forest Practices Rules:

The primary body of regulation affecting management of the Black-backed Woodpecker on private lands is the California Forest Practices Rules (hereafter referred to as "the Rules"). The Rules are administered by the California Department of Forestry and Fire Protection (CDFFP), and are the regulations implementing the Z'berg Nejedley Forest Practices Act of 1973 (Cal. Pub. Res. Code Ch. 8). The Rules provide for timber harvest and site preparation practices to be utilized. The Rules require timber operators to produce a Timber Harvest Plan (THP) that is intended to serve as a substitute for the planning and environmental protection requirements of the California Environmental Quality Act of 1970 (Pub. Res. Code §§ 21000-21177). THPs are comprised of a lengthy checklist and supporting documentation, or in the case of the majority of the plans exempted from the THP process, by 1–2 page applications. The Rules allow complete removal of all Black-backed Woodpecker habitat and do not provide protection of elements essential to the species, such as large trees, snags and downed wood, and high canopy closure. The lack of direction to protect these habitat elements has resulted and continues to result in degradation and destruction of late-successional habitat.

Lack of forests with late-successional characteristics on private lands is not surprising given that the applicable rules allow maximization of timber production utilizing intensive logging methods. For all logging prescriptions under the rules that apply to the THP process, silvicultural objectives are defined as follows: "[t]he RPF [registered professional forester] shall select systems and alternatives which achieve *maximum sustained production* of high quality timber products." (14 CCR § 913) (emphasis added).

Specific even-aged regeneration methods allowed in the Rules include clearcutting, in which all or most of the stand is removed at once; seed tree regeneration, in which most of the stand is removed, and then the few remaining seed trees are removed in a second step; and shelterwood regeneration, in which a stand is removed in three steps. These regeneration methods entail complete removal of forest canopy and large trees, and as is clear by their definitions, would result in elimination of Black-backed Woodpecker habitat. In addition, regeneration methods result in significant reductions in canopy closure. This has the potential to degrade potential black-backed habitat by reducing pre-fire canopy closure. Moreover, the goal of maximum timber production and the various harvest methods are likely to result in removal of merchantable snags and trees appropriate for the future recruitment of large snags.

The Rules also allow uneven-age regeneration prescriptions, including transition, selection, and group selection logging (14 CCR § 913.1, 913.2). The uneven age methods involve removal of individual trees or groups of trees. Though occurring over several entries, these methods on private lands also are likely to result in removal of habitat characteristics required by the woodpecker—high densities of trees, and large trees and snags.

The Rules also define several "intermediate treatments." (14 CCR § 913.3) These treatments include both commercial thinning and sanitation-salvage logging. Under the Rules, commercial thinning is defined as follows:

> "Commercial thinning is the removal of trees in a young-growth stand to maintain or increase average stand diameter of the residual crop trees, promote timber growth, and improve forest health. The residual stand shall consist primarily of healthy and vigorous dominant and codominant trees from the preharvest stand."

This treatment is designed to remove most trees, leaving a relatively small number of widely spaced trees. Such stands lack most or all of the stand components required by the Black-backed Woodpecker if the stands later burn at high-intensity simply because there are not enough large snags to ensure suitable Black-backed Woodpecker habitat.

Most troubling for Black-backed Woodpeckers is the fact that the Rules governing forest management on private lands in California allow immediate removal of 100% of suitable Black-backed Woodpecker habitat. Post-fire salvage logging, or the "emergency management" of timber, is exempted from the requirements of the THP process. This exemption applies to stands that have been substantially affected by fire or other natural causes. Cal. Pub. Res. Code § 4592; 14 CCR §§ 895.1 (definitions), 1052, 1052.1, 1052.2. In addition, the sanitation/salvage method is a commonly utilized prescription under the timber planning process and is defined in the Rules as removal of trees that are "insect attacked or diseased trees…[or, for sanitation logging] trees…that are dead, dying, or deteriorating" because of damage from a variety of causes (14 CCR § 913.3 (b)). The Rules provide little criteria for defining what constitutes a "dying or diseased" tree.

While the Forest Practice Rules provide no explicit protection for the Black-backed Woodpecker and its habitat, the Rules do require that where significant impacts to non-listed species may result, the forester "shall incorporate feasible practices to reduce impacts" (14 CCR §§ 919.4, 939.4, 959.4). However, the Rules do not mandate surveys be conducted for Black-backed Woodpeckers, do not require identification of Black-backed habitat, and provide no information concerning possible thresholds over which impacts to Black-backed habitat or the species might be "significant." Thus, it is very unlikely that this requirement would result in significant additional protection for woodpecker habitat. Further, the Rules fail to identify what constitutes a significant impact, and reduction of impacts is generally treated as optional, rather than required.

Although snags clearly are a critical component of woodpecker habitat, the Rules list numerous conditions under which snags may be removed and fail to require that a minimum number of snags be retained, meaning that Black-backed Woodpecker habitat can be eliminated. Further, the Rules suggest removal of large (14 CCR § 919.1 (d)) snags near roads and ridge tops (14 CCR § 919.1 (a)(1), (a)(2)). The Rules fail to require retention of a minimum number of snags and encourage removal of snags to such a degree that it is extremely unlikely that snags would be retained at levels needed to maintain suitable habitat for the woodpecker. In practice, few timber harvest documents appear to require retention of snags.

In conclusion, few or none of the logging prescriptions described in the Rules would result in retention of habitat features critical to the maintenance of Black-backed Woodpecker populations on private land. The "emergency management" of burned forests is exempted from THP requirements. The result is that essentially all intensely burned forests on private lands can be immediately salvage-logged with no protections or even surveys for the Black-backed Woodpecker. The net result is that the Rules do not regulate logging on private lands in a manner that is adequate to maintain Black-backed Woodpecker habitat or populations on private land within California.

Recent/Current Logging in the Sierra Nevada of California:

Petitioners have gathered information on post-fire salvage logging (both public and private lands) and commercial thinning operations (public lands) over the past 7 years (the time frame for which burned forests are suitable for *P. arcticus*) in the Sierra Nevada, which comprises essentially all of the Black-backed Woodpecker's range in California. Herein, we present this information as evidence that post-fire salvage logging primarily, and commercial thinning secondarily, is systematically eliminating critical habitat for the species. We express the area involved in acres, rather than in hectares, in this section because the documents cited used acres instead of hectares.

Post-fire Salvage Logging on Private Lands—The vast majority of the Black-backed Woodpecker habitat created on private lands since 2003 occurred within the Moonlight and Wheeler fire area, and much lesser, but significant, amounts occurred on private lands in the Freds and Power fire areas. These examples, discussed below, describe the great majority of the effects of post-fire salvage logging to Black-backed Woodpecker habitat on private lands in California since 2003 (areas are described in acres, since Forest Service logging project documents discuss all figures in terms of acres).

Moonlight & Wheeler Fire Area: A total of 19,238 acres of private land are within the Moonlight/Wheeler fire area (USDA 2009a [Moonlight and Wheeler RFEIS, p. 1]).

Using the methods described above in the assessment of existing Black-backed Woodpecker habitat, we determined that there were 8,237 acres of high-intensity fire in mature forest with moderate/high pre-fire canopy cover (CWHR 4M, 4D, 5M, 5D, and 6) created on private lands by the adjacent Moonlight and Wheeler fires of 2007. There were also 3,962 acres of moderate-intensity fire in mature forest with moderate/high pre-fire canopy cover created on private lands by the Moonlight/Wheeler fire. Thus, a combined total of 12,199 acres of suitable and marginal Black-backed Woodpecker habitat resulted on private lands from the Moonlight/Wheeler fire in 2007. As of the summer of 2008 (approximately one year post-fire), 11,454 acres had been salvage logged on private lands within the Moonlight/Wheeler fire area after the occurrence of the Moonlight and Wheeler fires (USDA 2009a [Moonlight and Wheeler RFEIS, Table B-2]). Salvage logging was ongoing at this time, and additional post-fire salvage logging on private lands within the Moonlight/Wheeler fire area occurred after the Moonlight and Wheeler RFEIS was issued. There were 2,817 acres of low-intensity fire on private lands in mature forest with moderate/high pre-fire canopy cover within the Moonlight/Wheeler fire area. Little if any salvage logging occurred in these low-intensity areas since there were very few fire-killed trees. There were also some non-forested and very sparsely forested or immature forest areas on private lands where little if any salvage logging would have occurred (due to lack of any significant merchantable timber volume). Therefore, it is clear that, by one year post-fire (at which point in time 11,454 acres of post-fire salvage logging already had occurred on private lands in the Moonlight/Wheeler fire area), most (and likely the great majority) of the 12,199 acres of suitable and marginal Black-backed Woodpecker habitat already had been salvage logged on private lands within the Moonlight/Wheeler fire area.

Freds Fire Area: A total of 3,110 acres of private land are within the Freds fire area (USDA 2005b [Freds FEIS, p. 3]). Using the methods described above in the assessment of existing Black-backed Woodpecker habitat, we determined that there were 281 acres of high-intensity fire in mature forest with moderate/high pre-fire canopy cover (CWHR 4M, 4D, 5M, 5D, and 6) created on private lands by the Freds fire of 2004. There were also 195 acres of moderate-intensity fire in mature forest with moderate/high pre-fire canopy cover created on private lands by the Freds fire. Thus, a combined total of 476 acres of suitable and marginal Black-backed Woodpecker habitat resulted on private lands from the Freds fire in 2004. As of the summer of 2005 (approximately one year post-fire), 2,100 acres had been salvage logged (clearcut) on private lands within the Freds fire area after the occurrence of the Freds fire (USDA 2005b [Freds FEIS, p. 417]). Salvage logging was ongoing at this time, and additional post-fire salvage logging on private lands within the Freds fire area occurred after the Freds FEIS was issued. There were 127 acres of low-intensity fire on private lands in mature forest with moderate/high pre-fire canopy cover within the Freds fire area. Little if any salvage logging occurred in these low-intensity areas since there were very few fire-killed trees. There were also some non-forested and very sparsely forested or immature forest areas on private lands where little if any salvage logging would have occurred (due to lack of any significant merchantable timber volume). Therefore, it is clear that, by one year post-fire (at which point in time 2,100 acres of post-fire salvage logging had already occurred on private lands in the Freds fire area), most (and perhaps all) of the 476 acres of suitable and marginal Black-backed Woodpecker habitat had already been salvage logged on private lands within the Freds fire area.

Power Fire Area: A total of 3,382 acres of private land are within the Power fire area (USDA 2005a [Power FEIS, Summary, p. i]). Using the methods described above in the assessment of existing Black-backed Woodpecker habitat, we determined that there were 675 acres of high-intensity fire in mature forest with moderate/high pre-fire canopy cover (CWHR 4M, 4D, 5M, 5D, and 6) created on private lands by the Power fire of 2004. There were also 570 acres of moderate-intensity fire in mature forest with moderate/high pre-fire canopy cover created on private lands by the Power fire. Thus, a combined total of 1,245 acres of suitable and marginal Black-backed Woodpecker habitat resulted on private lands from the Power fire in 2004. As of the summer of 2005 (approximately one year post-fire), 938 acres had been salvage logged on private lands within the Power fire area after the occurrence of the Power fire (USDA 2005a [Power FEIS, p. 360]). Salvage logging was ongoing at this time, and additional post-fire salvage logging on private lands within the Power fire area occurred after the Power FEIS was issued. There were 678 acres of low-intensity fire on private lands in mature forest with moderate/high pre-fire canopy cover within the Power fire area. Little if any salvage logging occurred in these low-intensity areas since there were very few fire-killed trees. There were also some non-forested and very sparsely forested or immature forest areas on private lands where little if any salvage logging would have occurred (due to lack of any significant merchantable timber volume). Therefore, it is clear that, by one year post-fire (at which point in time 938 acres of post-fire salvage logging had already occurred on private lands in the Power fire area), the majority of the 1,245 acres of suitable and marginal Black-backed Woodpecker habitat had already been salvage logged, or was being salvage logged, on private lands within the Power fire area.

Post-fire Salvage Logging on Public Lands:

Most (75%) of the Black-backed Woodpecker habitat created since 2003 occurred within five fire areas: the Moonlight and Wheeler fire area; the Angora fire area; the Freds fire area; the Power fire area; and the American River Complex fire area. As described above, most of all current suitable Black-backed Woodpecker habitat in California was created in 2007 in a single fire area: the Moonlight/Wheeler fire area. These examples, discussed below, describe the great majority of the effects of post-fire salvage logging to Black-backed Woodpecker habitat on public lands in California since 2003.

Moonlight and Wheeler Fire Area: By the Plumas National Forests' definition of suitable Black-backed Woodpecker habitat (moderate and high burn intensity [>50% basal area mortality] in mature forest with moderate and high pre-fire canopy cover [CWHR 4M, 4D, 5M, 5D, and 6]), the Moonlight and Wheeler Fires "Recovery and Restoration" Project (Moonlight and Wheeler Project) would salvage log about 38% of the suitable Black-backed Woodpecker habitat on public lands within the Moonlight/Wheeler fire area—12,397 acres salvage logged out of a total of 32,569 acres of suitable Black-backed Woodpecker habitat (as defined by the Plumas National Forest) on public lands in the Moonlight/Wheeler fire area (USDA 2009a [Moonlight and

Wheeler RFEIS, p. D-36, Table 1]). The salvage logging of those 12,397 acres of Black-backed Woodpecker habitat began in the summer of 2009 and is ongoing currently. An additional 7,525 acres of burned forest habitat (11% of the 68,409 acres of public lands within the "analysis area" [i.e., the combined Moonlight and Wheeler fire areas]) were salvage logged on public lands within the Moonlight/Wheeler fire area prior to implementation of the Moonlight and Wheeler Project via roadside "hazard tree" logging projects (USDA 2009a [Moonlight and Wheeler RFEIS, p. 71]). The Moonlight and Wheeler RFEIS does not divulge how much of this 7,525 acres of roadside logging was within suitable Black-backed Woodpecker habitat but, given that the Plumas National Forest broadly defined nearly half of the public land acreage in the Moonlight/Wheeler fire area as suitable Black-backed Woodpecker habitat (USDA 2009a [Moonlight and Wheeler RFEIS, p. D-36, Table 1]), we can estimate that, of the 7,525 acres of roadside salvage logging, roughly 3,500 acres of Black-backed Woodpecker habitat was eliminated. Approximately 500 acres of additional post-fire salvage logging on public lands occurred within the Moonlight/Wheeler fire area through the Camp 14 and North Moonlight logging projects (USDA 2009a [Moonlight and Wheeler RFEIS, p. 71]). Therefore, of the 32,569 acres characterized by the Plumas National Forest as suitable Black-backed Woodpecker habitat on public lands within the Moonlight/Wheeler fire area, approximately 20,000 acres (about 61%) have been salvage logged, or are in the process of being salvage logged, on public lands.

Moreover, as evidenced by a 2008 Forest Service map of planned salvage logging in the Moonlight/Wheeler fire area, essentially all of the remaining Black-backed Woodpecker habitat was initially planned for post-fire salvage logging—much of it via the "Frazier Fire Recovery and Restoration Project" (Frazier Project), which would have salvage logged 18,074 acres (see **Appendix B** attached hereto). The Frazier Project proposal was not advanced beyond the initial planning stage after Earth Island Institute successfully filed suit against the largest of the roadside salvage logging projects, alleging that the Forest Service failed to analyze direct and cumulative environmental impacts in an EIS (*Earth Island Institute v. Carlton*, Case No. 2:08-cv-01957-FCD-EFB). Therefore, it was only because a nonprofit conservation organization happened to be able to file suit, and was successful, that the entirety of the Black-backed Woodpecker habitat was not salvage logged on public lands in the Moonlight/Wheeler fire area—the fire area that contains most of the little existing suitable habitat for this species in the entire state of California (as discussed above). Of course, nonprofit conservation groups are not always able to file or sustain costly and time-consuming lawsuits against the federal government, and even successful lawsuits often represent empty victories as most of the planned logging will have already occurred by the time the case is resolved. Moreover, now that post-fire logging is being done primarily for biomass in some projects (rather than sawtimber), the mere fact that several years may have passed since the fire in question, and the fact that the trees are no longer merchantable for lumber, does not mean that the area in question will not be subjected to post-fire logging—even clearcutting (or close to it)—for biomass production, as the Lake Tahoe Basin Management Unit (LTBMU) just decided to do in the Angora fire area. The Environmental Assessment for that logging project admits that it would "remove" 70% of all suitable Black-backed Woodpecker habitat on the Angora fire, which equates to nearly all remaining suitable habitat on the entire LTBMU national forest currently, for biomass production (see LTBMU website for the Environmental Assessment and Decision Notice for the "Angora Fire Restoration Project"). This is a very dangerous precedent that greatly compounds the already very serious risks and threats to the viability of the Black-backed Woodpecker population in California. Because the Framework forest plan does not require any protections for Black-backed Woodpecker habitat, the remaining Black-backed Woodpecker habitat in the Moonlight-Wheeler fire area—i.e., after the current salvage logging for sawtimber is completed—would still be under threat from a future biomass logging project.

Angora Fire Area: The Angora fire of 2007 on the Lake Tahoe Basin Management Unit national forest created approximately 1,149 acres of suitable Black-backed Woodpecker habitat (USDA 2010b, p. 3.6-65)—the only remaining suitable habitat on the entire national forest as of 2012 (two much smaller fires, occurring in 2002, are both now too old to provide suitable habitat [USDA 2010b, p. 3.6-68]). The U.S. Forest Service proposed to salvage log 62% of all Black-backed Woodpecker suitable habitat in the entire Angora fire area, and 70% of all high-quality habitat in the fire area—and refused to prepare any analysis of whether the little remaining suitable habitat on this national forest would be sufficient to maintain viable populations of Black-backed Woodpeckers on the forest (USDA 2010b, pp. 3.6-65 and 3.6-67). This logging project has now been completed, and 70% of all high-quality Black-backed Woodpecker habitat remaining on the entire national forest has been essentially clearcut due to 96% removal of snags (USDA 2010b, p. 3.1-2, Table 3.1-1 (showing pre-logging snag density) and p. 3.1-5 (stating that only 4 snags per acre would be retained)). The Forest Service stated that the trees removed (all sizes) would be used primarily to feed commercial biomass energy plants in northern California (USDA 2010b, p. 3.11-2).

Freds Fire Area: On public lands within the Freds fire area, the Forest Service estimated that there were approximately 3,025 acres of forest with moderate-intensity and high-intensity effects prior to post-fire salvage logging (USDA 2005b [Freds FEIS, p. 276]). Under the chosen alternative, Alternative 1, all of this was proposed for post-fire salvage logging on public lands, except three small "snag retention clumps" of 55 acres, 62 acres, and 47 acres, respectively (USDA 2005b [Freds FEIS, p. 278, Table 3-78]). In other words, approximately 95% of the Black-backed Woodpecker habitat was proposed for logging. The Ninth Circuit Court of Appeals ruled that this logging was illegal, but every acre of the planned salvage logging was cut by the time this ruling was issued, given that the district court denied plaintiff's request for a preliminary injunction (which is almost always the case with challenges to post-fire salvage logging within Black-backed Woodpecker habitat in California). *Earth Island Institute v. U.S. Forest Service*, 442 F.3d 1147 (9^{th} Cir. 2006).

Power Fire Area: On public lands within the Power fire area, the Forest Service proposed to salvage log 4,991 acres of the 6,282 acres of Black-backed Woodpecker habitat under the chosen alternative, Alternative 4 (USDA 2005a [Power FEIS, p. 249, Table 3-77])—an elimination of nearly 80% of Black-backed Woodpecker habitat on public lands in the Power fire area. The Ninth Circuit Court of Appeals ruled that this logging was illegal, but most of the planned salvage logging was cut by the time this ruling was issued, given that the district court denied plaintiff's request for a preliminary injunction (which is almost always the case with challenges to post-fire salvage logging within Black-backed Woodpecker habitat in California). *Earth Island Institute v. U.S. Forest Service*, 442 F.3d 1147 (9th Cir. 2006).

American River Complex Fire Area: On public lands within the American River Complex Fire Area, out of a total of 2,190 acres of suitable Black-backed Woodpecker habitat in this fire area, the Forest Service salvage logged 850 acres (39%) of suitable Black-backed Woodpecker habitat (USDA 2009b [Black Fork MIS Report, p. 23, Table 2.4]). Because most of the moderate/high-intensity fire occurred within an inventoried roadless area, which is protected, the 850 acres of Black-backed Woodpecker habitat logged represented nearly all of the suitable habitat outside of the roadless area (USDA 2009b, p. 2, Table1.1).

<u>Eastern Cascades Region of Oregon</u>:

Northwest Forest Plan 1994 Record of Decision: The Northwest Forest Plan was adopted in 1994, directing management on 24 million acres of federal land in the planning area, including the Cascade Mountains of Oregon, and northern California and the Siskiyou Mountains. The plan incorporates 30% Late Successional Reserve, 6% adaptive management, 1% managed Late Successional areas, 6% administratively withdrawn, 11% riparian reserves, and 16% matrix lands. Certain thinning and salvage activities are allowed in the reserves, but programmed timber harvest can only occur in 22% of the land designated as matrix or adaptive management areas.

Snag Retention: As a minimum, snags are to be retained within the harvest unit at levels sufficient to support species of cavity-nesting birds at 40 percent of potential population levels based on published guidelines and models. The objective is to meet the 40 percent minimum standard throughout the matrix, with per-acre requirements met on average areas no larger than 40 acres. To the extent possible, snag management within harvest units should occur within the areas of green-tree retention.

The Standards and Guidelines state that Black-backed Woodpeckers will "not be sufficiently aided by application of mitigation measures for riparian habitat protection or for marbled murrelets alone." The plan's guidelines state "maintain adequate numbers of large snags and green-tree replacements for future snags within the [Black-backed Woodpecker's] range in appropriate forest types." Standards and Guidelines C-46.

The 100 percent population potential for Black-backed Woodpeckers is assumed by the 1994 Plan to be 0.12 conifer snags per acre in forest habitats, based upon potential nest tree density; these snags must be at least 43 cm dbh (or largest available if 17 inch dbh snags are not available) and in hard decay stages, and must be provided in stands of mixed conifer and lodgepole pine in higher elevations of the Cascade Range.

As identified by the expert panel, Black-backed Woodpeckers also require beetle-infested trees for foraging; some such trees should be provided in appropriate habitat, and sanitation harvest of all such trees would be detrimental to the species. More information is needed on habitat use, seasonal occurrence, and use of forest age classes and burns, for the Black-backed Woodpecker. Standards and Guidelines C-46.

Note: The snag recommendations above are based on the model presented by Neitro and others (1985). In that model, snag requirements for individual species were treated as additive in developing snag requirements for the overall community of cavity excavators. As noted above, "provision of snags for other cavity-nesting species, including primary cavity nesters, must be added to the requirements for these two woodpecker species" (Black-backed and White-headed Woodpeckers). Standards and Guidelines C-47. Moreover, snag guidelines based upon densities of potential individual nest trees fail to include the vastly higher densities of snags needed for burned forest (and beetle-killed forest) specialists to have adequate food to survive—a problem specifically identified by Hutto (2006) and Bonnot et al. (2009). The conifer snag densities of less than 1 snag per acre identified in the 1994 Plan are, based upon current science, associated with non-occupancy of Black-backed Woodpeckers (Hanson and North 2008, Bonnot et al. 2009, Siegel et al. 2012).

Standards and Guidelines C-14:

1. The potential for benefit to species associated with late-successional forest conditions from salvage is greatest when stand-replacing events are involved. Salvage in disturbed sites of less than 10 acres is not appropriate because small forest openings are an important component of old-growth forests. In addition, salvage should occur only in stands where disturbance has reduced canopy closure to less than 40 percent, because stands with more closure are likely to provide some value for species associated with these forests.

3. Snags provide a variety of habitat benefits for a variety of wildlife species associated with late-successional forests. Accordingly, following stand-replacing disturbance, management should focus on retaining snags that are likely to persist until late successional conditions have developed and the new stand is again producing large snags. Late-successional conditions are not associated with stands less than 80 years old.

In other words, the Northwest Forest Plan acknowledges that it does not provide sufficient protection for the preferred habitat of the Black-backed Woodpecker: large stands of high-intensity burned forests.

Fremont National Forest 1989 Land and Resource Management Plan:

The Black-backed Woodpecker is not an MIS but primary cavity excavators are (appendix 6 page 73).

Fish and Wildlife Management Standards and Guidelines p. 103:

Dead Trees

1. Snag densities will be provided within the harvest units. Past harvest units should be evaluated to determine need to provide snags within those units. Densities will be maintained through the full rotation on these areas.

2. Wildlife trees in Management Areas 2, 3**,** and 14 will be maintained at levels to provide habitat for at least 100 percent of the potential population of cavity-dependent species. Dead and defective trees will be maintained to carry at least 100 percent of the potential population of cavity-dependent species in Management Areas 7 and 15 except where safety concerns (hazard trees in developed and dispersed campsites) dictate a lower level of habitat. Management Areas 4, 6, 12, and 13, being areas of high human activity, will be managed to maintain 60 percent of the potential population of cavity-dependent species where safety concerns permit such management. Management Areas 8, 9, 10, 11**,** and 16 will provide wildlife trees at whatever level naturally occurs in those areas.

3. Management Areas 1 and 5 will be managed to provide habitat for 40 percent of the potential population of cavity-dependent species except where retention of wildlife trees may not be possible due to past management activities or around log landings, rock pits, along certain roads, or other activities. Wildlife trees should be managed for 80 percent of the potential cavity-nesting population in the following situations:
a. within 200 feet of dry, moist, or wet meadows and scab rock flats greater than two acres in size;
b. in timbered stringers less than one-quarter mile wide.

4. Each successional stage, including those in early succession (i.e., clearcuts), will carry the appropriate amount of habitat for the prescribed potential population of cavity-dependent species.

5. Snags and leave trees should be retained in the same species composition of the harvested stand. Where dead trees are not available for present numbers of snags, green trees will be retained and made into snags to meet the desired level for that area. These green trees should be of low value, cull, limby or deformed. If such trees are not available, then higher value trees should be made into snags to meet the desired level.

6. The number of dead trees needed for present habitat as well as green replacement trees for wildlife habitat through the rotation will be retained as shown in Tables 24 and 25. The number of dead and live trees are those present at the completion of the project and retained through a full rotation.

Table 7. Dead Trees Needed to Meet Present and Long-Term Habitat Requirements for Primary Excavators (Woodpeckers) by Timber Types

TIMBER TYPE AND MANAGEMENT LEVEL	NUMBER OF DEAD TREES PER 100 ACRES d.b.h. (2) X HEIGHT	
	10 - 12" x 15'	12 -20" x 15' - 30'
Lodgepole Pine		
40%	49	23
60%	73	35
80%	97	47
100%	121	59
Pine and Pine-Associated		
40%	30	60
60%	127	8
80%	169	11
100%	211	14

Table 9. Live Trees Needed to Meet Present and Long-Term Habitat Requirements for Primary Excavators (Woodpeckers) by Timber Types

TIMBER TYPE AND MANAGEMENT LEVEL	NUMBER OF GREEN TREES PER 100 ACRES d.b.h (2) IN INCHES										
	0 (3)	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20
Lodgepole Pine											
40%	370	72	72	72	48	44	16	84	5		
60%	555	108	108	108	71	65	23	11	5		
80%	740	144	144	144	95	87	31	15	8		
100%	925	180	180	180	119	109	39	19	9		
Pine and Pine-Associated											
40%	219	147	88	88	88	73	64	40	23	12	3
60%	329	221	133	133	133	110	96	60	34	17	4
80%	438	294	159	159	159	146	128	80	45	22	6
100%	548	368	221	221	221	183	160	100	56	28	8

7. On acres receiving uneven-aged management, wildlife trees and their replacements should be uniformly distributed or in patches. On acres receiving even-aged management, snags should be uniformly distributed where possible. In clearcuts, emphasis is placed on creating wildlife tree/replacement tree clumps. A mixture of clumps and individual trees can be created on harvest units. Table 26 provides wildlife tree clump sizes per harvest unit size and timber type for Management Areas 1 and 5.

Table 10. Number of One-Acre Wildlife Tree Clumps Per Harvest Unit Size and Timber Type, Management Areas 1 and 5

TIMBER TYPE	HARVEST UNIT SIZE 20	40	60	80	100
Ponderosa Pine	1	2	3	4	5
Pine Associated	1	2	3	4	5
Lodgepole Pine	1	1	2	2	2

8. Wildfire areas equal to or greater than 200 acres in size will be managed for standing dead trees at the following levels:

a. Pine and pine-associated: four snags per acre, of which two are equal to or greater than 20 inches in d.b.h. and at least 30 feet tall; and two equal to or greater than 12 inches in d.b.h. and at least 15 feet tall
b. Lodgepole pine: four snags per acre which are equal to or greater than 12 inches in d.b.h. and at least 15 feet tall
c. Larger snags or replacement trees may be substituted for small snags. If larger snags or replacement trees are absent, smaller snags may be used to obtain desired number.

Direction for Managing Fire in Wilderness, Appendix P 44:

1. Suppress all wildfires within wilderness in accordance with the direction in FSM 5130.

2. Fire ignited by lightning may be permitted to bum if prescribed in an approved plan (FSM 2324 and 5150).

Winema National Forest 1990 Land and Resource Management Plan:

Wildlife Tree (Snag) Habitat p. 4-50:

4-18 Habitat capability for woodpeckers (indicators for cavity-nesting species) shall be continually maintained throughout the Forest at not less than 40 percent of potential population levels (Thomas et al. 1979) in all forested lands except lodgepole pine. In lodgepole pine, the decrease in large diameter trees because of catastrophic mountain pine beetle infestation may preclude achieving the 40 percent level. In lodgepole pine, the highest potential population level possible shall be achieved up to the 40 percent level. With the possible exception of lodgepole pine, this will result in maintenance of sustaining populations of cavity-nesting species.

TABLE 4-14
Number of Snags and Green Trees for Each 40 Acres to Produce a 40 Percent Potential Population Level for Cavity Nesters

DBH Class	Dead trees needed per 40 acres	Green trees needed per 40 acre
10 - 12	12	24
12 - 20	22	33
20+	2	2
Total	36	59

Timber Standards and Guidelines p. 4-78:

13-1 Programmed timber harvest activities shall occur only on lands classified as suited for timber production. However, harvest activities may occur on other lands for the following purposes:

Removal of timber killed by catastrophic events, such as fire, windthrow, drought, insects or disease (36 CFR 219.27[~][1]). The decision to salvage harvest an area shall be based on an analysis of existing conditions following the disturbance.

13-22 (p 4-81) Uneven-aged management shall be the preferred silvicultural system on climax ponderosa pine stands and on healthy pine associated stands.

9. Stands should not be salvage logged at other than the prescribed entry cycle; the exception is where wildfire, bark beetles, disease, or other conditions have created catastrophic mortality.

Management Area 6 – Wilderness:

Wilderness Protection p. 4-123

2. All man-caused wildfires in wilderness should be suppressed.

4. Using both planned and unplanned ignitions, a prescribed fire program may be used to meet wilderness fire management objectives of: (1) permitting fires to play (as nearly as possible) their natural ecological role within wilderness; and (2) reducing the risks and consequences of wildfire within the wilderness or of wildfire escaping from the wilderness.

5. Naturally caused ignitions may be allowed to burn if they meet conditions in an approved prescribed burn plan and if funds and necessary staffing are available.

6. Preference shall be given to those suppression methods and strategies that are cost-effective and limit the area burned and that have the least effect on wilderness values.

Within Management Area 7 – Old-Growth Ecosystems:

Standards and Guidelines – Wildlife and Fish:

P 4-134 Three-toed woodpecker area requirements are as follows:
1. A minimum of 75 acres of contiguous old-growth and/or mature lodgepole pine or subalpine fir shall be provided as primary breeding and foraging habitat for one pair of three-toed woodpeckers.
2. Three-toed woodpecker areas shall be dispersed throughout suitable habitat, not more than 2.5 miles apart from the center of one area to the center of another area.
3. Within the 75-acre primary breeding area, a minimum average of two hard snags per acre greater than 10 inches DBH shall be maintained as follows:
a) Forty-five suitable nesting snags (hard) greater than 12 inches DBH shall be available within the 75-acre primary breeding area.
b) Within the 75-acre breeding area, 105 hard snags greater than 10 inches DBH shall be maintained.
4. Disturbing human activities within .25 mile of an active three-toed woodpecker nest site shall be discouraged or minimized from April 15 through July 15 (refer to forestwide standards and guidelines).

Deschutes National Forest 1990 Land and Resource Management Plan:

Standards and Guidelines, p. 4-55:

Provide sufficient snags to maintain 40% of potential population levels of woodpeckers (generally) in even-aged logging units, and 60% of potential population levels of woodpeckers in uneven-aged logging units.

NOTE: This standard is based upon the same assumptions about the density of potential nest trees equating to the population density, without regard to necessary snag density for foraging, and also pertains to woodpeckers generally, not to Black-backed Woodpeckers. Thus, like the LRMPs (forest plans) for the Fremont and Winema National Forests, and the Northwest Forest Plan, discussed above, the snag retention standard equates to less than one snag per acre.

Standards and Guidelines, p. 4-118:

Following catastrophic natural disturbance, clearcuts larger than 40 acres are allowed [no size limit].

Standards and Guidelines, p. 4-119:

Within the general forest landscape, suppress fires in order to prevent mortality in tree plantations, and to prevent large fires.

Standards and Guidelines, p. 4-110:

Within wilderness, suppress all human-caused fires.

Rogue River National Forest 1990 Land and Resource Management Plan:

Standards and Guidelines, pp. 4-36, 4-74, 4-89, 4-103, 4-114, 4-183, 4-194, 4-238, 4-239, 4-253, and 4-277:

Maintain only 1-4 snags per acre.

Standards and Guidelines, p. 4-248:

"***Aggressively*** suppress" natural snag recruitment from competition and beetles (emphasis in original).

Summary of Eastern Oregon Cascades LRMP (Forest Plan) Provisions:

Current forest plans require retention of, on average, less than 1 snag per acre and, generally, retention of 0 to 1, or 1-2 medium/large live trees per acre. The plans also allow or require widespread fire suppression, and encourage extensive post-disturbance salvage logging, including clearcutting with no limits on clearcut sizes. As such, current forest plans are wholly inadequate to conserve populations of Black-backed Woodpeckers, based upon the foregoing discussion of habitat needs.

Oregon Forest Practices Act:

Oregon Forest Practices Act 527.676: Leaving snags and downed logs in harvest type 2 or 3 units; green trees to be left near certain streams. (1) In order to contribute to the overall maintenance of wildlife, nutrient cycling, moisture retention and other resource benefits of retained wood, when a harvest type 2 unit exceeding 25 acres or harvest type 3 unit exceeding 25 acres occurs the operator shall leave on average, per acre harvested, at least:

(a) Two snags or two green trees at least 30 feet in height and 11 inches DBH or larger, at least 50 percent of which are conifers; and

(b) Two downed logs or downed trees, at least 50 percent of which are conifers, that each comprise at least 10 cubic feet gross volume and are no less than six feet long. One downed conifer or suitable hardwood log of at least 20 cubic feet gross volume and no less than six feet long may count as two logs.

(2) In meeting the requirements of this section, the operator has the sole discretion to determine the location and distribution of wildlife leave trees, including the ability to

leave snags, trees and logs in one or more clusters rather than distributed throughout the unit and, if specifically permitted by the State Board of Forestry by rule, to meet the wildlife leave tree requirements by counting snags, trees or logs otherwise required to be left in riparian management areas or resource sites listed in ORS 527.710, subject to:

(a) Safety and fire hazard regulations;

(b) Rules or other requirements relating to wildlife leave trees established by the State Board of Forestry or the State Forester; and

(c) All other requirements pertaining to forest operations.

(3) In meeting the requirements of this section, the State Forester:

(a) Shall consult with the operator concerning the selection of wildlife leave trees when the State Forester believes that retaining certain trees or groups of trees would provide increased benefits to wildlife.

(b) May approve alternate plans submitted by the operator to meet the provisions of this section, including but not limited to waiving:

(A) The requirement that at least 50 percent of wildlife leave trees be conifers, upon a showing that a site is being intensively managed for hardwood production; and

(B) In whole or in part, the requirements of this section for one operation if an alternate plan provides for an equal or greater number of wildlife leave trees in another harvest type 2 or harvest type 3 operation, that the State Forester determines would achieve better overall benefits for wildlife.

(c) May require, for operations adjacent to a fish-bearing or domestic use stream, in addition to trees otherwise required to be left in riparian management areas, up to 25 percent of the green trees required to be retained under this section to be left in or adjacent to the riparian management area of the stream.

(d) May require by rule, for operations adjacent to a small, nonfish-bearing stream subject to rapidly moving landslides as defined in ORS 195.250, that available green trees and snags be left in or adjacent to the stream. The operator must leave available green trees and snags under this paragraph within an area that is 50 feet on each side of the stream and no more than 500 feet upstream from a riparian management area of a fish-bearing stream.

(4) When a harvest type 2 or harvest type 3 unit occurs adjacent to a prior harvest type 2 or harvest type 3 unit, resulting in a combined total contiguous acreage of harvest type 2 or harvest type 3 under single ownership exceeding 25 acres, the wildlife leave tree and downed log requirements of subsection (1) of this section apply to the combined total contiguous acreage. [1996 c.9 §9 (enacted in lieu of 527.675); 2001 c.340 §1]

Oregon Administrative Rules Chapter 629 Division 035:

Forest Management Planning:

(1) In managing forest lands as provided in OAR 629-035-0020, the State Forester shall develop Forest Management Plans, based on the best available science, that establish the general management framework for the planning area of forest land. The Board may review, modify, or terminate a plan at any time; however the Board shall review the plans no less than every ten years. The State Forester shall develop implementation and operations plans for forest management plans that describe smaller-scale, more specific management activities within the planning area.

(b) The plans shall include strategies that:

(A) Contribute to biological diversity of forest stand types and structures at the landscape level and over time:

(i) through application of silvicultural techniques that provide a variety of forest conditions and resources; and

(ii) through conserving and maintaining genetic diversity of forest tree species.

(B) Manage forest conditions to result in a high probability of maintaining and restoring properly functioning aquatic habitats for salmonids, and other native fish and aquatic life, and protecting, maintaining, and enhancing native wildlife habitats, recognizing that forests are dynamic and that the quantity and quality of habitats for species will change geographically and over time.

Summary of Private Lands Management in the Eastern Oregon Cascades:

Only 2 snags per acre are required to be retained. As such, current laws governing private forestlands in the eastern Oregon Cascades are wholly inadequate to conserve Black-backed Woodpecker populations, based upon the foregoing discussion of habitat needs.

Recent/Current Logging in the Eastern Oregon Cascades Mountains:

Due in large part to historic and recent logging, only 15-19% of the eastern Oregon Cascades is now comprised of dense, older forest (Moeur et al. 2005 [Table 11])—the type of forest that provides moderate to high quality Black-backed Woodpecker habitat in the event that it experiences higher-intensity wildland fire or substantial beetle mortality (which is rare in these forest types, but can occur in stands that have extremely high densities—see discussion above regarding Goggans et al. 1989). The current threat to the Black-backed Woodpecker in the eastern Oregon Cascades stems from the rapid rate at which the U.S. Forest Service is currently targeting this old forest for intensive logging—both post-fire salvage logging and aggressive pre-disturbance thinning (with the goal of essentially eliminating the potential for any significant tree mortality from fire or beetles for decades).

For instance, the B&B fire of 2003 in the Deschutes National Forest is by far the largest fire within the past decade in the Black-backed Woodpecker's range in the eastern Oregon Cascades region. The fire was nearly 100,000 acres in size, and more than one-third of it had high-intensity fire effects (USDA 2005c). However, much of the fire area was on the western side of the Cascade crest on the Willamette National Forest, outside of the range of the Black-backed Woodpecker, which lives only on the eastern side of the crest, and much of the moderate- and high-intensity fire was in sparsely forested or alpine areas, and produced relatively few, or no, snags (USDA 2005c [Map 3.10-2, p. 3-221]). Only a small portion of the overall fire area had the combination of dense, older forest and moderate/high-intensity fire effects—a combination that produced moderate to high quality Black-backed Woodpecker habitat (which, as defined by the Deschutes National Forest, is 62-126 and >126 snags per acre 10 inches in diameter or larger, respectively) (USDA 2005c [Map 3.10-2]). The chosen alternative, Alternative 2, subjected 6,823 acres to post-fire salvage logging, mostly clearcutting (in 15% of each logging unit, 2 fire-killed trees per acre were retained) (USDA 2005c). While the Final EIS for the B&B project noted that the salvage logging represents only about 7% of the overall fire area, the 6,823 acres of salvage logging was disproportionately targeted at moderate and high quality Black-backed Woodpecker habitat. While the Final EIS neglected to divulge the exact amount by which such Black-backed Woodpecker habitat was reduced by salvage logging, a comparison of this habitat in the No Action and Proposed Action alternatives shows that, conservatively, the salvage logging removed 30-40% of the Black-backed Woodpecker habitat (USDA 2005c [Map 3.10-2 and Map 3.10-3]). Moreover, after salvage logging much of the remaining higher quality Black-backed Woodpecker habitat existed only in small isolated patches surrounded largely by a clearcut landscape, especially in the northern third of the project area where the largest contiguous areas of Black-backed Woodpecker habitat existed before logging (USDA 2005c [Map3.10-2 and 3.10-3]).

A similar outcome occurred in the Davis fire area. Though the Davis fire of 2003 on the Deschutes National Forest was less than one-quarter of the size of the B&B fire, it burned predominantly at high-intensity (Cahall and Hayes 2009). However, about 40% of the higher-intensity portion of the fire area was salvage logged, again targeting the areas of highest snag densities (like the B&B fire, not all areas of high-intensity fire occurred in mature forest). Though some patches of moderate/high-quality Black-backed Woodpecker habitat were retained unlogged, only 4 significant stands of the highest quality nesting habitat, ranging from 25 to 44 acres in size (10-18 hectares), remained unlogged after salvage logging was completed (Cahall and Hayes 2009). Salvage logging removed at least 80-90% of the larger snags, significantly reducing Black-backed Woodpecker occupancy, even where about half or more of the smaller snags were retained (Cahall and Hayes 2009).

More recent fires in the eastern Oregon Cascades forests, within the range of the Black-backed Woodpecker, have been much smaller, with less high-intensity fire. The relatively little habitat created by these more recent fires has been predominantly in Wilderness or Inventoried Roadless Areas, and therefore has largely not been available to post-fire logging. Even so, the Forest Service has tended to remove all of the high-intensity fire area outside of protected forests, such as in the Black Crater Fire Timber Salvage Project (USDA 2006a).

One of the most significant threats to Black-backed Woodpecker populations currently in the eastern Oregon Cascades is the surge of very large, intensive commercial "thinning" logging projects targeting the little remaining dense, older forest on national forest lands. The explicitly stated goals of these projects are to prevent the occurrence of moderate- and high-intensity fire, and the potential for any significant tree mortality from beetles, for decades—goals that they claim to accomplish through substantial reduction of stand basal area, and removal of mature and old-growth trees, over many thousands of acres. Some of the most notable of these recent logging projects are the Five Buttes Project, the EXF Project, the West Bend Project, and the Flank Project (USDA 2007, USDA 2010c, USDA 2010d, USDA 2010e). The Five Buttes project is logging (ongoing) 7,798 acres, targeted in dense, old forest, such that the logged stands would remain sparsely forested, with little competition between trees (and, therefore, essentially no potential for any significant snag recruitment from beetle mortality) for at least 30-50 years (USDA 2007).

The EXF Project, currently underway, proposes to intensively log 2,554 acres of the densest, old forest in the entire watershed, removing the great majority of trees, including one-third of all old-growth trees, and 70% of all trees over 15 cm in diameter at breast height (USDA 2010c, p. 92, Table 38). The Final EIS for the EXF project states that stand density will be reduced so dramatically that it will take 50-150 years, or longer, for most of the logged stands to return to a level of stand density with the potential to produce any significant tree mortality from competition and beetles (USDA 2010c, p. 94, Table 41). Moreover, the Final EIS states that the logging project would prevent the occurrence of higher-intensity fire for decades (USDA 2010c, pp. 3-4). About one-quarter of the planned logging has occurred to date, and logging is ongoing, pending a decision from the Ninth Circuit Court of Appeals on the legality of the timber sale.

The West Bend project, which is being proposed currently (with a Draft EIS expected out in the spring of 2012), would intensively log 13,190 acres, and also targets dense, old forest (USDA 2010d).

The Flank Project is currently logging 5,519 acres of mostly dense, mature forest, reducing basal area to only 20 to 60 square feet per acre, or only about 5 to 14 square meters per hectare, specifically to preclude the potential for any significant snag recruitment from beetles or fire for decades (USDA 2011a, pp. 4, 6, 30, 35-42). Thus, as discussed above in the "Habitat" section, and in the "Thinning" subsection of the "Threats" section, thinning reduced forest density to levels considerably below the 18 to 20 square meters per hectare of snag basal area associated with successful Black-backed Woodpecker nesting and foraging (i.e., at only 5 to 14 square meters per hectare, even if the area experienced nearly complete tree mortality from fire, which is extremely unlikely, it still would not create suitable Black-backed Woodpecker habitat).

A similarly intensive thinning project on the Deschutes National Forest in 2006, known as the Lava Cast Project, thinned 9,299 acres of dense, mature forest down to only 40 to 60 square feet per acre of basal area, or about 9 to 14 square meters per hectare—too low, once again, to provide suitable Black-backed Woodpecker habitat even if the area experiences high-intensity fire (USDA 2006b).

On the Rogue River National Forest, the proposed Equine Thin commercial logging project would log 550 acres of mature forest that had naturally regenerated after a high-intensity wildland fire over a century ago. Like the other commercial thinning projects discussed, this logging project was placed on the landscape to target exceptionally dense forest stands (the stands with the greatest potential for significant snag recruitment from competition and beetles—i.e., the stands with the greatest potential to naturally create some Black-backed Woodpecker habitat), with the explicitly stated goal of essentially eliminating the potential for natural tree mortality from beetles or fire for decades (USDA 2011b).

On the Fremont-Winema National Forest in the eastern Cascades region of Oregon, despite the fact that the U.S. Forest Service has acknowledged that there is a deficit of large snags in the eastside forests of Oregon (Donnegan et al. 2008), recently the U.S. Forest Service has proposed, and is in the process of implementing, landscape-level intensive mechanical thinning projects which cover tens of thousands of acres, target the older portions of the forest with the densest stands conditions (i.e., the areas most likely to produce significant snag recruitment from competition and beetle mortality), remove forest plan protections against logging eastside old growth trees, remove all snags up to 21 inches in diameter (i.e., most of the existing snags), and reduce stand densities in most stands to far below the stand basal area levels (i.e., at least 18-21 square meters per hectare, or at least 80-90 square feet per acre, of snag basal area) usually associated with successful Black-backed Woodpecker occupancy—both nesting and foraging (as discussed in detail above). For this reason, even if these stands experienced 100% mortality from fire—an extremely unlikely possibility, given that the projects state that they will preclude the potential for high-intensity fire for decades—they would still not provide suitable Black-backed Woodpecker habitat. Such logging projects include the currently proposed Deuce logging project (26,616 acres of logging [USDA 2011c]), the Red Knight logging project (32,305 acres of logging [USDA 2012a]), and logging projects already being implemented, such as the Black Hills logging project (18,716 acres of logging [USDA 2012b]), the Coyote logging project (3,462 acres of logging [USDA 2011d]), and the Modoc logging project (3,723 acres of logging [USDA 2011e]).

Together, these commercial thinning logging projects represent a major additional threat (beyond direct post-disturbance salvage logging) to Black-backed Woodpecker populations not only by preventing any significant tree mortality from natural disturbance for decades, but also by targeting the few remaining dense, old forest areas in the eastern Oregon Cascades and removing the forest structure necessary for Black-backed Woodpecker habitat creation (i.e., dense, older forest). This current management direction threatens to eliminate suitable Black-backed Woodpecker habitat from these forests.

Summary of Management Situation in the Oregon/California Population:

In the Oregon/California population of Black-backed Woodpeckers, Black-backed Woodpecker habitat can be wholly eliminated from both private lands, as well as from national forests outside of protected forestlands, which contain a minority of the very small amount of current moderate/high-quality suitable habitat that exists. As discussed above in the "Status and Trend" section, even an optimistic assessment of the current habitat, and population abundance, indicates a population of less than 1,000 pairs, and likely considerably fewer pairs. The most current and comprehensive review of extinction data shows that there is a significant risk of extinction in the near future when a population of birds is less than about 3,400 (i.e., equivalent to about 1,700 pairs) (Reed et al. 2003, Traill et al. 2007, 2010). Thus, due to current lack of habitat protections, and ongoing management efforts to preclude creation of new habitat (e.g., fire suppression, large-scale thinning), the Oregon/California population is at significant risk of extinction in the near future unless it is afforded protection under the Endangered Species Act.

Black Hills:

Black Hills National Forest 2005 Amendment to the 1997 Land and Resource Management Plan:

Black Hills National Forest Standards and Guidelines, from Appendix D to 2005 Final EIS, LRMP Amendment, Alternative 6 (chosen alternative) (see http://www.fs.usda.gov/blackhills, follow link to "Land and Resources Management", then to "Planning"):

Overall management approach (Appendix D-3): "This alternative approaches fire, insect, and disease intensively…across the landscape…At the landscape scale fire, insects, and diseases are addressed by altering [reducing] denser concentrations of conifer cover types…" (see also 2005 Black Hills LRMP Amendment, Record of Decision, p. 2 ["My decision to choose Alternative 6 will promote reduction of forest density" to reduce the incidence of high intensity wildfires and prevent significant tree mortality from beetles]).

Snags (Appendix D-8, and D-34): Maintain at least 3 conifer snags per acre, 25% of which are greater than 14 inches in diameter, ***except*** in salvage logging of post-fire areas, salvage logging of areas with tree mortality from beetles, or where snags are proposed for removal as hazard trees along roads.

Tree Mortality from Insects (Appendix D-26): In ponderosa pine forests (which comprise most of the forests in the Black Hills), "reduce acreage of ponderosa pine stands that are in medium or high risk for infestation."

Black-backed Woodpecker Habitat (Appendix D-28): Retain 50% of combined "stand-replacing" fire and insect mortality, "up to" (but no more than) 10,000 acres (4,049 hectares), occurring within the most recent 5 years across the entire Black Hills National Forest.

Summary of Black Hills LRMP (Forest Plan) Provisions:

The current forest plan for the Black Hills National Forest overtly emphasizes the goal of targeting the densest, oldest forest (which the forest plan characterizes as being at the "highest risk" of beetle mortality because dense, older stands have greater competition between trees) for intensive logging explicitly in order to prevent the creation of high-intensity fire patches and patches of high tree mortality from beetles—i.e., suitable Black-backed Woodpecker habitat. Across green forests generally, only 3 conifer snags per acre are required to be retained, but this does not apply to salvage logging units. Most troubling is the fact that the forest plan not only allows clearcut salvage logging of 50% of recent (within the most recent 5 years) "stand-replacing" (high-intensity) mortality areas from fire or beetles, but also sets an *upper limit* of 10,000 acres, or 4,049 hectares, of such moderate/high-quality Black-backed Woodpecker habitat for the entire national forest (areas of fire or beetle mortality more than 5 years old may be salvage logged without restriction). As discussed above in "Abundance and Population Trend—Abundance and Population Trends in Oregon/California and South Dakota", current scientific data within the Black Hills concludes that Black-backed Woodpecker density in such habitat is about one pair per 300 hectares. Thus, the current forest plan only requires the U.S. Forest Service to maintain enough suitable Black-backed Woodpecker habitat for about 14 pairs of Black-backed Woodpeckers. The most current and comprehensive review of extinction data shows that there is a significant risk of extinction in the near future when a population of birds is less than about 3,400 (i.e., equivalent to about 1,700 pairs) (Traill et al. 2007, 2010). The Black Hills National Forest's forest plan provisions fall so vastly short of this threshold that it is clear no serious effort was made to ensure the viability of the Black Hills population of Black-backed Woodpeckers. Moreover, currently proposed meta-landscape-level logging projects target remaining Black-backed Woodpecker habitat, and future potential habitat, across the entire national forest in one sweep, as discussed below. Thus, the Black Hills population is at significant risk of extinction in the near future unless it is protected under the Endangered Species Act.

Recent/Current Logging in the Black Hills:

The Black-backed Woodpecker is listed as a Sensitive Species in U.S. Forest Service Region 2, which includes the Black Hills National Forest (BHNF). Sensitive Species designation means that there is a concern about the population viability of the species within the region. The BHNF is the only national forest in U.S. Forest Service Region 2 that has resident Black-backed Woodpeckers. As discussed above, Black-backed Woodpeckers depend upon large patches of very high, and recent, tree mortality from fire or beetles, and post-mortality salvage logging eliminates habitat for this species. As Bonnot et al. (2009) conclude, the pervasive salvage logging, and lack of protections for

Black-backed Woodpecker foraging habitat at the nest-stand and territory scales, represents a current threat to the population viability of this species in the Black Hills National Forest.

The scale and intensity of two currently proposed massive logging projects, the MPB (Mountain Pine Beetle) Response Project and the Vestal Project (as well as other similar smaller projects currently proposed) represent a forest-wide effort to largely eliminate suitable Black-backed Woodpecker habitat from the Black Hills National Forest. These projects, covering several hundred thousand acres, would intensively log *most* of the forested acreage in the entire BHNF, including most of, or the great majority of, the stands that currently provide suitable Black-backed Woodpecker habitat (dense stands wherein many/most trees are affected by beetles), as well as targeting denser (in terms of basal area) pine stands that would otherwise offer the best potential for future Black-backed Woodpecker habitat across the forest (http://www.fs.usda.gov/blackhills [follow link for "Land & Resources Management", and then "Projects"]). All told, these current logging projects would log about 160,000 hectares (about 400,000 acres) in a national forest with less than 100,000 hectares of forest in which the Black-backed Woodpecker can potentially reside (again, making the unrealistically optimistic assumption that all acres mapped by the Forest Service as having some level of beetle mortality, and all post-fire areas, within the past decade have sufficient snag densities to provide suitable Black-backed Woodpecker habitat), targeting not only current beetle mortality areas but also denser, older forest areas that have the potential for some beetle (or fire) mortality in future years/decades. Together these logging projects represent a serious threat to the population viability of an entire subspecies (a subspecies is considered a "species" under the Endangered Species Act—e.g., the Northern Spotted Owl and the Mexican Spotted Owl are subspecies of the same species).

Specifically, these logging projects threaten the viability of the Black-backed Woodpecker in the Black Hills in three ways. First, the projects plan to focus logging activities in areas of high beetle mortality or projected mortality (areas with moderate to high levels of current/recent beetle activity in trees), thus directly removing most of the current suitable Black-backed Woodpecker habitat (especially live trees with signs of active beetle larvae presence, with regard to both the MPB and Vestal projects, and possibly recently dead trees, in the case of the MPB project).

Second, the projects have the explicit goal of reducing stand density, and tree spacing, to such an dramatic degree that the potential for both future beetle mortality (from competition between trees) and future fire (except perhaps the lowest intensity fire that kills few trees) are precluded, or greatly reduced, for decades, due to extremely wide proposed spacing between trees, thus preventing future habitat from occurring on these areas for decades to come—a serious adverse impact to a species whose habitat is ephemeral, and which depends upon a constantly replenished supply of such habitat to maintain viable populations (Bonnot et al. 2009, p. 227).

Third, by reducing stand density to such low levels through thinning, even if extreme fire weather did allow some moderate-severity or high-severity fire to occur after thinning and fuels treatments (unlikely but possible), there would not be enough snag basal area to provide suitable habitat for the Black-backed Woodpecker. For example, the Vestal project Draft EIS states (pp. 14–15) that the prescriptions across tens of thousands of acres will generally reduce live tree basal area to less than 14 square meters per hectare (less than 60 square feet per acre) in order to prevent competition between trees and essentially preclude future beetle mortality for decades. A small proportion of the acreage (less than 10%) would retain up to about 18-21 square meters per hectare (approximately 80–90 square feet per acre), and 0 to 27 square meters per hectare (0 to 120 square feet per acre) would be retained on 1,054 acres, but the Draft EIS does not specific how much of this would be near 27 square meters per hectare. In all, the great majority of the area (about 25,000 acres proposed for logging) would be reduced to 14 square meters per hectare of basal area or less, and live trees with signs of beetle larvae (i.e., trees that currently provide habitat, and food, for Black-backed Woodpeckers) would be actively removed. As discussed above, Black-backed Woodpeckers depend upon areas with higher basal area density of beetle-killed trees than the basal area density that would be retained in the Vestal project. The Vestal project proposes about 25,000 acres of intensive logging, which would remove or preclude Black-backed Woodpecker habitat, and the Proposed Action is the only action alternative—the project Draft EIS does not contain a single action alternative that would accomplish home protection by thinning only within narrow zones of a few hundred feet from property boundaries or structures (which is the only effective way to achieve fire protection for homes, according to the science on the subject—see Cohen and Butler 1996, Cohen 1999, and Cohen 2008), while protecting Black-backed Woodpecker habitat in the areas not immediately adjacent to homes. Scientists have recently criticized the Forest Service for focusing fuel reduction, thinning, and fire management activities far from homes where such activities have little or no relevance to home protection (Schoennagel et al. 2009).

Similarly, the MPB project proposes to focus logging in the denser stands (the ones most likely to otherwise provide future Black-backed Woodpecker habitat from beetles, or fire), as well as in areas of active beetle presence, but proposes to do so on a staggering 325,000 acres spread across the entire national forest (MPB Scoping Notice, pp. 1–3, and map). The project map in the Scoping Notice identifies, and targets for logging, the areas in the entire BHNF that either have active beetle presence or have denser forest stands. It is unclear how much suitable, or potential, Black-backed Woodpecker habitat would remain if the MPB and Vestal projects, as currently envisioned, are completed, but it is clear that it would be very, very little.

Other Natural or Anthropogenic Factors

Inherent Vulnerability of Small Populations:

As discussed above in the “Status and Trend” section, the current population of Black-backed Woodpeckers in Oregon/California and the Black Hills is approximately 700-100 and 411, respectively. This falls far short, in both cases, of the population threshold below which there is a significant risk of extinction in the near future, according to the most current scientific literature reviews on extinction (Reed et al. 2003, Traill et al. 2007, Traill et al. 2010). The risk to these two small, isolated populations is exacerbated by the ephemeral nature of suitable Black-backed Woodpecker habitat, as discussed immediately below.

Ephemeral Nature of Habitat:

Black-backed Woodpecker habitat is created by high-intensity fire and large-scale insect outbreaks that kill most of the trees across large areas of dense mature forest. The very nature of these disturbances results in a supply of suitable habitat that is highly unpredictable and ephemeral. Habitat must be replaced over time to support breeding of woodpeckers and other cavity-nesting birds. Fire-killed trees only support a certain number of generations of wood-boring beetles and bark beetles before populations of beetle larvae (the Black-backed Woodpecker's food source) begin to steeply decline (Dixon and Saab 2000). Although the length of time since fire that an area remains suitable varies by site depending on size, intensity, and landscape patterns of the natural disturbance (Saab et al. 2004, Saab et al. 2007), the optimal habitat for the species based on research regarding available food resources, number of individuals, number of breeding pairs, and nest success is mature and old forest with high pre-fire canopy and high densities of trees of all sizes that recently (i.e., 1–4 years prior) burned at high intensity.

Studies of Black-backed Woodpecker numbers over time indicate that burned forests represent critical but only temporarily suitable habitat. Murphy and Lehnhausen (1998) found Black-backed Woodpeckers common 2 years after fire in interior Alaska, but by the third year were rare and had left the area by the fourth year post-fire. Saab et al. (2004) and Saab et al. (2007) found that Black-backed occupancy declined steeply after about 3–5 years post-fire, and Siegel et al. (2010 [Fig. 15]) found the same in California.

In addition to overall abundance, nest densities decline over time. Saab et al. (2002, 2004, 2007) found that time since fire had the greatest influence on occupancy of nest cavities for the Black-backed Woodpecker—nest densities peaked at about 3–5 years post-fire—and postulated that mammalian and reptilian nest predators begin to recolonize a burned site over time. The fire at one of their study sites was much larger in extent and burned at greater intensity than the other, and nest predators took 2 years longer to recolonize this site.

The Black-backed Woodpecker is more strongly tied to intensely burned forests than perhaps any other bird species. The rarity of the Black-backed Woodpecker in unburned forests suggests that these forests represent sink habitats. Unburned forests may allow the species to temporarily persist but the population of Black-backed Woodpeckers will inevitably decline unless intensely burned forest and its associated abundance of food resources and lower predation levels once again becomes available (Murphy and Lehnhausen 1998). In other words, the persistence of Black-backed Woodpeckers is likely dependent upon maintaining a patchwork of intensely burned forests of large enough size, containing sufficiently high densities of small to large dead trees, where these patches are constantly replenished over time. Large areas in which most trees have recently been killed by beetles also provide suitable habitat for Black-backeds for several years post-disturbance (Bonnot et al. 2008, 2009).

A recent paper by Hutto (2008) explored the ecological relationship between Black-backed Woodpeckers and intensely burned forests, and investigated the implications of an avian species that evolved to depend upon high-intensity fire in regard to our current beliefs about the pre-historical prevalence of this disturbance. Hutto (2008) noted on p. 1,831 that "[n]o other bird that occupies conifer forests is as specialized on such a small subset of forest types or conditions…This bird species was also relatively restricted in its distribution…to the severely burned end of the fire severity spectrum." Hutto further stated on p. 1,828 that "[e]xtreme specialization by an organism can evolve only if the particular conditions to which it is adapted were sufficiently abundant during its speciation, which for most bird species occurred millions of years ago." In other words, the Black-backed Woodpecker would not have evolved in tandem with high-intensity fire without a sufficient degree and frequency of this type of habitat disturbance during its evolutionary history. The fact that Black-backed Woodpeckers occur at the greatest densities in intensely burned coniferous forests, and that nesting success is highest in these habitat types, strongly indicates that intense fires and the resulting standing dead trees to which wood-boring beetles are attracted were historically, and are currently, an important part of forest dynamics in the range of the species (Hutto 2008).

A common misperception of many forest managers is that the frequency and extent of high-intensity fire is greater now than during the period of pre-European settlement. This misperception has led to widespread efforts to prevent high-intensity fire, to suppress fires when they do burn, and to remove recently burned snag forests and replant the area.

The Black-backed Woodpecker depends upon a constantly replenished supply of intensely burned forest, or forest with similarly high levels of tree mortality from beetles, that contains high densities of medium and large dead trees. This habitat apparently occurred with enough frequency to support the species throughout its evolutionary history in North America. Over the past century, however, its favored habitat has been methodically and systematically eliminated by fire suppression and post-disturbance salvage logging (see discussion below), to the point where intensely burned mature and old-forest receives no regulatory protection whatsoever. In fact, current policies governing post-fire forest management on both private and public lands actively encourage the removal of the burned habitat that Black-backed Woodpeckers depend upon for survival as part of "post-fire restoration." As a result, the Black-backed Woodpecker population could become endangered or extinct in the foreseeable future. If old-forest habitats are not protected, if such habitats are prevented from burning intensely or experiencing large patches of similarly high mortality from beetles, and if the snags in such habitat are not permitted to remain standing, the Black-backed Woodpecker will continue to be threatened with extinction.

Climate Change:

Though it is often popularly assumed that climate change will result in more fire, and more intense fire, in conifer forests of the western U.S., the scientific evidence does not clearly support that assumption and in fact may contradict it. The warming climate more likely will lead to vegetation changes that will reduce the abundance of pyrogenic vegetation, leading to a fire "retreat" (reduced fire activity) in the forests of the Sierra Nevada and eastern Cascades, while desert areas, and the Great Basin areas to the east of the Sierra Nevada and eastern Cascades, will see fire increases (Krawchuk et al. 2009 [Figure 3]). While some climate models predict increased overall fire by about 10–20% in montane forests by 2099 relative to the 20th century fire-suppressed extent of fire, in terms of average annual area burned (all fire, not high-intensity fire), the models predict much larger *decreases* in the upper elevation forest types inhabited by the Black-backed Woodpecker as the climate warms (Lenihan et al. 2008 [Fig. 1 through 3]), indicating a substantial overall loss of habitat even if fire increases somewhat. One modeling study, using a hypothetical scenario in which summer precipitation was assumed to be on a substantial decreasing trend, projected a near doubling of total annual area burned (all fire intensities combined) by 2080 in the eastern Oregon Cascades (Littell et al. 2010). However, actual precipitation data shows that summer precipitation has been progressively increasing substantially, and continues to increase, in western North America, and in Oregon and California specifically, since at least the early 20th century (Mote 2003, Hamlet et al. 2007, Girardin et al. 2009).

Moreover, summer precipitation may be a more powerful predictor of fire behavior than temperature, as the former reduces fire while the latter increases it (Parisien and Moritz 2009), and summer precipitation is increasing in forested regions of the U.S. West within the range of the Black-backed Woodpecker. Though, in any given one or two decades, precipitation may increase or decrease somewhat, often depending upon warm or cold phases of the Pacific Decadal Oscillation (PDO), actual data from weather stations over the past *several* decades shows an overall progressive pattern of increases in precipitation, especially summer precipitation (which tends to reduce wildland fire occurrence and intensity) in California (WRCC 2010 [http://www.wrcc.dri.edu/], Crimmins et al. 2011) and in the eastern Oregon Cascades (Mote 2003). Similar increases in summer precipitation in Canada's boreal forests have led to a progressive decline in high-intensity fire occurrence and, consequently, a decline in Black-backed Woodpecker habitat over the past 150 years (Girardin et al. 2009). Further, comprehensive data from the U.S. Forest Service's research branch and the U.S. Geological Survey conclude that, since 1984, there has been no increase in fire intensity (Schwind 2008) (all vegetation types combined). Specifically in forests, Hanson et al. (2009) found that fire intensity has not increased since 1984 in the eastern Cascades, including the southern Cascades in California; and Collins et al. (2009) found no increase in fire intensity in a forested study area in Yosemite National Park. Lutz et al. (2009) modeled fire intensity in Yosemite National Park, comparing 1985–2006 to 2020–2049. Their data show that the high-intensity proportion is projected to remain at about 16% in both the current and future time periods (Lutz et al. 2009 [Table 1]).

Miller et al. (2009) reported an increase in summer precipitation in the Sierra Nevada over the past several decades, but also reported an increase in fire intensity in *some* forest types since 1984 in the Sierra Nevada. However, they excluded 40% of the available fire intensity data, including the largest and most intense fire in the early years of the data set (the 1992 Fountain fire), which led to a substantial underrepresentation of high-intensity fire in the earlier years, and the incorrect impression of an increasing fire intensity trend. Also, they used current GIS layers for vegetation to exclude shrubs, which can lead to a disproportionately large exclusion of conifer forest that burned at high intensity in the earlier years of the data set, and which was more recently re-classified as shrub habitat (more recent high-intensity patches still appear as forest in remote sensing, whereas older high-intensity patches, due to snag attrition and shrub maturation, appear as shrub habitat). This leads to the appearance of an upward trend in fire intensity where none actually exists. Using complete fire data, and using pre-1984 GIS layers for vegetation (in order to avoid excluding more high-intensity fire in conifer forest in the earlier years), Hanson and Odion (in review) found no increase in fire intensity in forests of the Sierra Nevada since 1984 (which is when accurate fire intensity satellite imagery data became available), consistent with all other current research on this subject in California's forests (Schwind 2008, Collins et al. 2009, Lutz et al. 2009, Hanson et al. 2009, Hanson et al. 2010, Miller et al. 2012 in press).

CONCLUSION

Black-backed Woodpeckers depend upon an environment that is unpredictable and ephemeral, which remains suitable for only several years post-fire. Thus, their populations are precarious—numbers are extremely low in forests without high tree mortality from recent natural disturbance (mostly fire). Populations of Black-backed Woodpeckers are clearly regulated by the extent of fires and insect outbreaks and by the management actions people choose to take in those affected forests—such as salvage logging.

Unfortunately, national and state rules and regulations provide absolutely no regulatory protection for intensely burned forests on private and public lands throughout most of the range of the Black-backed Woodpecker, and this is especially troubling in Oregon/California, and the Black Hills, where woodpecker populations are perilously small. Intensely burned forest habitat not only has no legal protection, but standard practice on private and public lands is to actively eliminate it. When fire and insect outbreaks create excellent woodpecker habitat, salvage logging promptly destroys it. Fire suppression—also standard practice—prevents the creation of new Black-backed Woodpecker habitat, and mechanical thinning degrades potential Black-backed Woodpecker habitat once a thinned area has burned. It is no surprise, then, that the woodpecker, which was once described as numerous, is now considered a rare species.

The John Muir Project, the Center for Biological Diversity, the Blue Mountains Biodiversity Project, and the Biodiversity Conservation alliance have concluded that the Black-backed Woodpecker is now threatened with endangerment or extinction in

California/Oregon, and in the Black Hills of South Dakota and Wyoming. Based on woodpecker density estimates using the best available scientific data, we approximate an extant population of only 700 to 1,000 pairs of Black-backed Woodpeckers in East-Cascades-Oregon/California and 411 pairs in South Dakota—and the great majority of the habitat in which even those small number of pairs currently reside is threatened by current or future post-disturbance logging and large-scale commercial thinning not only for sawtimber but also now for biomass production. Such small populations are at significant risk of extinction (Reed et al. 2003, Traill et al. 2007, 2010), especially when their habitat is mostly unprotected and is currently under threat of destruction and degradation, as discussed and documented above. We submit this petition to obtain desperately needed legal protection for the Oregon/California and Black Hills populations of Black-backed Woodpeckers and the snag forest habitat upon which they depend.

REQUEST FOR CRITICAL HABITAT DESIGNATION

The ESA mandate that, when USFWS lists a species as endangered or threatened, the agency must also concurrently designate critical habitat for that species. 16 U.S.C. §§ 1533(a)(3)(A)(i) and 1533(b)(6)(C). The petitioners expect that USFWS will comply with this mandate and designate critical habitat concurrently with the listing of the Oregon/California and Black Hills populations of the Black-backed Woodpecker.

SUGGESTIONS FOR FUTURE MANAGEMENT

A. Establish Black-backed Woodpecker protection zones at least 150 ha in size (i.e., home range size) to include all areas of moderate- to high-intensity burned mature and old-growth conifer forest with moderate to high pre-fire canopy cover (i.e., potential nest stands). No salvage logging would be allowed within these potential nest stands or home ranges.

B. Retain all trees with Black-backed Woodpecker nest cavities.

C. In unburned forests, retain patches of snags in a variety of decay stages, including those susceptible to future insect occupancy. Prevent salvage logging in large patches of high conifer mortality from beetles/competition/drought.

D. Halt or greatly restrict and reduce fire suppression activities outside of the urban/wildland interface, at least until average annual fire extent approximates historical, pre-suppression extent.

E. Focus fuel-reduction and beetle prevention thinning operations in the immediate vicinity of homes or administrative structures (www.firelab.org), and halt current plans to reduce/eliminate high-intensity fire in conifer forest wildlands not adjacent to homes.

F. Prohibit insecticide use in suitable Black-backed Woodpecker habitat.

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APPENDIX A. National forest, name, age, size, and dominant pre-fire habitat of 17 fires surveyed in the Sierra Nevada in 2008, number of stations at which playback surveys were conducted, and number Black-backed Woodpeckers detected at each station. From Siegel et al. (2008 at p. 24).

National Forest	Fire Name	Year of Fire	Years Since Fire	Hectares of Burned Area (Any Severity) on National Forest Land	Dominant Pre-fire Habitat [1]	No. Stations Surveyed	No. Stations w/ BBWO Detections
Eldorado	Plum	2002	6	461	Sierra Mixed Conifer	19	0
Eldorado	Saint Pauli	2002	6	132	Sierra Mixed Conifer	0	0
Eldorado	Ralston	2006	2	2,699	Sierra Mixed Conifer	4	0
Inyo	Crater	2001	7	996	Jeffrey Pine	29	8
Lassen	Cone	2002	6	769	Eastside Pine	20	0
Lassen	Poe	2001	7	551	Sierra Mixed Conifer	0	0
Lassen	Straylor	2004	4	1,231	Eastside Pine	21	1
Modoc	Bell	2001	7	1,092	Eastside Pine	22	0
Plumas	Boulder Complex	2006	2	1,416	Jeffrey Pine	22	11
Plumas	Moonlight	2007	1	26,159	Jeffrey Pine/Red Fir	24	16
Sequoia	Cooney	2003	5	751	Jeffrey Pine/Red Fir	25	0
Sequoia	Vista	2007	1	170	Jeffrey Pine/Red Fir	20	5
Sierra	North Fork	2001	7	1,636	Sierra Mixed Conifer	20	0
Sierra	Rock Creek 2	2002	6	99	Sierra Mixed Conifer	15	0
Stanislaus	Kibbie	2003	5	1,374	Jeffrey Pine/Red Fir	39	5
Stanislaus	Mud	2003	5	1,641	Jeffrey Pine/Red Fir	33	6
Tahoe	Bassetts	2006	2	925	Subalpine Conifer	14	11
Tahoe	Gap	2001	7	947	Sierra Mixed Conifer	25	1
Tahoe	Rock Creek	2001	7	187	Jeffrey Pine/Red Fir	19	4