

# Black-backed Woodpecker (*Picoides arcticus*) Status Review under the California Endangered Species Act

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and

Center for Biological Diversity

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## TABLE OF CONTENTS

<b>Introduction</b> .....	<b>1</b>
<b>Executive Summary</b> .....	<b>1</b>
<b>I. Habitat Essential to the Continued Existence of the Species</b> .....	<b>4</b>
<b>A. Range of Subspecies</b> .....	<b>4</b>
<b>B. Suitable Habitat</b> .....	<b>8</b>
<b>1. Nesting Habitat</b> .....	<b>9</b>
<b>2. Foraging Habitat</b> .....	<b>14</b>
<b>3. Home-range Size</b> .....	<b>17</b>
<b>II. Listing the Black-backed Woodpecker is Warranted Because the Continued Existence of the Black-backed Woodpecker in California is in Serious Danger or is Likely to Become So in the Foreseeable Future Due to One or More Listing Factors</b> .....	<b>19</b>
<b>A. Present or Threatened Modification or Destruction of the BBWO’s Habitat</b> .....	<b>19</b>
<b>1. BBWO Habitat Loss Relative to Historic Extent</b> .....	<b>19</b>
<b>2. Extreme Scarcity of Moderate and High Quality Suitable Habitat</b> ..	<b>22</b>
<b>3. Destruction of Habitat and Lack of Regulatory Mechanisms to Protect the Species or Its Habitat</b> ..	<b>28</b>
<b>a. Post-disturbance Salvage Logging</b> .....	<b>28</b>
<b>b. Ongoing Fire Suppression</b> .....	<b>32</b>
<b>c. Forest Thinning—Suppression of Natural Tree Mortality</b> .....	<b>32</b>
<b>4. Current Laws and Regulations Do Not Protect BBWO Habitat</b> .....	<b>34</b>
<b>a. Public Land</b> .....	<b>34</b>
<b>i. U.S. Forest Service’s Elimination of the Wildlife Viability Requirement</b> .....	<b>34</b>

ii.	Sierra Nevada Forest Plan Amendment 2001 and 2004.....	36
iii.	Northwest Forest Plan 1994 Record of Decision.....	39
b.	Private Lands.....	40
i.	California Forest Practices Rules.....	40
ii.	Oregon Forest Practices Act.....	42
5.	5. Significant Post-fire Salvage Logging is Occurring on Public and Private Lands.....	42
a.	Public Land.....	43
b.	Private Land.....	46
6.	6. Even if the Amount and Severity of Fire Increases in the BBWO’s Range, Anthropogenic Climate Change and Its Associated Impacts to Suitable BBWO Habitat are Projected to Lead To a Contraction and Net Loss of Habitat.....	48
B.	B. Predation (Which is Exacerbated by Scarcity of Large, Recent High-intensity Fire Patches).....	58
C.	C. Other Natural Occurrences or Human-Related Activities.....	58
1.	1. The BBWO is Inherently at High Risk Due to Its Very Small Population Size and the Ephemeral Nature of Its Habitat.....	58
a.	Burned Forest Habitat.....	58
b.	Unburned Forest.....	60
c.	Overall Population—Burned and Unburned Combined.....	62
d.	Forest Service Estimates of BBWO Populations in Unburned Forests of California are Unrealistically High to a Dramatic Degree and Are Not Based Upon the Best Available Science.....	63
i.	Erroneous U.S. Forest Service Extrapolation Assumes Approximately Equal BBWO Density Per Square Kilometer in Unburned Forest Than in Recent Burned Forest, Despite Vastly Lower Detection Rates in Unburned Forest.....	64

ii.	Underestimation of Home Range Size.....	64
iii.	Inconsistency With Data on Snag Density in Areas in Which BBWOs Successfully Nest and Reproduce.....	65
iv.	Unsupported Assumption that BBWO Presence in Unburned Forest Equates to BBWO Nesting.....	67
v.	Overestimation of Spatial Extent of Unburned Forest in Which BBWOs Have Been Detected.....	68
vi.	Probability of Detection.....	69
vii.	Potential for Substantial Overestimation Due to Even a Small Error in Species Misidentification.....	69
III.	Management Activities and Other Actions Recommended for the Conservation and Recovery of the Species.....	71
IV.	Listing Recommendation.....	71
V.	References.....	74

## **Introduction**

This status review for the Black-backed Woodpecker was prepared by the John Muir Project and the Center for Biological Diversity pursuant to the California Endangered Species Act's ("CESA") implementing regulations, specifically Cal. Code Regs., tit. 14, § 670.1 (h), which allows "interested parties . . . to submit a detailed written scientific report to the commission on the petitioned action." This same regulation explains that parties "may seek independent and competent peer review of this report prior to submission," and we have done so. Furthermore, to comply with the Fish and Game Code, section 2074.6, this report must be "based upon the best scientific information available."

All scientific findings and conclusions in this report were prepared by Dr. Chad Hanson. His CV is attached as Exhibit A. Dr. Hanson has a Ph.D. in Ecology from the University of California at Davis, where he focused his dissertation research on Black-backed Woodpeckers. Dr. Hanson has published scientific studies in peer-reviewed journals on topics including Black-backed Woodpecker habitat selection, fire history, post-fire conifer response, current landscape-level fire patterns in the Sierra Nevada, and fire trends and forest regrowth rates in Northern Spotted Owl habitat in the eastern Cascades and Klamath region.

## **Executive Summary**

Much research has been conducted in recent years regarding not only the Black-backed Woodpecker, but also regarding the role of moderate and high-intensity fire in western forests. This research has rapidly changed our understanding of the role fire plays in forest ecosystems and we now know that we got it wrong when we assumed that fire is "bad" and that it ought to be suppressed at all costs. In fact, not long ago, even low-intensity fire was treated with the negative attitudes that are now largely reserved for high-intensity fire.

Over the last two decades, many scientists began testing whether our assumptions about fire were in fact true, and we now know that many species not only can be found in forests that have burned at high-intensity, many species actually *rely* on the habitat created by high-intensity fire. The Black-backed Woodpecker is one of those species, and is an indicator of the biodiversity and richness of snag forest habitat. Moreover, as a result of the work of scientists who study this habitat, we now know that the snag forest created by higher-intensity fire supports equal or greater biodiversity than unburned forest (Hutto 1995, Caton 1996, Donato et al. 2009, Fontaine et al. 2009, Burnett et al. 2010, Malison and Baxter 2010, Swanson et al. 2010).

High-intensity fires, also called stand-initiating or crown fires, are defined by the widespread mortality of the dominant vegetation that substantially changes the forest structure. Low-intensity fire, on the other hand, rarely kills overstory trees and has little impact on the dominant vegetation. An important aspect of fires in California is that they are often of mixed intensity. This means that the fire creates a patchy mosaic of lightly burned forest and completely burned forest, thus establishing a highly heterogeneous array of habitats in the area impacted by the fire. In other words, contrary to popular perception, when a fire burns, it does not burn to the same degree throughout the entire fire area. Instead, mixed-intensity fire creates a highly diverse landscape that contains patches of habitat from different fire intensities.

Fire and the Black-backed Woodpecker are inextricably linked. Research stretching from California to Quebec repeatedly confirms the bird's strong affinity for the "snag forest habitat" created by large patches of high-intensity fire in dense, mature/old conifer forest. Unfortunately for the Black-backed Woodpecker, however, the relationship that humans have with high-intensity fire has culminated in a situation that heavily disfavors the woodpecker's continued existence. First, because of the bias against high-intensity fire that has existed for well over a century, fires have been, and continue to be, suppressed – both through direct suppression of fires while they occur and through pre-fire suppression in the form of landscape-level commercial thinning – thus preventing the creation of the snag forest habitat that Black-backed Woodpeckers rely upon. Second, the post-fire habitat created by high-intensity fire has for decades been considered a wasteland whose only value is as lumber from salvage logging – consequently, even when high-intensity fire has occurred and not been extensively suppressed, the resulting ecosystem has often been destroyed by salvage logging. Third, there are no laws – on public or private land – that specifically serve to protect or create the snag forest habitat that Black-backed Woodpeckers call home.

The research in recent years regarding the Black-backed Woodpecker has answered many, but not all, questions about the species. For instance, while we know that Black-backed Woodpeckers rely heavily on snag forest habitat created by fire and insects, less is known about the use of unburned forests by the species. The available information, however, strongly suggests that Black-backed Woodpeckers only nest in old, green forest habitat that contains a very high number of recent snags – averaging at least 20-25 square meters per hectare of very recent snag basal area (i.e., over 90 square feet per acre of recent snag basal area, or about 100 medium to large snags per acre). Such habitat, like the type of post-fire forest habitat relied upon by Black-backed Woodpeckers, is extremely rare on the landscape. In other words, while much green forest in general exists in California, the *kind* of green forest that Black-backed Woodpeckers very likely need is extremely limited.

The California Endangered Species Act, like any good conservation law, seeks to protect species before it is too late. Consequently, the Act, like the Federal ESA, "contains no requirement that the evidence be conclusive in order for a species to be listed. . . . The purpose of creating a separate designation for species which are 'threatened', in addition to species which are 'endangered', was to try to 'regulate these animals before the danger becomes imminent while long-range action is begun.'" *Defenders of Wildlife v. Babbitt*, 958 F.Supp. 670, 679-81 (D.D.C. 1997) (internal citations omitted). This is why wildlife agencies are "not obligated to have data on all aspects of a species' biology prior to reaching a determination on listing." *Id.* A species should be listed "even though many aspects of the species' status [are] not completely understood, because a significant delay in listing a species due to large, long-term biological or ecological research efforts could compromise the survival of the [species]." *Id.*

Listing the Black-backed Woodpecker ("BBWO") as threatened or endangered is warranted. The Black-backed Woodpecker population in California meets the criteria for "endangered" status (Fish & Game Code, § 2062, and Cal. Code Regs., tit. 14, § 670.1(i)) or, at least, for "threatened" status because it will likely become endangered in the "foreseeable future" in the absence of "special protection and management efforts." (Fish & Game Code, § 2067, and Cal. Code Regs., tit. 14, § 670.1(i))

In California, the factors that must be considered when determining whether a species is endangered or threatened include “loss of habitat, change in habitat, overexploitation, predation, competition, and disease.” (Fish & Game Code, § 2062.) Per CESA’s implementing regulations, “a species shall be listed as endangered or threatened . . . if . . . its continued existence is in serious danger or is threatened by any one or any combination of the following factors: 1. Present or threatened modification or destruction of its habitat; 2. Overexploitation; 3. Predation; 4. Competition; 5. Disease; or 6. Other natural occurrences or human-related activities.” (Cal. Code Regs., tit. 14, § 670.1(i))

As explained in detail in this report, listing of the BBWO is warranted because:

- a) **Present or threatened modification or destruction of habitat:** the suitable habitat for the Black-backed Woodpecker in both burned and unburned forests is extremely narrow (very recent, very high tree mortality from fire or beetles in large patches within dense, mature/old higher-elevation conifer forest<sup>1</sup> that has not experienced any significant level of salvage logging), and the extent of the moderate to high-quality suitable habitat created by wildland fire or beetles at any point in time equates to less than 3% of the montane conifer forests within the range of this species in California currently;
- b) **Present or threatened modification or destruction of habitat:** there are essentially no substantive protections for suitable Black-backed Woodpecker habitat on either public or private lands in California (or Oregon), and the U.S. Forest Service, which manages lands that include most of the existing Black-backed Woodpecker habitat at any point in time, recently declared a campaign to conduct landscape-level intensive forest management designed to target the densest forests upon which Black-backed Woodpecker depend in order to prevent and eliminate the higher-intensity natural disturbances from fire or beetles—the very natural disturbances which create suitable Black-backed Woodpecker habitat on California’s national forests;
- c) **Other natural occurrences or human-related activities:** the scientific literature on the expected effects of climate change project that wildland fire may increase or decrease somewhat in the coming decades (depending upon the extent of increasing precipitation) but, even if wildland fire increases, suitable Black-backed Woodpecker habitat is projected to experience a substantial net loss in the coming decades due to range contraction as the higher-elevation forest types upon which Black-backed Woodpeckers depend move upslope and shrink;
- d) **Other natural occurrences or human-related activities:** Black-backed Woodpeckers have large home ranges (50 hectares per pair to more than 800 hectares per pair, depending upon the habitat quality and time since fire), and populations are very small due to this factor and due to the scarcity of suitable habitat on the landscape—likely less than 600 pairs in California, according to the best available science, which is far less than

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<sup>1</sup> Generally, forest stands at least 60 years old (and usually older) in conifer forest types from mixed-conifer forest to higher-elevation types, such as white fir, red fir, Jeffrey pine, lodgepole pine, eastside pine, and eastside mixed-conifer.

the minimum viable population threshold identified in the scientific literature for bird species, creating a significant risk of extinction in the foreseeable future unless the population is protected;

- e) **Other natural occurrences or human-related activities:** even if the other portion of the Pacific North American subspecies of the Black-backed Woodpecker (i.e., the eastern Oregon Cascades) is included in the population totals, the best available science indicates that the combined California and eastern Oregon Cascades population totals are less than 850 pairs, which is also well below the population viability threshold identified in the scientific literature—i.e., the minimum population needed to avoid a significant risk of extinction in the near future.

At various points throughout this document, summary conclusions (“**Conclusion:** ...”) of the material are included for the convenience of the reader.

## **I. Habitat Essential to the Continued Existence of the Species**

The Fish and Game Code, section 2074.6, requires that any status report “include a preliminary identification of the habitat that may be essential to the continued existence of the species.” As discussed below, there are two important issues regarding the range and habitat of BBWOs in California. First, current data indicates that the California population is part of a subspecies of the BBWO that exists in Oregon and California, but may even be distinct from the Oregon population as well – genetic tests are currently being conducted to examine the relatedness of the Oregon and California birds. Second, the Black-backed woodpeckers in California are, like BBWOs throughout the species’ range, habitat specialists that rely on perhaps the most ephemeral habitat of all – areas of high tree mortality that result from very recent wildland fire or native beetle activity.

### **A. Range of Subspecies**

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; an isolated population in Black Hills, South Dakota; and another separate population in the eastern Oregon Cascades and California (Figure 2).

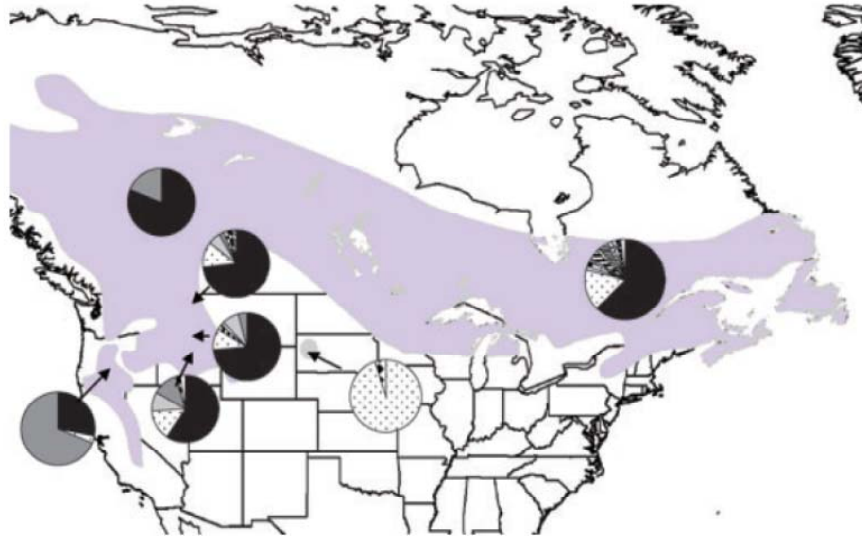


Figure 1. The distribution of Black-backed Woodpeckers (Natureserve) with 7 sampling locations: Oregon, Idaho, Missoula, Glacier, Alberta, and Quebec. The frequency of observed mtDNA cytochrome *b* haplotypes at each sampling location is represented by pie charts at each location. From Pierson et al. (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 were low in Oregon/California and South Dakota and were highest in the large boreal population (Pierson et al. 2010). 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).

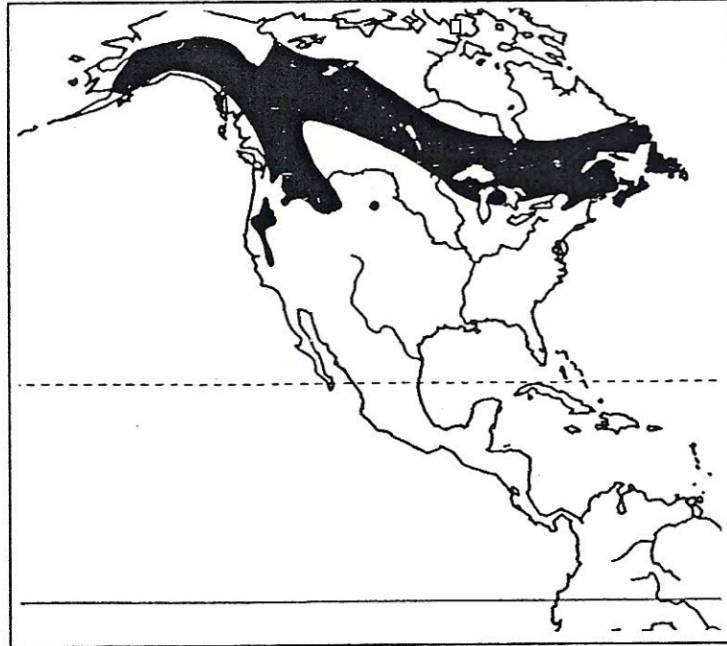


Figure 2. Map of the Range of the Black-backed Woodpecker across North America from Winkler et al. (1995), showing the three distinct populations.

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 forms a distinct subspecies of the Black-backed Woodpecker.

In addition, as noted by Pierson et al. (2010), it is possible that the California population itself is genetically distinct from the eastern Oregon Cascades population. Indeed, many range maps show large gaps in the range, and in potential habitat, between the eastern Oregon Cascades and the Sierra Nevada (e.g., Stralberg and Jongsomjit 2008 [<http://data.prbo.org/cadc2/index.php?page=maps>]).

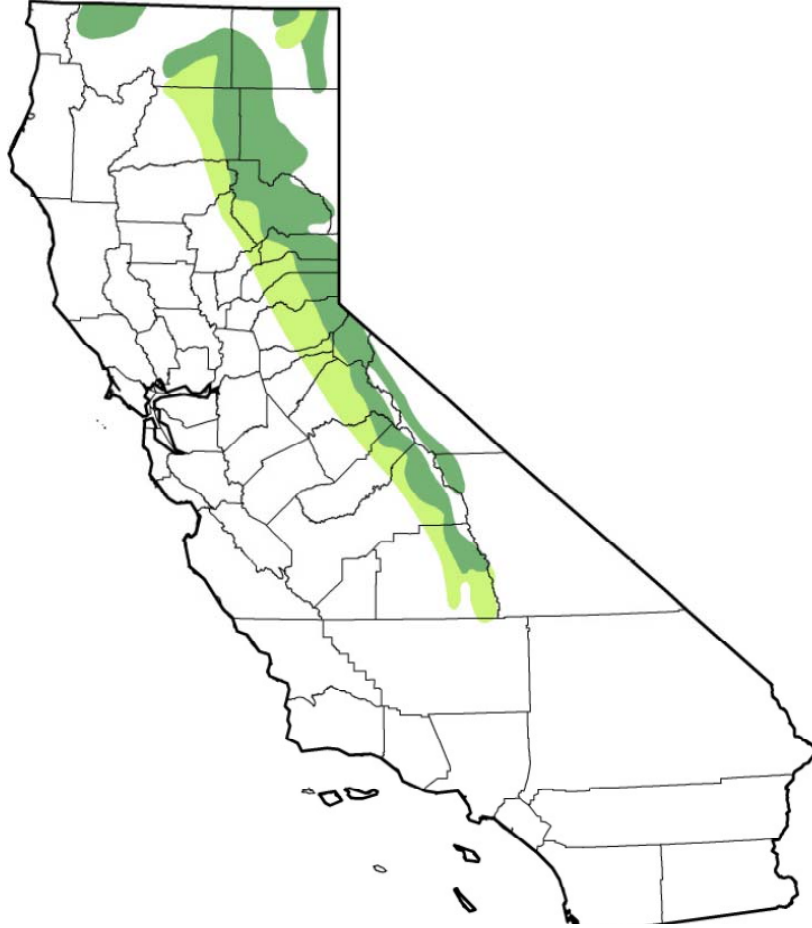


Figure 3. Gap in the range of the Black-backed Woodpecker between Oregon and California (California Department of Fish and Game 2005, from Siegel et al. 2008). Light green indicates probable winter range, dark green indicates probable year-round range.

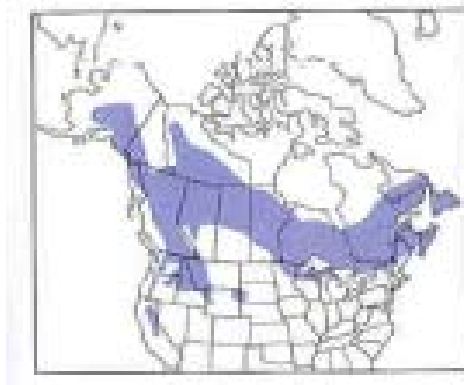


Figure 4. Discontinuity in Black-backed Woodpecker range between the eastern Oregon Cascades and the Sierra Nevada (National Geographic Society Field Guide to Birds of North America).

**Conclusion:** The Black-backed Woodpecker populations in California and the eastern Oregon Cascades form a genetically-isolated distinct subspecies, and the California population may also be its own, even more isolated, subspecies.

## **B. Suitable Habitat**

Black-backed Woodpeckers are found nesting and successfully reproducing in unlogged, intensely burned conifer forests, as well as areas of high tree mortality from beetles. Suitable Black-backed Woodpecker habitat is defined by dense, older, higher-elevation conifer forests comprised of very high densities of medium/large snags (Goggans et al. 1989, Caton 1996, Russell et al. 2007, Hanson and North 2008, Saab et al. 2009, Tarbill 2010, Siegel et al. 2011, Siegel et al. 2012a, Siegel et al. 2012b). In California, Black-backed Woodpecker occupancy drops to zero, or near zero, in lower western montane forest types in the Sierra Nevada, such as ponderosa pine/black oak and Douglas-fir/tanoak (Siegel et al. 2010, Siegel et al. 2011).

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. (2012b) 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-backed 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-backed preferentially selected larger individual snags for foraging; and g) there was a strong negative effect of post-fire salvage logging on foraging (Black-backed showed almost complete avoidance of salvage logged areas—see Fig. 10 of Siegel et al. 2012b). 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.

### **1. 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 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.

In the Sierra Nevada, Black-backed Woodpeckers nest in areas with about 275 snags per hectare, most of which are medium-sized snags 27.1-60 cm dbh (Tarbill 2010, p. 27, Table 2, and Fig. 5b). Using diameter-class midpoints (and conservatively assuming a mean diameter of 70 cm for the >60 cm dbh class), and converting to snag basal area from the data in Table 2 of Tarbill (2010) yields a snag density of 39 square meters per hectare of recent snag basal area. This is generally consistent with other findings (Burnett et al. 2012, p. 25 [133 snags per acre, or 329 snags per hectare, at nest sites], Seavy et al. 2012 [13.3 snags >23 cm dbh per 0.04-ha plot, or

about 333 snags per hectare]). Time since fire is a critical factor for the Black-backed Woodpecker, and habitat generally remains suitable for 7-8 years following fire, due to the decline of the Black-backed's food source (beetle larvae), but can remain suitable a few years longer if habitat quality is particularly high (Saab et al. 2007, Siegel et al. 2010).

Caton (1996) extensively surveyed burned and unburned forest to an equal degree in Montana, and found Black-backed Woodpeckers nesting in burned forest about ten times more than in adjacent unburned forest, and essentially all foraging occurred in burned forest (Caton 1996, Figs. 1-3). Total basal area of stands used by Black-backed Woodpeckers was 34 square meters per hectare, with nearly all of this comprised by recent snags (Caton 1996, Table 10). Caton (1996 [Table 14]) also found that post-fire logging posed a serious threat to the conservation of this species, reducing Black-backed Woodpecker abundance by sevenfold even with partial salvage logging.

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 1 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 1: Species and Condition (Snag or Live) of Nest Trees Used by Black-backed Woodpeckers from 3 studies.

Study	Site description	N	PIPO <sup>1</sup> snag	PSME <sup>2</sup> snag	PSME live	PICO <sup>3</sup> snag	PICO live	ABLA <sup>4</sup> live	LAOC <sup>5</sup> 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					

<sup>1</sup> Ponderosa pine, <sup>2</sup> Douglas-fir, <sup>3</sup> Lodgepole pine, <sup>4</sup> Subalpine fir, <sup>5</sup> Western larch

In a study of burned forests of western Idaho, Black-backed Woodpeckers selected larger trees for nesting (average =  $39.7 \pm 2.1$  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  $32.3 \pm 2.8$  cm.

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 =  $122.5 \pm 28.3$  trees  $\geq 23$  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. Similarly, Saab et al. (2007) found that Black-backed Woodpecker nest density was nearly five times lower in areas that had been even partially salvage logged following fire.

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 2: 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 ( <i>n</i> = 2 sites)	Moderate prefire canopy cover ( <i>n</i> = 2 sites)	Low prefire canopy cover ( <i>n</i> = 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 3: 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-backed 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.

## **2. 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 (Hanson 2007, Hanson and North 2008, Bonnot et al. 2008, 2009). 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. 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. 2012b).

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 ( $\geq 50$  cm) than would be expected based on availability in several burned sites throughout the Sierra Nevada, California. In the instances in which 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  $\geq 40$  cm within stands dominated by smaller-sized trees. In addition, in fires less than 5 years old, 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. By 6–8 years post-fire, Black-backed Woodpeckers may increasingly forage in more moderately burned areas, and even in unburned forest adjacent to the fire, taking advantage of delayed mortality from weakened trees killed by beetles a few years after the fire, indicating that heterogeneity created by mixed-intensity fire effects may benefit Black-backed Woodpeckers in later post-fire years before a site becomes unsuitable due to time since fire (Dudley et al. 2012).

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-backed 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 100 square meters per hectare of basal area (total) in which 28% of trees were killed by beetles, i.e., about 25-30 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]).

### 3. 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 385.8 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 4).

Table 4: 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).

Time since fire <sup>a</sup>	N	Distance (m) <sup>b</sup>	MCP <sup>c</sup>		95% FK <sup>d</sup>	95% bootstrap <sup>e</sup>
			95%	100%		
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) <sup>a</sup>

<sup>a</sup> Males 1-3 radio-tracked in 2000, male 4 in 2002

<sup>b</sup> Mean distance between successive radiotelemetry relocations. Standard error in parentheses.

<sup>c</sup> Minimum convex polygon

<sup>d</sup> Fixed-kernel

<sup>e</sup> 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 4), 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. (2012b) 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).

**Conclusion:** The published literature demonstrates time and again that the habitat most essential to the continued existence of Black-backed Woodpeckers is large patches of very high tree mortality that results from very recent wildland fire or native beetle activity within a limited subset of forest structural conditions (dense, mature/old forest) in a narrow band of higher-elevation conifer forest. The species is highly sensitive to any significant levels of salvage logging.

## **II. Listing the Black-backed Woodpecker is Warranted Because the Continued Existence of the Black-backed Woodpecker in California is in Serious Danger or is Likely to Become So in the Foreseeable Future Due to One or More Listing Factors**

Under CESA, “a species shall be listed as endangered or threatened . . . if . . . its continued existence is in serious danger or is threatened by any one or any combination of the following factors: 1. Present or threatened modification or destruction of its habitat; 2. Overexploitation; 3. Predation; 4. Competition; 5. Disease; or 6. Other natural occurrences or human-related activities.” (Cal. Code Regs., tit. 14, § 670.1) As discussed in detail below, the BBWO is endangered, or at least threatened, in the foreseeable future (the next 100 years) in the absence of special protection and management efforts. (Fish and Game Code, § 2067)

### **A. Present or Threatened Modification or Destruction of the BBWO’s Habitat**

#### **1. BBWO Habitat Loss Relative to Historic Extent**

As just explained above, BBWOs are reliant on an extremely ephemeral and narrow habitat type. In order to examine the extent to which such habitat has been reduced relative to its historic extent, by activities such as fire suppression, this analysis 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/>). This analysis was restricted to unmanaged forests (Inventoried Roadless Areas, Wilderness Areas, National Parks, and Wild and Scenic River Corridors) in order to eliminate stand initiation from logging from the analysis. The rate of new stand initiation has declined substantially in all areas since the early 20<sup>th</sup> century, but the decline has been the most severe within the California and eastern Oregon Cascades populations, which have seen a more than fourfold decline in habitat since the early 20<sup>th</sup> century, equating to a substantial 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 Figure 5 below).

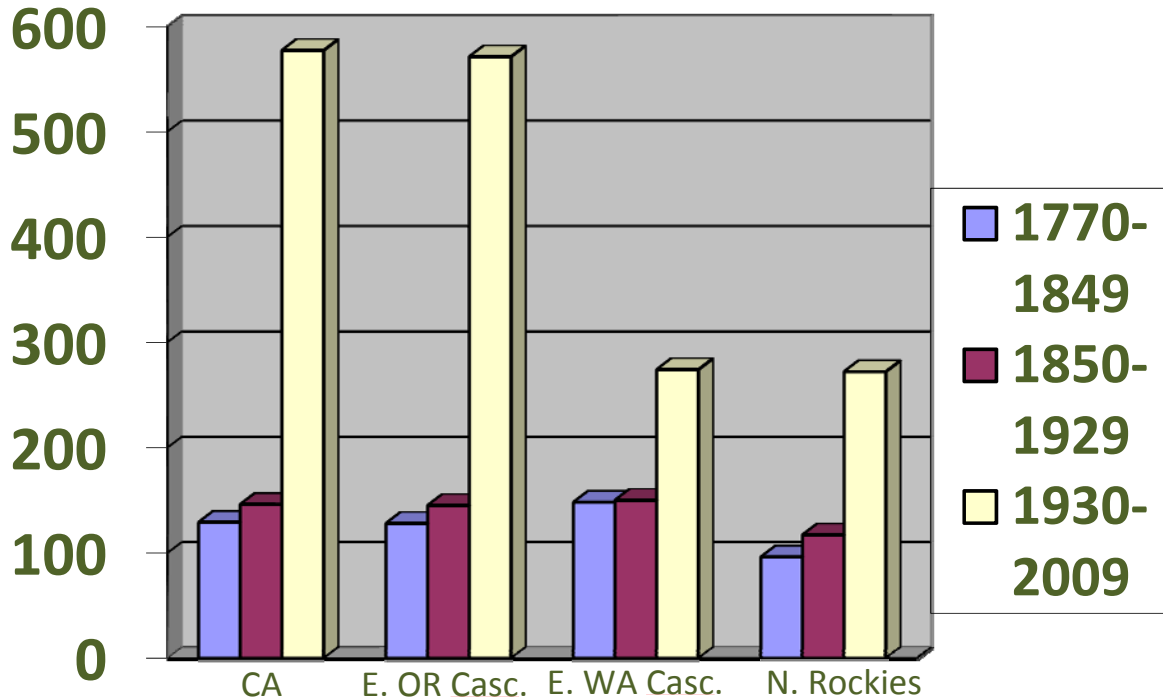


Figure 5. Rotation interval of high-intensity natural disturbance in years (y-axis) since the 19<sup>th</sup> century in unmanaged conifer forests within the range of the Black-backed Woodpecker in California, eastern Oregon Cascades, eastern Washington Cascades and northern Rockies.

Because of the extremely close association between Black-backed Woodpeckers and higher-intensity fire, the large decline in high-intensity fire since the early 20<sup>th</sup> century can be expected to correspond to a similar decline in Black-backed Woodpecker populations within their range in California. Any assumption to the contrary would depart dramatically from the known data about population densities in burned versus unburned forest (see, e.g., Russell et al. 2009). This decline in post-fire habitat is exacerbated by post-fire logging (described above), which further widens the gap between historic and current amounts of Black-backed Woodpecker habitat. Indeed, Cooper (1870) described the Black-backed Woodpecker as “quite numerous” in 1870,

long before fire suppression and post-fire logging policies. Today, it is consistently described as very rare, and is one of the rarest forest birds in the Sierra Nevada (Burnett et al. 2010 [Table 1], Burnett et al. 2011 [Table 1]).

To expand upon the analysis above (Figure 5) which compared current to historic high-intensity fire extent, in this Status Review we examined standard U.S. Forest Service satellite imagery data (RdNBR data; see [www.mtbs.org](http://www.mtbs.org)), using the same RdNBR threshold (641) to define high-intensity fire as that used by the Forest Service in Miller and Thode (2007) – a threshold that defines high-intensity fire broadly and inclusively such that it equates to approximately 60-70% basal area mortality (Hanson et al. 2010) (i.e., significant amounts of moderate-intensity fire are also included) – and we found that the current high-intensity fire rotation interval for middle/upper montane westside forests and eastside forests combined is 791 years since 1984. This is longer than rotations prior to the influence of fire suppression based on available research that allows calculations of historic rotations. Bekker and Taylor (2001), in a remote, unmanaged area of mixed-conifer and upper montane forest in the southern Cascades of California, found that 50-60% of these forests experienced high-intensity fire over a 76-year period prior to effective fire suppression. Baker (2012), using U.S. Government field plot data from the mid/late 1800s, found a high-intensity fire rotation of 435 years in dry mixed-conifer forests of the eastern Cascades of Oregon, and a mixed/high-intensity rotation of about 165 years. Minnich et al. (2000) studied fire intensity patterns in mixed-conifer forests of northern Baja California, Mexico within an area that had not been logged or subjected to fire suppression. In these forests, Minnich et al. (2000) found a natural high-intensity fire rotation of 300 years. In a modeling study reconstructing historic fire patterns, Stephens et al. (2007) estimated a high-intensity fire rate, prior to 1850, of 5% every 12 to 20 years for ponderosa pine and mixed-conifer forests of the Sierra Nevada (rotation of 240 to 400 years), and shorter rotations for upper montane fir forests. In another study, Collins and Stephens (2010), an average of 15% high-intensity fire was found in reference mixed-conifer forests with overall fire frequencies that were similar to those used in Stephens et al. (2007), suggesting similar, or slightly shorter, high-intensity fire rotations relative to those modeled in Stephens et al. (2007). In short, the multiple sources of data strongly indicate that there is substantially less high-intensity fire now than there was historically. A recent analysis of high-intensity fire in the Sierra Nevada management region (Sierra Nevada and Cascade-Modoc region in California) concluded that, overall, only 102,944 hectares of high-intensity fire have occurred across a total of 3,172,308 hectares of montane conifer forest, equating to a high-intensity fire rotation interval of 801 years (Miller et al. 2012b, Table 3). The authors noted that current high-intensity fire rotation intervals in the western Sierra Nevada and Cascade-Modoc regions, which comprise 75% of the total, range from 859 years to nearly 5,000 years, and are too long relative to the natural frequency of high-intensity fire to maintain biodiversity, recommending *increased* high-intensity fire in these regions, which comprise most of the Black-backed Woodpecker's range in California (Miller et al. 2012b).

With regard to high-intensity fire patch size alone, data do not yet exist to compare current patches to historic ones. The first analysis to be conducted on this subject occurred recently in ponderosa pine and mixed-conifer forests of Colorado's Front Range – forests that are similar in species composition to those of the Sierra Nevada, and which have been fire-suppressed like Sierra Nevada forests. The authors found that both mean and maximum high-intensity patch sizes were higher historically, and have become smaller since fire suppression (Williams and

Baker 2012b). High-intensity fire patches sometimes reaching thousands of hectares in size each were documented in pre-fire suppression conifer forests of the northern Sierra Nevada (Leiberg 1902) and southern Cascades in California (Bekker and Taylor 2010).

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). This is also true in forests that have “missed” several “fire return intervals” since the beginning of fire suppression, and such forests are not burning at higher intensity than forests with fewer “missed” fire return intervals (Odion and Hanson 2006, Odion and Hanson 2008, Odion et al. 2010, Miller et al. 2012, van Wagtendonk et al. 2012). This is likely due to natural self-thinning of understory vegetation (both small conifers and shrubs) and lower branches in older stands as canopy cover becomes high with increasing time since the last fire, thus shading-out subcanopy and lower-canopy vegetation (Odion and Hanson 2006, Odion et al. 2010).

**Conclusion:** Black-backed Woodpecker habitat has declined dramatically (fourfold) since the 19<sup>th</sup> century in California due to fire suppression. This decline is exacerbated by *additional* habitat loss and degradation from post-fire salvage logging and intensive landscape-level mechanical thinning, as discussed below.

## **2. Extreme Scarcity of Moderate and High Quality Suitable Habitat**

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, this analysis employed 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 (the year reliable satellite imagery became available to determine fire intensity) 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 is 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 below – i.e., substantial portions of the area in light green has been logged):

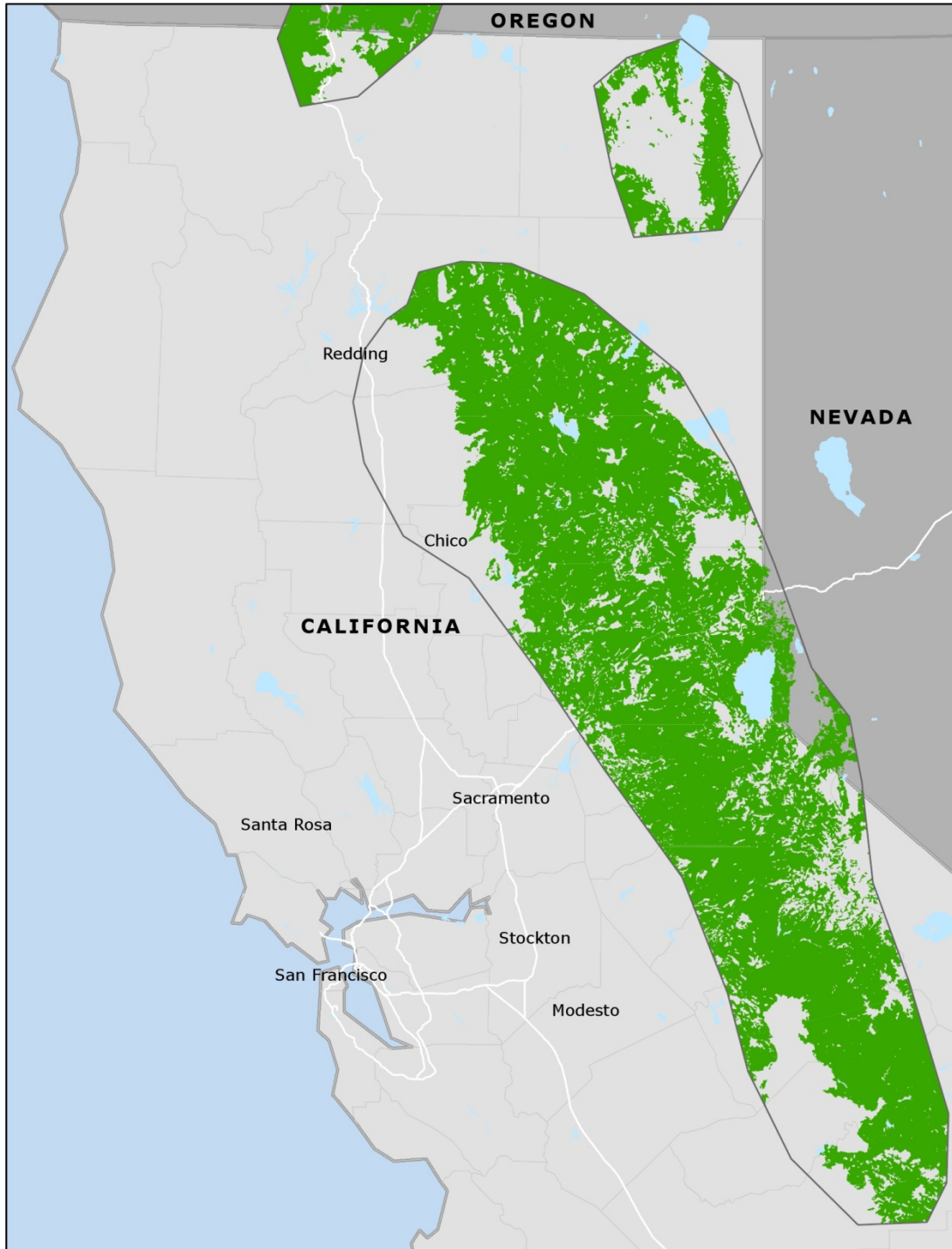


Figure 6a. The current distribution of conifer forest types that could potentially be used by the Black-backed Woodpecker in California.

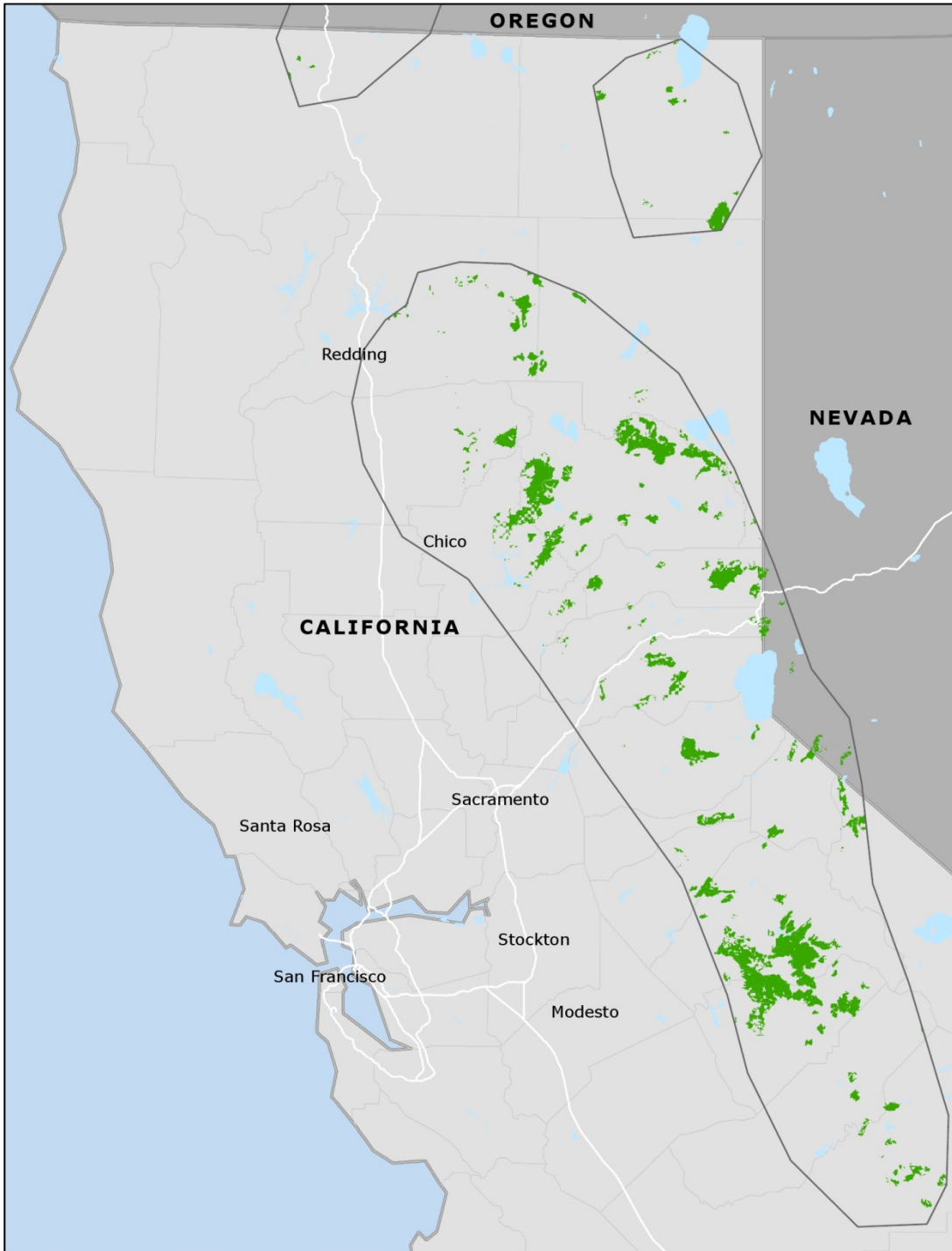


Figure 6b. Fires since 1984 on federal lands within relevant forest types on federal lands in California.

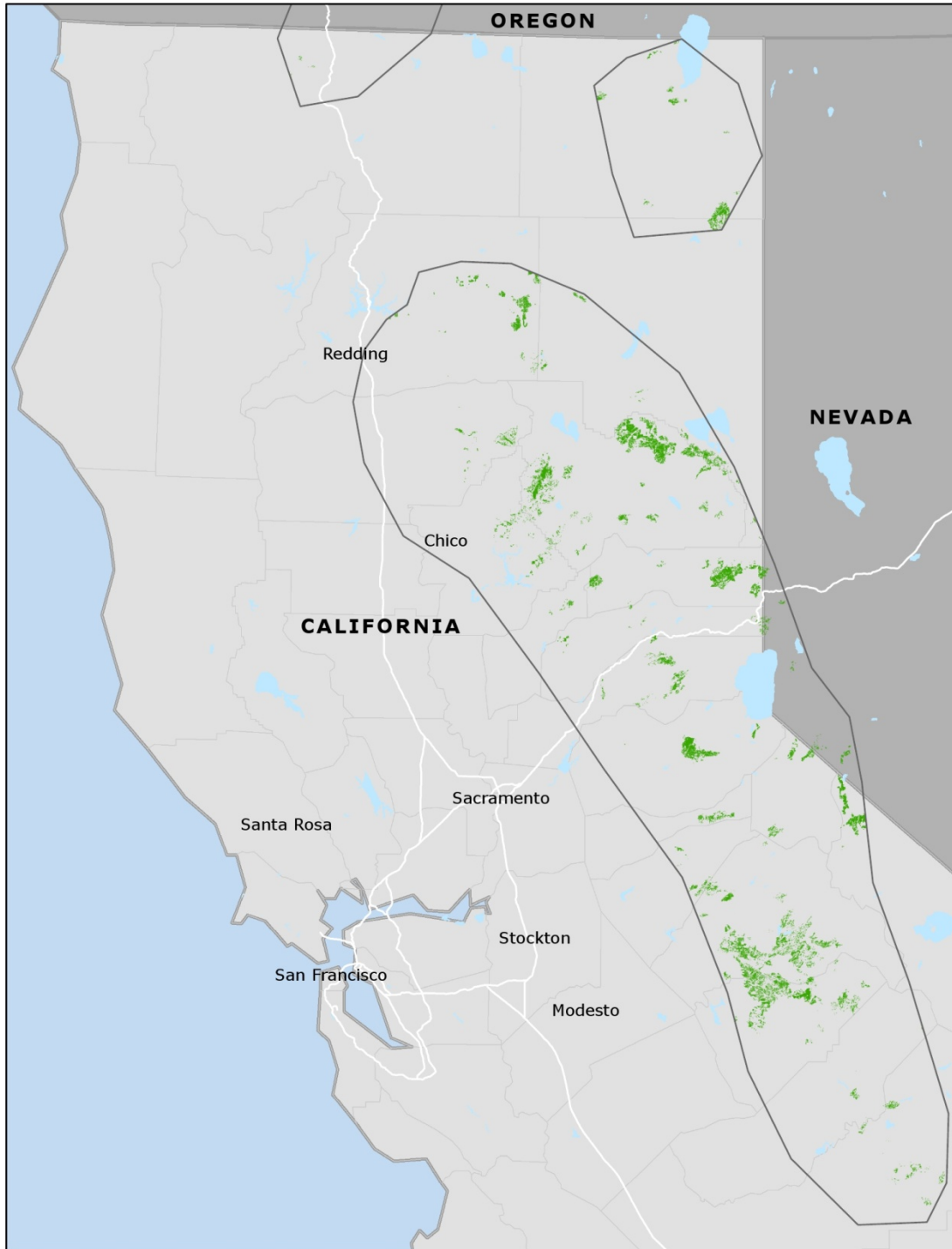


Figure 6c. Fires since 1984 with higher intensity fire effects ( $RdNBR > 574$  from satellite imagery, corresponding to  $>50\%$  mortality in trees over 30 cm in diameter [Hanson et al. 2010]) within relevant forest types on federal lands in California.

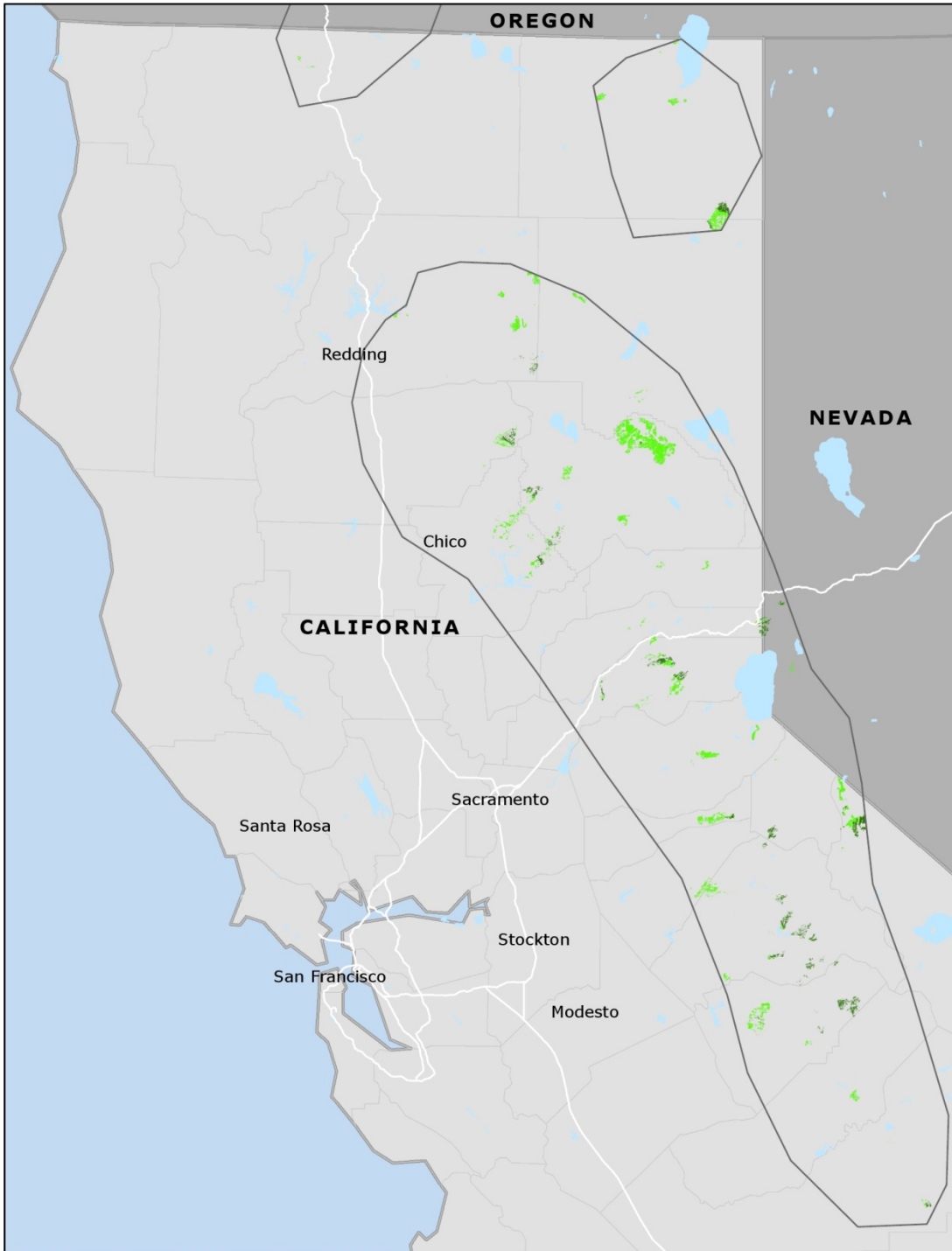


Figure 6d. Moderate/high-intensity fire since 2001 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green in California.

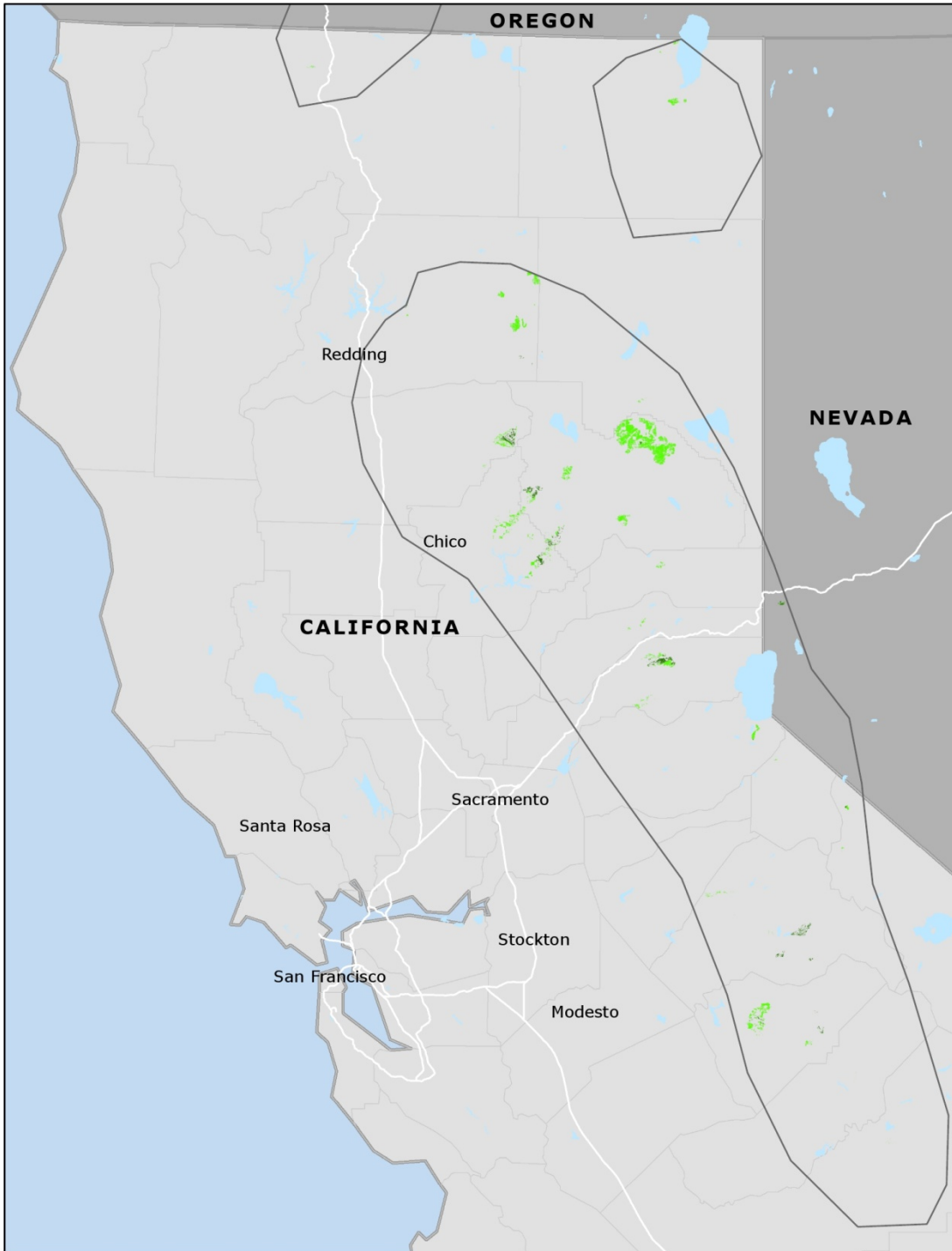


Figure 6e. Moderate/high-intensity fire since 2006 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green in California.

### **3. Destruction of Habitat and Lack of Regulatory Mechanisms to Protect the Species or Its Habitat**

Black-backed Woodpecker habitat is directly eliminated and indirectly reduced or degraded by management actions conducted on public and private forests throughout the range of the species. Habitat is systematically lost, or prevented from occurring in the first place, through post-disturbance salvage logging, active fire suppression, and pre-disturbance thinning (which is designed to reduce fire risk or tree mortality from beetles). 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 harmful activities like 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). Moreover, not only are harmful activities taking place in regard to BBWO habitat, there are currently no meaningful regulatory prescriptions in place that offer Black-backed Woodpeckers the protections necessary to prevent further declines of the species' habitat (Hanson 2007, Hanson and North 2008), and, as explained below, future climate changes may further reduce habitat availability.

#### **a) 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). Logging of recently killed trees (due to fire or beetles) is perhaps the most important and most well-documented threat to the viability 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, and foraging behavior, in forests with any significant level of salvage logging as compared to unlogged post-disturbance forests (Goggans et al. 1989, Hutto 1995, Hutto and Gallo 2006, Saab et al. 2007, Hanson and North 2008, Hutto 2008, Cahall and Hayes 2009, Siegel et al. 2012b [clearcut salvage logging eliminated foraging]). 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 post-fire habitat critical for Black-backed Woodpeckers and instead, eliminates it. 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. In the northern Sierra Nevada, Burnett et al. (2011 [pp. 29-30]) only found Black-backed Woodpecker nests in post-fire habitat on national forest lands that had not yet been salvage logged, and found none on salvage logged private lands, despite some snag retention. Burnett et al. (2012 [Fig. 8]) found that, for nesting habitat, Black-backed Woodpeckers selected areas with over 200 snags per hectare (>8 snags per 11.3-meter-radius, or 0.04-ha, plot), and Black-backed Woodpecker nesting potential dropped to near zero below 100 snags per hectare. Saab and Dudley (1998) followed 17 Black-backed Woodpecker nests from 1994 to 1996 in forests of western Idaho that had 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  $73.4 \pm 9.3$  snags >23cm/ha, and after logging were  $45 \pm 5.1$  snags >23cm/ha and  $129.6 \pm 19.8$  snags  $\leq$ 23cm/ha. The unlogged burned stands had  $67.8 \pm 11.5$  snags >23cm/ha and  $100.4 \pm 19.7$  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. Caton (1996) found that post-fire salvage logging reduced Black-backed Woodpeckers by sevenfold even though much of the salvage logging was only partial.

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 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 ( $\geq 50$  cm) snags/ha in intensely burned forest, could reduce foraging habitat quality for Black-backed Woodpeckers.

The authors surveyed for the species in three 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 ( $\geq 50$  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 described 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.

Similar to post-fire habitat, in the rare areas of very high tree mortality from beetles in unburned forest, 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.

**b) Ongoing Fire Suppression**

As discussed in greater detail above in Sections II.A.1 and II.A.2., suitable Black-backed Woodpecker habitat has been dramatically reduced due to fire suppression. This threat is ongoing, and indeed appears to be worsening as the Forest Service in 2012 ordered that all wildland fires, including lightning fires, be suppressed even in remote roadless and Wilderness Areas (USDA 2012a).

**c) Forest Thinning—Suppression of Natural Tree Mortality**

Post-disturbance salvage logging represents the most obvious negative impact to Black-backed Woodpecker populations. However, actions designed to prevent moderate-high intensity fire from occurring prevents the woodpeckers’ preferred habitat from being created. These forest thinning projects detrimentally affect the Black-backed Woodpecker in multiple ways. If the thinning projects meet their desired objectives, then high-intensity fire, or significant beetle mortality, is precluded, and Black-backed Woodpecker habitat that otherwise might have been created is also precluded. 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. 7 below).

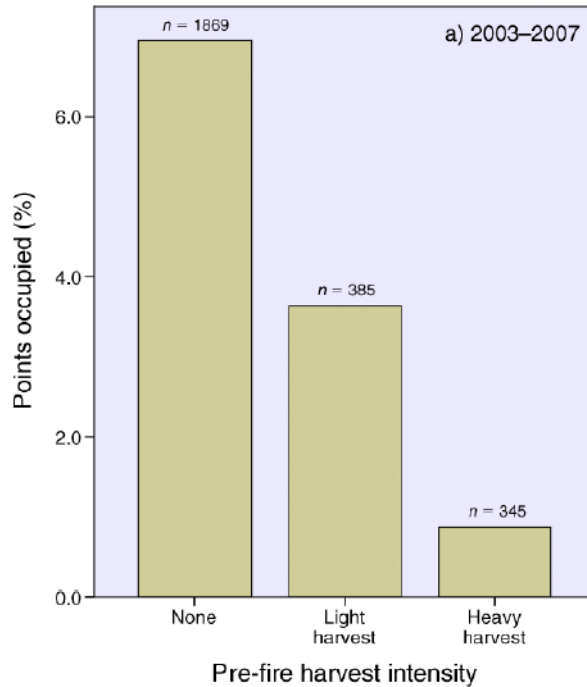


Figure 7. The probability of detecting a Black-backed Woodpecker decreases substantially with intensity of recent pre-fire thinning. From Hutto (2008 at p. 1,830).

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, 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). Moreover, in addition to the substantial loss of habitat quality in thinned areas that later burn, thinning also adversely affects Black-backed Woodpeckers in unburned forests because thinning targets the densest, older forests and substantially reduces stand density with the goal of reducing or preventing recruitment of new snags. Thus, thinning prevents occurrence of the small number of areas in unburned forest that are sufficiently dense to facilitate snag levels (due to recruitment from competition) adequate for Black-backed Woodpecker nesting (see pp. 65-66 below), further threatening the species, especially in periods when fire is scarce.

**Conclusion:** Salvage logging after natural disturbances from fire or insects poses a serious threat to the viability of Black-backed Woodpecker populations. Ongoing landscape-level forest thinning similarly threatens the viability of Black-backed Woodpecker populations.

#### **4. Current Laws and Regulations Do Not Protect BBWO Habitat**

##### **a) Public Land**

##### **i. U.S. Forest Service’s Elimination of the Wildlife Viability Requirement**

In January of 2012, the Forest Service issued a Final Programmatic Environmental Impact Statement (PEIS) for a system-wide national forest planning rule that will govern all national forests in the U.S. under the National Forest Management Act (NFMA). The PEIS identified the 1982 NFMA planning rule as a potential alternative, but then eliminated it. 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]).

In the Final PEIS, the Forest Service selected an alternative, Modified Alternative A, that does not contain a wildlife viability requirement and instead creates a standard that applies only if a given Regional Forester chooses to designate the Black-backed Woodpecker (or any other species) as a “Species of Conservation Concern” (<http://www.fs.usda.gov/planningrule>; 36 C.F.R. 219.9). Consequently, if the Regional Forester does not designate the Black-backed woodpecker as a “Species of Conservation Concern” then the Forest Service will not be bound, in any given Forest Plan, to “provide the ecological conditions necessary to . . . maintain a viable population” of the Black-backed woodpecker. (36 C.F.R. 219.9.) It remains to be seen whether the Black-backed woodpecker will receive this designation for National Forests in California. Moreover, unlike the 1982 NFMA regulations, the new 2012 regulations do not apply directly to

site-specific projects, but rather only govern Forest Plan amendments and revisions.

The 2012 national planning rule will apply to Forest Plans created in the future; thus, until new Forest Plans are issued by any given National Forest unit, current Forest Plans will continue to guide the agency's decisions. Recently, in the Sierra Nevada region, the U.S. Forest Service, for the first time ever, argued in federal court that its Lake Tahoe Forest Plan does not actually contain a wildlife viability mandate, and therefore, project level decisions need not explain how they are contributing to the maintenance of viable populations. The Court agreed, and as a result, only if a Forest Plan "contain[s] *specific provisions* regarding wildlife viability" will a project in a National Forest be required to demonstrate viability for any given species. *Earth Island Inst. v. United States Forest Serv.*, 697 F.3d 1010 (9th Cir. 2012) (emphasis in original).

The Forest Plan at issue in *Earth Island Inst. v. United States Forest Serv.* explicitly stated that "[t]he Forest Service must manage habitat to, at the least, maintain viable populations." *Id.* Nonetheless, the Court found that such a statement in a Forest Plan is not "specific" and does not create any mandatory duties that must be addressed at the project level in regard to species viability. *Id.* Consequently, Forest Plans that were previously believed to have a project-level viability requirement (because of statements such as the one in the LTBMU Forest Plan), do not in fact have such a requirement in light of the recent Court ruling. This situation is exacerbated by the fact that the Forest Service has an acknowledged financial conflict of interest in regard to the projects it oversees and keeps 100% of all timber sales revenue from selling fire-killed or beetle-killed trees on national forests to the commercial logging industry. *Earth Island Inst. v. United States Forest Serv.*, 442 F.3d 1147, 1178 (9th Cir. 2006) ("It has not escaped our notice that the USFS has a substantial financial interest in the harvesting of timber in the National Forest. We regret to say that in this case, like the others just cited, the USFS appears to have been more interested in harvesting timber than in complying with our environmental laws."). The situation is further exacerbated by the fact that the Regional Office of the U.S. Forest Service in California (Region 5) unveiled a "Leadership Intent" document designed to govern and guide all upcoming forest plan revisions. This document<sup>2</sup> states a goal of eliminating higher-intensity wildland fire and patches of high tree mortality from native beetles – i.e., eliminating the habitat most essential to the continued existence of Black-backed Woodpeckers – and the first proposed forest plan revision (the Lake Tahoe Basin Management Unit forest plan revision, 2012 Draft Environmental Impact Statement) since the Leadership Intent document was released proposes to allow 90% removal of suitable Black-backed Woodpecker habitat, and contains no requirement to maintain viable populations of Black-backed Woodpeckers (USDA 2012b).

These legal developments represent a threat to the conservation of Black-backed Woodpecker populations in California, especially given that most of the Black-backed Woodpecker habitat created by natural disturbance in these areas is on national forest lands and in unprotected landscapes – i.e., 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

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<sup>2</sup> See [www.fs.fed.us/r5/EcologicalRestoration/pdfs/LeadershipIntent.pdf](http://www.fs.fed.us/r5/EcologicalRestoration/pdfs/LeadershipIntent.pdf)

23.1—see figures for East-side ponderosa pine through limber pine]). On federal lands, my GIS analysis of current suitable habitat 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.

ii. **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 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 an 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. 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.

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 greatly reduce high-intensity fire on 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, results in an additive loss of available habitat for Black-backed Woodpeckers in California. Moreover, the 2004 SNFPA’s elimination of previous protections for old forest

that experienced high-intensity fire has significant 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. Hanson (2007) 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 forest lands under the 2004 SNFPA (outside of designated Wilderness), existing rules/laws are inadequate to protect the woodpecker. Moreover, only about one-quarter 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 should 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.

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 (USDA 2004). Moreover, 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 wrongly 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 could 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. In 2012, the Forest Service commissioned a conservation strategy for the Black-backed Woodpecker in California, which was released in early October of 2012 and recommends some meaningful conservation measures to conserve and recover Black-backed Woodpecker populations in California (Bond et al. 2012). However, the Forest Service has expressed no intention to incorporate any of the conservation strategy’s recommendations into forest plans.

### **iii. 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 assumes that 100 percent population potential for Black-backed Woodpeckers is maintained by retaining 0.12 conifer snags per acre (over 43 cm dbh) 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). The Plan’s snag guidelines were based upon densities of potential individual nest trees, without regard to the required food source for native woodpeckers, such as the Black-backed, and, therefore, fails 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. 2012b).

**Conclusion:** On public lands, while some constraint existed in past years on the Forest Service’s ability to salvage log suitable Black-backed Woodpecker habitat, as of 2012 that is no longer the case, and the agency has formally announced a campaign to prevent and eliminate suitable Black-backed Woodpecker habitat on national forests in the Sierra Nevada, creating a major threat to Black-backed Woodpecker populations.

## **b) Private Lands**

### **i. 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 FPRs”). The FPRs are administered by the California Department of Forestry and Fire Protection (Cal Fire), and are the regulations implementing the Z’berg Nejedley Forest Practices Act of 1973 (Cal. Pub. Res. Code Ch. 8). The FPRs generally 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 (Cal. Pub. Res. Code, §§ 21000-21177). However, under what are referred to as Emergency Notices (Cal. Pub. Res. Code, § 4592) , as well as Exemption Notices (Cal. Pub. Res. Code, § 4584(c)), private land holders can salvage log without filing a Timber Harvest Plan.

Under an Exemption Notice, the harvesting of dead or dying trees of any size in amounts less than 10% of the average volume per acre may begin immediately when the conditions listed under Cal. Code Regs., tit. 14, § 1038(b)(1-10) are met (or § 1038(f)(1-16) in the Tahoe Basin). However, if the timberland proposed for harvest under the exemption is “substantially damaged,” the limit of 10% of the volume per acre above does not apply when harvesting dead trees which are unmerchantable as sawlog-size timber (see Cal. Code Regs., tit. 14, §1038(d) or § 1038(f)(16)).

Under an Emergency Notice, an “emergency” means that conditions exist that will cause “waste or loss” of timber resources that may be minimized by immediate harvesting (see Cal. Code Regs., tit. 14, § 895.1). Timber operations performed under an Emergency Notice must comply with the operational provisions of the Forest Practice Act and District Forest Practice Rules applicable to a Plan.

The Forest Practice Act and FPRs together allow both the destruction of, and the prevention of, black-backed woodpecker habitat, and do little to provide for elements essential to the species, such as large trees, snags and downed wood, and high canopy closure.

Moreover, the current predominant lack of forests with late-successional characteristics on private lands means that little private land, when it burns, will provide the highest quality BBWO habitat. This reality of a lack of mature or old forest on private lands is likely to continue for the foreseeable future given that the FPRs do not require the creation of old or mature forest habitat and allow for rotations that preclude a forest from achieving mature status and maintaining such status.

Specific even-aged regeneration methods allowed in the FPRs 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 FPRs also allow uneven-age regeneration prescriptions, including transition, selection, and group selection logging (Cal. Code Regs., tit. 14, § 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 FPRs also define several “intermediate treatments.” (Cal. Code Regs., tit. 14, § 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 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; Cal. Code Regs., tit. 14, § 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 (Cal. Code Regs., tit. 14, § 913.3 (b)). The FPRs provide little criteria for defining what constitutes a dying or deteriorated 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” (Cal. Code Regs., tit. 14, §§ 919.4, 939.4, 959.4). However, the FPRs 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 FPRs fail to identify what constitutes a significant impact, and reduction of impacts is generally treated as unnecessary because impacts are treated as insignificant.

Although snags clearly are a critical component of woodpecker habitat, the FPRs 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 (Cal. Code Regs., tit. 14, § 919.1 (d)) snags near roads and ridge tops (Cal. Code Regs., tit. 14, § 919.1 (a)(1), (a)(2)). The FPRs 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 any meaningful retention of snags.

In conclusion, few or none of the logging prescriptions described in the Forest Practice Act or the FPRs would result in retention of habitat features critical to the maintenance of Black-backed Woodpecker populations on private land. Emergency management, exemption management, and salvage logging together allow essentially all of the intensely burned forests on private lands to be harvested with no protections or even surveys for the Black-backed Woodpecker. The net result is that the FPRs 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.

## ii. Oregon Forest Practices Act

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

**Conclusion:** Very few protections exist for Black-backed Woodpecker habitat on private lands thus resulting in such lands being essentially non-habitat.

## 5. Significant Post-fire Salvage Logging is Occurring on Public and Private Lands

I have gathered information on post-fire salvage logging (both public and private lands) and commercial thinning operations (public lands) over the past 7-9 years (the time frame for which burned forests may remain suitable for *P. arcticus*) in the Sierra Nevada, which comprises essentially all of the Black-backed Woodpecker's range in California. Herein, I present this information which is evidence that post-fire salvage logging primarily, and commercial thinning secondarily, is resulting in the loss of habitat for the woodpecker. I express the area involved in

acres, rather than in hectares, in this section because the documents cited used acres instead of hectares.

a) **Public Land**

Most (over three-quarters) of the Black-backed Woodpecker habitat created since 2003 occurred within a small number of fire areas: the Moonlight and Wheeler fire area; the Angora fire area; the Freds fire area; the Power fire area; the American River Complex fire area; the Chips fire area of 2012; and the Reading fire area of 2012. As described above, most of the 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

(USDA 2008). 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, as well as commercial sawtimber (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 [Fred's 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 [Fred's 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 (9th 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, Table 1.1).

*2012 Fires:* The three main fires creating habitat within the range of the Black-backed Woodpecker on public lands in California in 2012 are the Reading fire, the Chips fire, and the Barry Point fire. The Reading Fire, at 28,079 acres, had a very slow rate of spread for the great majority of its duration, indicating low fire intensity and relatively few patches of moderate/high-intensity fire in dense, mature/old conifer forest (<http://www.inciweb.org/state/5>) (see fire perimeter maps by date). The U.S. Forest Service has stated that it plans to salvage log the portion of the Reading fire on the Lassen National Forest, recently issuing a Proposed Action that would eliminate, according to our estimate, about 80% of the suitable Black-backed Woodpecker habitat in the Reading fire area on the Lassen National Forest. The Chips fire, at about 75,000 acres, is primarily at elevations (900 to 1400 meters) too low for Black-backed Woodpeckers (Siegel et al. 2011), and about half of this fire burned through the 2000 Storrie fire, either more rapidly in some of the high-intensity fire areas from 2000 (which creates no new Black-backed Woodpecker habitat, since the trees can only be killed once) or more slowly/lightly in areas that burned at lower-severity in 2000 (which also creates little or no new Black-backed Woodpecker habitat) (<http://www.inciweb.org/state/5>). About half of this fire burned outside of the 2000 Storrie fire, occasionally somewhat more rapidly, indicating some moderate- and high-intensity fire effects, to the west, southwest, south, east, and northeast of

Butt Valley Reservoir, but most of this area is, once again, too low in elevation to provide good Black-backed habitat and most of the higher-elevation portion of the burn (above 1500 meters) is on a large private timberland inholding to the east and northeast of Butt Valley Reservoir (<http://www.inciweb.org/state/5>; see fire perimeter maps by date), where it is currently subject to post-fire clearcutting. A few larger patches (80-150 hectares) of moderate/high-intensity fire in mature forest occurred east and northeast of Butt Valley Reservoir on national forest lands at sufficiently high elevations to provide Black-backed Woodpecker habitat. However, the Plumas National Forest has stated its intention to salvage log this area. Extensive roadside “hazard” tree salvage logging has already occurred in the fire area, and the Lassen National Forest recently released a Proposed Action that would salvage log nearly all of the suitable Black-backed Woodpecker habitat on the Lassen National Forest side of the Chips fire, and a smaller portion of the Plumas National Forest. It is not yet clear whether additional post-fire logging proposals will be issued with regard to the portion of the Chips fire in the Plumas National Forest. A smaller amount of habitat was created in the Barry Point fire on the Modoc National Forest (16,524 acres of fire overall on national forest lands on the Modoc National Forest, with about 5,280 acres burning at high intensity, but some of this occurred in pinyon/juniper forest types not used by Black-backed Woodpeckers). The Modoc National Forest has proposed thus far to salvage log 2,000 acres of post-fire habitat, which may represent the majority of the high-intensity burn area within forest types used by Black-backed Woodpeckers. Moreover, additional salvage logging proposals may arise with regard to this fire area.

#### **b) Private Land**

The vast majority of the Black-backed Woodpecker habitat created on private lands since 2003 occurred within the Moonlight and Wheeler fire area, and lesser, but significant, amounts occurred on private lands in the Freds and Power fire areas, and in the 2012 Ponderosa fire. 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, I 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, I 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 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, I 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.

*Ponderosa fire of 2012:* The Ponderosa fire (27,676 acres according to CalFire's website) is entirely on private timberlands, and other private property, and is currently being subjected to post-fire salvage clearcutting. No suitable habitat for the Black-backed Woodpecker will remain.

**Conclusion:** Extensive post-fire salvage logging, focused on areas suitable to Black-backed Woodpeckers, greatly exacerbates the ongoing deficit of suitable Black-backed Woodpecker habitat caused by fire suppression, posing a major threat to Black-backed Woodpecker populations.

**6. Even if the Amount and Severity of Fire Increases in the BBWO's Range, Anthropogenic Climate Change and Its Associated Impacts to Suitable BBWO Habitat are Projected to Lead To a Contraction and Net Loss of Habitat**

Audubon (2009) and Stralberg and Jongsomjit (2008) predict substantial range contractions for the Black-backed Woodpecker in the coming decades due to a large-scale loss of higher-elevation montane and subalpine conifer forests from climate change. Moreover, the studies that project an increase in fire behavior in the future, based upon the assumption that the longstanding trend of increasing precipitation will reverse itself, also project a much larger overall loss of montane and subalpine conifer forest types, such that the net effect is a dramatic reduction of the intersection of wildland fire and montane conifer forest (Lenihan et al. 2008 [Figs. 1 through 3]; see also Gonzalez et al. 2010 [Figs. 1 through 3—reporting an actual long term trend of increasing precipitation, assuming a future trend of decreasing precipitation, and projecting slight increases in fire in the southernmost Sierra Nevada, and no change or decreases in fire in the northern Sierra Nevada, but also projecting a loss of about half or more of the montane conifer forest in the Black-backed's range in California]). In short, the middle and upper-montane conifer forest types upon which the Black-backed Woodpecker depends (in snag forest patches, following significant natural disturbance) are projected to move upslope and substantially diminish in their overall spatial extent, replaced by lower montane hardwood/pine forest types (which are not suitable for Black-backed Woodpeckers, even if burned) that will move upslope. These results indicate the likelihood of a dramatic contraction of the Black-backed Woodpecker's range in the coming decades due to anthropogenic climate change. In addition, without protections for Black-backed Woodpecker habitat, any increase in fire would not result in an increase in habitat but, rather, an increase in the area salvage logged. Further, due to fire suppression, availability of habitat may become inconsistent in time and space even if overall fire area increases, due to easy suppression of smaller fires across the landscape. This is of particular concern, given that the maximum detection distance for Black-backed Woodpeckers

appears to be about 50 km (Hoyt and Hannon 2002). Thus, the occurrence of periods wherein fire occurs mainly in a smaller number of larger fires, separated by large distances, can lead to fire areas being undetected and unoccupied by Black-backed Woodpeckers, and prolonged conditions of suboptimal foraging, as well as local extinctions where energy requirements cannot be met. Indeed, we are already seeing this begin to occur, as Black-backed Woodpeckers cannot be detected in nearly half of the fire areas in which they should be found in the Sierra Nevada (Siegel et al. 2008 [p. 1: not detected at 9 of 19 fire areas surveyed], Siegel et al. 2010 [p. 1: not detected at 23 of 51 fire areas], Siegel et al. 2011 [p. 1: not detected at 20 of 49 fire areas], Siegel et al. 2012 [p. 2: not detected at 26 of 50 fire areas]).

Moreover, a number of scientific studies project a decrease in future fire in California's forests, rather than an increase. While temperature has increased somewhat, precipitation, including summer precipitation, has also been on an increasing trend for decades – a more substantial upward trend, in fact (Mote 2003, Hamlet et al. 2007, Gonzalez et al. 2010 [Fig. 1b], Crimmins et al. 2011). This factor, increasing summer precipitation, has a profound suppressing effect on fire activity (even with relatively small increases), one that may well outweigh temperature (Krawchuk and Moritz 2011). Numerous studies project a decrease in future fire in California's forests, while in some cases projecting an increase in desert areas and the Great Basin (see, e.g., Krawchuk et al. 2009 [Fig. 3], Gonzalez et al. 2010 [Fig. 3b], Liu et al. 2010 [Fig. 1]).

Some modeling studies predict that fire will increase in California's forests in the future, but the modeling assumptions chosen by the authors of these studies are based upon the presumption of substantially decreased precipitation, including summer precipitation, in the future, despite a century-long trend of increasing precipitation with climate change, and these studies do not explain why they believe that this longstanding precipitation pattern will reverse itself, and decrease substantially, in the future under the same climate change trend conditions under which precipitation has increased for the past several decades. For example, the projected potential increases for biomass burning in Marlon et al. (2012) are based upon modeling that assumes hotter and drier (drought) conditions (see Fig. 2 of Marlon et al. 2012), rather than the warmer and wetter trend that has actually been occurring in most western U.S. forests, including California, as discussed above. Further, the increases in fire that these studies project, under the assumption of decreased precipitation, are quite modest – generally averaging about 20% by the end of the century (see, e.g., Lenihan et al. 2003, Lenihan et al. 2008; see also Moritz et al. 2012) – and such an increase, if it occurred, would not even come close to making up the dramatic current fire deficit relative to natural historic conditions, as discussed above (see also Stephens et al. 2007 [concluding that overall fire extent, or average area burned annually, is currently several times lower in California's forests than it was in the 19<sup>th</sup> century, prior to fire suppression]).

Nor do most scientific studies indicate that fires are becoming more severe. Miller et al. (2009) reported increased fire intensity in Sierra Nevada forests since 1984, but this study did not include 40% of the fire intensity data available at the time the study was prepared, and used a vegetation layer that post-dated the time series and thus excluded much of the conifer forest that burned at high intensity in the earlier years. In an update of Miller et al. (2009), Miller and Safford (2012) once again reported an increase in fire severity, but once again used another vegetation layer that post-dated the time series, and thus excluded conifer forest that burned at high-intensity fire in the earlier years of the time series, and was later reclassified as non-conifer

vegetation as natural succession processes occurred. Hanson and Odion (revision in review 2013) conducted the first comprehensive assessment of fire intensity since 1984 in the Sierra Nevada using 100% of available fire intensity data, and, using Mann-Kendall trend tests (a common approach for environmental time series data – one which has similar or greater statistical power than parametric analyses when using non-parametric data sets, such as fire data), found no increasing trend in terms of high-intensity fire proportion, area, mean patch size, or maximum patch size. Hanson and Odion (revision in review 2013) checked for serial autocorrelation in the data, and found none, and used pre-1984 vegetation data (1977 Cal-Veg) in order to completely include any conifer forest experiencing high-intensity fire in all time periods since 1984 (the accuracy of this data at the forest strata scale used in the analysis was 85-88%). Hanson and Odion (revision in review 2013) also checked the results of Miller et al. (2009) and Miller and Safford (2012) for bias, due to the use of vegetation layers that post-date the fires being analyzed in those studies. Hanson and Odion (revision in review 2013) found that there is a statistically significant bias in both studies ( $p = 0.032$  and  $p = 0.021$ , respectively), the effect of which is to exclude relatively more conifer forest experiencing high-intensity fire in the earlier years of the time series, thus creating the false appearance of an increasing trend in fire intensity. Interestingly, Miller et al. (2012a), acknowledged the potential bias that can result from using a vegetation classification data set that post-dates the time series. In that study, conducted in the Klamath region of California, Miller et al. used a vegetation layer that preceded the time series, and found no trend of increasing fire severity. Miller et al. (2009) and Miller and Safford (2012) did not, however, follow this same lesson. The results of Hanson and Odion (revision in review 2013) are consistent with *all* other recent studies of fire intensity trends in California's forests that have used all available fire intensity data, including Collins et al. (2009) in a portion of Yosemite National Park, Schwind (2008) regarding all vegetation in California, Hanson et al. (2009) and Miller et al. (2012a) regarding conifer forests in the Klamath and southern Cascades regions of California, and Dillon et al. (2011) regarding forests of the Pacific (south to the northernmost portion of California) and Northwest.

Further, all studies in California's forests have found unequivocally that increasing time since fire, typically used as a proxy for increased fuel loads, is not associated with increased fire activity or severity and, in fact, is generally associated with decreased fire severity, due to a reduction in pyrogenic shrubs and an increase in cooling shade and fuel moisture as canopy cover increases with increasing time since fire (Odion et al. 2004, Odion and Hanson 2006, Odion and Hanson 2008, Odion et al. 2010, Miller et al. 2012, van Wagtendonk et al. 2012). In other words, contrary to widespread popular assumptions that fires are burning more severely now due to fire suppression, all of the studies investigating this question have found that this assumption is incorrect.

The threat to Black-backed Woodpeckers from climate change is illustrated by the figures below from the existing scientific literature, which projects that, whether fire increases or decreases, suitable Black-backed Woodpecker habitat will experience a substantial net loss by as early as mid-century, and even more so by 2070.

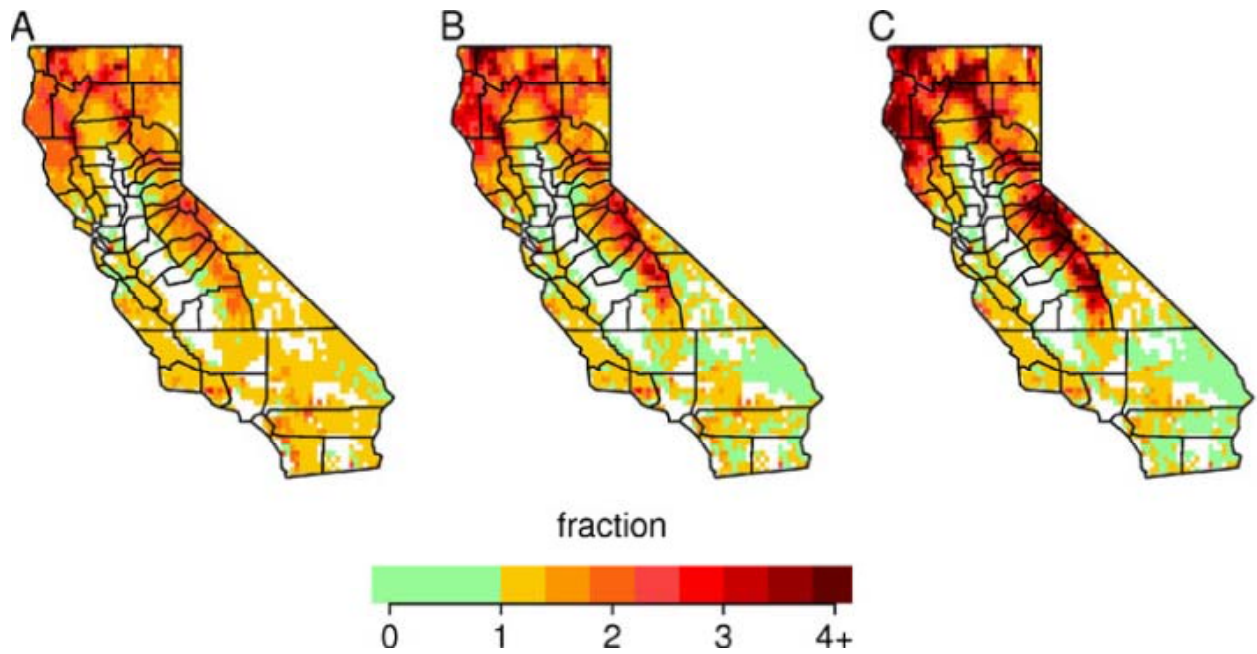


Figure 8. A doubling of fire, on average (a “1” equates to no increase in fire), under three climate modeling scenarios assuming hotter, drier conditions, from Westerling et al. (2011). As discussed in Westerling et al. (2011), the models do not represent a prediction of what will likely occur but, rather, potential outcomes among the modeling scenarios chosen.

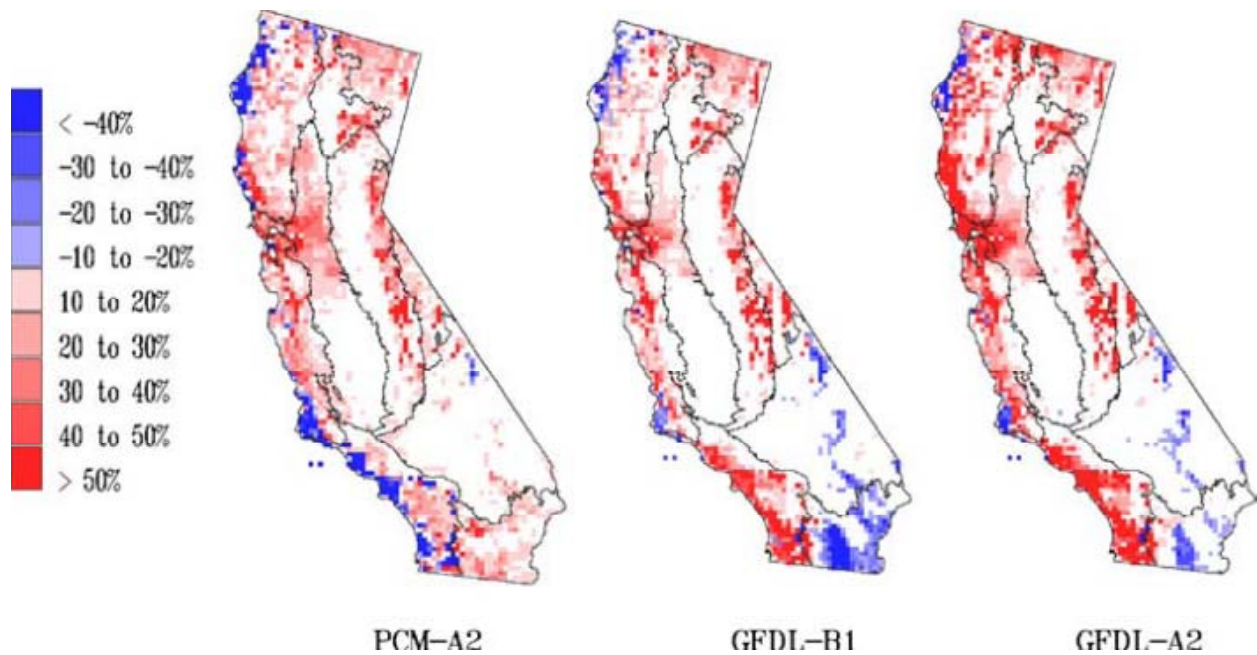


Figure 9. Projected increases, due to climate change, in wildland fire in alpine/subalpine zones (lodgepole pine and subalpine forest types) by 2070-2099, generally averaging 20-40%, while little or no increases are projected in evergreen conifer forest types, such as mixed-conifer (from Lenihan et al. 2008).

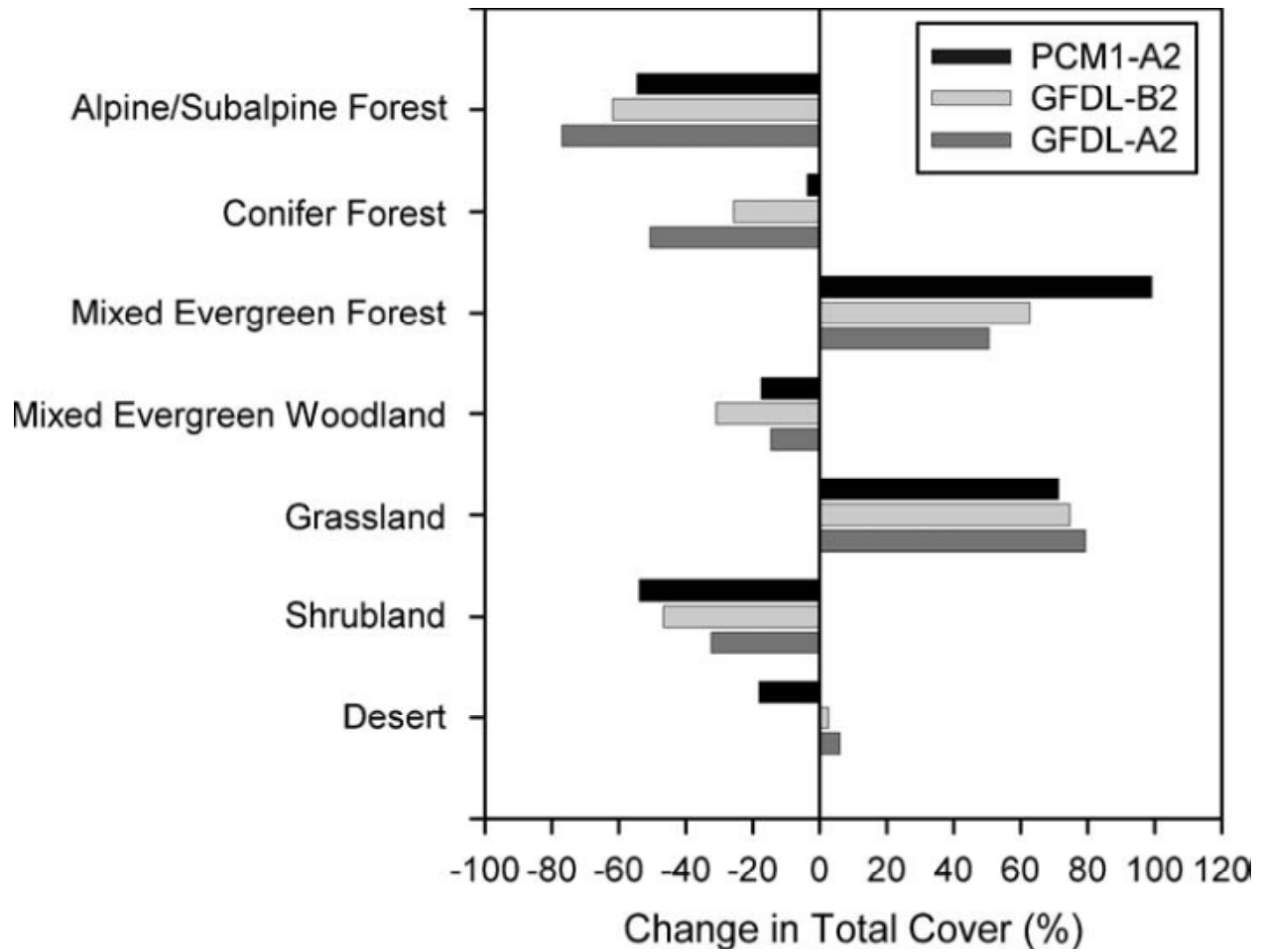


Figure 10. Projected loss, due to climate change, of approximately 20-60% of forest types in which suitable Black-backed Woodpecker habitat occurs (conifer forest and subalpine conifer forest) by 2070-2099 (from Lenihan et al. 2008). Lenihan et al. (2008) defined alpine/subalpine as including lodgepole pine and subalpine forest types, defined evergreen conifer forest as including montane conifer forest types, such as mixed-conifer, and defined “mixed evergreen forest” as “warm, temperate/subtropical mixed forest” such as “Douglas fir-tanoak forest”, “tanoak-madrone-oak forest”, and “ponderosa pine-black oak forest” (Lenihan et al. 2008, Table 1).

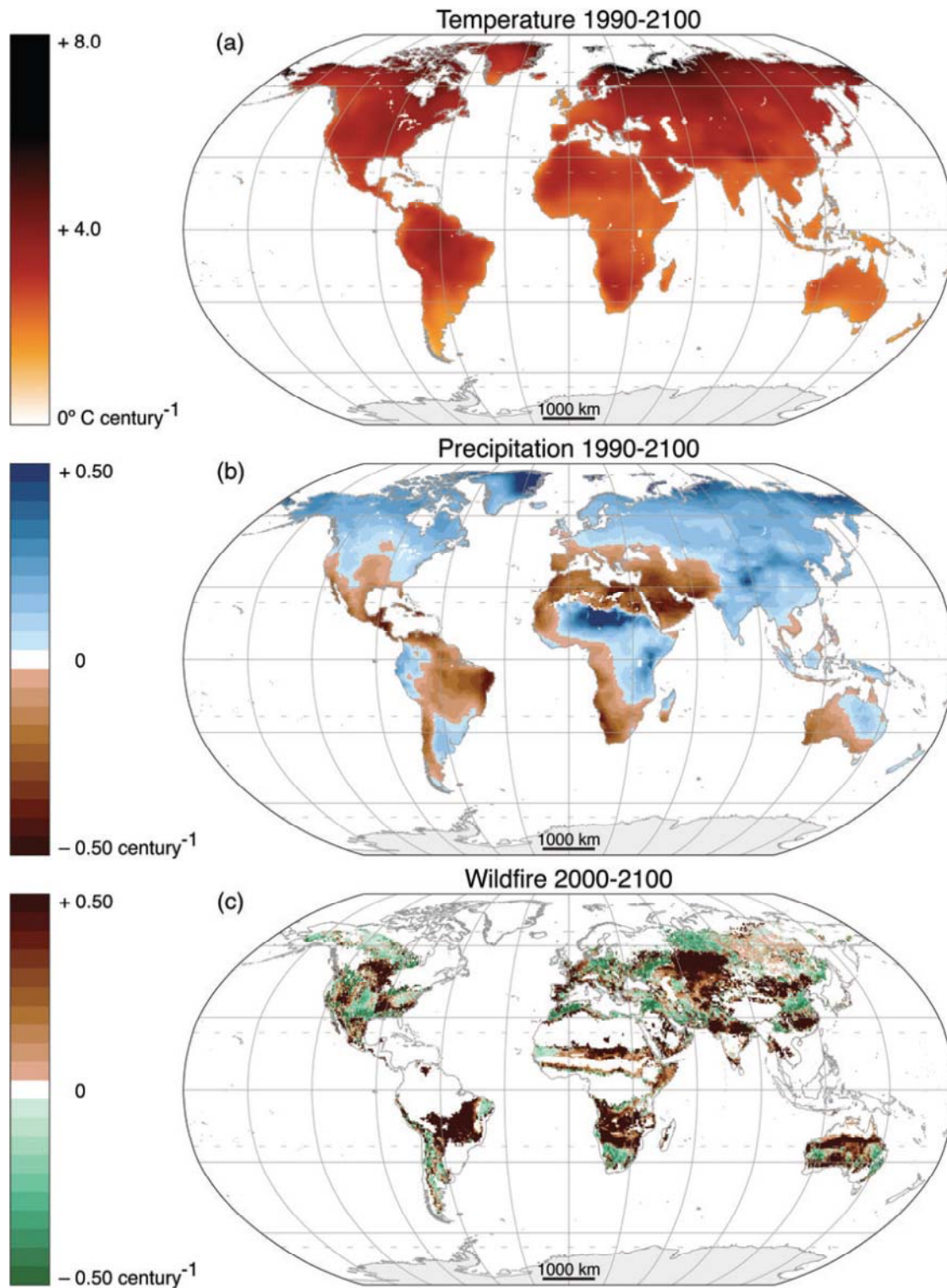


Figure 11. Projected increases in fire in intermountain rangeland regions, with projected lack of change, or moderate decrease, in the Sierra Nevada and Cascades (from Gonzalez et al. 2010).

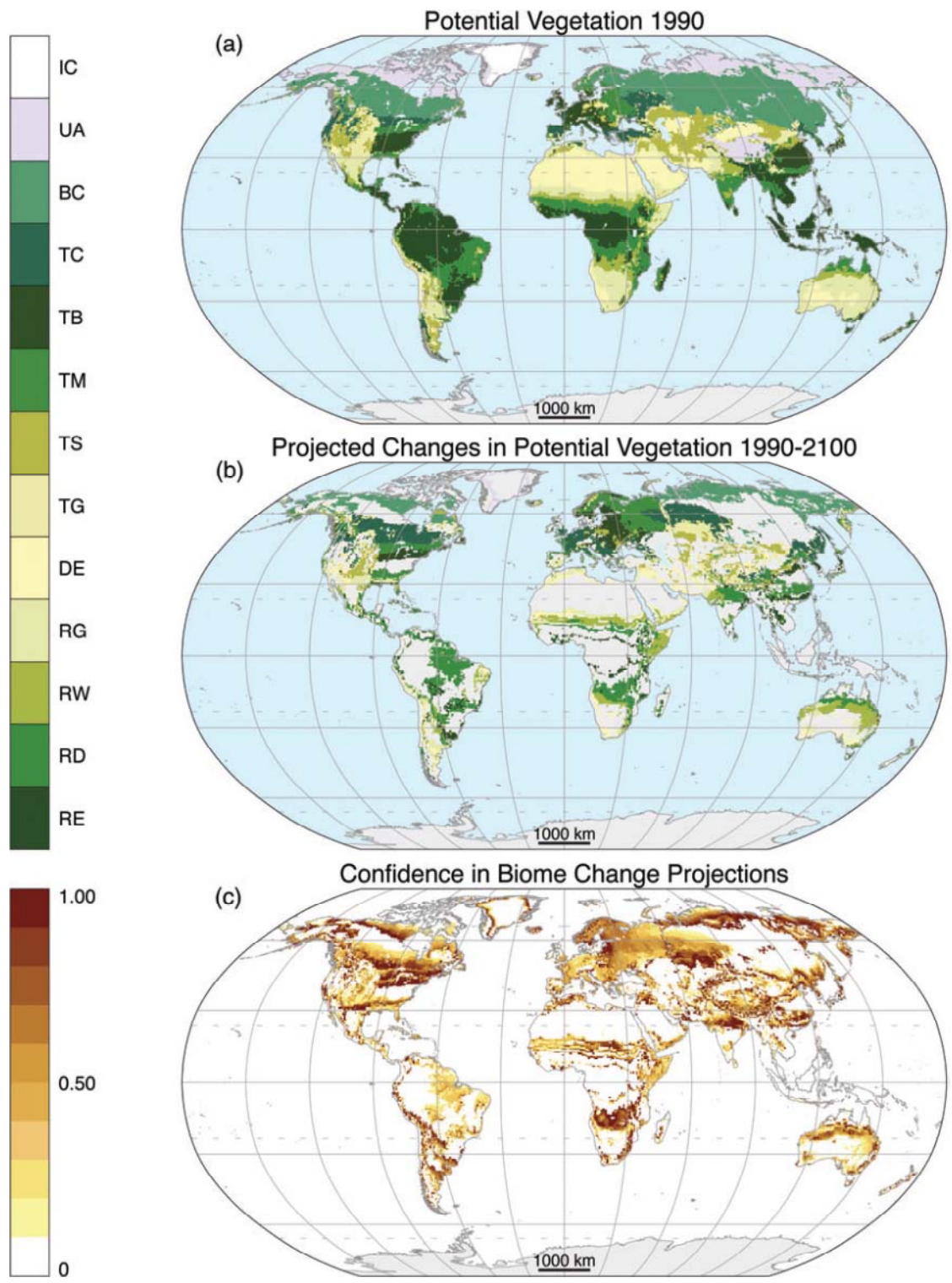


Figure 12. Projected massive loss (>80%) of temperate conifer forest (TC, shown in dark teal green) by the end of the century due to climate change (from Gonzalez et al. 2010).

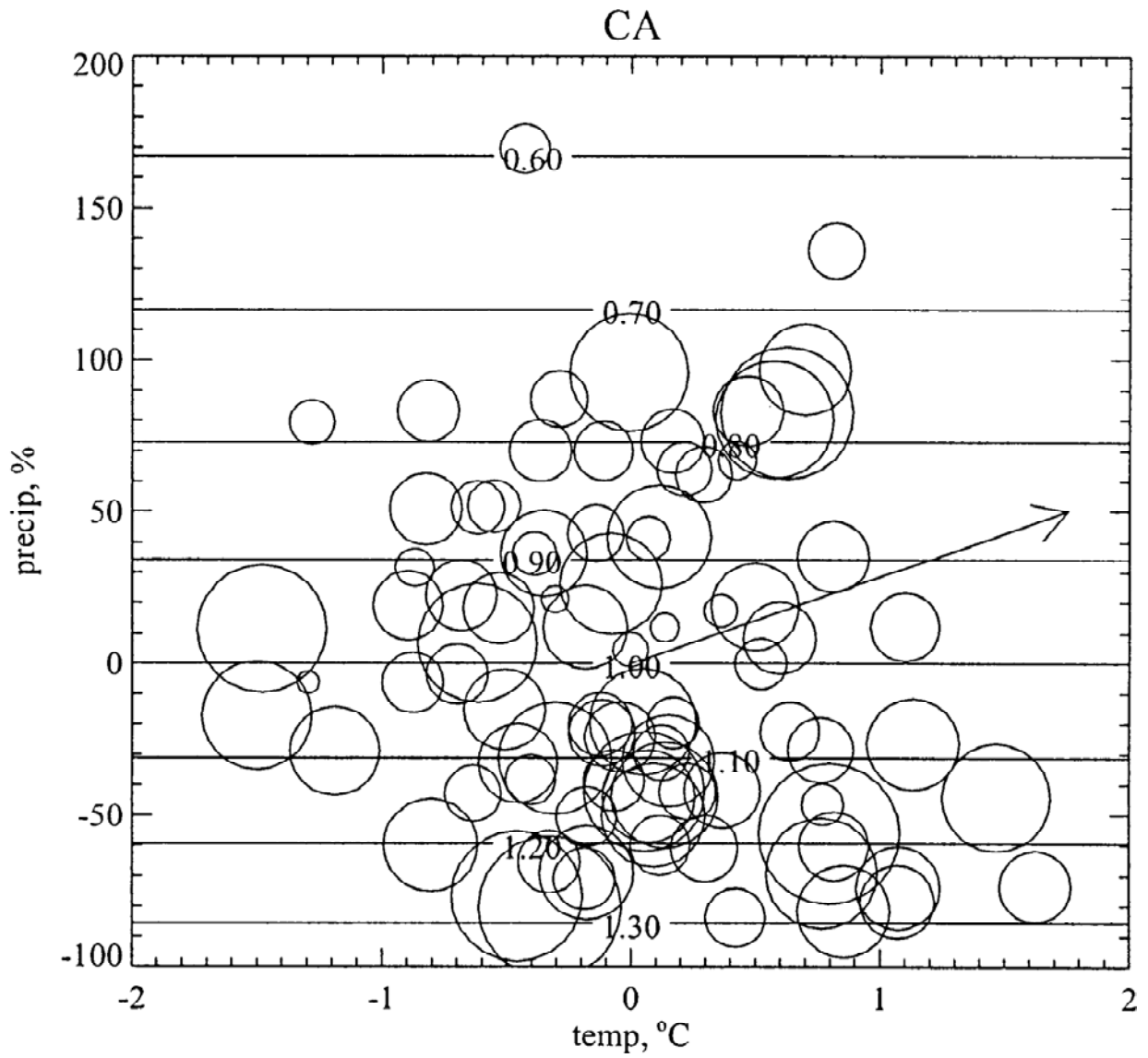


Figure 13. Fire in California's forests projected to decrease, due to climate change, by about 15% (from baseline of 1.00 to about 0.85 of baseline at the point of the arrow) by 2070-2100, while temperature and precipitation both increase (McKenzie et al. 2004).

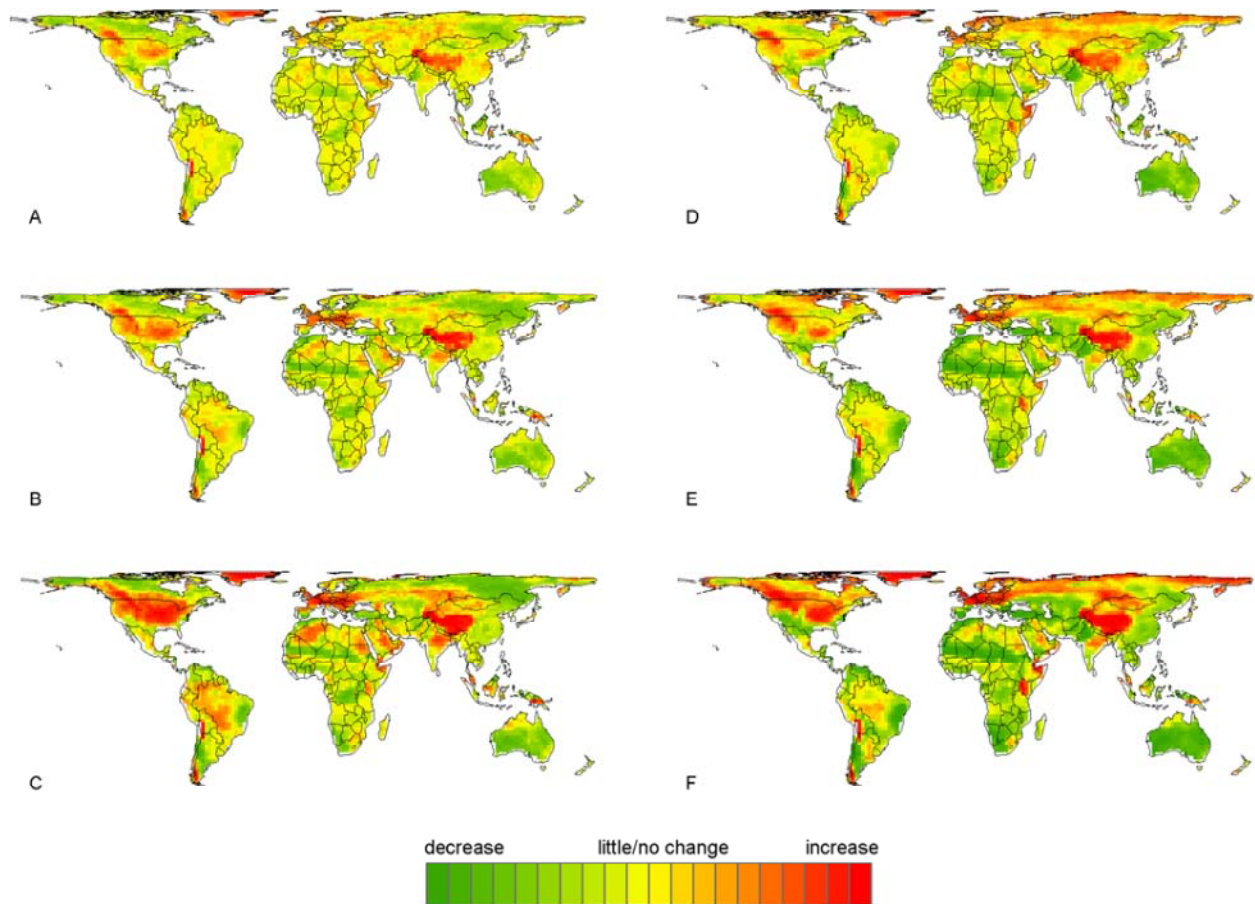


Figure 14. Climate change projected to result in no change (yellow) in wildland fire in the forests of the Sierra Nevada and eastern Cascades for 2010-2039 (A and D) and 2040-2069 (B and E), and, by 2070-2099, projected to result in either no change on the western slope and a slight increase on the eastern slope (C [see yellow and light orange in the Sierra Nevada and eastern Cascades regions]) or a combination of no change and a moderate decrease in fire (F [see yellow and green in the Sierra Nevada and eastern Cascades regions]), depending upon the climate models (Krawchuk et al. 2009).

**Conclusion:** Due to anthropogenic climate change, suitable Black-backed Woodpecker habitat will likely experience a large-scale net loss over the next several decades due to loss of higher-elevation conifer forest types (replaced by low-elevation mixed-hardwood/conifer types moving upslope) and the resulting Black-backed Woodpecker range contraction; and there are no regulatory mechanisms in place to address maintenance of Black-backed Woodpecker habitat, and connectivity of habitat, in light of projected contraction of upper-elevation conifer forests due to climate change. This large-scale net loss of suitable habitat, and consequent large-scale net loss of Black-backed Woodpecker populations, is projected even if wildland fire increases. Further, if any additional habitat were created by fire, without protection for Black-backed

Woodpecker habitat, such post-fire areas would be simply be met with a commensurate increase in salvage logging. Moreover, numerous studies project that wildland fire will decrease, due to the longstanding trend of increasing precipitation, which would accelerate the net loss of Black-backed Woodpecker habitat and populations.

### **B. Predation (Which is Exacerbated by Scarcity of Large, Recent High-intensity Fire Patches)**

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). Current forest management policies on public and private lands, discussed above (e.g., fire suppression and landscape-level thinning), designed to prevent larger high-intensity fire patches are likely to unnaturally exacerbate predation effects on Black-backed Woodpeckers, further threatening populations.

### **C. Other Natural Occurrences or Human-Related Activities**

The major threat posed by anthropogenic climate change to Black-backed Woodpecker populations in the coming decades is discussed in detail above in Section II.A.6.

#### **1. The BBWO is Inherently at High Risk Due to Its Very Small Population Size and the Ephemeral Nature of Its Habitat**

##### **a. Burned Forest Habitat**

According to the data from the U.S. Forest Service’s own report, based upon extensive field surveys in post-fire habitat within the Black-backed Woodpecker’s range in California, “approximately 37,183 ha [hectares] (i.e., 20.5%) of the 181,381 ha of burned forest on the ten national forests within our sampling frame were occupied by Black-backed Woodpeckers in 2011 . . . .” (Siegel et al. 2012a). This is based upon hundreds of point counts and playback surveys, and includes not only unlogged moderate- and high-severity fire areas, but also low-severity fire areas, as well as moderate- and high-severity fire areas that have been subjected to post-fire logging, for fires spanning a 12-year post-fire period, 1999-2011 (Siegel et al. 2012a).

Within occupied post-fire forest, Black-backed Woodpecker nest density averages 10 pairs per year across 60 plots, each of which is 20 hectares in size, i.e., approximately one pair per 120 hectares, according to data from another U.S. Forest Service report (Burnett et al. 2011, pp. 9 and 13, and p. 26 Table 2). Adjusting upwards for an estimated 20% rate of missed nest sites – i.e., nest sites that were not detected during surveys (Burnett, pers. comm. 2010) – there is approximately one Black-backed Woodpecker pair per 100 hectares of post-fire forest. This figure is likely to be optimistic, and the true density may be significantly lower than this, given that the data is heavily weighted toward very recent fires (45 of 60, or 75%, of plots occurring in recent fires, 2-year and 3-years post-fire, at which peak Black-backed Woodpecker density is found [Saab et al. 2007, Siegel et al. 2011]) that have not been subjected to post-fire logging (50 of 60 plots, or 83%, unlogged) (Burnett et al. 2011). Thus, even using figures that are likely to be unrealistically optimistic (i.e., likely to overestimate Black-backed Woodpecker numbers), within the 37,183 hectares of occupied post-fire forest in California, there are only 372 pairs. This is based upon the same methodological approach used by the report for the U.S. Forest Service in 2010 (Siegel et al. 2010) – i.e., occupied post-fire area divided by pair density per unit of area – but is updated to include the current total of post-fire area and post-fire nest density figures from the Sierra Nevada, which were not available at the time Siegel et al. (2010) was released.

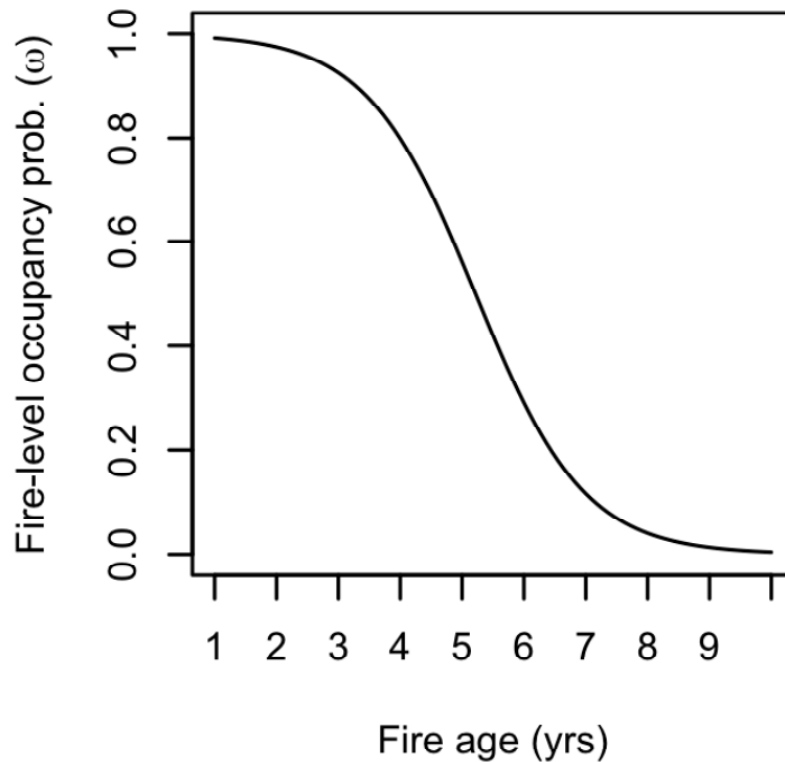


Figure 15. Dramatic decline in Black-backed Woodpecker occupancy by 6 years post-fire as their food source declines with increasing time since tree mortality (from Siegel et al. 2011).

The analysis herein used the U.S. Forest Service's own fire severity data ([www.mtbs.gov](http://www.mtbs.gov); <http://www.fs.fed.us/postfirevegcondition/>), and preliminary U.S. Forest Service fire severity data for the 2012 fires to date on public lands in the Sierra Nevada management region, to determine the proportion of the Sierra Nevada forest landscape that is currently moderate to high quality Black-backed Woodpecker habitat, based upon the amount of recent moderate- to high-severity fire in middle/upper-montane (and subalpine) conifer forests (using a lower RdNBR threshold of 574, which equates to approximately 50-100%, from Hanson et al. 2010, in the medium/large tree sizes relevant to Black-backed Woodpeckers). Only 1.3% of the montane conifer forests of the Sierra Nevada have such post-fire habitat for fires 10 years old or less. However, as Siegel et al. (2011 [Fig. 15a]) found, Black-backed Woodpecker occupancy declines dramatically after about 5 years post-fire. Focusing only on moderate- to high-severity fire that is no more than 5 years post-fire, such habitat comprises only 0.7% of the Sierra Nevada forests; moreover, less than 20% of this habitat is within the protected forest landscape (Wilderness Areas, National Parks, Inventoried Roadless Areas, and Wild and Scenic River Corridors). A significant portion of the recent moderate- to high-severity fire areas have already been severely salvage logged, and are no longer habitat; thus, the actual figure for current moderate to high quality habitat is significantly less than 0.7% of the landscape.

#### **b. Unburned Forest**

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-backed within hundreds of meters around) to detect Black-backed 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-backed 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 Black-backed Woodpecker population estimate in unburned forest from Appendix 2 of Fogg et al. (2012) is based upon the assumption of Black-backed being present across 18,494 cells of unburned forest, each of which is 1 square-km in size – i.e., 1,849,400 ha, or about 4.57 million

acres (Fogg et al. 2012, p. 26). However, as discussed below in Section II.C.1.d, this figure substantially exaggerates the amount of unburned forest that might potentially be inhabited by Black-backed Woodpeckers. Nonetheless, even if the assumptions relied upon in Fogg et al. (2012) are used, the spatial extent of Black-backed Woodpecker presence in unburned forest is still substantially overestimated. For the analysis herein, the coordinates of each survey location from Fogg et al. (2012) were obtained, and detection location, for 2009-2011 from the authors of Fogg et al. (2012). Using these locations, the 100% minimum convex polygon area of unburned montane conifer forest was determined, excluding burn edges (“burn-influenced” areas), just as Fogg et al. (2012) did, in each of four equal latitudinal sections (spanning the southernmost and northernmost detections) wherein Black-backed Woodpeckers have been detected at any location during 2009-2011 in the unburned forest surveys conducted for Fogg et al. (2012). These surveys included five point count stations at each of an average of 450 transect locations per year, with an average of 55% of point count stations visited twice per year (a total of approximately 10,463 individual point counts 2009-2011), plus Black-backed Woodpecker playback surveys at 472 locations, with an average of 1.5 playbacks per location, in 2011 (Fogg et al. 2012, pp. 4-5). To err on the side of being inclusive, this analysis included all forest types from lower montane hardwood-conifer forest up to subalpine forest types, on both the western and eastern slopes of the Sierra Nevada management region. Again, the analysis herein followed the criteria used by Fogg et al. (2012) for their unburned forest population estimate – specifically, areas >2 km from fires that have occurred since 2001. The total area of “unburned” forest in the 100% minimum convex polygon is only 436,260 hectares. The 100% minimum convex polygon represents the extreme outer spatial boundaries of detected Black-backed Woodpecker presence in unburned forest – i.e., the maximum area in which Black-backed have actually been detected in unburned forest after thousands and thousands of surveys over the course of three years throughout the Sierra Nevada. In other words, within the 100% minimum convex polygon, some Black-backed Woodpecker detection has occurred (though it may be very low and, as discussed above, cannot be assumed to represent a territory occupied by a nest), and outside of the 100% minimum convex polygon, zero Black-backed Woodpecker detections have been recorded at any time in any of the three years of survey effort and thousands of surveys.

Within the minimum convex polygon, in the first round of playback surveys in 2011, only 5 Black-backed Woodpecker detections were recorded out of 82 locations – a rate of 6%. Even if an unrealistically optimistic level of occupancy of these 436,260 ha of unburned forest is assumed, e.g., 50% (which is more than twice the level of occupancy found in recent burned forest habitat by Siegel et al. 2011 and Siegel et al. 2012a), this yields only 218,130 ha of occupied unburned forest. As discussed above in Section I.B, regarding the findings of Goggans et al. (1989), a density of nearly one pair per 200 ha may be expected in unburned forest with extraordinarily high levels of very recent snag basal area – over 20 square meters per ha of recent snag basal area, specifically. However, the FIA data discussed below in Section II.C.1.d.iii indicate that only 12 of 522 plots (only 2.3%) have snag basal area >20 square meters per ha from recent (5 years previous or less) mortality due to insects or disease. Thus, such a density would be highly unrealistic for the great majority of the 218,130 ha in question. Nevertheless, even if we unrealistically assume one pair per 200 ha for 10% of the 218,130 ha, that would yield only 109 pairs. For the remaining 90%, using the figure of one pair per approximately 750 ha from the two Black-backed Woodpecker territories in Siegel et al. (2012a) which were mostly in unburned forest, there would be an additional 262 pairs, for a total of 371 pairs in unburned

forest in California. Again, however, this is very likely to be a substantial overestimation, given that it likely overstates Black-backed Woodpecker occupancy and density, and assumes Black-backed Woodpeckers found foraging in unburned forest 2-5 km from fire edges are nesting in the unburned forest, as opposed to nesting in the nearby burned forest and occasionally foraging outward from the burn, as found by Siegel et al. (2012b). Thus, if a more realistic estimate of about 21% occupancy within the minimum convex polygon was used (91,615 hectares actually occupied)—one equal to the level of occupancy in recently burned forest from Siegel et al. (2011, 2012a) (which is likely still unrealistically high, given this species' selection for recently burned forest over unburned forest), the estimate would be only about 175 pairs in unburned forest in California.

### **c. Overall Population—Burned and Unburned Combined**

In summary, even using estimates that are likely to be unrealistically optimistic, there are only 372 pairs of Black-backed Woodpeckers in burned forest and only about 175 pairs in unburned forest in California (and, as mentioned above, most of the detections in unburned forest are within a home range width of a fire perimeter), for a combined total of less than 600 pairs. This is far below the minimum population threshold needed to avoid a significant risk of extinction (3400 adults, or about 1700 pairs), as identified by the most recent conservation biology meta-analyses (Traill et al. 2007, Traill et al. 2010).

Moreover, we know from recent genetic analyses that the geographically isolated Black-backed Woodpecker population in the Oregon Eastern Cascades and California is genetically distinct from the Rocky Mountain/boreal population, and that this distinction is at the level of subspecies (Pierson et al. 2010). However, there are also significant gaps in habitat between the Oregon Eastern Cascades and California, including large areas of lava fields, pinyon/juniper forest (which is not used by Black-backed Woodpeckers [Siegel et al. 2008]), and huge meadow/wetland areas – often 10-20 miles across each. Therefore, there is reason to believe that the California population could also be genetically distinct from the population in the Oregon Eastern Cascades, but that data and analysis is not final yet. Even if there is no significant gene flow barrier between Oregon Eastern Cascades and California, this would change things little with regard to the dangerously small population size, since there are only 52,681 hectares of post-fire forest in the Oregon Eastern Cascades over the past decade within the range of the Black-backed Woodpecker, and only about 21%, or 11,063 hectares, can be expected to be occupied by Black-backed Woodpeckers (Siegel et al. 2012a), equating to only about 111 pairs of Black-backed Woodpeckers, using our optimistic estimate above of one pair per 100 hectares. And, there are 2,288,217 hectares of unburned forest in the Oregon Eastern Cascades within the Black-backed's range. So, if the approach used above to estimate populations in unburned forests in California is used for the unburned forests of Oregon's eastern Cascades, this equates to only 114,411 hectares of occupied unburned forest, or only about 202 pairs of Black-backed Woodpeckers (this may be an unrealistically high estimate of Black-backed populations in unburned forest in Oregon's eastern Cascades, especially given the findings of Russell et al. 2009 [no Black-backed nests found in unburned forests]). So, even if the Oregon Eastern Cascades population is considered, this would still bring the cumulative total in both states, in both burned and unburned forest, to a little over 850 pairs – far below the minimum thresholds needed to avoid a significant extinction risk (Traill et al. 2007, Traill et al. 2010).

Although there is no formal definition in the California Endangered Species Act for the term “foreseeable future” as used in the legal description of “threatened,” a court has noted that a 1% probability of extinction in 100 years is sufficient to indicate a significant threat of extinction of a population in the foreseeable future. *Center for Biological Diversity v. Lohn*, 296 F.Supp.2d 1223, 1232 (W.D. Wash. 2003) (“a group of scientists convened by NMFS recently recommended that a 1% probability of extinction in 100 years could meet the “conservation status” element of the DPS Policy for purposes of defining a species or population as endangered”). 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). Thus, the scientific evidence indicates populations of only about 850 pairs of Black-backed Woodpeckers in the Oregon/California population equates to a high risk of extinction over the next century, especially when the ongoing threats of habitat loss from increasingly aggressive fire suppression and landscape-level logging (both salvage and thinning) are considered.

**d. Forest Service Estimates of BBWO Populations in Unburned Forests of California are Unrealistically High to a Dramatic Degree and Are Not Based Upon the Best Available Science**

This subsection analyzes an unpublished report, Fogg et al. (2012), which was prepared for the U.S. Forest Service regarding Black-backed Woodpecker (BBWO) populations in unburned forests of California. This analysis specifically addresses Appendix 2 of Fogg et al. (2012), which extrapolates their results to project that 3,980 sites (range of 1,398 to 6,899) across 1,849,400 hectares of unburned forest could be occupied by BBWOs in the Sierra Nevada management region (Sierra Nevada, southern Cascades, and Modoc region in California—essentially the BBWO’s range in California) – a density of one occupied territory per 465 hectares of unburned forest throughout the Sierra Nevada. For comparison, the estimated density of Black-backed Woodpeckers in burned forest in the Sierra Nevada from Siegel et al. 2010 (pp. 44-45) is an average of 783 territories across 323,358 hectares of recently burned forest, or about one territory per 413 hectares. Thus, the Forest Service claims, based upon the modeling extrapolations in Fogg et al. (2012, Appendix 2), that Black-backed Woodpecker density per hectare is approximately as high in unburned forest as it is in burned forest; and, further, claims that this presence in unburned forest is unrelated to the Black-backed Woodpecker’s food source, recent snags, an inconsistency with biological reality which suggests that birds detected by Fogg et al. (2012) were either dispersing through the unburned forest to find new post-fire habitat (and were not nesting there), were nesting in fire areas a few kilometers away and were foraging about to see if any pockets of high mortality existed in nearby unburned forest, or were simply not Black-backed Woodpeckers. For the following reasons, however, the estimate in Fogg et al. (2012) very likely dramatically overestimates the BBWO population in unburned forests of California, due in large part to modeling assumptions that depart significantly from the existing data. Because, as explained below, Fogg et al.’s estimate does not rely on the best available science, and relies upon unsupported assumptions unconnected to data, and directly contradicted

by widely available data, it should not be relied upon. Instead, the numbers are likely about 175 pairs *at most* in unburned forest in California, using a data-based estimate.

**i. Erroneous U.S. Forest Service Extrapolation Assumes Approximately Equal BBWO Density Per Square Kilometer in Unburned Forest Than in Recent Burned Forest, Despite Vastly Lower Detection Rates in Unburned Forest**

In 2011, the Forest Service conducted playback surveys (three playback intervals followed by listening, and watching for visual detection, at each location) for Black-backed Woodpeckers in unburned forests at 472 locations in Sierra Nevada montane conifer forests, 47% of which were surveyed again later in the season (Fogg et al. 2012). Fogg et al. (2012) analyzed locations over 2,000 meters from fires less than 10 years old as “unburned” (in recognition of the fact that Black-backed Woodpeckers nesting in fire areas may forage thousands of meters into the unburned forest (Siegel et al. 2012b). There were approximately 300 locations more than 2,000 meters from the edges of fires less than 10 years old. For these locations, the initial playback survey in 2011 yielded 5 Black-backed Woodpecker detections, for a rate of 1.67% detection per playback survey (detections at 1.67% of playbacks) (Fogg et al. 2012, Appendix 1). For the 47% of these locations that were re-surveyed later in the nesting season in 2011 (approximately 141 locations), there were 2 Black-backed Woodpecker detections for the playback surveys, or a rate of 1.42% detection per playback survey (Fogg et al. 2012, Appendix 1). In contrast, for similar playback surveys conducted in burned forests in the Sierra Nevada, the rate is about 18%--about 12 times higher than in unburned forest (Siegel et al. 2008, p. 10).

In the eastern Oregon Cascades, Russell et al. (2009) found 21 Black-backed Woodpecker nests in post-fire habitat and 0 in unburned forest. In Montana, Caton (1996) conducted both extensive nest density surveys and point counts and found Black-backed Woodpeckers almost exclusively in burned forest versus unburned forest (Caton 1996, Figs. 2 and 3). There are no data indicating similar or comparable Black-backed Woodpecker nest densities in burned and unburned forest, except in the rare circumstances of very recent, extremely high mortality from beetles (Goggans et al. 1989, Bonnot et al. 2008, 2009). Such conditions in unburned forest occur on only a tiny fraction of the unburned forest landscape at any point in time, as discussed below.

**ii. Underestimation of Home Range Size**

Fogg et al. (2012), on p. 26, divide the portion of the unburned forest landscape that they estimate to have some BBWO presence into 1 square-km (100 hectares [ha], or 247 acres) cells, and then “assume” that each cell is an occupied BBWO territory. However, Fogg et al. (2012) do not provide citations to any data sources to support this assumption of a BBWO density in general/typical unburned forest that is equal to or considerably higher than that documented in moderate/high-quality recent burned forest habitat (i.e., peak densities in high-quality post-fire habitat) (Siegel et al. 2012b). For example, Burnett et al. (2011) conducted extensive BBWO nest surveys in 98 unlogged burned forest plots in 2009 and 2010 (combined) in the northern Sierra Nevada and southern Cascades in California (p. 77 of Burnett et al. 2011), with each plot being 20 ha in size (Burnett et al. 2011, p. 82), and found a total of 20 BBWO nests, or about one

nest per 98 ha of burned forest (and most of these plots were surveyed at peak densities, in terms of time since fire: 2-3 years post-fire). Siegel et al. (2012b [p. 32]) found BBWO home ranges generally exceeded 200-300 ha in recent (2-3 years post-fire) post-fire habitat, with an average of 27% overlap – i.e., approximately 200 ha of post-fire habitat per BBWO pair at peak post-fire density, based upon the most reliable and accurate methods of estimating home range size. In addition to the data regarding burned forest habitat, the existing data indicate that BBWO home ranges in unburned forest are far larger than the 100 ha assumed by Fogg et al. (2012), even when the recent snag basal area found in the unburned forest is much higher than the average in the unburned forests surveyed in Fogg et al. (2012). For instance, Goggans et al. (1989), in a radiotelemetry study of BBWOs in dense, old forests of the eastern Oregon Cascades with very high levels of snag basal area due to recent beetle mortality, found an average home range size of 557 acres, or 225 ha, for BBWOs, with 0% overlap in home ranges (Goggans et al. 1989, pp. 24, 27). This was in an area in which 28% of the trees had been killed by pine beetles – 94% of which were stage 1 (very recent) snags (Goggans et al. 1989, p. 34) – and where the forests had an overall basal area of approximately 400 square feet per acre, or about 92 square meters per hectare (Goggans et al. 1989, p. 33). In other words, in this area, recent snag basal area was about 26 square meters per hectare. Similarly, Bonnot et al. (2008) found 0.13 BBWO nests per 40 ha (Bonnot et al. 2008, p. 453), or one nest per 308 ha, in an area of unburned forest of the Black Hills with very recent snag levels often reaching 200-490 per ha (Bonnot et al. 2008, p. 451). In a recent radiotelemetry study of BBWOs in the Sierra Nevada management region, the two territories which were primarily outside of the fire perimeter (but which had nests inside the fire perimeter) had home ranges of approximately 729-796 ha, using the two more common methods of estimating home range size, and 266-287 ha using the most restrictive and conservative method, which tends to significantly underestimate true home range size (Siegel et al. 2012b, p. 32, Table 1). The overlap in these two home ranges was only about 5% (Siegel et al. 2012b, p. 26, Fig. 9). Thus, the best available science indicates that, even with extraordinarily high and uncommon snag densities in unburned forest, the density of BBWOs in areas known to be occupied is one pair per 225-800 ha – not one pair per 100 ha, as Fogg et al. (2012) assume, without citation to any data source, for unburned forests. This alone results in a three-fold or greater overestimation of BBWO density in unburned forest by Fogg et al. (2012). Further, as discussed below, the extent of the overestimation is much larger than this once we account for the fact that the great majority of the unburned forest surveyed by Fogg et al. (2012) has far lower snag densities than the unburned forests in which BBWOs have been found nesting in the literature discussed above.

iii. **Inconsistency With Data on Snag Density in Areas in Which BBWOs Successfully Nest and Reproduce**

Fogg et al. (2012) report that Black-backed Woodpecker occupancy in unburned forests is unrelated to snag densities – i.e., that successful Black-backed Woodpecker occupancy is unrelated to the presence of the Black-backed Woodpecker's food source. This represents a huge disconnect with biological reality, given that, as discussed in Section I.B above, the confirmed occurrences of successful Black-backed Woodpecker nesting in the scientific literature have generally been in areas with at least 15-40 square meters per hectare of recent snag basal area, or higher (Tarbill 2010, Burnett et al. 2012).

Furthermore, Kathryn Purcell, in unpublished data, found several active Black-backed Woodpecker nests in a small area of unburned lodgepole pine and red fir forest during several years of surveys (1995-2002). However, no forest structure data was presented from these surveys. For the analysis herein, we digitized her map of the locations of these Black-backed Woodpecker nest sites in unburned forest near Courtright Reservoir on Sierra National Forest, and I surveyed these locations on May 30, 2012. We found that these sites are old-growth/ancient red fir and lodgepole pine forest with extraordinarily high basal area of both live trees (200 to 400 square feet per acre, or about 46 to 92 square meters per hectare) and snags (averaging 63 square feet per acre, or about 14 square meters per hectare, in Decay Class 2 through 4 alone). We excluded Class 1 snags which likely resulted from trees dying since the Purcell data was gathered, and excluded Class 5 and 6 snags, which may have already been too old to be useful for BBWOs when the Purcell data was gathered, though many of the Class 5 snags would have been relatively recent mortality in the late 1990s. Also, we did not include snags that may have been standing in 1995-2002, but which have recently fallen, unless some portion of the stem remained standing. Thus, our figures on snag density are conservative, and the actual density of standing snags during 1995-2002 was likely at least 40% higher – at least 20-25 square meters per hectare.

To evaluate the spatial extent of areas with recent snag basal area consistent with Black-backed Woodpecker occupancy within unburned forests (as defined by Fogg et al. 2012) in the conifer forest types used by Black-backed Woodpeckers, the analysis herein used U.S. Forest Service Forest Inventory and Analysis (FIA) fixed field plot data (<http://www.fia.fs.fed.us/tools-data/>). For this analysis, spatially-extensive U.S. Forest Service Forest Inventory and Analysis (FIA) fixed data plots were used for mid-montane forest types, such as ponderosa pine, mixed-conifer, and white fir, as well as upper montane and subalpine forest types, such as red fir, Jeffery pine, eastside pine, lodgepole pine, and western white pine, for a total of 522 FIA plots in forest unburned since 1984 in these forest types within the Sierra Nevada management region. Only 12 plots out of 522, or 2.3%, have >20 square meters per hectare of snag basal area from recent (5 years previous or less) mortality due to insects or disease. FIA plots have a frequency of about one plot per 2400 hectares of forest. Thus, these 12 plots represent only about 28,800 hectares of unburned forest. As discussed above, the data on forest structure where BBWOs have actually been documented nesting in unburned forest indicates not only extremely high levels of snag density, but also very recent tree mortality – i.e., the great majority of snags are generally 5 years old or less (Goggans et al. 1989, Bonnot et al. 2008). Even if we unrealistically assume 100% occupancy on these 28,800 hectares of unburned forest with high, recent snag levels, and use the Black-backed Woodpecker home range figures from Goggans et al. (1989) for unburned forests with very high recent beetle mortality, this equates to fewer than 150 pairs of Black-backed Woodpeckers.

In short, if Fogg et al. (2012, Appendix 2) had used the best available science regarding BBWO nest density in unburned forest, rather than an unsupported assumption, this alone would reduce Fogg et al.'s estimate of 3,980 BBWO territories in unburned forest dramatically. In addition, as discussed above, less than 2.3% of the unburned montane conifer forests in the Sierra Nevada contain levels of snag density consistent with the levels in unburned forests where BBWOs have actually been found successfully foraging in the scientific literature (and in unburned forests in the Sierra Nevada where some BBWOs have been found nesting in recent years, based upon my

snag density surveys there). It is worth noting that, in the scientific literature, outside of the very narrow and spatially rare circumstance of unburned forests with levels of recent snag basal area similar to levels found in moderate- to high-intensity fire patches within dense, old forest, zero Black-backed Woodpecker nests have been found in nest density studies, despite many hundreds of hectares being comprehensively surveyed (Kilgore 1971 [zero Black-backed Woodpecker nests found in 130 hectares of unburned forest], Marshall 1988 [zero Black-backed Woodpecker nests found in 500 hectares of unburned forest], Siegel and DeSante 2003 [zero Black-backed nests found in 360 hectares of unburned forest surveyed in each of three different years], Russell et al. 2009 [zero Black-backed Woodpecker nests found in 250 hectares of unburned forest]).

If Fogg et al. (2012, Appendix 2) had used the best available science on the above key factors, it would have dramatically reduced their estimate of BBWOs in unburned forest much more, bringing the estimate to less than 150 occupied territories. Additional unsupported assumptions in Fogg et al. (2012, Appendix 2), which are also inconsistent with the best available science, are discussed below.

**iv. Unsupported Assumption that BBWO Presence in Unburned Forest Equates to BBWO Nesting**

Appendix 2 of Fogg et al. (2012), on p. 26, assumes that 100% of BBWO detections >1.5 kilometers (km) from fires occurring since 2001 represent BBWOs nesting in such areas, as opposed to BBWOs nesting in fire areas and occasionally foraging well beyond the fire perimeters. However, this assumption is contradicted by recent BBWO radiotelemetry data finding two BBWO territories wherein the nests were within the fire area, but the birds actively foraged up to 4-6 km from the fire perimeter (Siegel et al. 2012b, p. 26, Fig. 9), likely taking advantage of some delayed tree mortality that often radiates outward from a fire perimeter in the years following fire, as beetles move outward in search of new habitat. These two territories, which were primarily outside of the fire perimeter, had home ranges of approximately 700-800 ha, using the two more comprehensive methods of estimating home range size (Siegel et al. 2012b, p. 32, Table 1). This indicates that many of the BBWO detections used for the estimate of population in unburned forest in Fogg et al. (2012) are likely birds nesting in fire areas, but foraging several km outside of fire perimeters – well beyond the 1.5 km zone used by Fogg et al. (2012).

This is a fundamental problem with Fogg et al. (2012 [Appendix 2]). Within each transect, an average of 8 point counts (5 point count locations per transect, and each visited about 1.6 times per year) and 1.5 playback surveys (one playback location in each transect, visited 1.5 times per year on average in each transect) were conducted per year, and any BBWOs believed to be detected (nearly all detections were auditory, and unconfirmed) at unlimited distances from the observer were recorded as “occupied” in each transect. Because BBWOs nest at the edge of burns and can have territories of 800 ha which extend for several kilometers from the fire edge (Siegel et al. 2012b, p. 26, Fig. 9), any transects within such territories will likely detect BBWOs at some point, leading to the erroneous assumption that because the birds are seen in the area, they are therefore nesting there, leading to a large overestimate of BBWO population in unburned forest. To illustrate this problem, imagine that 8 transects of 100 ha each were surveyed multiple times each year (point counts and playback) within an 800 km BBWO

territory wherein the nest is at the edge of a fire area, but nearly all of the territory is in the unburned forest (e.g., Siegel et al. 2012b, p. 26, Fig. 9). In such territories, the Fogg et al. (2012) approach would likely detect BBWOs passing through each transect at some point during the year, and would mistakenly assume that all transects are “occupied” by BBWO pairs when, in fact, there is only one pair and it is not nesting within the unburned forest at all.

For this reason, Fogg et al. (2012, Appendix 2) does not represent the best available science on this subject. Indeed, this is why researchers in the published, peer-reviewed scientific literature regarding such surveys in unburned forest tracked any BBWOs that they detected to the birds’ nests – it is the only way to confirm actual nest density, which is synonymous with actual population density (Russell et al. 2009). Fogg et al. (2012) did not do so. This protocol from the published scientific literature (i.e., not merely assuming that any bird heard or seen is a bird nesting in the immediate vicinity but, rather, confirming nest presence and density) is particularly important for a species, such as the BBWO, whose habitat is ephemeral, thus requiring the birds to disperse across the unburned forest in search of new post-fire habitat whenever a given fire area becomes too old to be suitable, or is salvage logged.

v. **Overestimation of Spatial Extent of Unburned Forest in Which BBWOs Have Been Detected**

As discussed above, the BBWO population estimate in unburned forest from Appendix 2 of Fogg et al. (2012) is based upon the assumption of BBWOs being present across 18,494 cells of unburned forest, each of which is 1 square-km in size—i.e., 1,849,400 ha, or about 4.57 million acres (Fogg et al. 2012, p. 26). However, as discussed above, this figure substantially exaggerates the amount of unburned forest that might potentially be inhabited by BBWOs. Nonetheless, even if the assumptions relied upon in Fogg et al. (2012) are used, the spatial extent of BBWO presence in unburned forest is still substantially overestimated, given that the minimum convex polygon in which all Black-backed Woodpecker detections in unburned forest occurred is only 436,260 hectares – not 1,849,400 hectares as assumed by Fogg et al. (2012, Appendix 2) for their estimate of Black-backed Woodpecker populations in unburned forest. Thus, in making their BBWO population estimate in unburned forest, Fogg et al. (2012 [Appendix 2]) erroneously extrapolated BBWO presence across an area more than 4 times larger than the area of unburned forest in which BBWOs have actually been detected. This, again, does not represent the best available science, and caused an additional overestimation of BBWOs in unburned forest beyond the overestimations caused by the problems discussed above.

Moreover, because Fogg et al. (2012) do not account for the much larger BBWO home ranges in unburned forest, relative to burned forest, they also do not account for the lower fitness of territories with much larger home ranges – reflective of the fact that the birds are working much harder, and expending far more energy, in order to obtain food, corresponding to lower reproduction and survival levels that are associated with non-viable “sink” populations (see, e.g., Carey et al. 1992, Ward et al. 1998).

**vi. Probability of Detection**

Appendix 2 of Fogg et al. (2012) reports very low probabilities of detection for BBWOs in unburned forest at the transect scale used for Appendix 2, and this fact results in the modeled proportions of the unburned forest landscape being much higher than the observed proportions. Adjusting for probability of detection is important, and scientifically supportable. However, the formula used to make this adjustment in Fogg et al. (2012), and Saracco et al. (2011), was not based upon any empirical data on the actual probability of detecting BBWOs known to exist in a given area. Fogg et al. (2012) used the same formula as was used in Saracco et al. (2011). However, though no empirical data was used for the formula in Saracco et al. (2011) regarding probability of detection either, the probability of detection in the burned forests studied in Saracco et al. (2011) were much higher (and the difference between observed results and modeled results was relatively minimal overall; see also Siegel et al. 2011), and may be more reflective of biological reality (Russell et al. 2009). In addition, the formula used to make assumptions about probability of detection, which is based upon detections and non-detections, without regard to known presence, creates a greater disparity between observed and modeled results in landscapes in which the birds are even rarer than usual, such as unburned forests. For example, in Fogg et al. (2012), at the transect scale, Appendix 1 shows detections at 21 transects over 2000 m from fire in 2011, or about 8.3%, whereas the modeled result used in Appendix 2 of Fogg et al. (2012) is 22%, which is a large proportional increase over the observed data.

Whatever the case, no data were gathered in Fogg et al. (2012) to determine the actual detected presence relative to known presence. For adjustments for probability of detection to be valid and accurate, they should be made based upon empirical data (Russell et al. 2009 provide a nice example) – a point that extends to all modeling, in fact, unless the goal of a model is to merely explore a “what if” scenario. Because Fogg et al. (2012) did not base this adjustment upon empirical data, the model is not calibrated in a way that can be assumed to reflect biological reality. This can lead to large overestimates – essentially multiplying the actual observed data by several times. And, these overestimates would be in addition to those already described in the subsections above.

**vii. Potential for Substantial Overestimation Due to Even a Small Error in Species Misidentification**

The great majority of detections in the U.S. Forest Service’s surveys discussed above, in both burned and unburned forest, are auditory, rather than from visual confirmation, which can cause an overestimation of birds through misidentification, particularly for rare species (Farmer et al. 2012). This is exacerbated by the fact that the most common calls for the Black-backed Woodpeckers and Hairy Woodpeckers are very similar (“pik” and “peek”, respectively [National Geographic Society 2008]), and can be difficult to distinguish in actual field conditions with twigs cracking under the feet of seasonal surveyors and breezes causing ambient noise in the trees. It is also exacerbated by the fact that Fogg et al. 2012 (pp. 4-5) conducted a Hairy Woodpecker playback survey prior to conducting Black-backed Woodpecker surveys, thus drawing Hairy Woodpeckers into the area, as well as by the fact that the Forest Service’s surveys have an unlimited distance for detections (Saracco et al. 2011, Siegel et al. 2011, Fogg et al. 2012, Siegel et al. 2012a), and misidentification of species increases dramatically beyond 70

meters from the observer, particularly for species with similar calls (Simons et al. 2007 [Fig. 5B]), such as the Hairy Woodpecker, which is far more numerous than the Black-backed Woodpecker (Burnett et al. 2011 [Table 1], Siegel et al. 2010 [Table 5]). Because Hairy Woodpeckers are much more common than Black-backed Woodpeckers, species misidentification of each at increasing distances from the observer would heavily result in overestimation of Black-backed Woodpeckers (e.g., if the actual number of Black-backed Woodpeckers and Hairy Woodpeckers present is 10 and 100, respectively, a 20% species misidentification rate for each – i.e., if Black-backed are misidentified as Hairies 20% of the time, and Hairies are misidentified as Black-backed 20% of the time – would result in observers recording a total of 28 Black-backed Woodpeckers (i.e., a nearly three-fold overestimate relative to actual), and 82 Hairy Woodpeckers). Thus, even with a fairly high success rate in correct species identification (80%), when two species using the same habitat have similar calls, and when one of them is far rarer than the other, the result is a substantial overestimation of the rarer species – especially in the unusual circumstance in which the more common species is purposefully called to the area before surveying for the rarer species. At a minimum, in such an unusual circumstance, the error rate should be determined, and the results calibrated and adjusted accordingly. This was not done in Fogg et al. (2012).

**Conclusion:** In summary, current moderate/high-quality suitable Black-backed Woodpecker habitat is so scarce that it comprises less than 3% of the existing forests (burned and unburned combined) within the range of this species in California; and estimated populations, based upon the best available science, are so small (less than 600 pairs in California, and only about 850 pairs if the eastern Oregon Cascades population is combined with California) that there is a significant risk of extinction in the foreseeable future unless the population is protected.

Further, the Fogg et al. (2012) report is not based upon the best available science, and dramatically overestimates current Black-backed Woodpecker populations in unburned forest because it: a) assumes one BBWO territory per 100 ha of unburned forest, without citation to data, despite the fact that the existing data indicate far lower BBWO densities in unburned forest even where the recent snag basal area per ha is far higher than the great majority of current unburned forest in California; b) extrapolates BBWO detections in unburned forest across 1,849,400 ha of forest when BBWOs have only been found in 436,260 ha of unburned forest over three years of surveys (despite thousands of surveys across the 1,849,400 ha area); c) assumes BBWOs detected 1.5-5 km from fires are nesting in unburned forest, despite clear recent evidence of BBWOs nesting within fire areas and regularly foraging up to 6 km from the fire perimeter into the unburned forest; d) does not use any empirical data to determine the actual probability of detection relative to known presence, and uses an algorithm that substantially over-adjusts for probability of detection when occurrence of a species is low, such as Black-backed Woodpeckers in unburned forest; e) reports that Black-backed Woodpecker presence is independent of snags – the source of the bird's food (native beetle larvae) – and assumes Black-backed nest occupancy in areas the great majority of which have snag levels far below the levels found in confirmed Black-backed Woodpecker territories in the scientific literature; and f) does not account for the substantial overestimation of Black-backed Woodpecker populations that can result from even a small error rate in auditory species identification – especially given that Hairy Woodpecker playback calls were conducted immediately before those for Black-backed.

### **III. Management Activities and Other Actions Recommended for the Conservation and Recovery of the Species**

Pursuant to section 2074.6 of the California Fish and Game Code, we recommend the following “management activities and other recommendations for recovery of the species”:

- 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 and moderate/high-quality foraging habitat). No salvage logging would be allowed within these potential nest stands or home ranges. Establish a requirement for all national forest plans in California that sufficient suitable habitat will be maintained to ensure viable populations of Black-backed Woodpeckers in California.
- Survey for Black-backed Woodpeckers at the beginning of nesting season in post-fire habitat within the range of the species in California in each post-fire year up to 10 years post-fire. Retain all trees with Black-backed Woodpecker nest cavities, and create a limited operating period within 600 meters from all known Black-backed Woodpecker nests from April 1<sup>st</sup> through August 30<sup>th</sup>.
- In unburned forests, retain patches of snags in a variety of decay stages, including those susceptible to future insect occupancy. Add management direction to forest plans to encourage retention of very dense, old stands in order to facilitate competition/beetle mortality as a desired condition. Prevent salvage logging in large patches of high conifer mortality from beetles/competition/drought.
- 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.
- Focus fuel-reduction and beetle prevention thinning operations in the immediate vicinity of homes or administrative structures ([www.firelab.org](http://www.firelab.org)), and halt current plans to reduce/eliminate high-intensity fire in conifer forest wildlands not adjacent to homes.
- Prohibit insecticide use, and beetle repellent use, in suitable Black-backed Woodpecker habitat or within the range of the species outside of the immediate zone of administrative facilities.

### **IV. Listing Recommendation**

Listing of the Black-backed Woodpecker in California is warranted. It is very likely to become endangered in the foreseeable future as a result of its isolation and low population size combined with a) very limited snag forest habitat, b) lack of new snag forest habitat (due to fire suppression, thinning, etc.), c) the ephemeral nature of snag forest habitat, d) loss of snag forest habitat due to salvage logging, e) climate change, and f) lack of legal protection for its habitat.

As explained in this status report, the best available science shows that Black-backed Woodpeckers rely primarily on “snag forest habitat” which is created by large patches of moderate/high-intensity fire, or beetle-kill, in dense, mature/old, higher-elevation conifer forest. Furthermore, this habitat type is only relevant to Black-backed Woodpeckers shortly after the fire or beetle disturbance occurs (i.e., for approximately seven or eight years, typically). In other words, the bird’s preferred habitat is naturally ephemeral and therefore Black-backed Woodpeckers must move from one disturbed area to another to find suitable habitat for nesting and foraging.

Not only is snag forest habitat ephemeral, it is very rare on the landscape due to three overarching reasons: 1) fire suppression when fires do occur (which, when fires do occur, prevents snag forest habitat from being created in greater amounts), 2) fire prevention (meaning the mechanical thinning and other efforts taken to prevent high-intensity fire, and hence, snag forest habitat, from occurring at all), and 3) salvage logging (which eliminates snag forest habitat when it does occur). Consequently, only in those rare instances where the above three factors do not play out does new snag forest habitat occur.

The above three factors are playing out to a significant degree, however. On public and private lands, fire suppression is the dominant modus operandi – the Forest Service has a policy of suppression as do private land holders. Likewise, on both public and private lands, fire prevention is the dominant modus operandi – the Forest Service seeks to limit as much as possible the occurrence of high-intensity fire, as do private forest landholders. Finally, on both public and private lands, there are no meaningful protections against salvage logging – consequently, both the Forest Service and private land holders can salvage log woodpecker habitat, and do.

Furthermore, while Black-backed Woodpeckers can be found in unburned forest, the best available science shows that Black-backed Woodpeckers likely require unburned forest that contains an extraordinarily high number of recent snags (due to density and aging of the forest) – averaging generally 20-25 square meters per hectare or more of very recent snag basal area from native beetles (i.e., over 90 square feet per acre of recent snag basal area, or about 100 medium to large snags per acre). Such habitat, like the type of post-fire forest habitat relied upon by Black-backed Woodpeckers, is extremely rare on the landscape. Consequently, it should be assumed for purposes of this listing consideration that, as discussed above, only a tiny fraction of unburned forest habitat is contributing in a significant way to the continued existence of Black-backed Woodpeckers in California. This is because there is “no requirement that the evidence be conclusive in order for a species to be listed.” *Defenders of Wildlife v. Babbitt*, 958 F.Supp. 670, 679-81 (D.D.C. 1997) (internal citations omitted). Rather, a species should be listed “even though many aspects of the species’ status [are] not completely understood, because a significant delay in listing a species due to large, long-term biological or ecological research efforts could compromise the survival of the [species].” *Id.* Here, while it is possible that a slightly higher fraction of unburned forest (relative to our estimate) meaningfully contributes to the viability of Black-backed Woodpeckers in California, the best available science does not demonstrate that. Moreover, as discussed above, the very small amount of snag forest habitat that occurs in unburned forest from native beetle mortality has no meaningful protections from salvage logging

across most of the Black-backed Woodpecker's range in California, just like snag forest habitat resulting from fire.

It is also important to keep in proper perspective the science regarding fire in California. It has been asserted that high-intensity fire will increase in the future in California and therefore that there will be more Black-backed Woodpecker habitat in the future. There are several problems with this assertion, however. First, even if the assertion regarding increased fire holds true, that does not necessarily equate with more Black-backed Woodpecker habitat because a) the burned forest would simply be salvage logged more extensively without protections for this habitat, and b) the burned forest might not occur in areas where Black-backed Woodpeckers occur (e.g., the fire might occur outside the elevational range of the woodpecker, especially given projected contraction of the upper-elevation forest types selected by Black-backed). Second, there are data suggesting just the opposite of the assertion – that fire will decrease, not increase, in the future as a result of the increased precipitation that may be associated with climate change in California. In other words, while climate change is certain, the impacts of climate change on fire in California may or may not result in increased fire and instead may result in decreased fire. Third, even if the assertion regarding increased fire holds true, climate change could have a very dramatic and drastic impact on forest types in California that results in a serious net loss of higher-elevation conifer forest types which would likely result in a significant Black-backed Woodpecker range contraction. Thus, even if it is assumed that fire will increase (which we should not assume), it cannot also be assumed that there will be a net benefit to Black-backed Woodpeckers. Instead, the weight of the evidence, and erring on the side of conservation, means that it should be assumed that climate change could have a very negative net effect on Black-backed Woodpeckers due to either less fire or loss of suitable forest types, or both.

Further, it is important to keep in mind that California Black-backed Woodpeckers are isolated from the boreal population and may even be isolated from the Oregon birds – the Oregon/California population is a subspecies, and it may also be that the California birds are separated from the Oregon birds, thus potentially making them even more vulnerable. Again, while the science on this issue is inconclusive as to the California population, addressing this issue from a conservation perspective means that we should act cautiously. This is partly why wildlife agencies are “not obligated to have data on all aspects of a species' biology prior to reaching a determination on listing,” *Defenders of Wildlife v. Babbitt*, 958 F.Supp. 670, 679-81 (D.D.C. 1997) (internal citations omitted) – to ensure that we make conservation based decisions while awaiting new information.

Finally, the best available science shows that the Black-backed Woodpecker numbers in California are likely very low – about 600 pairs. Our population estimate is the most supportable because it a) relies on the best available science regarding post-fire forest habitat in California, and b) relies on the best available science regarding likely use of unburned forest habitat. Other estimates, on the other hand (i.e., Fogg et al. 2012), rely on unsupportable assumptions regarding unburned forest habitat use, and regardless, acknowledge that there is “no way to determine the viability of the unburned forest portion of the population . . .” (Fogg et al. 2012).

In light of the foregoing information, it is reasonable to conclude that Black-backed Woodpeckers in California meet the criteria for “threatened” status because they will likely

become endangered in the “foreseeable future” in the absence of “special protection and management efforts.” (Fish & Game Code, § 2067, Cal. Code Regs., tit. 14, § 670.1). Per CESA’s implementing regulations, “a species shall be listed as endangered or threatened . . . if . . . its continued existence is in serious danger or is threatened by any one or any combination of the following factors: 1. Present or threatened modification or destruction of its habitat; 2. Overexploitation; 3. Predation; 4. Competition; 5. Disease; or 6. Other natural occurrences or human-related activities.” (Cal. Code Regs., tit. 14, § 670.1(i).) Again, Black-backed Woodpecker habitat is presently significantly modified due to fire suppression, logging, and other factors, and will very likely continue to be in light of the policies and lack of substantive protections for the species. Moreover, the scientific literature on the expected effects of anthropogenic climate change project that while wildland fire may increase or decrease somewhat in the coming decades (depending upon the extent of increasing precipitation), even if wildland fire increases, suitable Black-backed Woodpecker habitat is projected to experience a substantial net loss in the coming decades due to range contraction as the higher-elevation forest types upon which Black-backed Woodpeckers depend move upslope and shrink. Given these threats, and given that the best available population estimate shows that the species has far fewer numbers than the minimum viable population threshold identified in the scientific literature for bird species, listing the species is warranted.

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# EXHIBIT A

## Curriculum Vitae of Chad T. Hanson, Ph.D. P.O. Box 697, Cedar Ridge, CA 95924 (530) 273-9290

### EDUCATION

University of California at Davis, Ph.D., Ecology, June 2007  
Completed a Ph.D. in Ecology, with 3.97 GPA, focusing research on forest and fire ecology.

University of Oregon School of Law, Juris Doctorate, May 1995  
Specialized in natural resources law

University of California at Los Angeles, Bachelor of Science, 1990

### RESEARCH PUBLICATIONS

Hanson, C.T., D.C. Odion, D.A. DellaSala, and W.L. Baker. 2010. More-comprehensive recovery actions for Northern Spotted Owls in dry forests: Reply to Spies et al. *Conservation Biology* **24**: 334-337.

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