CENTER *for* BIOLOGICAL DIVERSITY

THE JOHN MUIR PROJECT *of* EARTH ISLAND INSTITUTE

February 11, 2013

California Fish and Game Commission
Attn: Sonke Mastrup, Executive Director
1416 Ninth Street, Suite 1320
Sacramento, CA 95814
fgc@fgc.ca.gov

Re: Black-Backed Woodpecker Status Review

Dear Commission:

On behalf of the John Muir Project of Earth Island Institute and the Center for Biological Diversity, we are submitting to you the attached Status Review regarding the Black-backed Woodpecker pursuant to the California Endangered Species Act's implementing regulations, Cal. Code Regs., tit. 14, § 670.1 (h), which allow "interested parties . . . to submit a detailed written scientific report to the commission on the petitioned action."

Included are the following documents:

1. Final Status Review
2. Attachments
    a. Letter describing how we addressed the peer reviewers' comments (Attachment 1)
    b. Peer reviewer comments (Attachment 2)
    c. Draft status review (i.e., the status review sent to the peer reviewers) (Attachment 3)
3. CD with references

When the Commission addresses the Black-backed Woodpecker at a public meeting, we respectfully request equal time with the Department of Fish and Wildlife to present our findings. If you have any questions about our Status Review, please do not hesitate to contact us.

Sincerely,

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Cc: Director Bonham, California Department of Fish and Wildlife

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

John Muir Project of Earth Island Institute

and

Center for Biological Diversity

February 11, 2013

Prepared by Chad Hanson, Ph.D.

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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[1] 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

[1] 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).

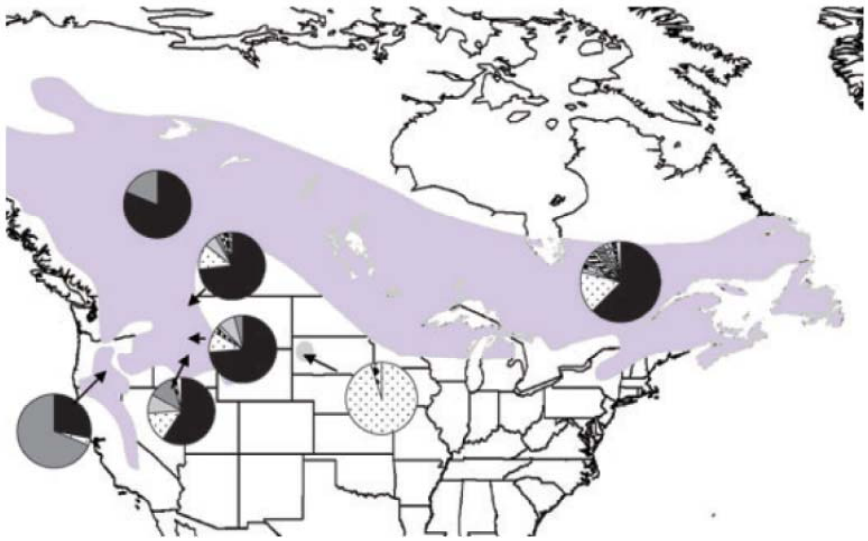

Figure 1. The distribution of Black-backed Woodpeckers (Natureserve) with 7 sampling locations: Oregon, Idaho, Missoula, Glacier, Alberta, and Quebec. The frequency of observed mtDNA cytochrome *b* haplotypes at each sampling location is represented by pie charts at each location. From Pierson et al. (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).

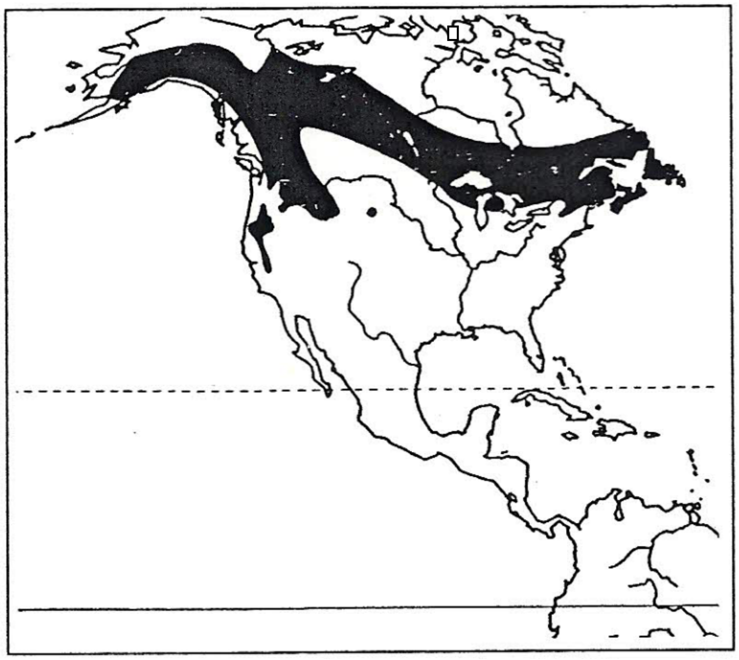

Figure 2. Map of the Range of the Black-backed Woodpecker across North America from Winkler et al. (1995), showing the three distinct populations.

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]).

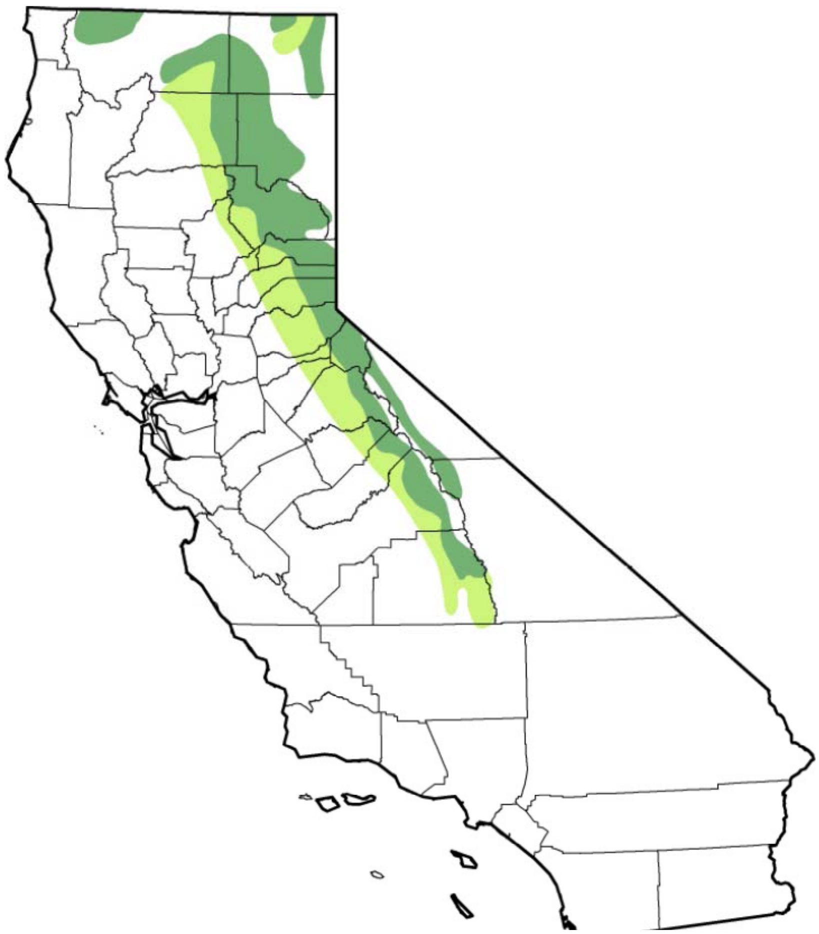

Figure 3.   Gap in the range of the Black-backed Woodpecker between Oregon and California (California Department of Fish and Game 2005, from Siegel et al. 2008). Light green indicates probable winter range, dark green indicates probable year-round range.

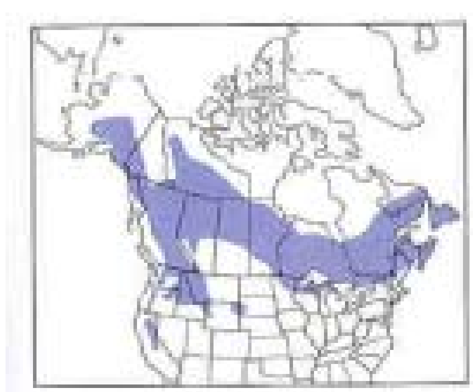

Figure 4. Discontinuity in Black-backed Woodpecker range between the eastern Oregon Cascades and the Sierra Nevada (National Geographic Society Field Guide to Birds of North America).

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-backeds could have smaller than average home ranges, and relatively greater concentrations); e) the most important variables determining where Black-backed Woodpeckers foraged were small snag density, medium snag density, and large snag density (with medium and large snag densities being the most important); f) Black-backeds preferentially selected larger individual snags for foraging; and g) there was a strong negative effect of post-fire salvage logging on foraging (Black-backeds 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[1] snag	PSME[2] snag	PSME live	PICO[3] snag	PICO live	ABLA[4] live	LAOC[5] snag
Caton 1996	NW MT, burned	11		2					9
Hoffman 1997	NW WY, undescribed	15			1	12	1	1	
Dixon and Saab 2000	SW ID, burned	35	19	16					

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

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

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

While nest trees selected by Black-backed Woodpeckers were smaller than those selected by some other cavity nesters (Saab and Dudley 1998, Raphael and White 1984), average sizes of nest trees still were larger than the average available snag. Saab and Dudley (1998) reported that the mean diameter of Black-backed nest trees was 32.3 $\pm$ 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 ± 1.09 cm (n = 20) compared to mean dbh at random sites of 19.8 ± 0.73 cm (n = 151); mean distance to an unburned edge from the nest tree was 605.95 ± 61.0 m compared to random distance of 168.7 ± 10.8 m; mean percent of low-intensity fire within 1 km of nest tree was 20.8 ± 1.90% compared to random 24.9 ± 0.54%, and mean snag density within 11.3 m of nest tree was 26.8 ± 4.17 m compared to random 13.3 ± 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 (±SE) of Black-backed Woodpeckers nesting in the Jasper Fire in the Black Hills, South Dakota.

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

Table 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-backeds selected nest sites in areas with higher snag densities and larger burned areas; tree density increased odds of nesting only if it coincided with increasing areas of moderate-high burn severity.

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

U.S. government surveys circa 1900 found that large expanses of high beetle mortality, and high-severity fire, are a natural part of the ecology in the Black Hills National Forest (Shinneman and Baker 1997, Bonnot et al. 2009).

Black-backed Woodpeckers are important primary cavity excavators in intensely burned snag forests, providing nesting sites for other cavity-nesting bird and mammal species. Saab et al. (2004) reported that 27% of Black-backed Woodpecker cavities subsequently were re-used by other weak-excavator and non-excavator bird species. In burned forests of Montana, Hutto and Gallo (2006) documented 6 cavities made by Black-backed Woodpeckers that were re-used 7 times by other species including Northern Flicker (*Colaptes auratus*; 2 nests), White-breasted Nuthatch (*Sitta carolinensis*; 2 nests), House Wren (*Troglodytes aedon*; 2 nests), and Mountain Bluebird (*Sialia currucoides*: 1 nest). All the Black-backed Woodpecker cavities were reused by another species.

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

Black-backed Woodpecker foraging in salvage logged areas often drops to near zero, based upon radiotelemetry data (Goggans et al. 1989). Specifically, Goggans et al. (1989) conducted a radiotelemetry study of Black-backed Woodpeckers in an area with about 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).

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

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

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

[c] Minimum convex polygon

[d] Fixed-kernel

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

Larger areas may be required during the post-breeding period, and as time elapses since fire (Dudley and Saab 2007). Home-range sizes were significantly larger at 8 years post-fire than 6 years post-fire (Table 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).

<u>Conclusion</u>: 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 20th 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 20th 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).

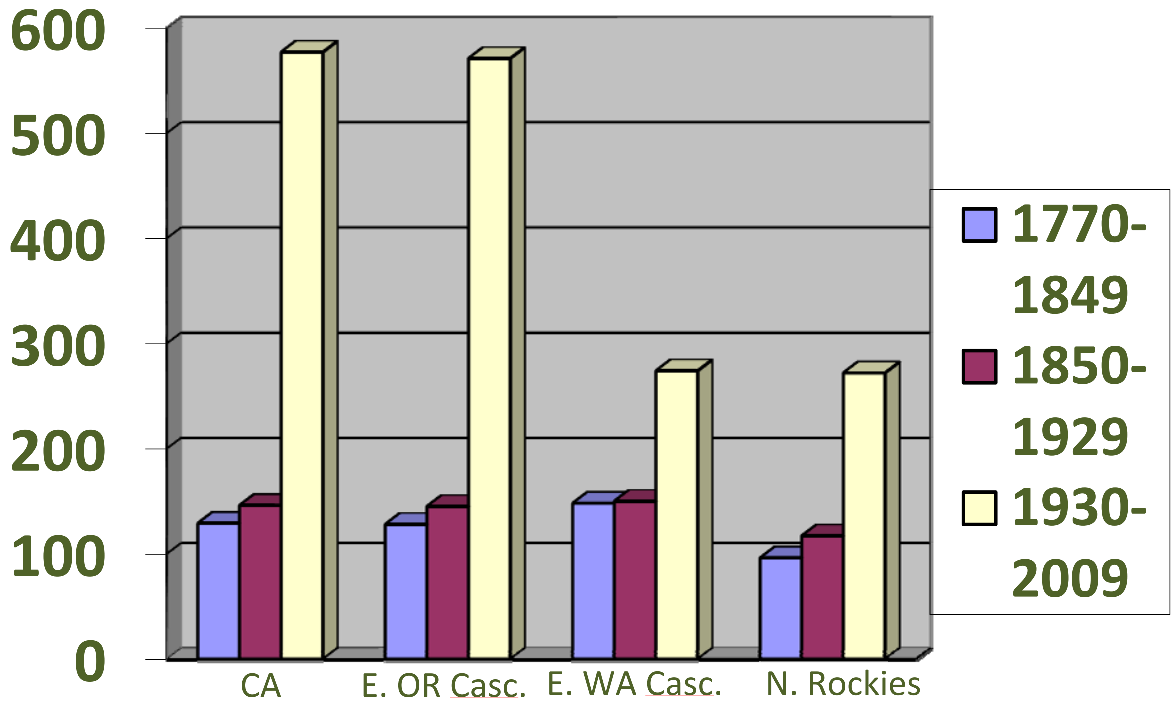

Figure 5. Rotation interval of high-intensity natural disturbance in years (y-axis) since the 19th century in unmanaged conifer forests within the range of the Black-backed Woodpecker in California, eastern Oregon Cascades, eastern Washington Cascades and northern Rockies.

Because of the extremely close association between Black-backed Woodpeckers and higher-intensity fire, the large decline in high-intensity fire since the early 20th 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), 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 19th 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):

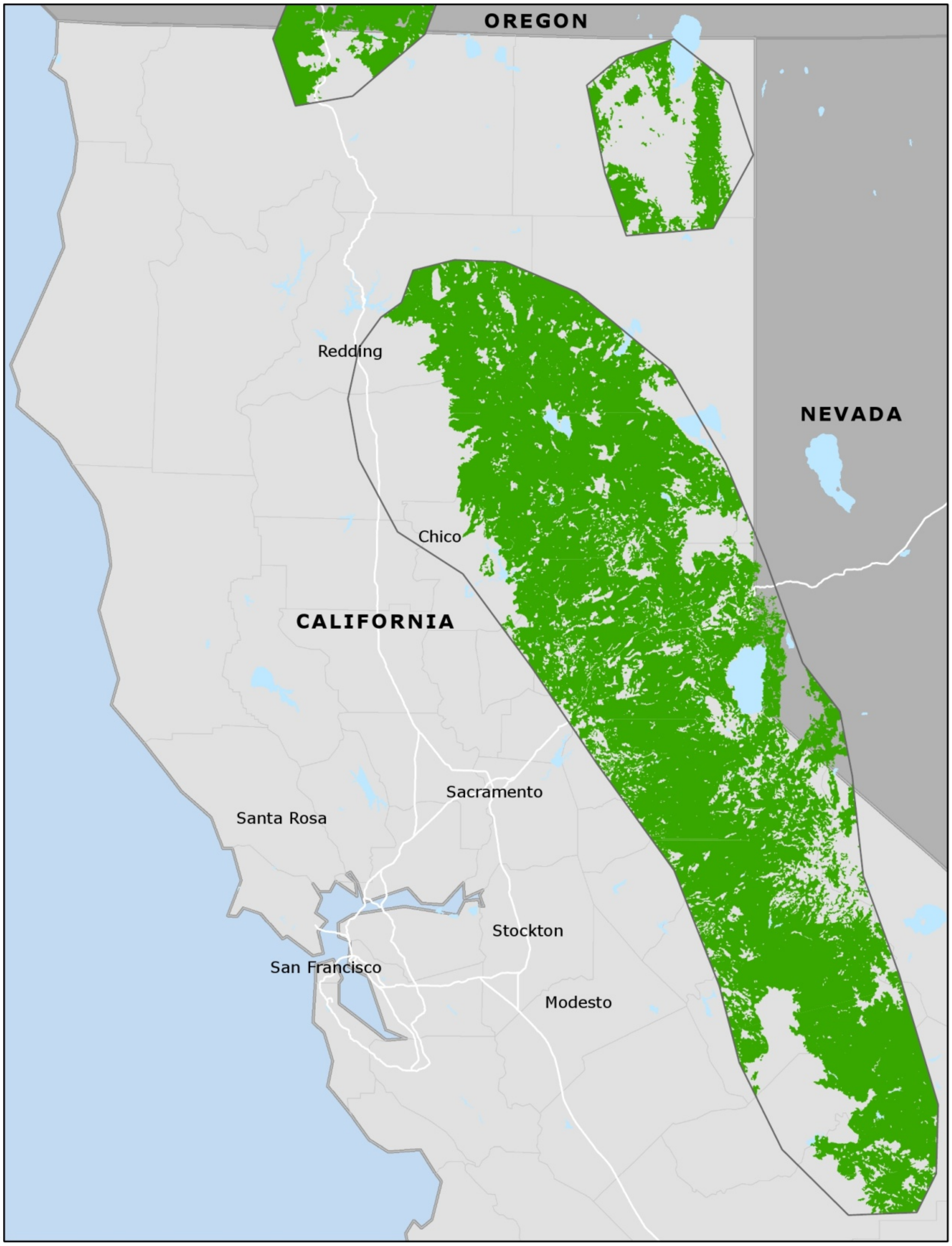

Figure 6a. The current distribution of conifer forest types that could potentially be used by the Black-backed Woodpecker in California.

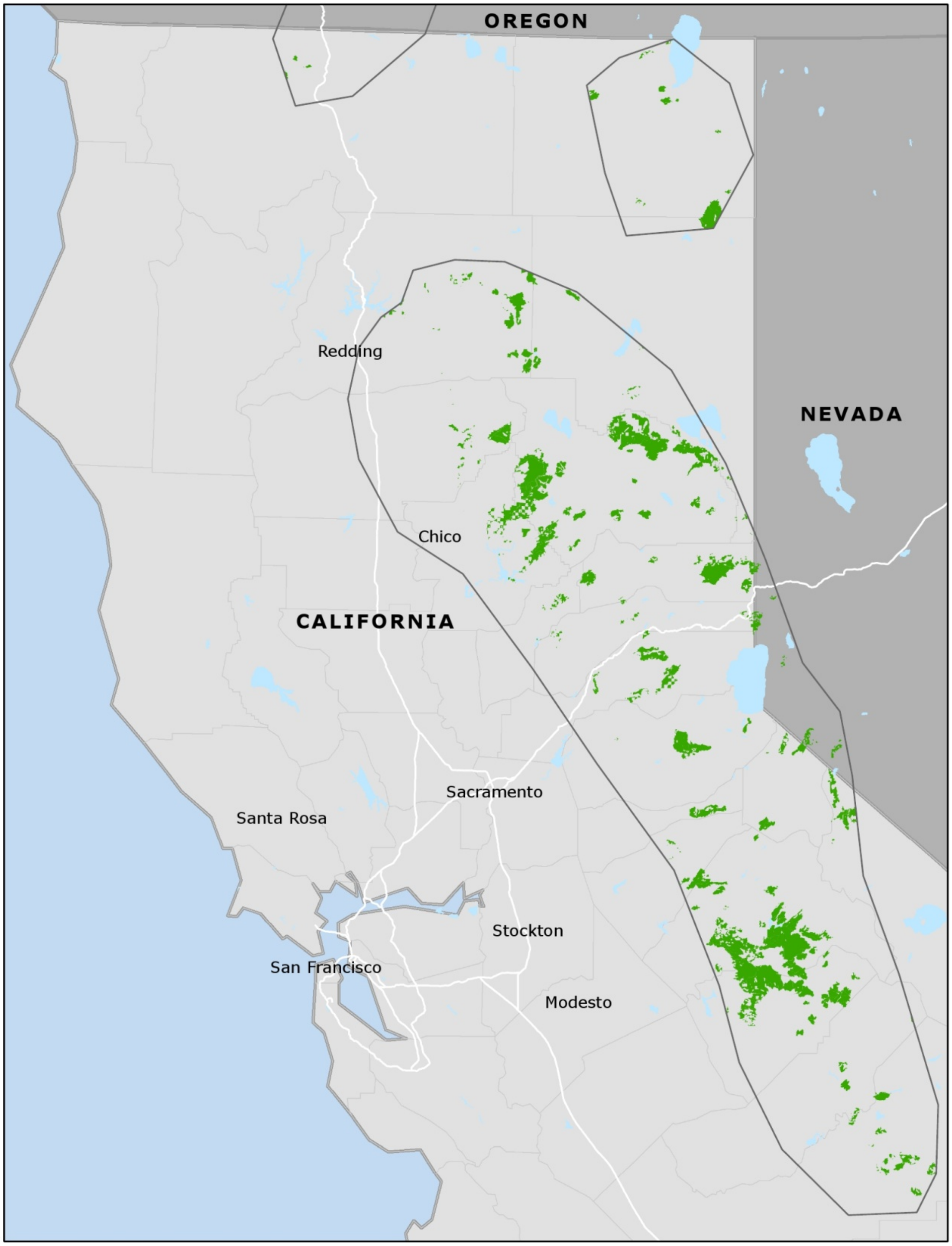

Figure 6b. Fires since 1984 on federal lands within relevant forest types on federal lands in California.

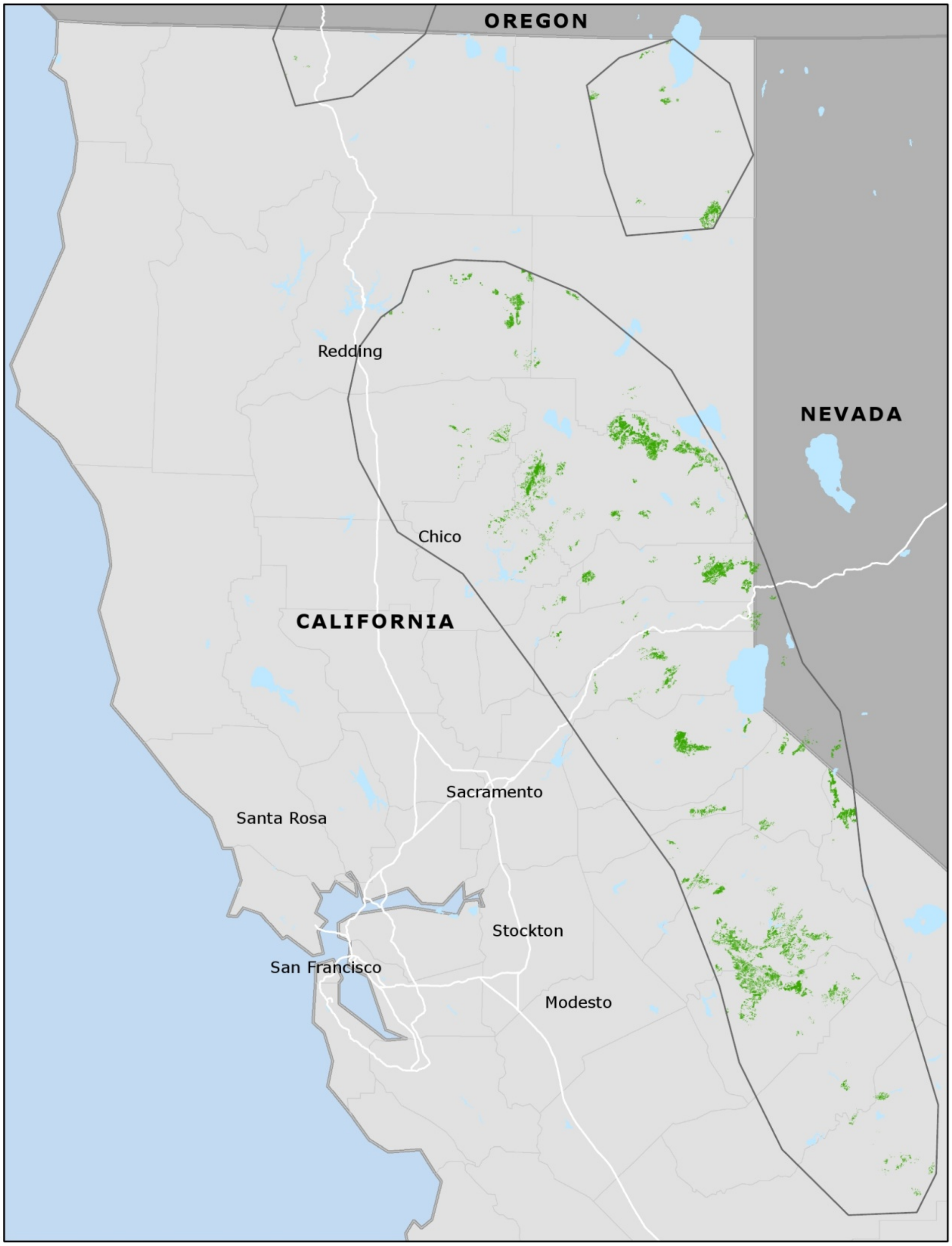

Figure 6c. Fires since 1984 with higher intensity fire effects (RdNBR >574 from satellite imagery, corresponding to >50% mortality in trees over 30 cm in diameter [Hanson et al. 2010]) within relevant forest types on federal lands in California.

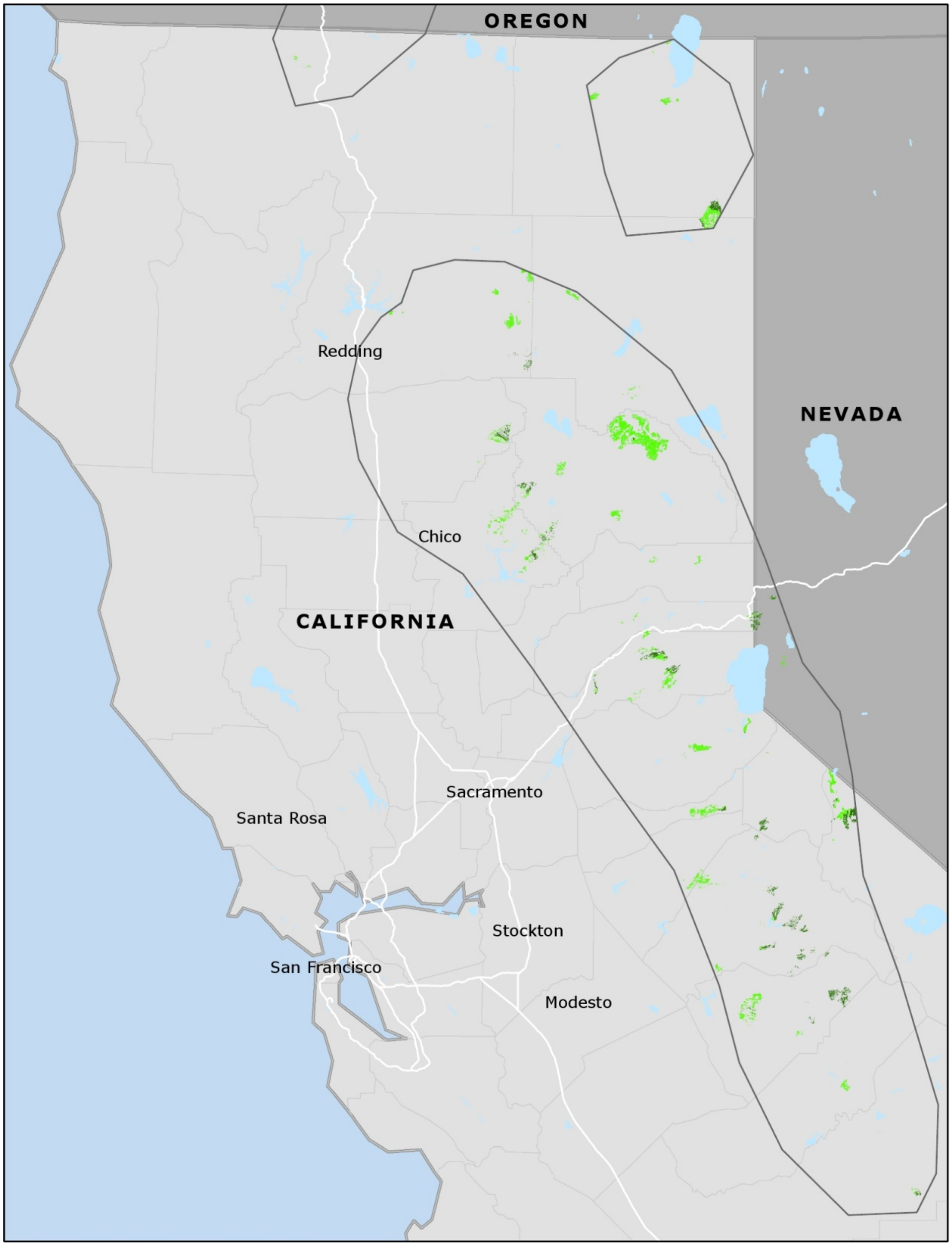

Figure 6d. Moderate/high-intensity fire since 2001 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green in California.

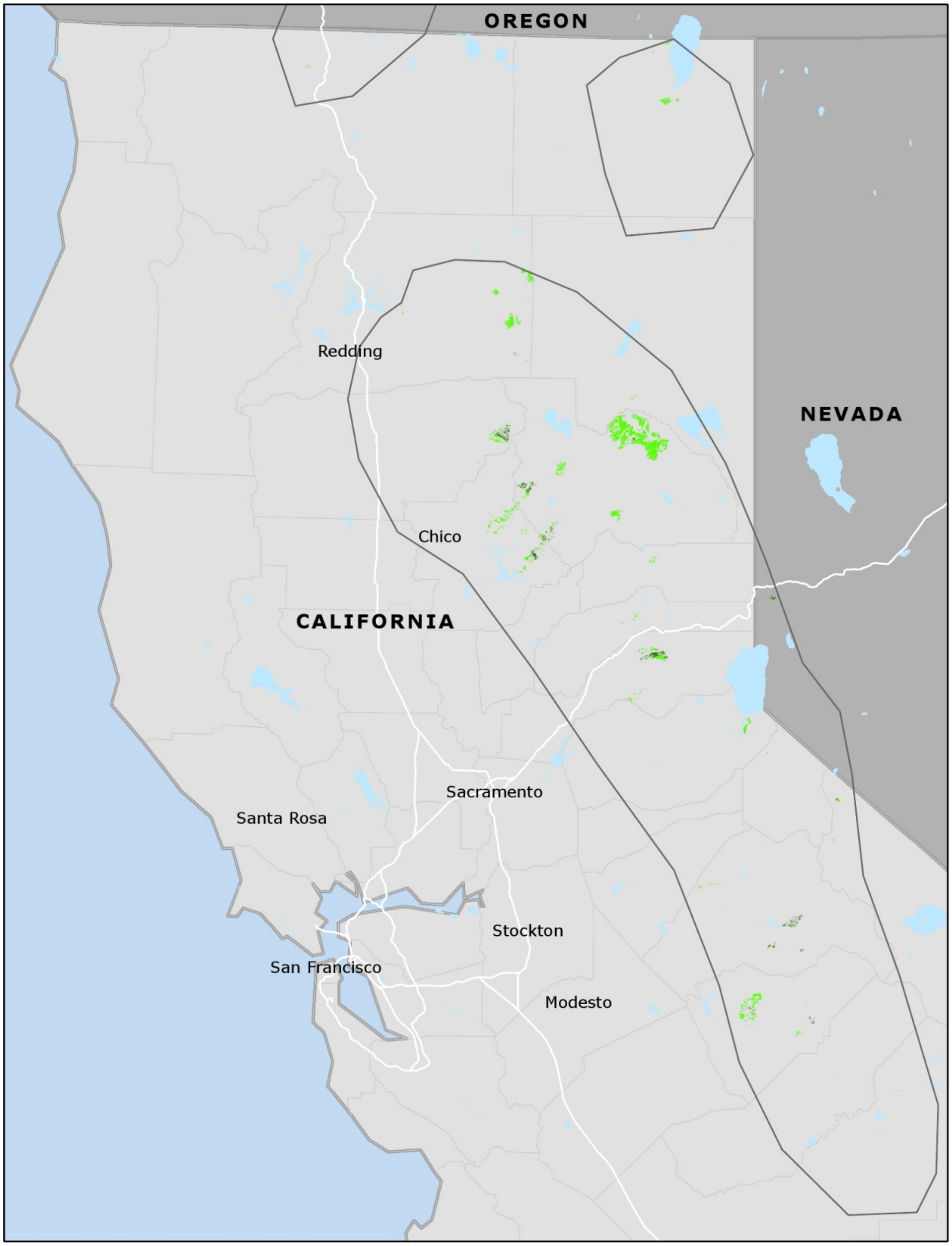

Figure 6e. Moderate/high-intensity fire since 2006 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green in California.

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 ± 9.3 snags >23cm/ha, and after logging were 45 ± 5.1 snags >23cm/ha and 129.6 ± 19.8 snags ≤23cm/ha. The unlogged burned stands had 67.8 ± 11.5 snags >23cm/ha and 100.4 ± 19.7 snags <23cm/ha. Numbers of nesting Black-backed Woodpeckers were significantly reduced in burned, logged stands compared to burned, unlogged stands elsewhere in the Rocky Mountains as well (Harris 1982 and Caton 1996 as cited in Dixon and Saab 2000). In the eastern Oregon Cascades, Cahall and Hayes (2009) found that partial salvage logging did not mitigate adverse effects to Black-backed Woodpeckers. 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 (≥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 (≥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).

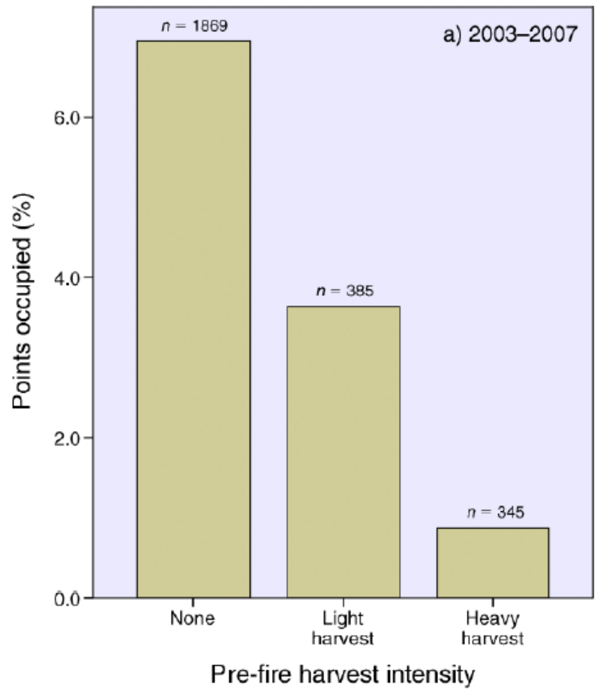

Figure 7. The probability of detecting a Black-backed Woodpecker decreases substantially with intensity of recent pre-fire thinning. From Hutto (2008 at p. 1,830).

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[2] 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

[2] *See* 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. <u>Sierra Nevada Forest Plan Amendment 2001 and 2004</u>

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 forests 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. <u>Northwest Forest Plan 1994 Record of Decision</u>

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).

<u>Conclusion</u>: 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 forseeable 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. <u>Oregon Forest Practices Act</u>

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.)

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

5. <u>Significant Post-fire Salvage Logging is Occurring on Public and Private Lands</u>

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 [Freds FEIS, p. 276]). Under the chosen alternative, Alternative 1, all of this was proposed for post-fire salvage logging on public lands, except three small "snag retention clumps" of 55 acres, 62 acres, and 47 acres, respectively (USDA 2005b [Freds FEIS, p. 278, Table 3-78]). In other words, approximately 95% of the Black-backed Woodpecker habitat was proposed for logging. The Ninth Circuit Court of Appeals ruled that this logging was illegal, but every acre of the planned salvage logging was cut by the time this ruling was issued, given that the district court denied plaintiff's request for a preliminary injunction (which is almost always the case with challenges to post-fire salvage logging within Black-backed Woodpecker habitat in California). *Earth Island Institute v. U.S. Forest Service*, 442 F.3d 1147 (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, Table1.1).

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) <u>Private Land</u>

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 19th 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.

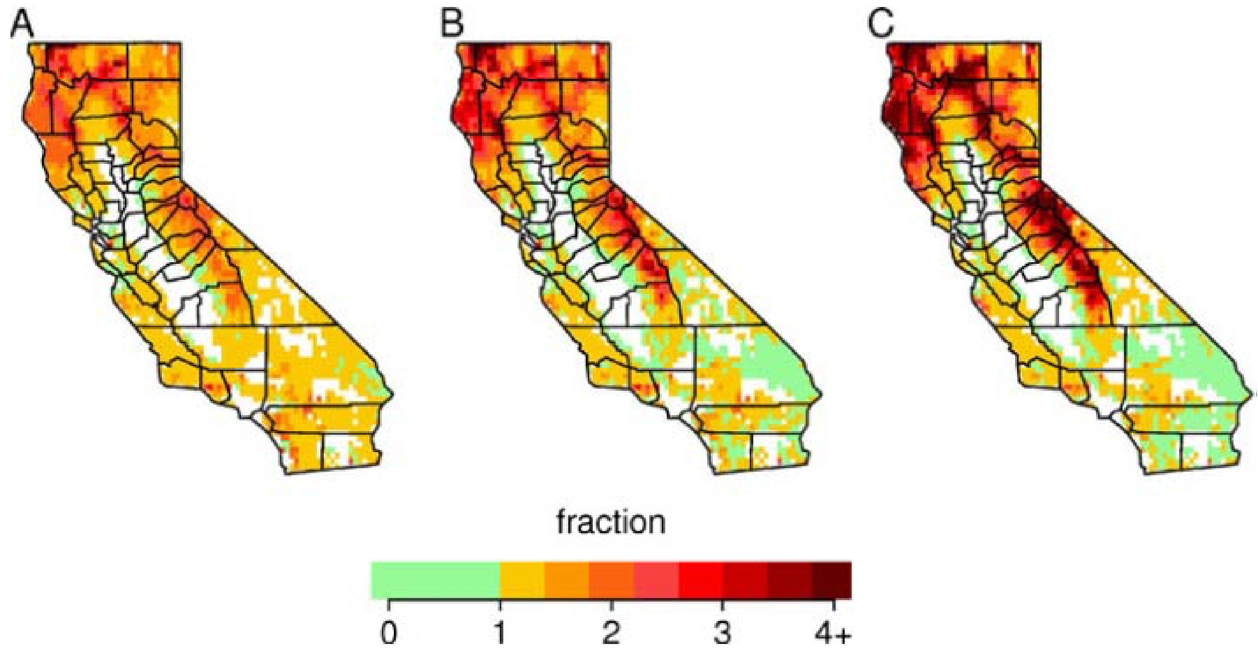

Figure 8. A doubling of fire, on average (a "1" equates to no increase in fire), under three climate modeling scenarios assuming hotter, drier conditions, from Westerling et al. (2011). As discussed in Westerling et al. (2011), the models do not represent a prediction of what will likely occur but, rather,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

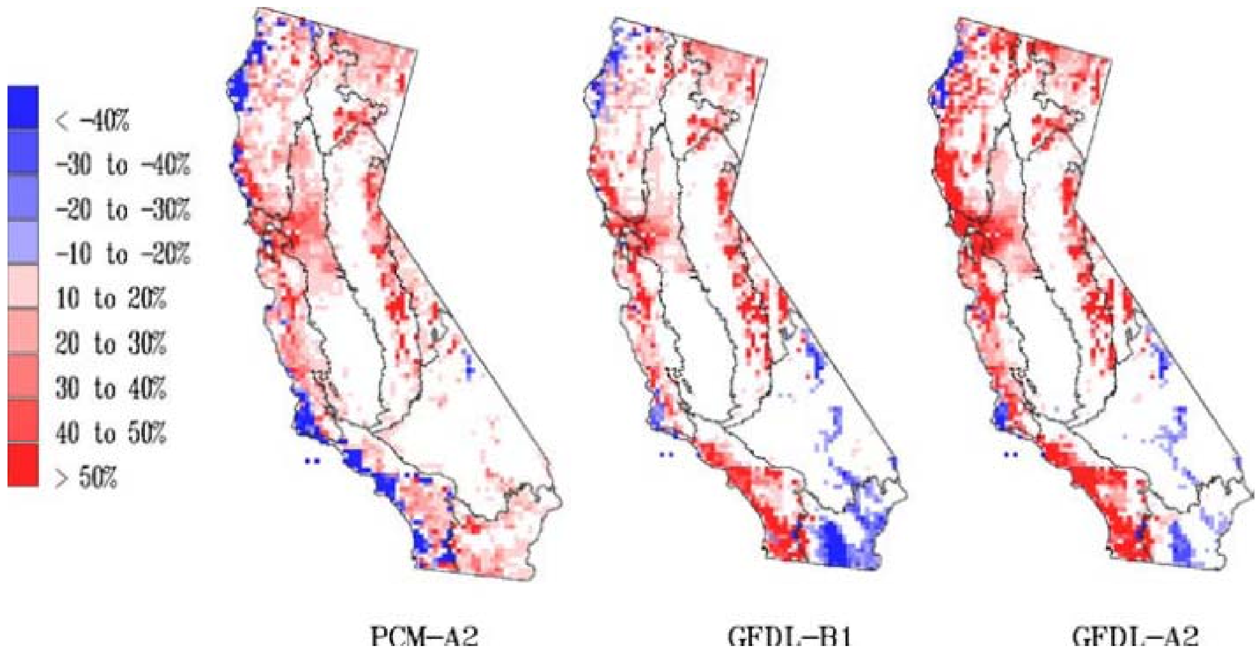

Figure 9. Projected increases, due to climate change, in wildland fire in alpine/subalpine zones (lodgepole pine and subalpine forest types) by 2070-2099, generally averaging 20-40%, while little or no increases are projected in evergreen conifer forest types, such as mixed-conifer (from Lenihan et al.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

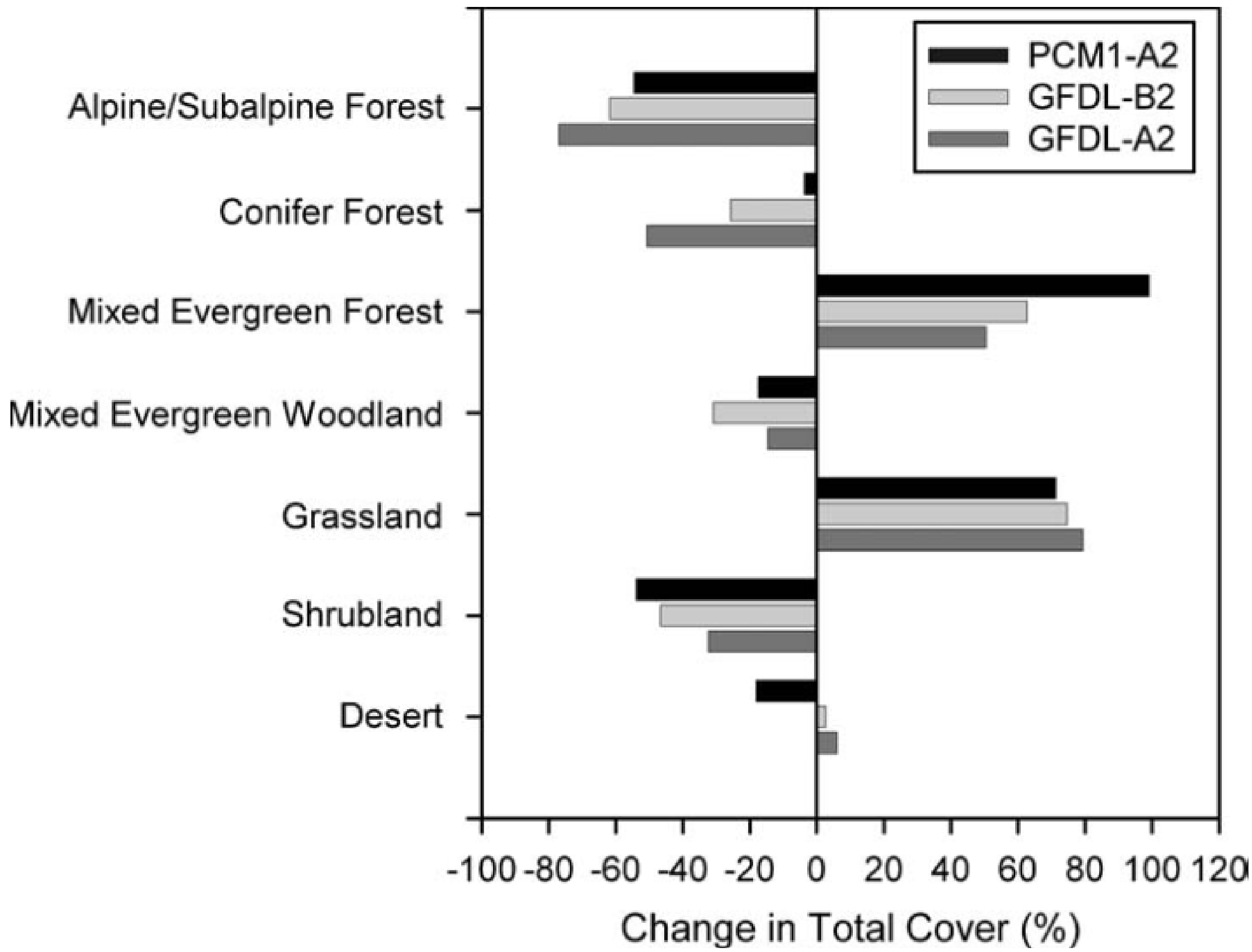

Figure 10. Projected loss, due to climate change, of approximately 20-60% of forest types in which suitable Black-backed Woodpecker habitat occurs (conifer forest and subalpine conifer forest) by 2070-2099 (from Lenihan et al. 2008). Lenihan et al. (2008) defined alpine/subalpine as including lodgepole 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).

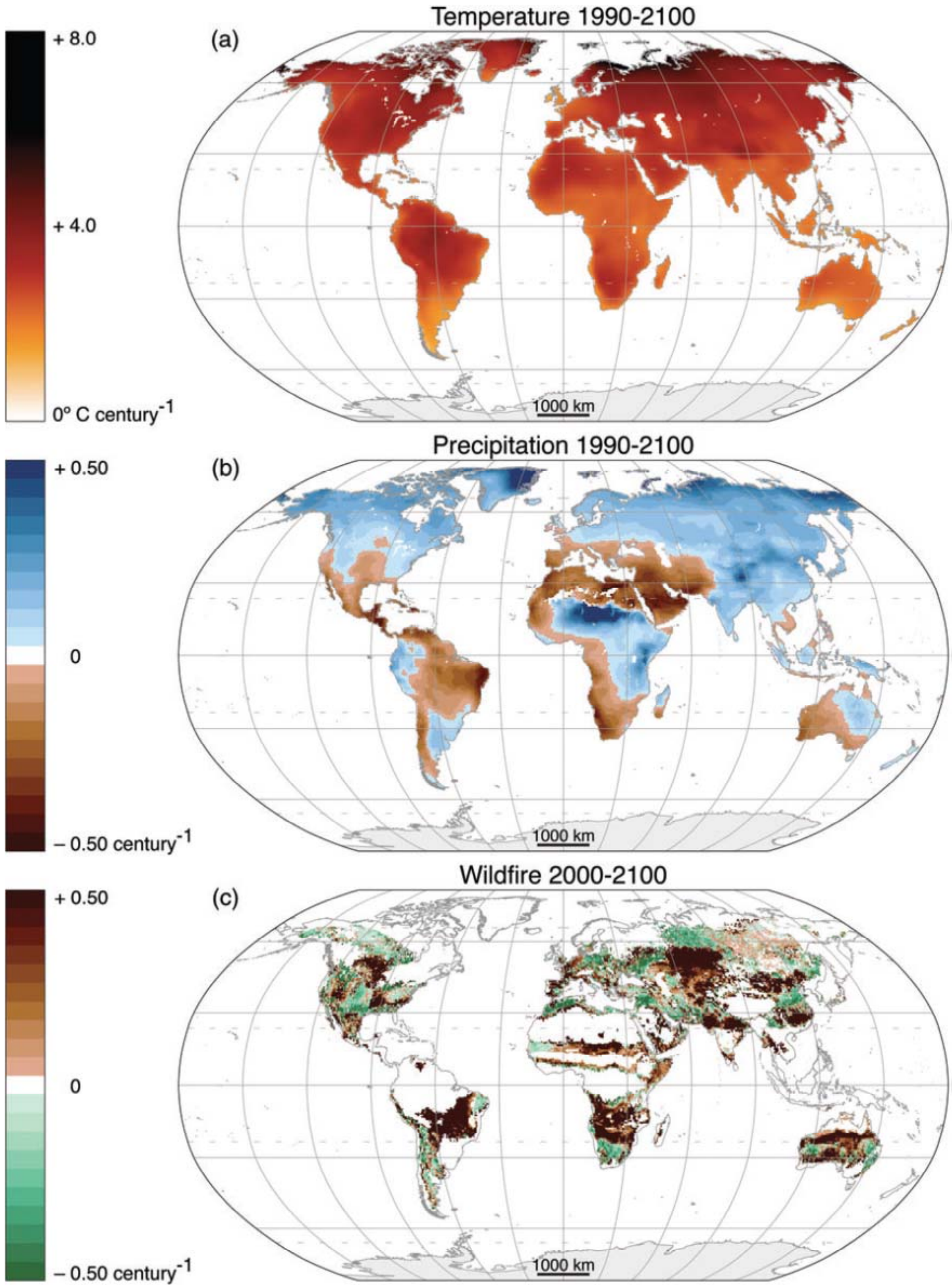

Figure 11. Projected increases in fire in intermountain rangeland regions, with projected lack of change, or moderate decrease, in the Sierra Nevada and Cascades (from Gonzalez et al. 2010).

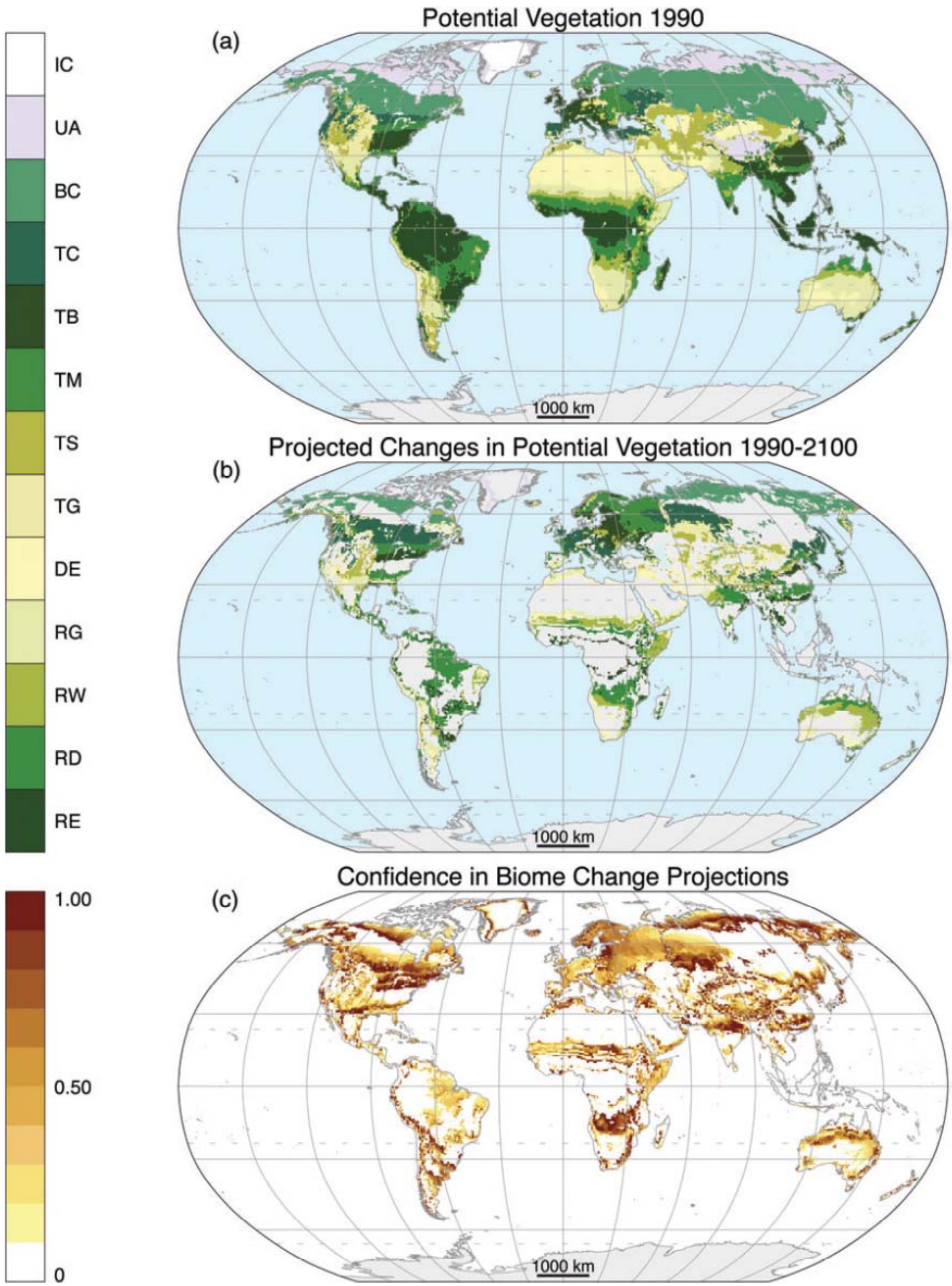

Figure 12. Projected massive loss (>80%) of temperate conifer forest (TC, shown in dark teal green) by the end of the century due to climate change (from Gonzalez et al. 2010).

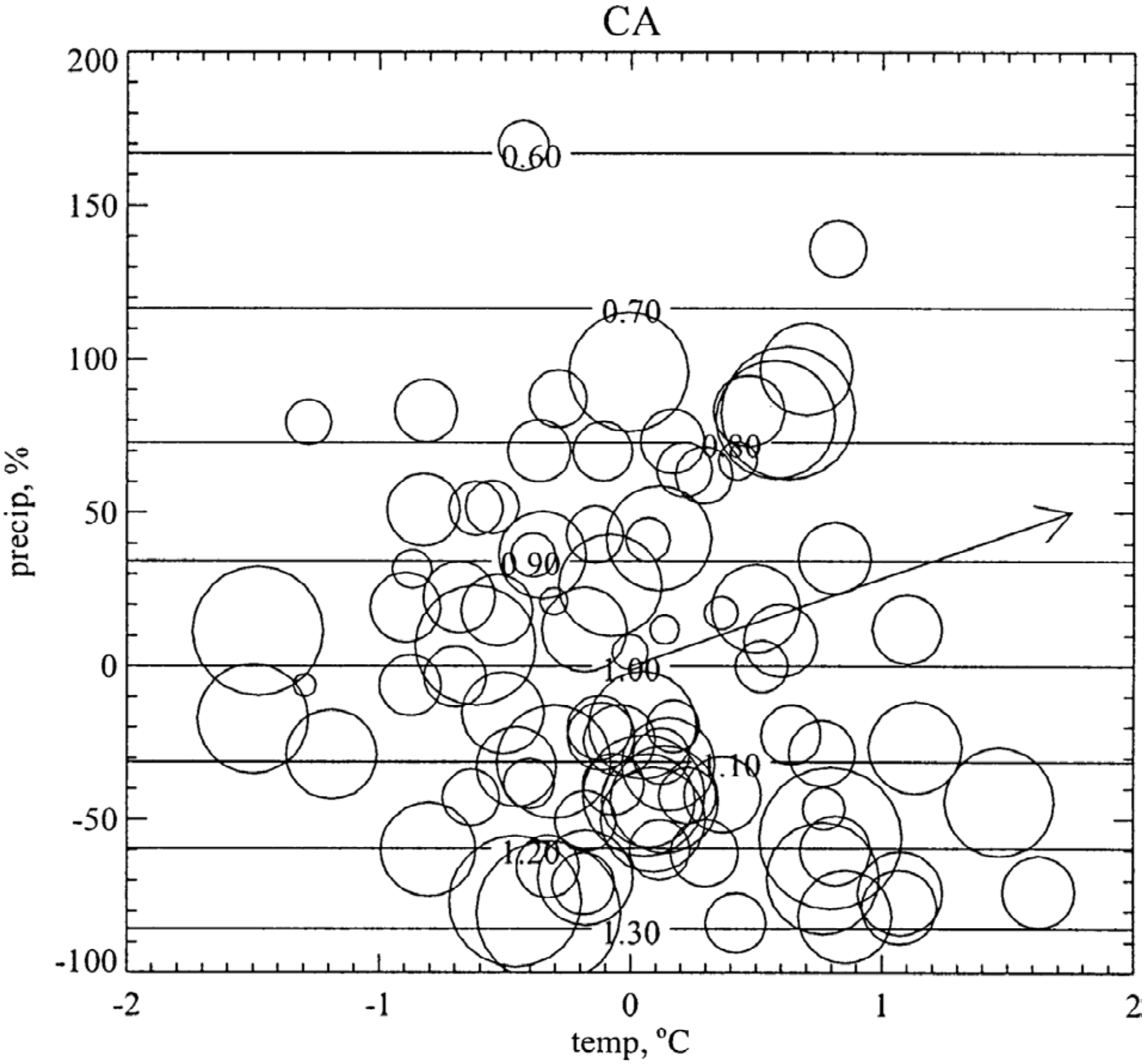

Figure 13. Fire in California's forests projected to decrease, due to climate change, by about 15% (from baseline of 1.00 to about 0.85 of baseline at the point of the arrow) by 2070-2100, while temperature and precipitation both increase (McKenzie et al. 2004).

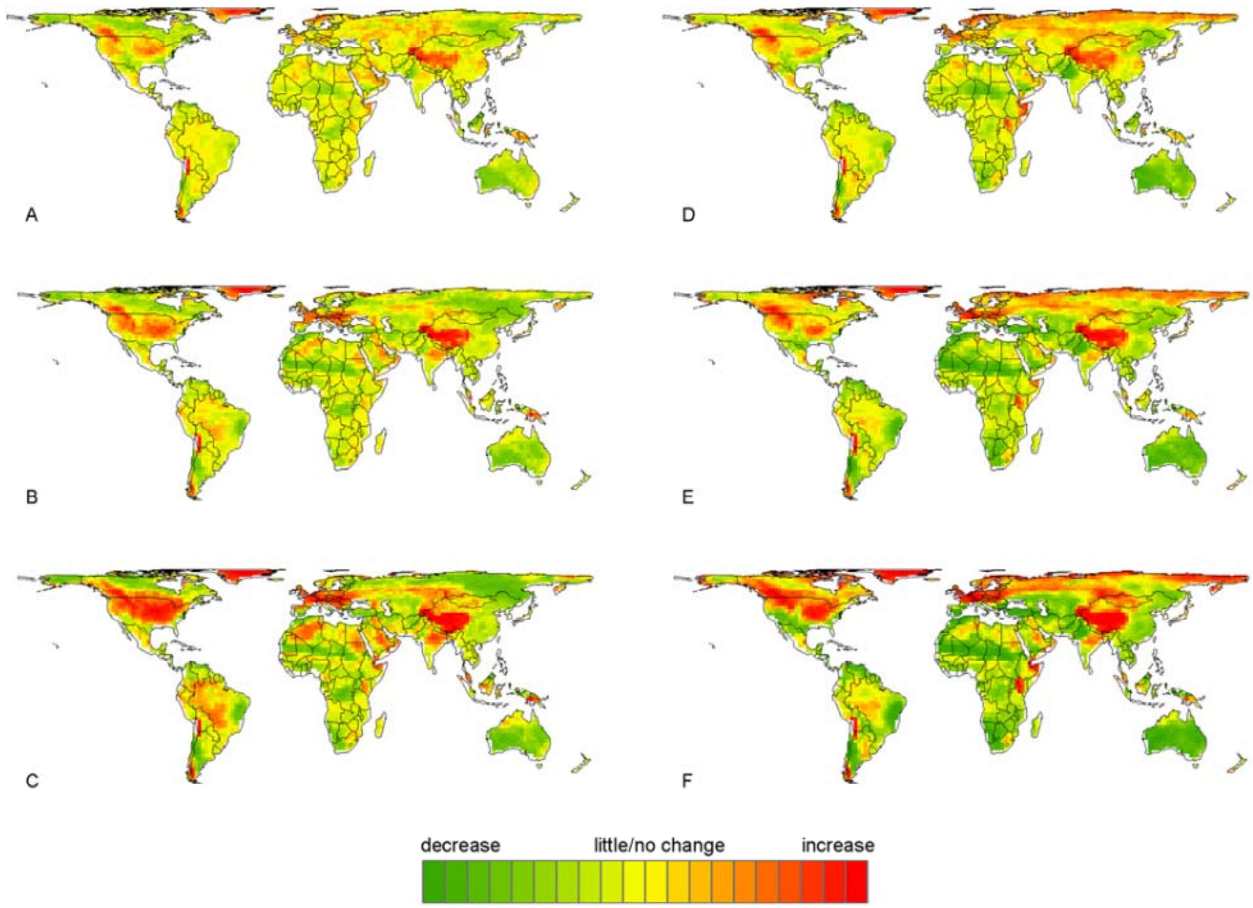

Figure 14. Climate change projected to result in no change (yellow) in wildland fire in the forests of the Sierra Nevada and eastern Cascades for 2010-2039 (A and D) and 2040-2069 (B and E), and, by 2070-2099, projected to result in either no change on the western slope and a slight increase on the eastern 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.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. <u>Unburned Forest</u>

A recent study on Black-backed Woodpecker nest densities in burned versus unburned forests used the playback method (through which recorded calls of Black-backed Woodpeckers are played to reliably attract Black-backeds within hundreds of meters around) to detect Black-backeds along 200-meter-wide transects, and then spent up to 90 minutes following the detected birds throughout the forested landscape (not just in the transects) to locate nests (Russell et al. 2009). The study found 21 Black-backed Woodpecker nests in a large burned forest area with substantial high-intensity fire and zero in unburned forest dominated by lodgepole pine and white fir at 1,500–2,000 meters in elevation in the Fremont-Winema National Forest, and on a Nature Conservancy preserve, just north of the California/Oregon border (Russell et al. 2009). Hanson and North (2008), conducted in the Sierra Nevada, found Black-backed Woodpeckers only in high-intensity/unlogged old forest, and found none in unburned forest. Similarly, Burnett et al. (2011 [Table 1]), in the northern Sierra Nevada, found Black-backed Woodpeckers only in large fire areas, and found zero in unburned forest, despite surveying for Black-backeds at several hundred detection stations across a vast area of unburned forest (covering much of the northern Sierra Nevada) over two consecutive years. In Hutto (2008), one of the largest data sets ever gathered for any wildlife species in ecological history, "[o]nly six of 194 [Black-backed] woodpecker detections occurred in something other than a burned forest." The 188 detections in burned forest were out of 3,218 sample points, i.e., Black-backed Woodpecker was present at 6.0% of burned points, while the 6 detections in unburned forest were out of a total of 13,337 points, i.e., Black-backed Woodpecker was present at only 0.045% of unburned points. In other words, in the most comprehensive data base, Hutto (2008) found Black-backed Woodpecker abundance in unburned forest to be 1/133th of their abundance in burned forest.

The Black-backed Woodpecker population estimate in unburned forest from Appendix 2 of Fogg et al. (2012) is based upon the assumption of Black-backeds 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-backeds 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-backeds 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. <u>Overall Population—Burned and Unburned Combined</u>

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. <u>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</u>

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. <u>Inconsistency With Data on Snag Density in Areas in Which BBWOs Successfully Nest and Reproduce</u>

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. <u>Unsupported Assumption that BBWO Presence in Unburned Forest Equates to BBWO Nesting</u>

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 homes 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-backeds are misidentified as Hairies 20% of the time, and Hairies are misidentified as Black-backeds 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-backeds.

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 1st through August 30th.

- 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), and halt current plans to reduce/eliminate high-intensity fire in conifer forest wildlands not adjacent to homes.

- Prohibit insecticide use, and beetle repellant 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-backeds). 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.

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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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Attachment 1 to Black-backed Woodpecker Status Review: Letter Regarding Peer Reviewers' Comments

CENTER *for* BIOLOGICAL DIVERSITY

THE JOHN MUIR PROJECT *of* EARTH ISLAND INSTITUTE

February 8, 2013

California Fish and Game Commission
Attn: Sonke Mastrup. Executive Director
P.O. Box 944209
Sacramento, CA 94244-2090
fgc@fgc.ca.gov

Re: Black-Backed Woodpecker Status Review

Dear Commission:

On behalf of the John Muir Project (JMP) of Earth Island Institute and the Center for Biological Diversity (CBD), we are submitting to you a Status Review regarding the Black-backed Woodpecker pursuant to the California Endangered Species Act's ("CESA") implementing regulations, Cal. Code Regs., tit. 14, § 670.1 (h), which allow "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. In November of 2012, we submitted the Draft Status Review to five scientist peer reviewers, all of whom are experts on either the Black-backed Woodpecker or on fire ecology of forest ecosystems. The peer reviewers generally concluded that our Status Review and its conclusions are scientifically sound:

<u>Richard L. Hutto, Ph.D., Director, Avian Science Center, University of Montana</u>: "[Y]ou have compiled a great summary of existing information. . . . The Black-backed Woodpecker . . . is a perfect endangered species candidate."

<u>Monica L. Bond, M.S., Chief Scientist, Wild Nature Institute</u>: "[T]he general methodology of extrapolation used by Dr. Hanson constitutes the best available current science, and gives a reasonable estimate of population size – a combined total of approximately 600 nesting pairs (or 1,200 nesting individuals) in California. . . . [T]he safeguards of CESA are . . . necessary to ensure that the ecosystems upon which Black-backed Woodpeckers depend are given regulatory protection that they presently lack, and that Black-backed Woodpecker populations are recovered from more than a century of logging and fire suppression."

<u>Dennis C. Odion, Ph.D., Earth Research Institute, University of California at Santa Barbara</u>: "I believe your review of the literature and evidence regarding the status of the black-backed woodpecker was thorough and reached a conclusion that is supported by the scientific evidence:

the California black-backed woodpecker is threatened and in need of protections to prevent its extinction. . . . Cooper (1870) described the species as 'numerous.' This description is a stark contrast to the current status of the Black-backed Woodpecker and suggests that there has been long, steep decline in its population in California. This trend probably began with fire suppression in the early 1900s, and may have accelerated in recent decades with the combined effects of forest thinning and clear-cut logging after fires . . . ."

Dominick A. DellaSala, Ph.D., President and Chief Scientist, Geos Institute: "[P]lease accept my review of your status review of the Black-backed Woodpecker and, most notably, my support for your recommendation to list the species at least as threatened under the California Endangered Species Act (CESA). . . . As a forest ecologist with decades of experience in mixed conifer and other forest types in this and other forested regions around the world, and with extensive experience in endangered species management, particularly in dry forest ecosystems, like the Sierra and eastern Cascades, I find your review to be scientifically sound and compelling enough to trigger listing under the CESA."

Mark A. Williams, Ph.D., University of Wyoming: "I think the review did an excellent job of summarizing the state of current knowledge on fire ecology in Sierra Nevada forests with regard to fire severity and fire frequency. I would concur that the rate of higher-severity fire in the current landscape is much lower than in the historical and this has likely led to less, available habitat for species who rely on recent and high-severity fire."

Nevertheless, each reviewer had a number of critiques, suggestions, or observations. Below we summarize such comments and describe how we addressed them in the final version of the Status Review:

Richard L. Hutto, Ph.D., Director, Avian Science Center, University of Montana:

1) With regard to the U.S. Forest Service report, Fogg et al. (2012), which used a series of modeling assumptions, not based upon empirical data, to estimate approximately equal density of Black-backed Woodpeckers in unburned forests as in burned forests in the Sierra Nevada (leading to an estimate of nearly 4,000 territories in unburned forests), Dr. Hutto wrote:

"I can tell you from 25 years of experience in burned forest research that the density of Black-backed Woodpecker in green forests is nowhere near its density in burned forests. Every peer-reviewed publication that has comparative data on the issue says the same thing—the bird species is 10-20 times more abundant in burned than in green forests. I notice that Fogg et al. adjusted count data by conducting transformations to 'density' estimates, but every single assumption necessary to make such an adjustment is known to be violated (movement of birds in response to observers, accurate counting, accurate distance estimation, and adequate sample sizes of independent distance estimates being among the most severe violations in this case), so I wouldn't trust the final 'transformed' numbers any farther than I could throw them toward the trash can. If I were you, I would not have included results from this preliminary and unpublished report. Just because it is a report does not make it great

> science; the best available science is at the very least peer-reviewed and published, and it also passes citation and other sorts of quality tests after publication."

We agree with Dr. Hutto that unpublished modeling reports, especially those in which the modeling extrapolations are not based upon empirical data, such as Fogg et al. (2012 [Appendix 2]), do not represent the best available science. We decided to keep our detailed analysis establishing why Fogg et al. (2012 [Appendix 2]) is inaccurate (Status Review, pp. 63-71), however, for the simple reason that, without this analysis, readers less informed about Black-backed Woodpecker biology might not understand that Fogg et al. (2012 [App. 2]) is not scientifically sound, and may otherwise rely upon it.

2) Dr. Hutto expressed concern that the discussion regarding reductions in fire relative to its past extent, and the possibility of further reductions in fire under some climate scenarios, might "***dilute the overarching justification for listing***" for some readers (emphasis in original). Dr. Hutto emphasized the problem as follows:

> "Hands down, the single most important management issue is the lack of appreciation of, and management for the maintenance of, burned forest environments. This lack of appreciation is reflected in the tendency of federal agencies to salvage log severely burned forests soon after they burn and the sunned appearance of "emergency" legislation and EA or EIS exemptions that surface every time a forest burns. Your discussion of this issue on pp. 29-32 and of the shocking facts surrounding recent salvage logging in California on pp. 43-48 is especially telling. Thus, the amount of burned forest we have on the landscape in the future is NOT the issue, and any reviewer should understand that your argument for giving the Black-backed Woodpecker endangered species status in the state of California does not hinge on the answer to any of those questions about future fire scenarios; what we do with our burned forestlands is the issue. In fact, an increase in severely burned forest acres in the future would not make the problem disappear; it would only make the problem worse because every acre would begin to fall under some special exemption to any sort of environmental review before the trees are allowed to be harvested."
>
> "Burned forest conditions need to be managed 'for' by leaving an abundance of the appropriate type of severely burned forest untouched and not 'against' by allowing salvage logging in precisely the same locations preferred by the most extremely specialized of all forest bird species in North America. The Black-backed Woodpecker represents well what the endangered species act is supposed to be about—the maintenance of specific ecosystems."

We agree with Dr. Hutto that the primary concern is the almost complete lack of protections for Black-backed Woodpecker habitat on public and private lands, especially from aggressive ongoing post-fire salvage logging practices. We likewise agree that this factor poses a major threat of extinction to this species regardless of whether fire increases or decreases in future decades, unless the species is listed as a threatened or endangered species. We have added this point in a few places in the final Status Review (pp. 48, 57-58, 73).

<u>Monica L. Bond, M.S., Chief Scientist, Wild Nature Institute:</u>

1) "I would clarify that the results of Siegel et al. 2012b are relevant to *clearcut salvage logging* effects on <u>foraging</u> by Black-backed Woodpeckers."

We added this clarification to the final Status Review (pp. 9, 14, 28).

2) "The possibility of missed nests was noted in the Status Review (20% missed nests) and incorporated into Dr. Hanson's methodology, but no justification was given for the 20% figure. Did they mean 20% missed nests that existed during the nest search, or 20% missed nests due to timing within the breeding season? This remains unexplained and I recommend the Status Review clarify this issue."

We clarified in the final Status Review that the "20% missed nests" was based upon an estimate from the lead author of Burnett et al. in a personal communication, and made clear that we adjusted our nest density figures upwards by 20% on this basis (p. 59).

3) "The Status Review provided a comprehensive overview of the lack of regulatory protection for the Black-backed Woodpecker's optimal severely burned habitat, and the actual rate of habitat loss due to post-fire salvage logging projects within the range of the species in California. Dr. Hanson's encyclopedic knowledge of logging projects over the past 10 years in the Sierra Nevada has proven very useful in documenting the systematic elimination of much of the severely burned forest habitat preferred by this species of woodpecker. However, with regard to threats, the Status Review might benefit from a discussion of the effects of thinning-type logging on *current* unburned habitat of Black-backed Woodpeckers (not just effects of thinning-logging on *future* habitat when forests burn). This type of logging is widely proposed in the Sierra Nevada and may adversely impact the Black-backed Woodpecker by potentially shrinking current suitable habitat in green, unburned forests… [S]ome scientists have speculated that unburned forests may act as reservoirs that support low numbers of woodpeckers that readily colonize and rapidly reproduce in forest stands once they burn. The available information strongly suggests that Black-backed Woodpeckers [within unburned forest] primarily nest in older green forest habitat that contains a high number of recent snags. Forest-thinning projects in green, unburned forests that reduce overall basal area of trees – particularly snags – are likely to affect the Black-backed Woodpecker population within this habitat type, and potentially diminish the probability of colonization of new fire areas. This is a potentially significant threat to this species."

We added text to emphasize this point in the section regarding the threats posed by thinning to Black-Backed Woodpeckers (p. 34).

Dennis C. Odion, Ph.D., Earth Research Institute, University of California at Santa Barbara:

1) "[Y]ou could have included one more bit of information about its decline that I suspect you intended to include: Cooper (1870) described the species as "numerous." This description is a stark contrast to the current status of the Black-backed Woodpecker and suggests that there has been long, steep decline in its population in California. This trend probably began with fire suppression in the early 1900s, and may have accelerated in recent decades with the combined effects of forest thinning and clear-cut logging after fires . . . ."

We included this reference in the final Status Review (p. 20-21).

2) "The woodpecker's narrow habitat requirements (occurring in mainly fire-killed forests) make it particularly vulnerable to further habitat loss and are a fundamental reason the species' viability is threatened. Because of fire suppression, not only has the area of suitable habitat shrunk, but availability may be much more inconsistent in time and space. This could cause chronic stress to the species. Even if fire were to increase with climate change, burned habitat may be much more widely spaced geographically than it was historically because smaller fires were more frequent, and these will continue to be suppressed. This is particularly important because the maximum detection distance for black-backed woodpeckers for burned forests may be about 50 km. Fire free periods may lead to prolonged conditions of suboptimal foraging and local extinctions where energy requirements are exceeded. Repopulation may be prevented due to the lack of burned habitat nearby enough to provide a source of immigrants. Therefore, an individual, large fire may have a limited benefit."

This is an important point, and we have incorporated it into the final Status Review (pp. 48-49).

Dominick A. DellaSala, Ph.D., President and Chief Scientist, Geos Institute:

1) "[T]his woodpecker faces multiple threats reflective of the listing criteria noted [including] uncertainties in how climate change will impact future habitat either through increases in fire accompanied by even more post-fire logging or a reduction in fire combined with ongoing suppression that further limits habitat . . . . [T]here are currently no meaningful regulatory mechanisms in place to assure population viability particularly as the region responds to climate change and ongoing land-use stressors . . . ."

We added text to note the lack of regulations that address means to protect Black-backed Woodpecker habitat, and maintain viable populations of this species, specifically in light of projected range contraction due to climate change, including, e.g., measures to maintain connectivity of habitat (pp. 57-58).

Mark A. Williams, Ph.D., University of Wyoming:

1) "'The current estimate for fire rotation in mid/upper elevation forests of the Sierra Mountains is 791 years' (page 22) - this comes from Miller et al. 2009, not Miller and Thode 2007 which analyzed remote sensing techniques to improve accuracy of fire-severity prediction. It should be noted that the estimate of current fire rotation from Miller et al. 2009 was made over a 23-year time period, too short to accurately estimate fire frequency. It is widely known that large fire years contribute disproportionately to fire rotation estimates and that accurate estimation should take place over longer time periods. It should also be noted that the time period of evaluation in the Miller et al. 2009 paper was post AD 1908, not presettlement; estimates of presettlement fire rotation demonstrate much shorter cycles than is current."

The passage quoted by Dr. Williams was not worded sufficiently clearly. The citation to Miller and Thode (2007) is to the RdNBR fire severity satellite imagery system itself, not to any high-intensity fire rotation estimate. The estimate of 791 years for the current high-intensity fire rotation interval in the Sierra Nevada (since 1984, when the satellite imagery became available) was conducted by Dr. Chad Hanson as part of the Status Review, using the RdNBR data. We have clarified this in the final Status Review (p. 21).

2) "It is unfortunate that the historical high-severity patch-size distribution has not been reconstructed (this is quite difficult to obtain) for the Sierra Mountains. It appears that larger patches would constitute higher-quality habitat for the woodpecker (e.g., greater foraging potential). I believe my work in the Colorado Front Range (Williams and Baker 2012, Ecosystems) is the only study that has compared high-severity patch sizes in presettlement and modern times. We found that the mean patch sizes had decreased in the modern landscape compared to the presettlement era. Given similarities in theses landscapes, both having reduced fire rotations, it would not be surprising to see an equivalent reduction in the Sierra Mountains. Thus, the amount of high-quality habitat from large, high-severity patches would be reduced from historical levels."

We added a reference to the Williams and Baker (2012) paper in *Ecosystems* (pp. 21-22).

If you have any questions about our Status Review, please do not hesitate to contact us.

Sincerely,

Chad Hanson, Ph.D., Ecologist
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Cc: Director Bonham, California Department of Fish and Wildlife

Attachment 2 to Black-backed Woodpecker Status Review: Peer Reviewer Comments (in alphabetical order, with CVs)

Monica Bond

Dominick DellaSala

Richard Hutto

Dennis Odion

Mark Williams

I am a wildlife biologist with a research focus on ecology of wildlife in burned forest landscapes. I hold a B.A. degree in Biology from Duke University (1992) and an M.S. degree in Wildlife Science from the Oregon State University (1998). I am a co-editor of "A Conservation Strategy for the Black-backed Woodpecker (*Picoides arcticus*) in California—Version 1.0," and in the spring and summer of 2011 I participated in a project using radio-telemetry to estimate home-range size and foraging ecology of Black-backed Woodpeckers in the Lassen National Forest. I am currently a Principal Scientist with the Wild Nature Institute, a non-profit scientific research and advocacy organization. I appreciate the opportunity to provide a peer review of the John Muir Project and Center for Biological Diversity's "Black-backed Woodpecker (*Picoides arcticus*) Status Review under the California Endangered Species Act."

The Black-backed Woodpecker population in California is threatened by its rarity in unburned forests, and by forest management practices that preclude or eliminate the species' optimal habitat – severely burned forests. The Black-backed Woodpecker is able to reproduce and persist at low densities in burned forests that have been logged, as well as in certain types of unburned forests, but the species forages preferentially, reaches its greatest densities, and attains its highest reproductive success in forests recently burned [1-10 years] by severe fire with high densities of hard snags of all sizes. Removal of fire-killed trees during clearcut postfire salvage logging most obviously reduces nesting and foraging opportunities for the woodpecker, but even partial salvage logging was shown to adversely affect occupancy of sites and nesting densities by this woodpecker in Oregon and Idaho, and adversely affect foraging in California.

<u>Life History and Ecology</u>: Overall, I found the Status Review to offer a comprehensive and thorough assessment of the current state of science regarding Black-backed Woodpeckers. The Status Review documents results from studies both in California and elsewhere within the species' range. Most of the discussion of the relevant literature is drawn from the CESA listing petition, with the inclusion of some more recent publications and information from the Conservation Strategy.

I concur with the presentation of this research in the Status Review. I would clarify that the results of Siegel et al. 2012b are relevant to *clearcut salvage logging* effects on <u>foraging</u> by Black-backed Woodpeckers. The study did not quantify effects of salvage logging on <u>nesting</u> or <u>population densities</u> nor did it quantify effects of *partial salvage logging* on foraging ecology. Future research needs in California include monitoring space use and foraging ecology of radio-marked Black-backed Woodpeckers in areas not subjected to any salvage logging, and comparing nesting or population densities of the species in comparative logged and unlogged areas.

<u>Population Size and Distribution</u>: The life history of the Black-backed Woodpecker, its general rarity outside of recent severely burned forests, and the ephemeral nature of its optimal habitat confounds efforts to estimate population size and distribution of local populations within the range of the species. Nonetheless, the Status Review offered a compelling analysis of the amount of current highly suitable Black-backed Woodpecker habitat (moderate and severely burned forests on protected, federal lands within the past 6 years). The listing petition also proposed a relatively reasonable estimated population size in California, in addition to providing an exhaustive critique of the methods and results from Fogg et al. (2012).

Dr. Hanson's Status Review utilized nest densities reported from studies of Black-backed Woodpeckers in burned and unburned forests in the Sierra Nevada, and extrapolated to different habitat types throughout the Sierra. Unfortunately, existing estimates of nesting densities of Black-backed Woodpeckers within burned and unburned areas of the Sierra Nevada are not highly robust. The nesting densities calculated by Burnett et al. (2011) and used by Dr. Hanson for the population estimate were obtained from nest searches conducted in a 20-ha plot only once per year, for 2 years (Burnett et al. 2011). The study was designed to measure habitat characteristics of cavity nests, and to compare relative density of nests located among different fires severities, but was not designed to locate every nest within the search area for that breeding season. Some Black-backed Woodpeckers will establish nests later during the breeding season than other birds, and some nests will be fledged when others are just beginning (Siegel et al. 2012; Figure 8); in other words, nesting is staggered. Thus, actual nesting densities may have been greater than those reported in Burnett et al. (2011) because they only conducted one 4-hour search in each transect, which would in turn lead to an underestimate of true nesting densities for this species. Furthermore, depending on the timing of the survey in each transect, some Black-backed Woodpecker pairs may have already attempted to nest and failed (see Siegel et al. 2012; Figure 8), and might not have been counted. The possibility of missed nests was noted in the Status Review (20% missed nests) and incorporated into Dr. Hanson's methodology, but no justification was given for the 20% figure. Did they mean 20% missed nests that existed during the nest search, or 20% missed nests due to timing within the breeding season? This remains unexplained and I recommend the Status Review clarify this issue. On the other hand, however, the Status Review noted that the nest density estimate may actually be overestimated given that the transects surveyed by Burnett et al. (2011) were in recent fires which would normally have higher nest densities than later fires. Thus, Dr. Hanson made efforts to incorporate the uncertainty. These issues illustrate the problems with using currently available estimates of nesting densities from studies that were not specifically designed for that purpose.

With that caveat aside, until additional, more robust data of nesting/population densities of Black-backed Woodpeckers are available for different habitat categories in California (e.g., unlogged burned stands of various severities and ages; logged burned stands of various severities and ages; green forests of various types; etc.), the general methodology of extrapolation used by Dr. Hanson constitutes the best available current science, and gives a reasonable estimate of population size – a combined total of approximately 600 nesting pairs (or 1,200 nesting individuals) in California.

More importantly, regardless of the exact number of Black-backed Woodpeckers occurring in the Sierra Nevada, these birds are undoubtedly rare in all habitats except in the very small amount of recent moderate and severely burned forest. No Black-backed Woodpecker biologist would dispute this fact. To compound the problem, many of these burned forests – on both private and public lands – are subjected to post-fire salvage logging, sometimes quite extensive, as was documented in this Status Review. Thus, regulatory protections for the Black-backed Woodpecker's optimal habitat are sorely needed to ensure the conservation of this species.

Threats: The Status Review provided a comprehensive overview of the lack of regulatory protection for the Black-backed Woodpecker's optimal severely burned habitat, and the actual rate of habitat loss due to post-fire salvage logging projects within the range of the species in California. Dr. Hanson's encyclopedic knowledge of logging projects over the past 10 years in the Sierra Nevada has proven very useful in documenting the systematic elimination of much of the severely burned forest habitat preferred by this species of woodpecker.

However, with regard to threats, the Status Review might benefit from a discussion of the effects of thinning-type logging on *current* unburned habitat of Black-backed Woodpeckers (not just effects of thinning-logging on *future* habitat when forests burn). This type of logging is widely proposed in the Sierra Nevada and may adversely impact the Black-backed Woodpecker by potentially shrinking current suitable habitat in green, unburned forests. While very little is known about population densities and habitat use of Black-backed Woodpeckers occupying unburned forests in California, some scientists have speculated that unburned forests may act as reservoirs that support low numbers of woodpeckers that readily colonize and rapidly reproduce in forest stands once they burn. The available information strongly suggests that Black-backed Woodpeckers primarily nest in older green forest habitat that contains a high number of recent snags. Forest-thinning projects in green, unburned forests that reduce overall basal area of trees – particularly snags – are likely to affect the Black-backed Woodpecker population within this habitat type, and potentially diminish the probability of colonization of new fire areas. This is a potentially significant threat to this species.

I would also note that the Conservation Strategy by The Institute for Bird Populations and California Partners in Flight is an excellent resource in terms of the state of the science and management recommendations, but government agencies and private landowners are under no obligation or mandate to follow the Strategy's recommendations. Thus, until conservation measures based on those provided in the Conservation Strategy are adopted as standards in forest plans, the safeguards of CESA are still necessary to ensure that the ecosystems upon which Black-backed Woodpeckers depend are given regulatory protection that they presently lack, and that Black-backed Woodpecker populations are recovered from more than a century of logging and fire suppression.

Thank you for the opportunity to review the John Muir Project and Center for Biological Diversity's "Black-backed Woodpecker (*Picoides arcticus*) Status Review under the California Endangered Species Act."

Monica L. Bond

Monica Bond, M.S.

MONICA BOND ■ Principal Scientist, Wild Nature Institute ■ monica@wildnatureinstitute.org

Current Position: ***Principal Scientist*, Wild Nature Institute.** Conduct scientific research on at-risk wildlife species and their habitats, advocate for their protection, and educate the public about the need to preserve wild nature.

Research Experience

Apr-July 2011 — ***Biologist,* The Institute for Bird Populations**, Lassen National Forest, California
Studied foraging and nesting ecology of Black-backed Woodpeckers in burned forests. Trained and supervised field assistants; captured, banded, and radio-tagged woodpeckers; radio-tracked owls daily from April until July; measured vegetation; entered and analyzed data; and assisted with writing manuscripts.

Dec-March 2004-2010 — ***Research Assistant*, PRBO Conservation Science**, SE Farallon Island, California
Participated in long-term demography study of northern elephant seals for 6 winter seasons. Tagged adults and pups and resighted tags; stamped adults and pups with bleach/dye numbers; conducted daily census surveys of adults and pups at breeding beaches; took weather and sea temperature readings; and wrote manuscripts.
June-July 2007 — Assisted marine mammal and seabird observers on NOAA ship MacArthur for 2 weeks in summer 2007.

Apr-Sept 2008, Apr-Aug 2009 — ***Field Biologist*, NMFS Pacific Islands Marine Science Center,** Northwestern Hawaiian Islands, Hawaii
Participated in long-term research on the critically endangered Hawaiian monk seal. Resighted tags; bleached adults and pups; tagged adults and pups; conducted census surveys on 11 islets; collected specimens and conducted necropsies; identified individual seals using a photo-database. Assisted with a green sea turtle hatchling success study.

Apr-Nov 2006, March-Apr 2007 — ***Co-Principal Investigator*, The Institute for Bird Populations**, Sequoia National Forest, California
Planned and implemented all aspects of a study on post-fire use of forests by California Spotted Owls in the Sequoia National Forest and a study on post-fire occupancy rates of Spotted Owls throughout the range of the subspecies. Raised all funds; developed budgets; hired, trained, and supervised field assistants; captured, banded, and radio-tagged adult Spotted Owls; radio-tracked owls nightly from May through Sept; measured vegetation; entered and analyzed data; and wrote manuscripts.

2001-2006 — ***Staff Biologist*, Center for Biological Diversity**, Idyllwild and San Francisco, California
Monitored public and private lands management to ensure adequate protection for imperiled species. Worked with government agencies and private developers to incorporate species protections in development and management plans; commented on proposed rules and CEQA and NEPA documents; developed and promoted protective measures including wildlife corridors, reserve design, and timber harvest retention standards; and wrote ESA listing petitions.

1999-2001 — ***Research Fellow*, U. of Minnesota Dept. Fisheries, Wildlife, & Conservation Biology**, Sierra Nevada, California
Studied demography and ecology of California Spotted Owls in the central Sierra Nevada. During field seasons (Apr–Aug) planned and participated in data collection on occupancy and reproductive status of owls; captured, measured, and banded adult and juvenile owls; trained and supervised field assistants; and measured vegetation. During the off-seasons (Sept–Mar) assisted in data management, analysis, and reporting of results; wrote manuscripts for scientific journals; interviewed and hired field assistants; and conducted analyses of owl habitat using GIS maps.

2000 — ***Consulting Biologist*, North Coast Resource Management**, Calpella, California
Conducted surveys for northern Spotted Owls on private lands in Mendocino County.

1998 — ***Field Biologist*, The Institute for Bird Populations**, Lemoore Naval Air Station, California
Participated in a demography and toxicology study of western burrowing owls. Captured, measured, banded, and radio-collared adult and juvenile owls; radio-tracked owls for 3 months to determine foraging ecology; assisted in developing field sampling methods, telemetry techniques, and equipment design.

Winter 1998 — ***Teacher's Assistant, Principles of Wildlife Conservation*, OSU Dept. Fisheries & Wildlife**, Corvallis, Oregon
Created and presented lectures and led discussions on wildlife and habitat conservation and management; maintained the student database; and proctored and graded exams.

1997 — ***Research Technician*, OSU Dept. Fisheries & Wildlife**, Corvallis, Oregon
Assisted with field research on the space-use and demographic responses of gray-tailed voles to the application of the insecticide Guthion. Helped with trapping and radio telemetry.

1996–1997 — ***Field Assistant*, OSU College of Forestry**, Corvallis, Oregon
Assisted Vegetation Management Cooperative with field research investigating regrowth of trees in response to varying levels of herbicide and fertilizer on private timberlands throughout Oregon and Washington. Aided Nursery Cooperative with laboratory research on root growth potential and frost hardiness of trees.

1996–1997 ***Intern*, Blue Mountains Biodiversity Project**, Fossil, Oregon
Conducted field surveys of timber sales on public forests in eastern Oregon to ensure compliance with federal environmental regulations and to determine presence of old-growth indicator species. Volunteer position.

Summer 1996 ***Bioscience Technician*, USDA Forest Service**, Sisters, Oregon
Mapped vegetation and assessed the ecological condition of the campgrounds along the Metolius River to determine compliance with the Wild and Scenic River Plan, for use in restoration efforts. Identified and quantified plant species along transects; produced maps; and created educational displays.

Spring 1996 ***Marbled Murrelet Surveyor*, Coast Range Association**, Corvallis, Oregon
Conducted field surveys for threatened marbled murrelets in the Oregon Coast Range, in partnership with the USDA Forest Service. Attended survey training and obtained certification from the Forest Service. Volunteer position.

Education

1996–1998 ***M. S. Wildlife Science*, Oregon State University**, Corvallis, Oregon
Master's Project: Density, Sex Ratio, and Space Use in Gray-tailed Voles (*Microtus canicaudus*)
Awards: Northwest Scientific Association Scholarship
Gamma Sigma Delta (The Honor Society of Agriculture) Scholarship

1988–1992 ***B. A. Biology*, Duke University**, Durham, North Carolina
Senior Independent Study: The Heat is On: The Hawaiian Geothermal Controversy
Honors: Dean's List 1990–1991
Dean's List with Distinction 1991–1992

Skills and Accomplishments

Certified Wildlife Biologist, The Wildlife Society, received May 10, 2000
The Wildlife Society Western Section - Conservation Affairs Committee, 2001-2004
Northern Spotted Owl Recovery Plan - Dry Forest Landscapes Working Group, 2009-present

Peer-reviewed scientific publications:

· Bond ML, Lee DE, Siegel RB, Tingley MW. Diet and home-range size of California Spotted Owls in burned forests. *Western Birds*. In review.
· Lee DE, Bond ML, Borchert MI, Tanner R. Influence of fire on site occupancy of spotted owls in the San Bernardino and San Jacinto Mountains of southern California. *Journal of Wildlife Management*. In press.
· Lee DE, Bond ML, Siegel RB. Dynamics of California Spotted Owl breeding-season site occupancy in burned forests. *The Condor*. In press.
· Siegel RB, Bond ML, Wilkerson RL, Barr BC, Gardiner C, Kinsella JM 2012 Lethal Procyrnea nematode infection in a Black-backed Woodpecker (*Picoides arcticus*) in California. *Journal of Zoo and Wildlife Medicine*. 43:421-424.
· Lee DE, Bettaso J, Bond ML, Bradley R, Tietz J, Warzybok P 2011. Growth, age at maturity, and age-specific survival of the Arboreal Salamander (*Aneides lugubris*) on Southeast Farallon Island, California. *Journal of Herpetology*. 46:64-71.
· Bond ML, Lee DE, Siegel RB 2010. Winter movements by California spotted owls in a burned landscape. *Western Birds* 41:174-180.
· Bond ML, Lee DE, Siegel RB, Ward, JP Jr 2009. Habitat selection and use by California spotted owls in a post-fire landscape. *Journal of Wildlife Management* 73:1116-1124.
· Bond ML, Lee DE, Bradley CM, Hanson CT 2009. Influence of pre-fire tree mortality on fire severity in conifer forests of the San Bernardino Mountains, California. *The Open Forest Science Journal* 2:41-47.
· Wolff JO, Bond ML 2008. Gray-tailed voles prefer interior to edge habitats. *Acta Theriologica Sinica* 28:1-6.
· Bond ML, Gutiérrez RJ, Seamans ME 2004. Modeling nesting habitat selection of California spotted owls (*Strix occidentalis occidentalis*) in the central Sierra Nevada using standard forest inventory metrics. *Forest Science* 50:773-780.
· Bond ML, Wolff JO, Krackow S 2003. Recruitment sex ratios in gray-tailed voles (*Microtus canicaudus*) in response to density, sex ratio, and season. *Canadian Journal of Zoology*. 81:1306-1311.
· Bond ML, Gutiérrez RJ, Franklin AB, LaHaye WS, May CA, Seamans ME 2002. Short-term effects of wildfires on spotted owl survival, site fidelity, mate fidelity, and reproduction. *Wildlife Society Bulletin* 30:1022-1028.
· Hunter JE, Bond ML 2001. Residual trees: wildlife associations and recommendations. *Wildlife Society Bulletin*. 29:995-999.
· Bond ML, Wolff JO 1999. Does access to females or competition among males limit home-range size of males in a promiscuous rodent? *Journal of Mammalogy* 80:1243-1250.

Scientific presentations:

· *Giraffe Skin Disease: Epidemiology of an Emerging Disease*. Association of Zoos and Aquariums Annual Conference, Phoenix, Arizona, September 2012.
• *Post-fire Habitat use by the Black-backed Woodpecker*. Interior West Fire Ecology Conference, Salt Lake City, Utah, November 2011.

· *Dynamics of California Spotted Owl breeding-season site occupancy in burned forests* (poster). Wildlife Society Annual Conference, Kona, Hawaii, November 2011.
· *Habitat Use and Selection by California Spotted Owls in a Postfire Landscape.* Wildlife Society Annual Conference, Monterey, California, September 2009.
· *Fire in the Sierra Nevada: Wildlife* (panel). Sierra Nevada Alliance 15th Annual Conference, Lake Tahoe, California, September 2008.
· *Short-term effects of wildfires on spotted owl survival, site fidelity, mate fidelity, and reproduction* (poster). Fire 2002: Managing Fire and Fuels in the Remaining Wildlands and Open Spaces of the Southwestern United States, San Diego, California, December 2002.
· *Density of old growth trees in the central Sierra Nevada: do spotted owl nesting areas reflect densities found in old forest areas?* Carnivores 2002, Monterey, California, November 2002.
· *Density, sex ratio, and space use in gray-tailed voles*. Humboldt State University Department of Wildlife Seminar, Arcata, California, November 1999.
· *Sex ratio, space use, and edge effects in the gray-tailed vole: field tests of alternative hypotheses*. University of Memphis Department of Biology Seminar, Memphis, Tennessee, March 1999.
· *Density, sex ratio, and space use of male gray-tailed voles*. Northwest Scientific Association/Society for Northwestern Vertebrate Biology Annual Meeting, Portland, Oregon, March 1998.

GEOS INSTITUTE

December 12, 2012

Chad Hanson, Ph.D.,
Director and Staff Ecologist
John Muir Project of Earth Island Institute, P.O. Box 697,
Cedar Ridge, CA 95924

Re: Peer review of Black-backed Woodpecker status review

Dear Dr. Hanson:

On behalf of the Geos Institute (www.geosinstitute.org), a science-based conservation group that works on climate change and forest ecosystems, please accept my review of your status review of the Black-backed Woodpecker and, most notably, my support for your recommendation to list the species at least as threatened under the California Endangered Species Act (CESA).

As a forest ecologist with decades of experience in mixed conifer and other forest types in this and other forested regions around the world, and with extensive experience in endangered species management, particularly in dry forest ecosystems, like the Sierra and eastern Cascades, I find your review to be scientifically sound and compelling enough to trigger listing under the CESA. In general, Black-backed woodpeckers meet at least 2 of the listing criteria required by the CESA: (1) present or threatened modification or destruction of its habitat; and (2) other natural occurrences or human-related activities. On top of such threats, insufficient regulations are a major driver of loss of habitat through damaging forestry practices.

As you have aptly noted in your review, this woodpecker faces multiple threats reflective of the listing criteria noted: (1) increased fire suppression of snag forests that were otherwise once generated in abundance by historic mixed-high severity fires producing numerous ecological benefits for this and other fire-dependent species; (2) preponderance of and increase in amount of post-fire logging of complex early seral forests (snag forests) on federal and nonfederal forests that is limiting availability of already rare habitat types; (3) destruction of mature and old-growth (green) forests with high snag densities caused by pre-disturbance logging; (4) ecologically inappropriate thinning of pre-burned forests to suppress important mixed-high severity fires; (5) uncertainties in how climate change will impact future habitat either through increases in fire accompanied by even more post-fire logging or a reduction in fire combined with ongoing suppression that further limits habitat; and (6) low population densities and ostensibly isolation of metapopulations at the subspecies and at the distinct population segment level.

In addition to these proposed listing factors, there are currently no meaningful regulatory mechanisms in place to assure population viability particularly as the region responds to climate change and ongoing land-use stressors (as noted above). There is very little conservation taken place pre- or post-fire aimed specifically at this species, including the need for adequate retention of old-forest habitat and large post-fire areas off limits to logging. As noted, complex early seral habitat with a preponderance of biological legacies (large snags primarily) and green old-growth forests are exceedingly rare on federal lands and even more so on nonfederal lands and will continue to decline due to aggressive pre- and post-fire logging that is occurring at the detriment of woodpeckers and other fire-dependent species. In particular, these stressors are barely recognized as limiting factors for woodpeckers by federal or state agencies. Protected habitat in wilderness and parks also is insufficient to sustain viable populations and the recent weakening of the viability provisions of the national forest-planning rule, which eliminated the requirement for maintaining well-distributed populations on the national forest system, is problematic. The regulatory climate on nonfederal lands is even worse as private landowners can log post-fire lands without filing a timber harvest plan. Moreover, in Oregon, state forest practices require leaving only 2 snags per acre and this is grossly inadequate for sustaining viable woodpecker populations.

In the absence of sufficient state regulations, there is a high likelihood that the noted decline in woodpecker populations and the ecosystems upon which it depends could trigger additional need for future federal listing and tighter restrictions on federal and nonfederal logging unless urgent conservation measures are taken immediately. Thus, even tough many aspects of the species' status are not completely understood at this time, the material presented in your status review is especially troubling and in my opinion as a scientist enough to warrant immediate conservation attention through listing at least at the state level. Recovery efforts are urgently needed to forestall the likelihood that this species could become endangered with extinction in the foreseeable future in the absence of "special protection and management efforts."

Sincerely,

Dominick A. DellaSala, Ph.D.
Chief Scientist & President

Dominick A. DellaSala
Curriculum Vitae

DOMINICK A. DELLASALA

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EDUCATION

Doctor of Philosophy. 1986. Natural Resources. University of Michigan, Ann Arbor, Michigan

Master of Science. 1982. Ecology. Wayne State University, Detroit, Michigan

Bachelor of Science. 1979. Biology. Adelphi University. Garden City, New York

SUMMARY

Three decades of experience managing interdisciplinary teams, board relations, fund raising, budget management ($1-10 million), program and organization development from the ground up, media and congressional relations, technical and general writing for diverse audiences on forest ecology, endangered species, large landscape conservation, and climate change adaptation and mitigation strategies. Considered a global leader in conservation science.

PROFESSIONAL EXPERIENCE

Geos Institute (www.geosinstitute.org). President and Chief Scientist. 2006-present. Organization co-founder, developed climate change and forest programs, hired staff and expanded programs, managing science staff (3-5), and partnering with forest groups, coalitions, and land managers. Also, co-founder of Global Forest Information Center, a databasin.org portal on tracking forest conditions (deforestation, carbon, protected areas) regionally (North America) and globally (underway).

Southern Oregon University, Honorary Adjunct Professor. 1997– present. Curricula development for science-policy classes, graduate and undergraduate committees and student intern projects on climate change adaptation and mitigation.

World Wildlife Fund - U.S. Forest Conservation Director. 1993-2006. Started and grew the U.S. forest program, overseeing staff and volunteers (12), and coordinating U.S. forest program interests with international programs and coalitions.

Ebasco Environmental (Bellevue, WA) – Director. 1988-1993. Managed multi-million dollar contracts related to environmental impact statements, FERC relicensing, forest research, and private companies across the West, including managing staff of 12 program officers.

Post-doc Research Fellow (Oregon State University, University of Wyoming). 1986-88. Managed 6-24 researchers and agency staff on studies of bald eagles, spotted owls, and small mammals in Oregon, and least terns, great blue herons, and sandhill cranes on the Platte River, Nebraska.

FUND RAISING & BOARD RELATIONS

Solid relations with foundations and donors. Extensive training in fund raising, management, and board development by Training Resources for the Environmental Community (TREC). Ongoing funding from Wilburforce, several other Northwest funders, Packard, Pew, Doris Duke, Kresge, several family foundations and numerous private donors.

Geos Institute Board of Directors, 2006-present– responsible for building and stewarding a diverse board of 12 members.

President Society for Conservation Biology, North America Section Board of Directors (2 terms). 2009-present. Overseeing international board of 14 US and Canadian scientists.

Global Board of Governors, Society for Conservation Biology. 2009-present. 24-member board includes participation on science and publications, global policy, and student development committees (also nominated for global board president).

Science Journal Editorial Boards: Natural Areas Journal (2008-present); Environmental Evidence (2011-present); Conservation Biology (handling editor, 2012-present); Earth Systems and Environmental Science module (global encyclopedia): Elsevier Publications, 2012-13.

PRESS EXPERIENCE

Solid media relations nationally and regionally resulting in extensive press (sometimes weekly) and numerous op-eds, including coverage on CNN; MSNBC; High Country News; LA, NY and Seattle Times; Science Magazine and Science Digest; National Geographic; National Audubon and National Wildlife Federation magazines; National Public Radio; national and regional PBS documentaries (several); Jim Lehrer News Hour; local TV, radio, and newspapers.

CONGRESSIONAL EXPERIENCE

Since 1995, I have testified in congress on climate change, forest health, fire ecology, post-fire logging, and endangered species management; organized congressional briefings; helped pass or kill bills; and attended President Clinton's historic roadless area signing ceremony in

Washington D.C. in 2001 and Secretary Bruce Babbitt's national monument designations in 2000.

SELECT COMMITTEES AND PROFESSIONAL RECOGNITIONS

Choice Publications "Outstanding Academic Excellence" for Temperate and Boreal Rainforests: Ecology and Conservation (Island Press). 2012. Over 7500 publications were eligible; my book was the only Island Press publication to receive the award in 2012.

Conservation Leadership Awards: Wilburforce Foundation (2006) and World Wildlife Fund (2000, 2004) for national leadership on roadless areas and new national monuments.

North Pacific Landscape Conservation Cooperative. US Fish & Wildlife Service. Science & Traditional Ecological Knowledge Committee. 2012-present.

Affiliate Scientist. 2011-present. Alaska Coastal Rainforest Center.

Chair Society for Conservation Biology Policy Committee (SCB). 2008-09. Responsible for overseeing SCB's policy programs in North America, including policy work on the Alberta tar sands, endangered species protections, energy policy, and defense of landmark forest policies.

*Northern Spotted Owl Recovery Team. 2006-08***.** Selected by U.S. Fish & Wildlife Service to represent conservation groups on a multi-stakeholder recovery team for the spotted owl. Became a whistle blower for inappropriate political interference in ESA by the Bush administration.

Natural Resources Advisory Council, Siskiyou National Forest. 2001-04. Selected by Under Sec. of Agriculture to Resource Advisory Committee-Siskiyou National Forest.

USDA Forest Service Chief Dombeck's Roundtable on Criteria and Indicators. 1998-99. Appointed by Chief Dombeck to roundtable on the Montreal Process Criteria and Indicators.

White House Office of Science and Technology Policy. 1998-99. Selected to White House committee assigned to develop forest ecosystem indicators in the United States.

North America Buyers Group of FSC wood products. 1994-98. Helped set up a group of companies committed to purchasing wood products from FSC-certified forests.

National Academy of Sciences, National Research Council. 1997. Appointed to Committee on Prospects and Opportunities for Sustainable Management of America's Nonfederal Forests.

Forest Stewardship Council Regional Standards and Buyers Groups. 1995-2000. Helped design regional standards for FSC certification and organize international buyers groups of FSC products.

North American Forest Committee, World Wildlife Fund. 1994-97. WWF US-Canada-Mexico task force on forest conservation, landscape analysis, and protected areas database development.

Yellowstone to Yukon Conservation Initiative. 1994-96. Helped to set up an international conservation alliance to protect the Y2Y region of the US and Canada.

Western Forest Carnivore Committee. 1995-99. Selected by interagency committee to develop research and management objectives for forest carnivores in the US and Canada.

International Forestry Working Group: *Chair*. 1993-1995. World Wildlife Fund. Developed one of the first international data layers on protected area coverage for the world's forests.

PUBLICATIONS & PROFESSIONAL DEVELOPMENT

Hundreds of opeds (not listed), a rainforest book blog[1], numerous workshops on adaptation strategies at professional meetings, and federal agency adaptation webinars

DellaSala, D.A., et al. Climate change may trigger broad changes in North America's coastal temperate rainforests. In review, *Conservation Biology*.

Beschta, R.L., D. A. DellaSala, D.L. Donahue, J.J. Rhodes, J.R. Karr, M.H. O'Brien, T.L. Fleishcner, and C. Deacon-Williams. 2012. Adapting to climate change on western public lands: addressing the impacts of domestic, wild and feral ungulates. *Environmental Management* DOI 10.1007/s00267-012-9964-9

Black, S.H., D. Kulakowski, B.R. Noon, and D. DellaSala. In press. Do bark beetle outbreaks increase wildfire risks in the Central U.S. Rocky Mountains: Implications from Recent Research. In press. *Natural Areas Journal*

DellaSala, D.A. 2012. Klamath-Siskiyou Conifer Forests of northern California and southwest Oregon. *Encyclopedia of Energy*, Pierce, Morris A. ed. Ipswich, MA; Salem Press

DellaSala, D.A. 2012. Eastern Cascades Forests of Oregon and Washington. *Encyclopedia of Energy*, Pierce, Morris A. ed. Ipswich, MA; Salem Press

DellaSala, D.A. 2012. Caucasus Mixed Forests of Western Eurasia. *Encyclopedia of Energy*, Pierce, Morris A. ed. Ipswich, MA; Salem Press

DellaSala, D.A. 2012. Hokkaido Montane Forests of Japan. *Encyclopedia of Energy*, Pierce, Morris A. ed. Ipswich, MA; Salem Press

[1] ***http://ipfieldnotes.org/author/dominickdellasala/***

DellaSala, D.A., J. M. Fitzgerald, B-G. Jonsson, J.A. McNeely, B. Delali Dovie, M. Dieterich, P. Majluf, S.C. Nemtzov, O.T. Nevin, E.M. Parsons, and J.E.M. Watson. 2012. Priority actions for sustainable forest management in the International Year of Forests. *Conservation Biology* 26:572-575.

Matsuoka, S., J.A. Johnson, and D.A. DellaSala. 2012. Succession of bird communities in young temperate rainforests following thinning. *J. Wildlife Management* DOI: 10.1002/jwmg.363

Olson, D.M., D.A. DellaSala, R.F. Noss, J. R. Strittholt, J. Kaas, M. E. Koopman, and T.F. Allnutt. 2012. Climate change refugia for biodiversity in the Klamath-Siskiyou ecoregion. *Natural Areas Journal* 32:65-74.

Noss, R.F., A. P. Dobson, R. Baldwin, P. Beier, C.R. Davis, D.A. DellaSala, J. Francis, H. Locke, K. Nowak, R. Lopez, C. Reining, F.A. Schmiegelow, S. C. Trombulak, and G.Tabor. 2012. Bolder thinking for conservation. *Conservation Biology 26:1-4.*

DellaSala, D.A., J.R. Karr, and D.M. Olson. 2011. Roadless areas and clean water. *Journal of Soil and Water Conservation* 66:78A-84A. doi:10.2489/jswc.66.3.78A

DellaSala, D.A., P. Alaback, T. Spribille, H. von Wehrden, and R.S. Nauman. 2011. Just what are temperate and boreal rainforests? Pp. 1-41 in D.A. DellaSala, Temperate and Boreal Rainforests of the World: Ecology and Conservation. *Island Press*.

DellaSala, D.A., F. Moola, P. Alaback, P.C. Paquet, J.W. Schoen, and R.F. Noss. 2011. Temperate and boreal rainforests of the Pacific Coast of North America. Pp. 42-81 in D.A. DellaSala, Temperate and Boreal Rainforests of the World: Ecology and Conservation. *Island Press*.

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Jules, E.S., D.A. DellaSala, and J.K. Marsden. 1999. The Klamath-Siskiyou ecoregion. *Natural Areas Journal* 19:295-297.

Ricketts, T., E. Dinerstein, D. Olson, C. Loucks, W. Eichbaum, D. DellaSala, K. Kavanagh, P. Hedao, P. Hurley, K. Carney, R. Abell, and S. Walters. 1999. A conservation assessment of the terrestrial ecoregions of North America. *Island Press*, Washington, D.C.

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Franklin, T.M., and D.A. DellaSala. 1996. Conservation strategies for the Inland Pacific Northwest: introduction. *Wildlife Soc. Bull. 24:178-179.*

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DellaSala, D.A., C.L. Thomas, and R.G. Anthony. 1989. Use of domestic sheep carrion by bald eagles wintering in the Willamette Valley, Oregon. *Northwest Sci*. 63: 104-108.

DellaSala, D. A., and D.L. Rabe. 1987. Response of least flycatchers *Empidonax minimus* to forest disturbances. *Biological Conservation* 41: 291-299

DellaSala, D.A. 1986**.** Polygyny in the yellow warbler**.** *Wilson Bulletin* 98:152-154**.**

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7 December 2012

Chad Hanson, Ph.D.
Director and Staff Ecologist
John Muir Project

Dear Chad:

Thanks for the opportunity to comment on the Black-backed Woodpecker Status Review that you put together.

My overall impression is that you have compiled a great summary of existing information. I am not familiar with the Fogg et al. (2012) report that you cite, but I can tell you from 25 years of experience in burned forest research that the density of Black-backed Woodpecker in green forests is nowhere near its density in burned forests. Every peer-reviewed publication that has comparative data on the issue says the same thing—the bird species is 10-20 times more abundant in burned than in green forests. I notice that Fogg et al. adjusted count data by conducting transformations to "density" estimates, but every single assumption necessary to make such an adjustment is known to be violated (movement of birds in response to observers, accurate counting, accurate distance estimation, and adequate sample sizes of independent distance estimates being among the most severe violations in this case), so I wouldn't trust the final "transformed" numbers any farther than I could throw them toward the trash can. If I were you, I would not have included results from this preliminary and unpublished report. Just because it is a report does not make it great science; the best available science is at the very least peer-reviewed and published, and it also passes citation and other sorts of quality tests after publication.

On top of that distraction from the truth, I worry that the somewhat speculative discussion about fire suppression causing a recent decrease in acres of burned forest, and about changes in fire severity and frequency with climate change will ***dilute the overarching justification for listing***. Hands down, the single most important management issue is the lack of appreciation of, and management for the maintenance of, burned forest environments. This lack of appreciation is reflected in the tendency of federal agencies to salvage log severely burned forests soon after they burn and the sunned appearance of "emergency" legislation and EA or EIS exemptions that surface every time a forest burns. Your discussion of this issue on pp. 29-32 and of the shocking facts surrounding recent salvage logging in California on pp. 43-48 is especially telling. Thus, the amount of burned forest we have on the landscape in the future is NOT the issue, and any reviewer should understand that your argument for giving the Black-backed Woodpecker endangered species status in the state of California does not hinge on the answer to any of those questions about future fire scenarios; what we do with our burned forestlands is the issue. In fact, an increase in severely burned forest acres in the future would not make the problem disappear; it would only make the problem worse because every acre would begin to fall under some special exemption to any sort of environmental review before the trees are allowed to be harvested.

The Black-backed Woodpecker is a phenomenal indicator of the presence of burned forest conditions and, as such, it is a perfect endangered species candidate. The woodpecker is a strong indicator (and let's face it, the bird is as tightly linked to burned forests as an American Dipper is to streams) of a forest condition that has yet to be appreciated by federal and state land management agencies. Burned forest conditions need to be managed "for" by leaving an abundance of the appropriate type of severely burned forest untouched and not "against" by allowing salvage logging in precisely the same locations preferred by the most extremely specialized of all forest bird species in North America. The Black-backed Woodpecker represents well what the endangered species act is supposed to be about—the maintenance of specific ecosystems.

Sincerely,

Richard L. Hutto
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Professor of Biology and Wildlife Biology
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ABBREVIATED CURRICULUM VITAE…July 2012

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EDUCATION:
B.A. in Zoology, 1971, University of California, Los Angeles.

M.S. in Biology, 1973, Northern Arizona University, Flagstaff.
Thesis title: The coexistence of heteromyid rodents.

Ph.D. in Biology, 1977, University of California, Los Angeles.
Dissertation title: The ecology of migratory wood warblers and the habitat distribution of small migratory landbirds in western Mexico.

PROFESSIONAL HISTORY:
University of Montana—Asst. Prof., 1977-1982; Assoc. Prof., 1982-1987; Prof., 1987-present
Connecticut Public Television—Host of "BirdWatch," a PBS distributed series, 1998-2000

AREAS OF RESEARCH INTEREST:
My research interests revolve around habitat selection, the factors that determine suitability of sites to landbirds, and the process by which birds choose to settle nonrandomly in space. Most of my research has been focused in conifer forest and riparian habitats in the northern Rockies and in northern Mexico.

FORMER AND CURRENT GRADUATE STUDENTS:
Aaron Flesch, Ph.D. (in progress)
Andrew Bosma, M.S.
Rebecca S. Burton, M.S.
Elaine Caton, Ph.D.
Amy Cilimburg M.S.
Charles Eldermire, M.S.
Paul D. Hampton, M.S.
D. Paul Hendricks, M.S.
Susan Hitchcox, M.S.
John R. Hoffland, M.S.
Jennifer Holmes, M.S. (in progress)
Peter Hunt, M.S.
Nedra Klein, M.S.
Amy L. Leider, M.S.
Marisa Lipsey, Ph.D. (in progress)
Jeffrey S. Marks, Ph.D.
Patricia McClelland, M.S.
Michael A. Munts, M.S.
Sophie Osborn, M.S.
L. Christine Paige, M.S.
Hugh Powell, M.S.
J. Michael Reed, M.S.
Bruce Robertson, Ph.D.
Nathaniel Shambaugh, M.S.

Karen Short, Ph.D.
Kristina Smucker, M.S.
Ty Smucker, M.S.
Bret Tobalske, M.S.
Jose Fernando Villaseñor, M.S.; Ph.D.
Crow White, M.S.
Vita Wright, M.S.
Jock Young, M.S.

PROFESSIONAL AND HONORARY SOCIETIES:
American Institute of Biological Sciences
American Ornithologists' Union—Elective Member, 1985; Fellow, 1995
Association for Fire Ecology
Audubon Society
Cooper Ornithological Society
Ecological Society of America
International Association of Wildland Fire
Society for Conservation Biology

PROFESSIONAL ASSOCIATION SERVICE:
Society for Northwestern Vertebrate Biology—Vice-President, and organizer of Inland Region meetings, 1978-79, 1982-83, 1989-1990; Associate Editor for Ornithology, *Murrelet*, 1983-1987.
American Ornithologists' Union—Annual meeting Session Chair, 1981, 1987, 1995; Membership Committee, 1985; Annual Meeting Co-chair, 1994, Committee on Brewster and Coues Awards, 1995; Associate Editor, *Auk*, 1995-1998.
Cooper Ornithological Society—Board of Directors, 1985-86, 1988-92; Auction Committee Chairman, 1986; Painton Award Committee, 1988; Student Participation Committee Chairman, 1989-1993; Nominating Committee Chairman 1990; Mewaldt-King Award Committee 1993-1995; Annual Meeting Co-chair, 1994; Miller Award Committee, 2002-2003, 2008-2009.
Wilson Ornithological Society—Annual Meeting Co-chair, 1994.
Montana Natural History Center—Board of Directors, 1990-1992.
National Science Foundation—Ecology Panel Member, 1990, 2007; Conservation and Restoration Ecology Panel (declined), 1990.
Consulting Editor—Studies in Avian Biology, 1990, 1995.
Neotropical Migratory Landbird Conservation Program—Member, USFS Region I Steering Committee, 1990-1991; Vice-chair, National Research Working Group, 1993-1994.
The Nature Conservancy—Board of Trustees, Montana Chapter 2004-2007.
Past and continuing reviewer of manuscripts and proposals for *American Naturalist, Animal Conservation, Avian Conservation and Ecology, Auk, Behaviour, Behavioral Ecology, Behavioral Ecology and Sociobiology, Biodiversity and Conservation, Biological Conservation, Bioscience, Biotropica, Bulletin of Marine Science,* The Canada Council, *Journal of Avian Biology, Canadian Field Naturalist, Canadian Journal of Forest Research, Canadian Journal of Zoology, Condor, Conservation Biology, Ecography, Ecology, Ecological Monographs, Ecological Applications, Environmental Management, Fire Ecology, Forest Ecology and Management, Forest Science,* Grand Canyon Monitoring and Research Center, *Great Basin Naturalist, Ibis, International Journal of*

Wildland Fire, Journal of Applied Ecology, Journal of Avian Biology, Journal of Environmental Management, Journal of Field Ornithology, Journal of Mammalogy, Journal of Tropical Biology, Journal of Wildlife Management, Landscape Ecology, Memoirs of the California Academy of Science, Montana Outdoors, National Fish and Wildlife Foundation, National Geographic Society, National Park Service, National Science Foundation, *Natural Areas Journal, Northwest Science, Northwestern Naturalist, Oecologia, Oikos, Proceedings of the Montana Academy of Sciences, Proceedings of the National Academy of Sciences, Science, Rangeland Ecology*, Smithsonian Institution, *Southwestern Naturalist, Studies in Avian Biology*, USDA Forest Service, USDI Fish and Wildlife Service, Wildlife Conservation Society, *Wildlife Society Bulletin, Wilson Bulletin*, World Wildlife Fund.

RESEARCH PROJECT GRANTS:

1975—$600 from Frank M. Chapman Memorial Fund of the American Museum for studies of the migration ecology of western wood warblers.

1975, 1977—$1,000 from University of California Regents' Research Grant and University of California Graduate Student Patent Fund for studies of the migration ecology of western wood warblers.

1975—$600 from University of Wyoming, Jackson Hole Research Station for studies of the migration ecology of western wood warblers.

1978—$3,800 from University of Montana, Research Advisory Council for studies of avian foraging behavior in relation to food availability.

1979-1981—$20,000 from USDI Fish and Wildlife Service for study of riparian bird communities in western Montana.

1983-1985—$35,500 from World Wildlife Fund-U.S./Smithsonian Institution for study of distributional ecology of migratory landbirds in Mexico.

1986-1988—$6,500 from McIntire-Stennis Coop. Forestry Research Grant for studies of trends in populations of migratory birds in Montana, and effects of timber harvesting on bird communities.

1986, 1988—$22,100 from NSF-MONTS for studies of distribution and foraging behavior of forest birds in relation to spruce budworm density.

1989-1991—$25,000 from National Geographic Committee for Research and Exploration for study of bird distribution in relation to the landscape context of forest fires.

1990-1993—$186,385 from National Fish and Wildlife Foundation for study of land use effects on migratory landbirds in western Mexico.

1991-1992—$50,980 from USDA Forest Service for modeling population trends of western neotropical migrant birds.

1991-1992—$13,000 from USDA Forest Service for study of monitoring methods for neotropical migrants.

1991-1992—$9,900 from USDA Forest Service for bird monitoring study on the Clearwater National Forest.

1992-1993—$34,600 from National Park Service for study of response of cavity-nesting birds to the 1988 fires in Glacier National Park.

1992—$3,400 from Bureau of Land Management for study of distribution patterns of riparian birds on Hoodoo Mountain, Montana.
1991-1994—$235,075 from USDA Forest Service for modeling habitat distribution and monitoring neotropical migratory birds in Region I.
1994-1996—$33,000 from USDA Forest Service for multi-scale analysis of habitat use by Flammulated Owls in the Bitterroot Mountains, Montana.
1995-1996—$14,000 from McIntire-Stennis Cooperative Forestry Research Program to study “Abundance and nest success of cavity-nesting birds in salvage-logged and uncut patches within a burned forest on the Blackfoot-Clearwater Game Range, Montana.”
1995-1996—$151,979 from USDA Forest Service for modeling habitat distribution and monitoring neotropical migratory birds in Region I.
1995—$5,000 from USDI Bureau of Land Management to supplement the USDA Forest Service-funded project on monitoring migratory songbirds.
1995—$5,000 from Plum Creek Timber Company to supplement the USDA Forest Service-funded project on monitoring migratory songbirds.
1996-1997—$75,000 from USDA Forest Service for continuing support of project on “Monitoring population trends and habitat use of neotropical migratory landbirds in Region I.”
1996—$5,000 from USDI Bureau of Land Management to supplement the USDA Forest Service-funded project on monitoring migratory songbirds
1997—$18,000 from USDA Forest Service for analysis of tradeoffs associated with alternative monitoring protocols.
1997-2002—$499,271 from USDA Forest Service for monitoring population trends and habitat use of neotropical migratory landbirds in Region I.
1998—$40,000 from National Fish and Wildlife Foundation for support of the Northern Region Landbird Monitoring Program.
1998-2000—$12,273 from USDI National Park Service for project on “Effects of management-ignited prescribed fire on birds in Saguaro National Park, Arizona.”
1998-2001—$75,000 from National Park Foundation for support of Karen Short as a Canon-National Parks Science Scholar.
1998-1999—$59,508 from USDA-CSREES Strengthening Award for support of “Effects of fire on wildlife populations: a synthesis of literature and a field investigation.”
2000-2001—$6,897 from USDI National Park Service in support of an investigation of “The effects of surface fires on birds and arthropods in southwestern ponderosa pine forests: an experimental approach.”
2000-2001—$77,632 from National Science Foundation for support of “Central computer network at the University of Montana Field Research Station at Fort Missoula,” Ken Dial, Erick Greene, Tom Martin, and Richard Hutto, co-PIs.
2000-2001—$3,750 from USDA Forest Service, Rocky Mountain Research Station for study on “Use of dispersal to refine survival estimates in Yellow Warblers.”
2002-2005—$400,000 from PPL-Montana for “A study of the distribution, nest success, and physiological condition of birds in relation to vegetation structure and land use along the Missouri and Madison river corridors.”

2002-2005—$100,000 from Bureau of Land Management for “A study of the distribution, nest success, and physiological condition of birds in relation to vegetation structure and land use along the Missouri and Madison river corridors.”
2003-2008—$521,669 from USDA Forest Service for agreement to conduct landbird monitoring and develop educational opportunities at the University of Montana.
2003-2005—$99,813 from MT Department of Environmental Quality/EPA Wetland Program for “Assessing the Biological Integrity of Wetlands in Montana using Bird Communities.”
2003-2006—$343,750 from USFS-RMRS for study of “Patterns of plant, bird, amphibian, and small mammal occurrence in salvage-logged and unsalvaged burned conifer forests in the Bitterroot Valley, Montana” (with L. Marcum, K. Foresman and P. Alaback)
2003-2005—$85,000 from Montana Fish, Wildlife and Parks for “Montana bird conservation partnership.”
2003-2007—$10,500 from Plum Creek Timber Company for helping to develop an integrated bird monitoring program.
2004-2005—$10,000 from Great Basin Bird Observatory to aid in the “establishment of a coordinated bird monitoring program in Montana.”
2004-2007—$325,000 from Joint Fire Sciences Program to study “The influence of local and landscape conditions on the occurrence and abundance of Black-backed Woodpeckers in burned forest patches,” (Deb Austin and Sallie Hejl, co-PIs).
2004-2007—$50,000 from USDI Fish and Wildlife Service for study of bird distribution and indicators of bird health in relation to riparian bottomland conditions in Sonora, Mexico.
2005—$8,036 from Montana Natural History Center for development of a “Wildland Fire Education Program.”
2004-2005—$10,000 from Bureau of Land Management for development of web site for the Montana Birding and Nature Trail.
2006-2008—$78,715 from PPL-Montana to evaluate the success of a habitat restoration project on the Madison River, MT.
2006-2008—$50,000 from National Park Service (Glacier NP) to conduct bird survey work in association with JFSP-sponsored fire research.
2006—$4,598 from Montana Fish, Wildlife & Parks for conducting education about river restoration via a bird-banding station at Beavertail Hill State Park.
2006—$3,011 from Montana Fish, Wildlife & Parks for conducting bird survey in association with a multi-agency Big Hole River restoration project.
2006-2007—$24,995 from MT Department of Justice-NRDP for a “Bird’s-eye view riparian watershed education program” to be conducted in the Clark Fork River basin.
2006-2008—$68,000 from The Nature Conservancy for development of the “Koeye Watershed Monitoring Project.”
2006-2010—$496,198 from USDA-CSREES for “Novel use of a landbird database to inform management” (with Rob Fletcher, Co-PI).2007-2009—$10,000 from Montana Fish, Wildlife & Parks, 2007 to conduct a project on “Flammulated Owls and citizen science monitoring.”
2007—$5,000 from Montana Fish, Wildlife & Parks for “Flammulated Owls and citizen science monitoring.”

2007-2009—$50,000 from PPL-Montana for “evaluating the presence and persistence of birds along previously surveyed portions of the Missouri River corridor.”
2007-2009—$25,000 from Big Hole Watershed Committee, USFWS, and MTFWP for the use of birds to assess restoration success in the Big Hole Valley, MT.
2008-2009—$71,000 from PPL-Montana for “evaluating the restoration success on O’Dell Creek of the Madison River.”
2007-2009—$25,000 from Big Hole Watershed Committee, USFWS, and MTFWP for the use of birds to assess restoration success in the Big Hole Valley, MT.
2008-2013—$127,000 from Bureau of Land Management for “Upper Missouri Bird Inventory in Montana”
2008-2013—$395,000 from USDA Forest Service (#03-CR-11015600-007) for agreement to conduct landbird monitoring and develop educational opportunities at the University of Montana.
2008-2009—$71,000 from PPL-Montana for “evaluating the restoration success on O’Dell Creek of the Madison River.”
2008-2009—$27,000 from The Nature Conservancy for the Koeye Watershed Monitoring Project.
2008-2010—$20,000 from the Big Hole Watershed Committee and the USFWS Arctic Grayling Recovery Program for “Upper Big Hole River avian monitoring: evaluating habitat restoration.”
2008-2013—$48,900 from National Park Service-CESU for investigating the “Distribution and status of breeding birds in the sky islands of northern Sonora.”
2009-2010—$31,000 from PPL-Montana for “evaluating the presence and persistence of birds along previously surveyed portions of the Missouri River corridor.”
2009-2010—$23,985 from Montana Fish, Wildlife and Parks for “Clark Fork Diversity Monitoring Porject.”
2009-2010—$27,492 from MTDOJ-NRDP for “Bird’s-eye view of the Clark Fork River Basin.”
2010-2011—$100,000 from MTDOJ-NRDP for “Bird’s-eye view of the Upper Clark Fork River Basin” (Erick Greene and Heiko Langner, co-PIs).
2010-2011—$36,000 from PPL-Montana for “Habitat-Based Modeling of Riparian Bird Communities: Prioritizing Restoration and Evaluating Land Use on the Missouri-Madison Rivers.”
2011-2012—$70,000 from the MPG Ranch for bird banding and riparian education program.
2011-2013—$19,216 from Montana Fish, Wildlife and Parks for Montana Landbird Monitoring.
2011-2013—$189,810 from USDI Fish and Wildlife Service for “Restoration and identification of priority habitats for neotropical migratory birds in the Madrean Sky Islands, northwest Mexico” (Aaron Flesch, co-PI).
2011-2013—$64,545 from Institute for Wetland and Waterfowl Research for “IWJV Administration and Cooperation: Grid-Based Monitoring.”
2012-2013—$175,000 from Montana Tech for “Bird banding and education in the Clark Fork River basin.”
2012-2013—$20,000 from PPL-Montana for ““Habitat-Based Modeling of Riparian Bird Communities.”
2012-2013—$33,000 from Ducks Unlimited for “Grid-based bird monitoring in Montana.”

2012-2013—$31,000 from USFWS for “Distribution, Abundance and Habitat of Madrean Breeding Birds in the Northern Sierra Madre Sky Islands” (Aaron Flesch, co-PI).
2012-2013—$88,629 from MPG Ranch for “Bird banding and analysis of spatial patterns of use of the MPG Ranch.”
2012-2013—$7,714 from MT Department of Justice for “Bird Banding at Mt Haggin, MT.”
2012-2013—$17,546 from MT Tech for “Milltown Dam Education Program.”
2012-2013—$94,274 from MT Tech for “Bird’s-eye View Education Program.”
2012-2017—$1,200,000 from NSF for “Learning Assistants Become Teachers (LABT)” (David Erickson, co-PI).

PRESENTATIONS AT MEETINGS, WORKSHOPS, AND SYMPOSIA:
(about 20 in past 10 years; 15 by invitation)

PUBLICATIONS:

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and an evaluation of existing ecological evidence. Ecology 87:1075-1085.

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The ‘88 fires: Yellowstone and beyond, Conference proceedings. Tall Timbers Misc. Publ. No. 16, Tall Timbers Research Station, Tallahassee, FL.

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PROFESSIONAL PUBLICATIONS

Hutto, R. L. 2009. The ecological necessity of severe fire: an education message still not heard [abstract]. P. 52 *in* R. E. Masters, K. E. M. Galley, and D. G. Despain (editors). The ‘88 fires: Yellowstone and beyond, Conference proceedings. Tall Timbers Misc. Publ. No. 16, Tall Timbers Research Station,, Tallahassee, FL.

30 September 2009—Hutto, R. L. “Fires, Floods, and Hurricanes…Hooray!” Audubon Field Guides on-line blog. http://audubonguides.wordpress.com/2009/09/30/fires-floods-and-hurricanes%e2%80%a6hooray/

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13 November 2009—Hutto R. L. “Molting while en route during fall migration” Audubon Field Guides on-line blog. http://audubonguides.wordpress.com/2009/11/13/molting-while-en-route-during-fall-migration/

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15 December 2009—Hutto, R. L., and S. Reel. “Pollinator buzz” Audubon Field Guides on-line blog. http://audubonguides.wordpress.com/2009/12/15/pollinator-buzz/

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I contributed voice track for the award winning film “Disturbance” produced by Jeremy Roberts (Paintbrush Films & Conservation Media http://www.vimeo.com/5197576), which aired on PBS television and elsewhere.

Audubon Guides: Exploring with Dick Hutto: Episode 1 (shaping the desert landscape)
http://www.youtube.com/watch?v=gPudgtzcN0I&list=PL7F70F134E853F520&index=1&feature=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 2 (The short-eared owl)
http://www.youtube.com/watch?v=j1VOs1ImIaw&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 3 (Red-tails in Central Park)
http://www.youtube.com/watch?v=CevcK-trVRE&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 4 (Biotic communities)
http://www.youtube.com/watch?v=RWKQzbejmqs&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 5 (American Dipper)
http://www.youtube.com/watch?v=AKZHdVPd9QE&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 6 (Bird Identification)
http://www.youtube.com/watch?v=W2uH-CgCQ48&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 7 (The Bitterroot River)
http://www.youtube.com/watch?v=vTbspxOTPJM&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 8 (Santa Cruz River)
http://www.youtube.com/watch?v=CblJHwkbsaY&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 9 (Finding birds)
http://www.youtube.com/watch?v=uCJCsNLrp2k&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 10 (Pollination systems)
http://www.youtube.com/watch?v=zR_DF2fbRus&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 11 (Raptor migration)
http://www.youtube.com/watch?v=QJ_FwdkGQ_Q&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 12 (Magee Marsh)
http://www.youtube.com/watch?v=-dRG-bi_nJc&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 13 (A woodlot as habitat)
http://www.youtube.com/watch?v=ck4y2GEL678&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 14 (Brown-headed Cowbird)
http://www.youtube.com/watch?v=D4e1AGCYewY&feature=BFa&list=PL7F70F134E853F520&lf=plpp_video
Audubon Guides: Exploring with Dick Hutto: Episode 15 (A burned forest)
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17 January 2013

Dennis C. Odion
Earth Research Institute
University of California
Santa Barbara, Ca. 93106
And
Department of Environmental Studies
Southern Oregon University
Ashland, Oregon 93106

Chad Hanson
Director
John Muir Project

Dear Dr. Hanson,

Thank you for the opportunity to review your assessment of the current status of the black-backed Woodpecker (*Picoides arcticus*) pursuant to the California Endangered Species Act. Since I am an ecologist specializing in fire and biodiversity, I am very interested in fire dependent biota and in preventing extinctions among these biota, so this status review is a subject of interest to me.

I believe your review of the literature and evidence regarding the status of the black-backed woodpecker was thorough and reached a conclusion that is supported by the scientific evidence: the California black-backed woodpecker is threatened and in need of protections to prevent its extinction. In fact, you could have included one more bit of information about its decline that I suspect you intended to include: Cooper (1870) described the species as "numerous." This description is a stark contrast to the current status of the Black-backed Woodpecker and suggests that there has been long, steep decline in its population in California. This trend probably began with fire suppression in the early 1900s, and may have accelerated in recent decades with the combined effects of forest thinning and clear-cut logging after fires, the factors that you identified as key threats to the bird's future.

The woodpecker's narrow habitat requirements (occurring in mainly fire-killed forests) make it particularly vulnerable to further habitat loss and are a fundamental reason the species' viability is threatened. Because of fire suppression, not only has the area of suitable habitat shrunk, but availability may be much more inconsistent in time and space. This could cause chronic stress to the species. Even if fire were to increase with climate change, burned habitat may be much more widely spaced geographically than it was historically because smaller fires were more frequent, and these will continue to be suppressed. This is particularly important because the maximum detection distance for black-backed woodpeckers for burned forests may be about 50 km. Fire free periods may lead to prolonged conditions of suboptimal foraging and local extinctions where energy requirements are exceeded. Repopulation may be prevented due to the lack of burned habitat nearby enough to provide a source of immigrants. Therefore, an individual, large fire may have a limited benefit. It is not really surprising that a species whose main habitat availability has been so drastically altered, not just in abundance, but in terms of the spatial and temporal pattern of availability, has plummeted and now appears threatened in California.

As the status review points out, fire suppression is not the only cause of habitat unavailability. Thinning and post-fire logging each directly reduce habitat. It would be possible to estimate fairly accurately how much habitat may be directly lost by pre-fire thinning and post-fire logging under different scenarios. This may be beyond the scope of the status review, but would be good research to recommend for the future. More research is also needed on reproductive rates and persistence in areas where fire has not occurred, if there are populations present in such areas.

I believe the time to protect the Black-backed Woodpecker from activities that have caused a steep population decline has come. If the decline continues much longer, this bird could become extinct in California. Therefore, I support the recommendations of the status review.

Sincerely,

Dennis C. Odion, Ph.D

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DOB: 4-15-59

PROFESSIONAL INTERESTS:

Plant ecology, vegetation patterns, fire, species diversity

EDUCATION

University of California, Santa Barbara

1995 Ph.D. Geography. Advisor, Frank W. Davis
1984 M.A. Botany, Advisor, J.R. Haller
1981 B.A. Environmental Biology

AWARDS

2007 Outstanding Scientific Partner, National Park Service, Klamath Network Inventory and Monitoring Program.

EXPERIENCE

1/04- present. Researcher, Department of Environmental Studies, Southern Oregon University. Ecologist. Klamath Network, National Park Service. Development of long-term programs for monitoring of vital signs and vegetation mapping in six National Parks. Principal investigator and project manager for mapping vegetation in three National Parks. (http://science.nature.nps.gov/im/monitor/).

1/95-2012. **Researcher**, Earth Research Institute/Institute for Computational Earth Systems Science. Research on fire and vegetation patterns, exotic plant diseases, rare plants and seed germination.

1/84-present. **Principal,** Odion Consulting. Ecological studies, technical reports, literature reviews. Fire ecology, resource management and restoration, rare plants and habitats distributions and conservation-related issues. Expert testimony.

8/95-7/2000. **Vegetation Ecologist**, Marin Municipal Water District, Corte Madera, Ca. Management of vegetation in Marin County California. Fire hazard/urban interface and exotic species issues. Managed crews, interns and volunteers. GIS database management.

1/1995-6/95. **Post-doctoral Research Biologist**. Department of Biological Sciences, University of California, Santa Barbara. Regeneration of California oaks and livestock impacts at the University of California, Sedgwick Reserve.

1992-1994. **Research Assistant**, Department of Geography, University of California, Santa Barbara. Vegetation mapping for Gap Analysis of California.

1988-1991. Research Assistant, Department of Biological Sciences, University of California, Santa Barbara. Vegetation study of a large desert alkaline wetland ecosystem, Owens Valley, California, in relation to soil properties.

1987-1990. **Research Assistant**, Department of Geography, University of California, Santa Barbara. Establishment of vegetation patterns following fire in chaparral.

9/87- 6/89. Teaching Assistant, Department of Geography, University of California, Santa Barbara. *California Geography*, *Quantitative Vegetation Analysis*, *Biogeography*.

6/84-9/87. **Editorial and Education Assistant**, Santa Barbara Botanic Garden. Wrote and edited publications and reports, field trip leader and course instructor.

1/84-6/85. **Research Assistant**, Department of Biology, University of California, Santa Barbara. Effects of ryegrass seeding on chaparral post-fire regeneration.

9/83-6/84. Teaching Assistant, Department of Biology, University of California, Santa Barbara. *Vegetation and Flora of California*, *Community Ecology*, *Advanced Plant Taxonomy and Systematics*.

6/83-9/84. **Assistant Curator**, Department of Biology, University of California, Santa Barbara. Teaching and research plant collections, botany lab set up.

8/81-9/82. Orchid grower/tour guide. Santa Barbara Orchid Estate.

1/81-7/81. Lab technician. Department of Biology, University of California, Santa Barbara. Collected plants and set up labs for *Plants of California*.

9/78-12/80. **Lab and Field assistant**. Marine Science Institute, University of Calfornia. Intertidal benthic studies.

9/77-9/78. Volunteer Editor. Condor Call, Newsletter of the Sierra Club.

RESEARCH GRANTS AND FUNDING

2009-present	National Park Service, $150,000/year.
2004-2009	National Park Service, $100,000/year
2003-2005	National Science Foundation, Co-PI, $50,000
1996-2000	California Department of Fish and Game, $15,000/yr
1985-1995	Santa Barbara County Fire and Resource Management.
1990-1992	California Department of Fish and Game
1992	The Nature Conservancy
1988	Lompoc Botanical Society
1987-1990	National Science Foundation, Co-PI, $35,000
1985-1986	National Audubon Society
1984-1985	US Forest Service

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Odion, Dennis C. 1995. Effects of variation in soil heating during fire on patterns of plant establishment and regrowth in maritime chaparral. Dissertation, Department of Geography, University of California, Santa Barbara. 289p.

D'Antonio, Carla M., **Dennis C. Odion**, and Claudia M. Tyler. 1993. Invasion of maritime chaparral by the alien succulent *Carpobrotus edulis*: The roles of fire and herbivory. *Oecologia* 95: 14-21.

Odion, Dennis C., Ragan M. Callaway, Wayne R. Ferren Jr., and Frank W. Davis. 1992. Vegetation of Fish Slough, an Owens Valley wetland ecosystem. Pages 173-197 in Clarence A. Hall, Vicki Doyle-Jones and Barbara Widawski, editors, History of Water: Eastern Sierra Nevada, Owens Valley, White-Inyo Mountains. University of California Press.

Haller, John R., Wayne R. Ferren Jr., Ragan M. Callaway, **Dennis C. Odion**, and Frank W. Davis. 1992. A phytogeographic comparison of the vascular flora of the wetlands of Fish Slough with the floras of neighboring desert basins. Pages 111-122 in Clarence A. Hall, Vicki Doyle-Jones and Barbara Widawski, editors, History of Water: Eastern Sierra Nevada, Owens Valley, White-Inyo Mountains. University of California Press.

Ferren, Wayne R. and **Dennis C. Odion**. 1992. Land and water-use history of Fish Slough: a chronology of selected events, observations, and publications from 1845 to the present. Pages 446-447 in Clarence A. Hall, Vicki Doyle-Jones and Barbara Widawski, editors, History of Water: Eastern Sierra Nevada, Owens Valley, White-Inyo Mountains. University of California Press.

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Davis, Frank W., Diana E. Hickson, and **Dennis C. Odion**. 1988. Vegetation composition in relation to age since burning and soil factors in maritime chaparral, California. *Madroño* 35: 169-195.

Odion, Dennis C., Tom L. Dudley, and Carla M. D'Antonio. 1988. Cattle grazing in southeastern Sierran meadows: ecosystem change and prospects for recovery. Pages 277-292 in Clarence A. Hall and Vicki Doyle-Jones (eds.) Plant Biology of

Eastern California. University of California, White Mountain Research Station publication.

Odion, Dennis C., Mary C. Carroll, and Carol J. Bornstein. 1988. Revegetation in Santa Barbara County: enduring dilemmas and potential solutions. Pages 76-91 in Proceedings of the Native Plant Revegetation Symposium, San Diego, Ca., April 1987. California Native Plant Society.

Odion, Dennis C. 1988. Fire and the Chaparral of the Los Padres. Los Padres Notes 4: 8-15.

Odion, Dennis C. and Shari Smith. 1988. Guide to the Garden. Santa Barbara Botanic Garden, 46 pages, maps and illustrations.

Nadkarni, Nalini M. and **Dennis C. Odion**. 1985. Effects of seeding exotic grass *Lolium multiflorum* on native seedling regeneration following fire in a chaparral community. Pages 115-121 in California Water Resources Center Report no. 62, Davis, Ca.

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Publications in progress

Odion, Dennis C., Hanson, Chad T., DellaSala, Dominick A., Baker, William L. 2012. Effects of Fire and Forest Treatments on Future Habitat of the Northern Spotted Owl. In review.

Odion, Dennis C., Chad T. Hanson, André Arsenault, William. L. Baker, Dominick A. DellaSala, Richard Hutto, Walt Klenner, Max A. Moritz, Rosemary Sherriff, Thomas T. Veblen, Mark A. Williams. An Examination of Historical and current low- versus mixed-severity fire regimes in drier forests of western North America. In review.

Odion, Dennis C. and Dominic DiPaolo. Vegetation of Oregon Caves National Monument and the proposed expansion area. For the National Park Service Publication Series, in review.

Tyler, Claudia M. and **Dennis C. Odion**. Germination cues and their implications for the conservation of the endangered, fire-dependent shrub, *Arctostaphylos morroensis*. In revision.

Moritz, Max A., Lori J. Miles, Erin M. Brown, Daniel Hüberli, Andrew A. Schaffner, Matteo Garbelotto, and **Dennis C. Odion**. Does smoke exposure affect the infection of *Umbellularia californica* (bay laurel) leaves by *Phytophthora ramorum*? In revision.

Selected Technical Reports

Smith, B. Sean., **Dennis C. Odion**, Alicea Fitzgerald, and Daniel A. Sarr. 2011. Klamath Network invasive species early detection monitoring protocol annual report 2011. Natural Resource Technical Report NPS/KLMN/NRTR—2010/XXX. National Park Service, Fort Collins, Colorado.

Odion, Dennis C. 2011. Use of Ecological Principles to Assess Effects of Freds Fire and Subsequent Management on Habitat Value. Prepared for: Carlson, Calladine & Peterson LLP San Francisco, California.

Frost, Evan, J., **Dennis C. Odion,** Pepper Trail, and Jack Williams. 2011. Cascade-Siskiyou National Monument boundary study: Identificatio of priority areas for monument expansion. Unpublished report produced for the Soda Mountain Wilderness Council.

Odion, Dennis C., Daniel A. Sarr, Elizabeth Perry, and Eric Dinger. 2010. Science, Research, and Climate Change for US Department of Interior Lands in the Klamath Region - Results of a Scoping Meeting. Unpublished Report on File. Klamath Network, National Park Service.

Odion, Dennis C. 2010. Expert report, the Ashland Forest Resiliency project. Prepared for Jay Lininger, Center for Biological Diversity, Albuquerque, New Mexico

Smith, Sean B., **Dennis C. Odion**, and Daniel A. Sarr. 2010. Klamath Network Invasive Species Early Detection Monitoring Protocol Annual Report 2009. National Park Service Natural Resource Technical Report NPS/KLMN/NRTR—2010/XXX

Smith, Sean B., **Dennis C. Odion**, and Daniel A. Sarr. 2010. Klamath Network 2009 Whitebark Pine Pilot Study, Crater Lake National Park. National Park Service Natural Resource Technical Report NPS/KLMN/NRTR—2010/XXX

Carroll, Carlos, **Dennis C. Odion**, Christopher A. Frissell, Dominick A. DellaSala, Barry R. Noon, and Reed Noss. 2009. Conservation implications of coarse-scale versus fine-scale management of forest ecosystems: are reserves still relevant? Wilburforce Foundation, 40 pages.

Odion, Dennis C. 2009. Expert Report, Federal District Court Case C08-1067-JCC, *Conservation Northwest (prevailing) vs. Mark E. Rey et al*. regarding vegetation management under the Northwest Forest Plan, 24 pages.

Lundgren, Heather, Ayzik Soloamesheh, **Dennis C. Odion**, and Daniel A. Sarr. 2008. Annual Report – Invasive Species Early Detection Monitoring (Pilot Study) 2007. National Park Service, Natural Resource Technical Report NPS/KLMN/NRTR—2008/105

Swanson Hydrology & Geomorphology et al. 2005-2007. Meeks Creek and High Meadow resource assessments and restoration plans Reports to Lake Tahoe Basin Management Unit.

Odion, Dennis C. 2007. Expert Report, Federal District Court Case Civ. 07-06283-HO *Sierra Club (prevailing) vs. Mark E. Rey et al*. regarding fire management in the eastern Cascades, 15 pages.

DellaSala, Dominick A., Greg Nagle, Rich Fairbanks, **Dennis C. Odion**, Jack E. Williams, James R. Karr, Chris Frissell, and Timothy Ingalsbee. 2006. The facts and myths of post-fire management: a case study of the Biscuit Fire, southwest Oregon.

World Wildlife Fund, Klamath-Siskiyou Program, 116 Lithia Way, Ashland, Oregon, 31 pages.

Frost, Evan J. and **Dennis C. Odion**. 2006. Effects of Livestock Grazing on Ecosystem Dynamics in Grassland and Woodland Plant Communities of the California Floristic Province. Unpublished Report, World Wildlife Fund, Klamath-Siskiyou Program, 116 Lithia Way, Ashland, Oregon, 114 p.

Odion, Dennis C. 2005. Expert Report, Federal District Court Case Civ S-04-2114GEB/DAD. *Sierra Club vs. Bosworth et al*. regarding categorical exclusion of fire management projects on federal lands, 25 pages.

Odion, Dennis C., Sarr, Daniel A., et al. 2005. Vital Signs Monitoring Plan for the Klamath Network: Phase II Report. Klamath Network-National Park Service, Ashland, Oregon, 124 p. 14 appendices.

Odion, Dennis C. 2005. Expert Report, Federal District Court Case C- 05-00898-CRE *Sierra Club (prevailing) vs. Bosworth et al*. regarding vegetation management in the Giant Sequoia National Monument, 12 pages.

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Conference and Invited Presentations

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Odion, Dennis C. , Diana E. Hickson, and Frank W. Davis. Vegetation development following fire in Burton Mesa Chaparral. Chaparral Paradigms Re-examined. Los Angeles County Museum of Natural History, 1986. Published abstract.

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Nadkarni, Nalini M. and **Dennis C. Odion**. Effects of seeding exotic grass *Lolium multiflorum* on native seedling regeneration following fire in a chaparral community. Chaparral Ecosystem Research Conference, Santa Barbara California, 1984.

SERVICE

Santa Barbara County, Marin County, University of California, U.S. Fish and Wildlife Service, National Park Service, California Department of Fish and Game, City of Ashland, Southern Oregon University

Manuscript Reviews

*Conservation Biology**
*Ecological Applications***
Forest Science
*Journal of Ecology**
*Madroño***
Northwest Science
*Oecologia**
University of California Press.
Ecology
Fire Ecology
International Journal of Wildland Fire
*Journal of Vegetation Science**
*National Park Service***
Proc. of the Nat. Acad. of Sciences
Plant Ecology

*Multiple reviews
**Four or more reviews

Boards and Committees

- **Board of Directors**: Soda Mountain Wilderness Council (current)
- **Science Advisory Board**: Geos Institute (current)
- **Science Advisory Board**: Umpqua Watersheds (current)
- **Northern Spotted Owl, Klamath Working Group**: U.S. Fish and Wildlife Service Science Team addressing fire management policy for the Spotted Owl Recovery Plan (current).
- **Scientific Review Committee**: Northern Spotted Owl. U.S. Fish and Wildlife Service (current)
- **Conservation Chair,** Native Plant Society of Oregon: Conservation Chair, Siskiyou Chapter (2004-2009).
- **Environment Now Panelist**: Achievement awards selection 2008, 2009.
- **The Wildlife Society, Science Team**: peer review of the 2008, 2010 Northern Spotted Owl Recovery Plans.
- **Marin County Oak Mortality Task Force**: Research Chair (2000).
- **Marin County Weed Management Area**: Organizer (1998-2000).
- **Save Sedgwick Ranch**: (now University of California Sedgwick Reserve) *ad hoc* committee organizer, writer. 1990-1993.

Teaching

- **Guest lecturer**: Department of Biology, Southern Oregon University, 2004-present.
- **Naturalist and field trip leader**: Soda Mountain Wilderness Council, 2001-present.
- **Instructor**: The Ecology and Conservation of California's Maritime Chaparral (2003)
- **Instructor**: Fire ecology of the Klamath Region. Siskiyou Field Institute (2002, 2003, 2004).
- **Naturalist and field trip leader**: Botanist, La Purisima State Historic Park, 1988-1991.
- **Teaching Assistant**: Field Botany, Botany Labs, Plant Ecology and Vegetation analysis. UC Santa Barbara, 1982-1993.
- **Thesis advisor**: Environmental Studies, University of California, Santa Barbara, 1988-1990.
- **Botanist**: Golden Trout Camp, Sierra Nevada, summer, 1987.
- **Instructor**: Environmental Studies Program, University of California, Santa Barbara, 1981.

Professional Organizations

California Botanical Society (1983- present)
California Native Plant Society (1983-present)
Ecological Society of America (1983-present)
Native Plant Society of Oregon (2000-present)
Society for Conservation Biology (1986-present)
The George Wright Society (National Park Service)(2006-present)

Other Training

Marin County Wildland Fire Academy, 1998

References

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Claudia M. Tyler, Ph.D. Post-doctoral Researcher. Institute for Computational Earth Systems Science/Instructor, College of Creative Studies, University of California, Santa Barbara, Ca. Phone: (805) 455-5711, email: tyler@lifesci.ucsb.edu.

19 January 2013

Chad Hanson, Ph.D.
Director and Staff Ecologist
John Muir Project

Dr. Hanson,

I have finished reviewing your report on the biological status for the black-backed woodpecker in California. As a fire ecologist/landscape ecologist, I reviewed the document with an eye toward habitat availability and not on the biological viability of the woodpecker, as I do not have the expertise to make that determination. However, as the woodpecker is found almost exclusively in recently burned forests, my review should be germane to the discussion.

Fire Severity/Rotations

"The current estimate for fire rotation in mid/upper elevation forests of the Sierra Mountains is 791 years" (page 22) - this comes from Miller et al. 2009, not Miller and Thode 2007 which analyzed remote sensing techniques to improve accuracy of fire-severity prediction.

It should be noted that the estimate of current fire rotation from Miller et al. 2009 was made over a 23-year time period, too short to accurately estimate fire frequency. It is widely known that large fire years contribute disproportionately to fire rotation estimates and that accurate estimation should take place over longer time periods. It should also be noted that the time period of evaluation in the Miller et al. 2009 paper was post AD 1908, not presettlement; estimates of presettlement fire rotation demonstrate much shorter cycles than is current.

The proportion of high-severity in modern fires was found to have increased from 1984 to 2006 in the Miller et al. 2009 paper (an average of 17% high severity to almost 30%). However, no subsequent paper has demonstrated this increase, including the Dillon et al. 2011 paper which looked at forests in several regions across the west. Though an increase or lack of increase in fire severity over a 23 year period is not completely inconsequential, it does not demonstrate an abnormal condition of burning over a meaningful temporal scale - say 100s or 1000s of years. Landscape estimates of historical fire severity in the eastern Cascades of Oregon cited in the review (Baker 2012) have not shown any increase in fire severity.

I think the review did an excellent job of summarizing the state of current knowledge on fire ecology in Sierra Nevada forests with regard to fire severity and fire frequency. I would concur that the rate of higher-severity fire in the current landscape is much lower than in the historical and this has likely led to less, available habitat for species who rely on recent and high-severity fire.

High-severity patch size

It is unfortunate that the historical high-severity patch-size distribution has not been reconstructed (this is quite difficult to obtain) for the Sierra Mountains. It appears that larger patches would constitute higher-quality habitat for the woodpecker (e.g., greater foraging potential). I believe my work in the Colorado Front Range (Williams and Baker 2012, Ecosystems) is the only study that has compared high-severity patch sizes in presettlement and modern times. We found that the mean patch sizes had decreased in the modern landscape compared to the presettlement era. Given similarities in theses landscapes, both having reduced fire rotations, it would not be surprising to see an equivalent reduction in the Sierra Mountains. Thus, the amount of high-quality habitat from large, high-severity patches would be reduced from historical levels.

Management perspectives and recommendations

- The perception that the amount of area burned and the fire severity have increased in the modern forest landscape is probably one of the biggest misconceptions that may impact the decision to list the woodpecker. The evidence presented in the review provides a strong platform for rebuttal.

- 'Allowing fires to be managed for resource benefit in areas outside of the WUI.' Having worked for the federal agencies for several years, I can anticipate a backlash to this suggestion. Though many fire managers would like to see more managed fire (either prescribed or wildland), the political pressure and potential liability often preclude this option.

- Targeting treatments in the WUI and in lower-elevation forests should already be a goal for the agencies. Cite Shoennagel and Nelson 2011, Frontiers in Ecology, where treatments have been implemented outside WUI in inappropriate forest types.

- Salvage logging operations are often done under the assumption that further fuel reduction is necessary - even after a fire - to prevent severe wildfires in the future. These operations are justified under the false premise that historical forests were all open and park-like and fires burned with low severity.

-Managing for potential changes in forest cover due to climate will be challenging for land managers.

In summary, the rate of high-severity fire has not been found to have increased in modern times. Recently burned, high-severity forest, the habitat required by the black-backed woodpecker, is undoubtedly rarer in today's forest than was historical. Salvage logging removes critical habitat to many wildlife species, retards tree regeneration, and removes nutrients useful for recovering forests. Therefore, the arrangement, extent and intensity of logging operations should be well thought out to minimize long-term impacts. Project-level operations have the potential for long-lasting impacts, especially for a species like the black-backed woodpecker that relies on this ephemeral habitat.

Thank you for the opportunity to comment,

Mark Williams, Ph.D.
Fire Ecologist
Bureau of Land Management, Nevada

CURRICULUM VITAE

Mark Alan Williams 8 February 2013

Personal data

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Education

Ph.D. 2010 Ecology, University of Wyoming, Laramie, Wyoming. Graduate Advisor: William Baker. Dissertation: Landscape reconstruction and analysis of historical structure and disturbances in dry western forests using General Land Office survey data

M.S. 2001 Biology, University of North Dakota, Grand Forks, North Dakota. Graduate Advisor: James Cronin. Thesis: Herbivore assemblage response to stressed and vigorous prairie roses

B.S. 1998 Biology, Missouri Southern State University, Joplin, Missouri.

B.A. 1998 Chemistry, Missouri Southern State University, Joplin, Missouri.

Professional Experience

Aug. 2012 - Fire Ecologist**,** Bureau of Land Management, Winnemucca, NV

2010-2011. Fire Effects Monitor, National Park Service, Pacific Northwest Region, Tule Lake, CA.

2003-2006. Fire Ecologist, Bureau of Land Management, Rawlins, WY

2002-2003. Fire Effects Monitor, National Park Service, Midwest Region, Van Buren, MO.

Publications

Williams, M.A. and W.L. Baker. 2013. Variability of historical forest structure and fire across ponderosa pine landscapes of the Coconino Plateau and South Rim of Grand Canyon National Park, Arizona, USA. *Landscape Ecology* **28**: 297-310.

Williams, M.A. and W.L. Baker. 2012. Comparison of the higher-severity fire regime in historical (A.D. 1800s) and modern (A.D. 1984–2009) montane forests across 624,156 ha of the Colorado Front Range. *Ecosystems* **15**: 832-847.

Williams, M.A. and W.L. Baker. 2012. Spatially extensive reconstructions show variable-severity fire and heterogeneous structure in historical western United States dry forests. *Global Ecology and Biogeography* **21**:1042-1052.

Williams, M.A. and W.L. Baker. 2011. Testing the accuracy of new methods for reconstructing the historical structure of forest landscapes using GLO survey data. *Ecological Monographs* **81**: 63-88.

Williams, M.A. and W.L. Baker. 2010. Bias and error in using survey records to set ponderosa pine landscape restoration goals. *Journal of Biogeography* **37**: 707-721.

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Poff, A. C., K. J. Haynes, M. Szymanski, D. Back, M. A. Williams and J. T. Cronin. 2002. Bird predation on host races of the goldenrod stem galler, *Eurosta solidaginis* (Diptera: Tephritidae). *Canadian Entomologist* **134**: 215-228.

Scholarships/Awards

NASA-MSU Professional Enhancement Award - International Association of Landscape Ecology 2010

Program in Ecology Summer Fellowship - University of Wyoming, 2007, 2008 and 2009

Francis F. Feris Scholarship, School of Arts and Sciences - University of Wyoming, 2008

Plummer Scholarship, School of Environment and Natural Resources - University of Wyoming, 2007

STAR Award - BLM Rawlins Field Office, 2006

Outstanding Graduate Student Research Award - University of North Dakota, 2000

Honors Scholarship Award - Missouri Southern State University, 1994-1998

Membership in Professional Organizations

International Association for Landscape Ecology

International Association of Wildland Fire

The Association for Fire Ecology

The Ecological Society of America

Presentations

Recent Talks

Expanding the scale of ponderosa pine historical forest reconstructions in the western US using survey data: results for 926,000 ha, February 2012, Sante Fe, New Mexico. Southwest Fire Conference, Association for Fire Ecology.

Macro-scale reconstruction and analysis of historical forest structure in ponderosa pine forests April 2010, Athens, Georgia, U.S. Meeting of the International Association of Landscape Ecology

Invited Talks

Plant quality and trophic cascades: the effects of plant stress and vigor on insect assemblages, August 2000, Iguassu Falls, Brazil, Symposia: Evolutionary Biology of Galling Insects, International Congress of Entomology.

Attachment 3 to Black-backed Woodpecker Status Review: Draft Status Review (this is the document that was submitted to the peer reviewers)

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

John Muir Project of Earth Island Institute

and

Center for Biological Diversity

November 20, 2012

Prepared by Chad Hanson, Ph.D.

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[1] 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

[1] 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 ("**<u>Conclusion:</u>** …") of the material are included for the convenience of the reader.

I. <u>Habitat Essential to the Continued Existence of the Species</u>

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. <u>Range of Subspecies</u>

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 (Fig. 2).

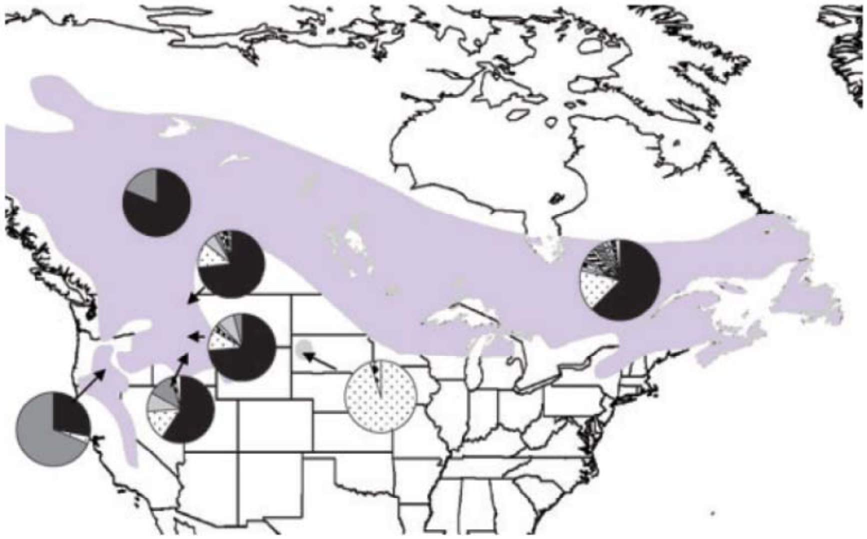

Fig. 1. The distribution of Black-backed Woodpeckers (Natureserve) with 7 sampling locations: Oregon, Idaho, Missoula, Glacier, Alberta, and Quebec. The frequency of observed mtDNA cytochrome *b* haplotypes at each sampling location is represented by pie charts at each location. From Pierson et al. (2010) 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).

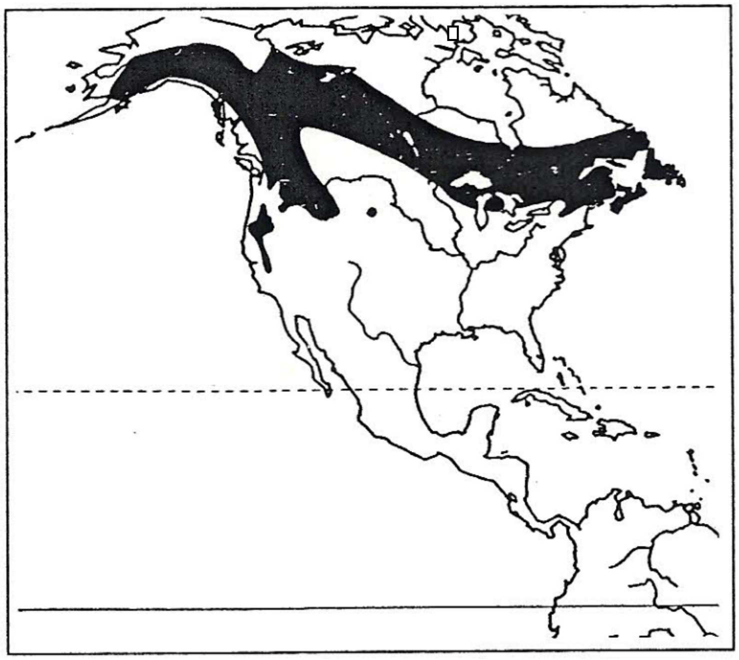

Figure 2. Map of the Range of the Black-backed Woodpecker across North America from Winkler et al. (1995), showing the three distinct populations.

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]).

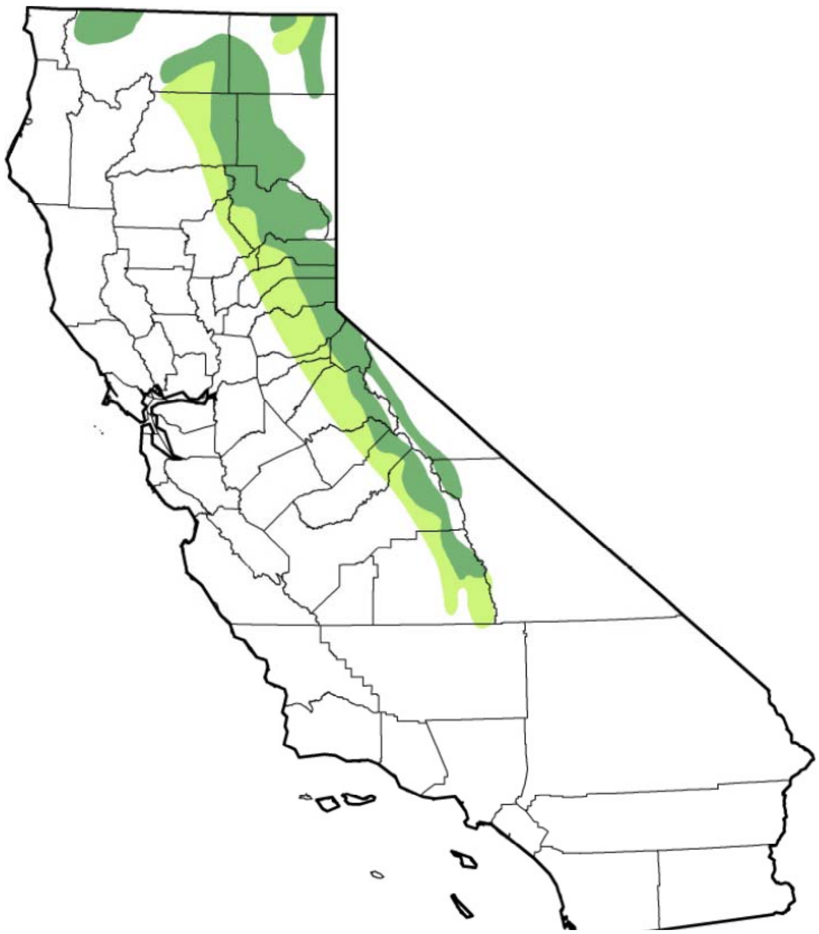

Fig. 3.   Gap in the range of the Black-backed Woodpecker between Oregon and California (California Department of Fish and Game 2005, from Siegel et al. 2008). Light green indicates probable winter range, dark green indicates probable year-round range.

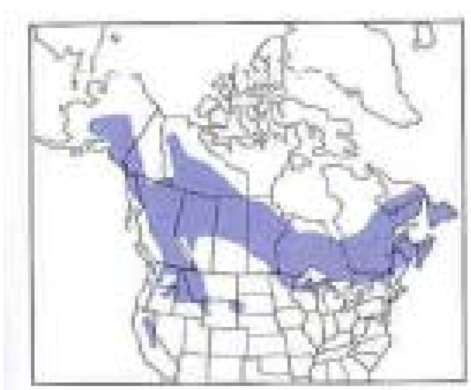

Fig. 4. Discontinuity in Black-backed Woodpecker range between the eastern Oregon Cascades and the Sierra Nevada (National Geographic Society Field Guide to Birds of North America).

<u>Conclusion</u>: 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. <u>Suitable Habitat</u>

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-backeds could have smaller than average home ranges, and relatively greater concentrations); e) the most important variables determining where Black-backed Woodpeckers foraged were small snag density, medium snag density, and large snag density (with medium and large snag densities being the most important); f) Black-backeds preferentially selected larger individual snags for foraging; and g) there was a strong negative effect of post-fire salvage logging (Black-backeds showed almost complete avoidance of salvage logged areas—see Fig. 10 of Siegel et al. 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. <u>Nesting Habitat</u>

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]). 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 2 below shows the species and condition of 61 nest trees utilized by Black-backed Woodpeckers in three different areas of the Rocky Mountains, two burned and one undescribed. Most nests (95%) were in snags.

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

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

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

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

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

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

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

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

Table 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-backeds selected nest sites in areas with higher snag densities and larger burned areas; tree density increased odds of nesting only if it coincided with increasing areas of moderate-high burn severity.

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

Black-backed Woodpeckers are important primary cavity excavators in intensely burned snag forests, providing nesting sites for other cavity-nesting bird and mammal species. Saab et al. (2004) reported that 27% of Black-backed Woodpecker cavities subsequently were re-used by other weak-excavator and non-excavator bird species. In burned forests of Montana, Hutto and Gallo (2006) documented 6 cavities made by Black-backed Woodpeckers that were re-used 7 times by other species including Northern Flicker (*Colaptes auratus*; 2 nests), White-breasted Nuthatch (*Sitta carolinensis*; 2 nests), House Wren (*Troglodytes aedon*; 2 nests), and Mountain Bluebird (*Sialia currucoides*: 1 nest). All the Black-backed Woodpecker cavities were reused by another species.

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

Black-backed Woodpecker foraging in salvage logged areas often drops to near zero, based upon radiotelemetry data (Goggans et al. 1989). Specifically, Goggans et al. (1989) conducted a radiotelemetry study of Black-backed Woodpeckers in an area with about 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 358.8 ha for a female that made a non-successful breeding attempt (Tremblay et al. 2009). In southwest Idaho, 1 adult male Black-backed Woodpecker was radio-tracked during June and July in unlogged, intensely burned ponderosa pine-Douglas-fir forest 4 years post-fire; home-range size was 72 ha (Dixon and Saab 2000). Dudley and Saab (2007) radio-tracked 2 males 6 years post-fire, and 2 males 8 years post-fire in burned ponderosa pine/Douglas-fir forests in southwestern Idaho. Average home-range size was 322 ha (range 123.5–573.4 ha) using 95 percent minimum convex polygon and 207 ha (range 115.6–420.9 ha) using fixed-kernel estimates (Table 5).

Table 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).

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

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

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

[c] Minimum convex polygon

[d] Fixed-kernel

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

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

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

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

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

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

In a radiotelemetry study of Black-backed Woodpeckers in burned forests of the Sierra Nevada region, Siegel et al. (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." (14 CCR 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 20th century, but that 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 20th 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 12 below).

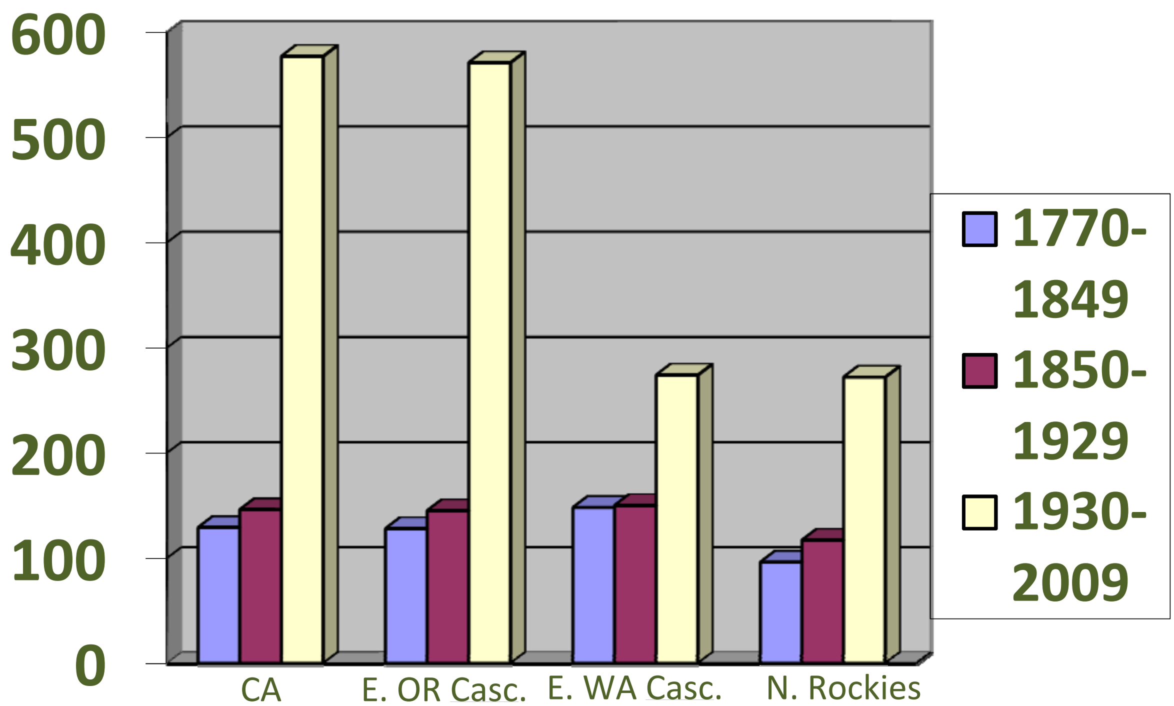

Figure 5. Rotation interval of high-intensity natural disturbance in years (y-axis) since the 19th century in unmanaged conifer forests within the range of the Black-backed Woodpecker in California, eastern Oregon Cascades, eastern Washington Cascades and northern Rockies.

Because of the extremely close association between Black-backed Woodpeckers and higher-intensity fire, the large decline in high-intensity fire since the early 20th 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.

To expand upon the analysis above (Fig. 12) which compared current to historic high-intensity fire extent, this analysis examined standard U.S. Forest Service satellite imagery data (RdNBR data; see www.mtbs.org), with the same RdNBR threshold (641) to define high-intensity fire as that used by the Forest Service (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 (i.e., significant amounts of moderate-intensity fire are also included)—and 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, similar in most important respects to the mixed-conifer forests of the Sierra Nevada, 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 (Miller et al. 2012b).

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. 2012a). 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 19th 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):

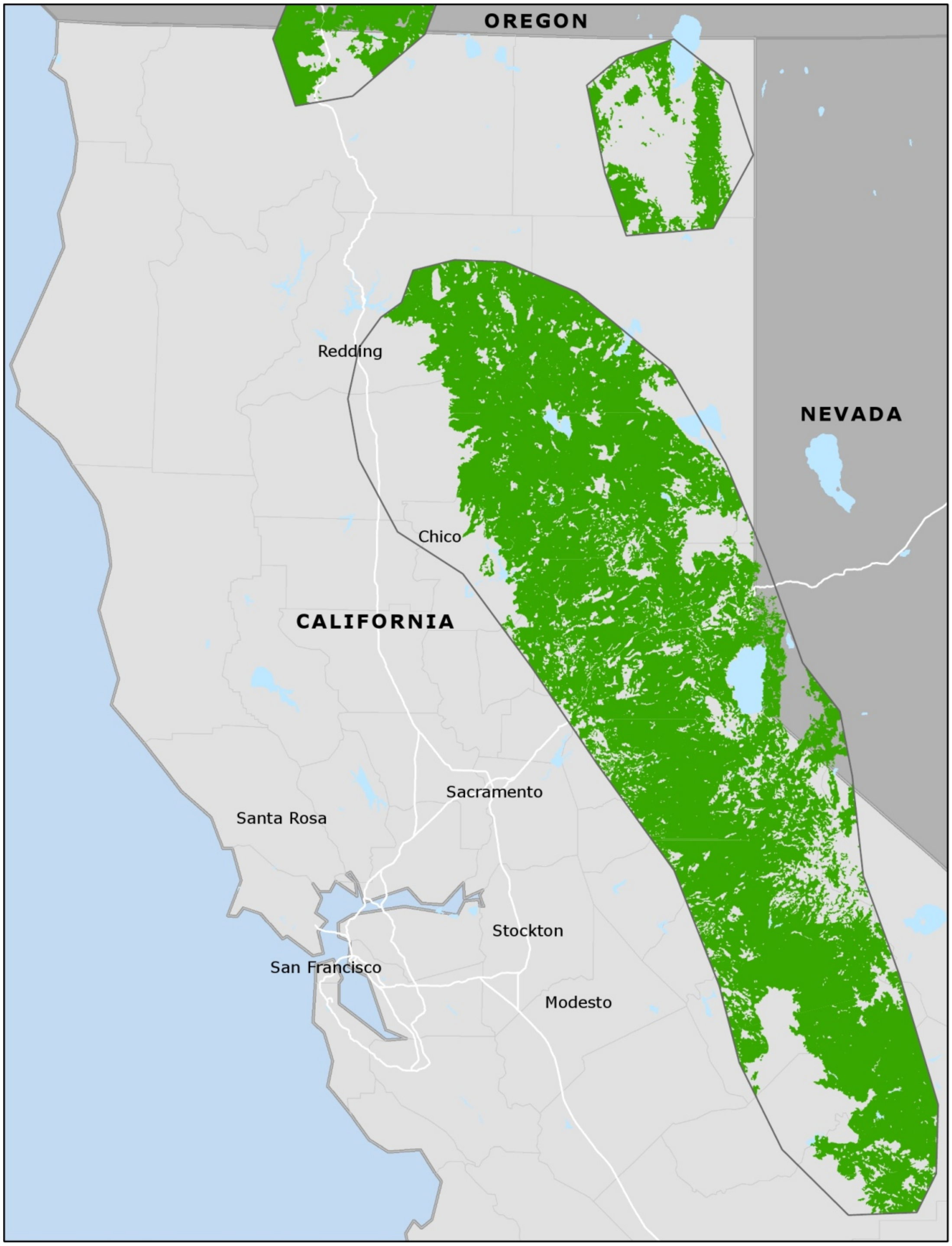

Figure 6a. The current distribution of conifer forest types that could potentially be used by the Black-backed Woodpecker in California.

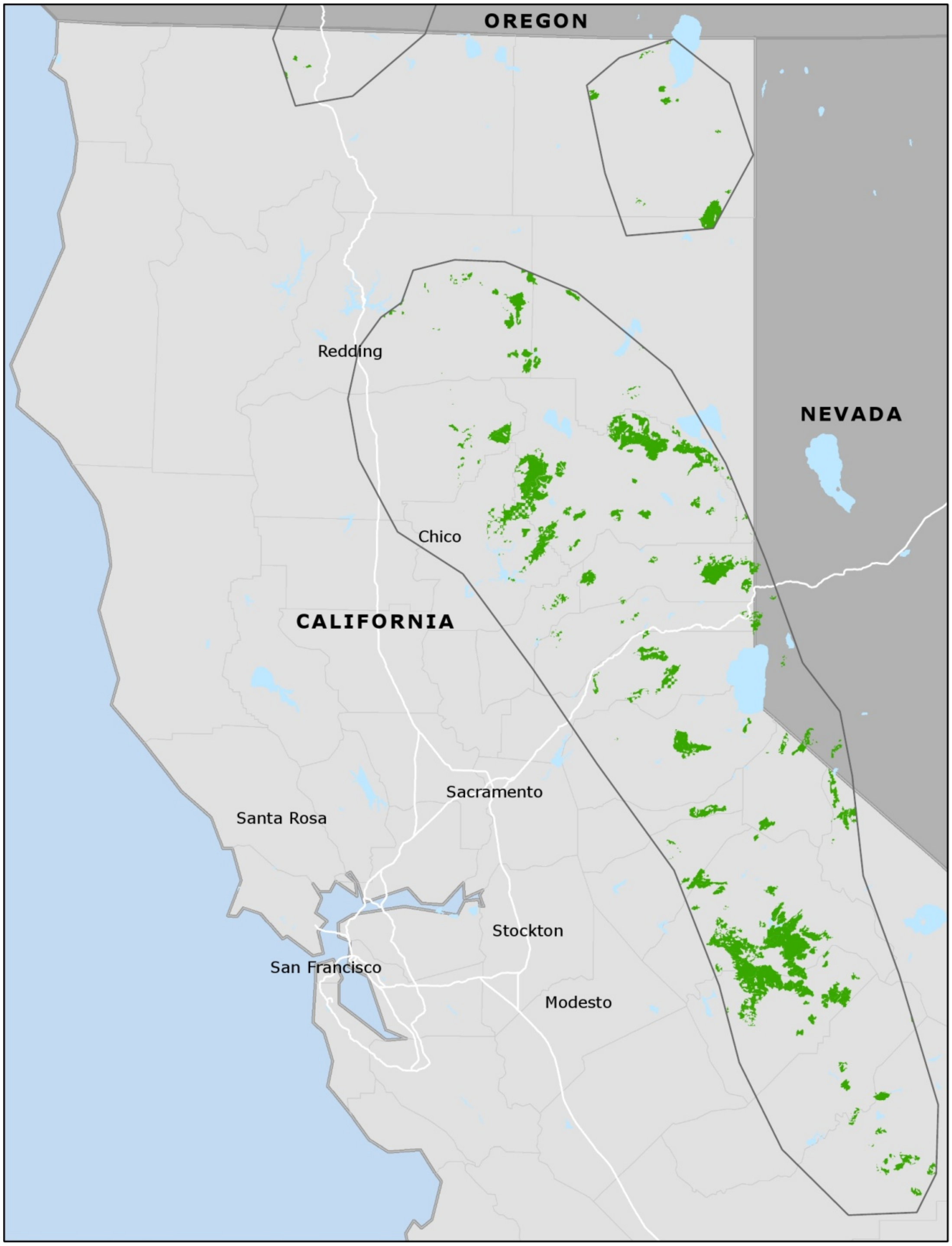

Figure 6b. Fires since 1984 on federal lands within relevant forest types on federal lands in California.

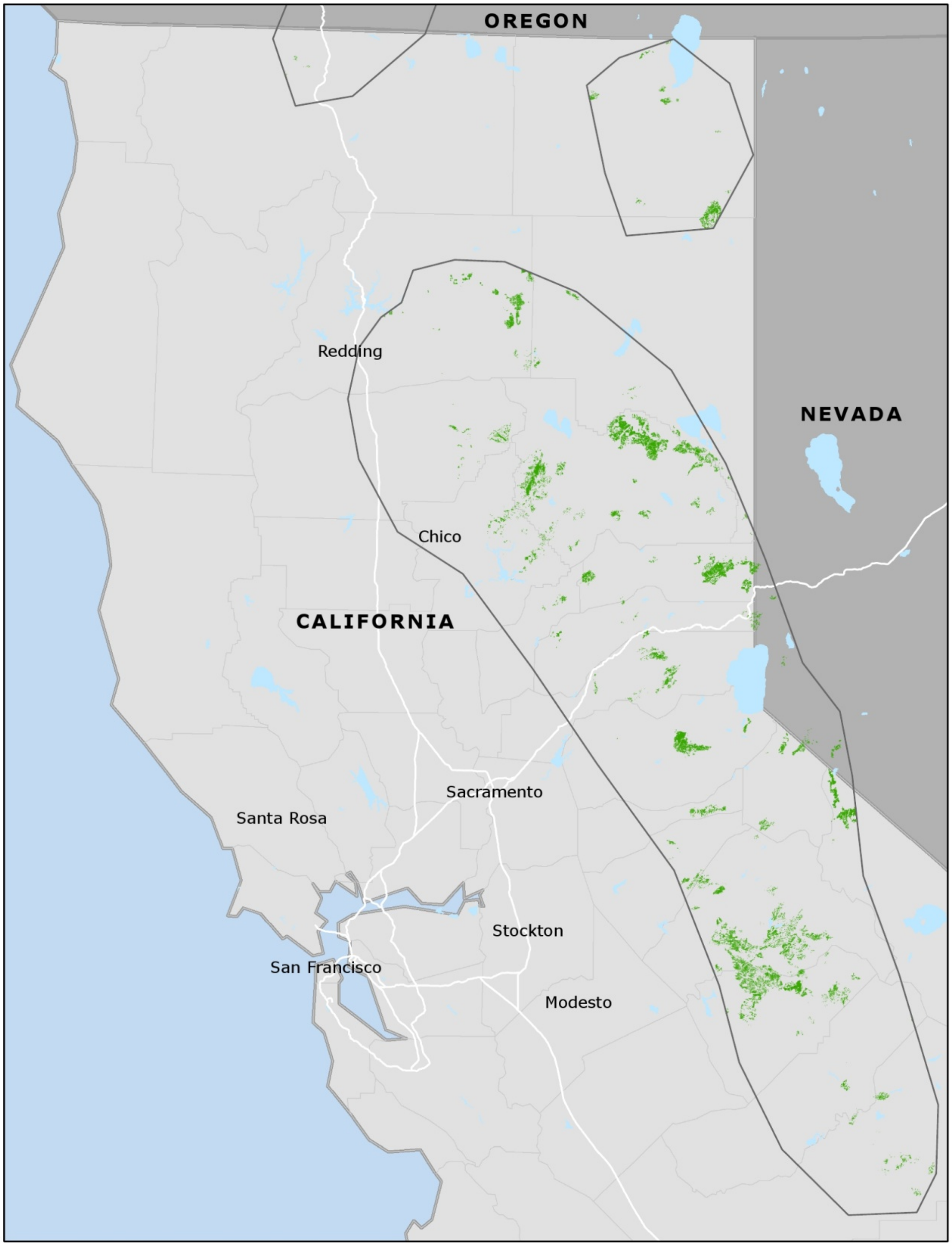

Figure 6c. Fires since 1984 with higher intensity fire effects (RdNBR >574 from satellite imagery, corresponding to >50% mortality in trees over 30 cm in diameter [Hanson et al. 2010]) within relevant forest types on federal lands in California.

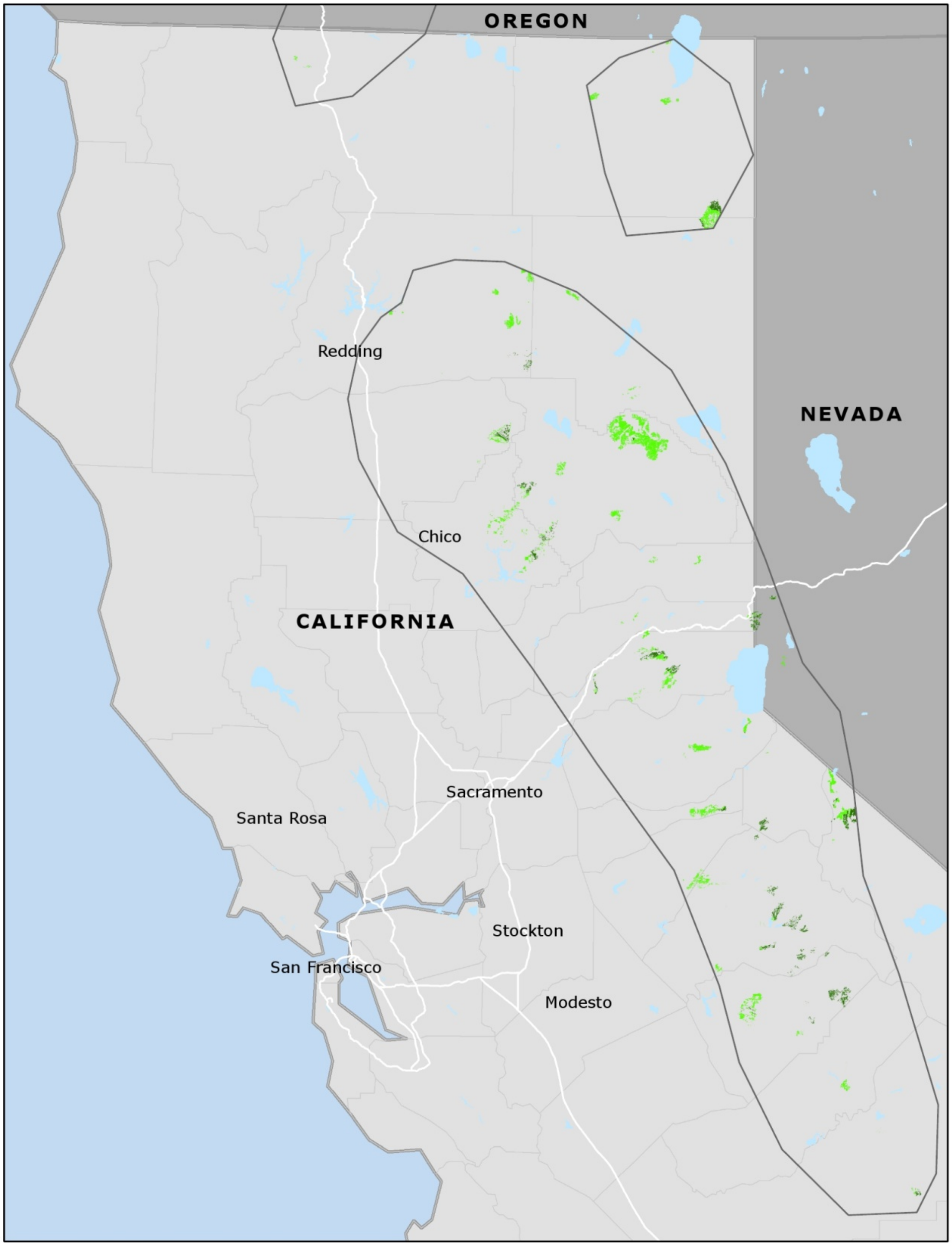

Figure 6d. Moderate/high-intensity fire since 2001 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green in California.

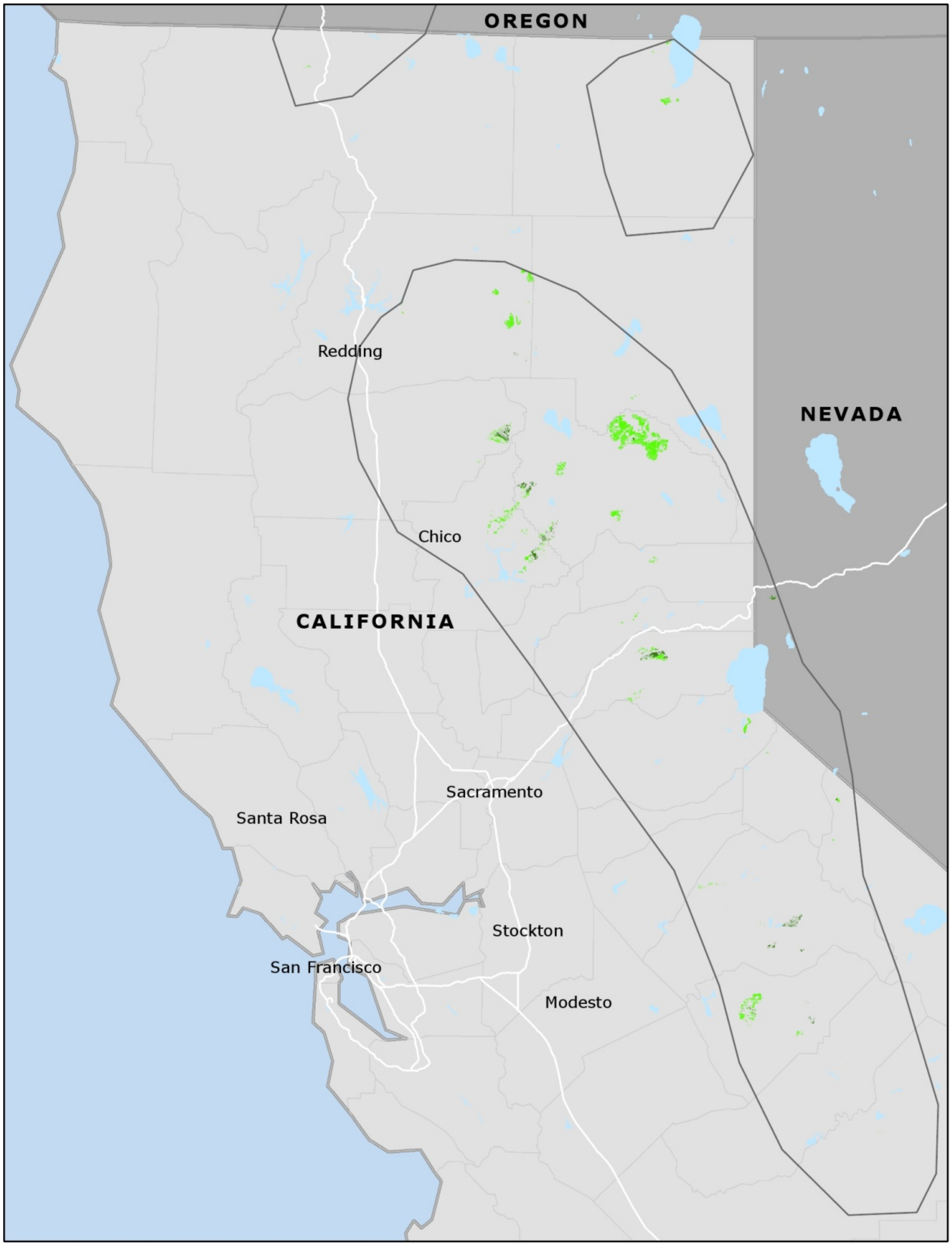

Figure 6e. Moderate/high-intensity fire since 2006 in relevant forest types on federal lands, with protected lands shown in dark green and unprotected lands shown in light green in California.

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 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). 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. 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 ± 9.3 snags >23cm/ha, and after logging were 45 ± 5.1 snags >23cm/ha and 129.6 ± 19.8 snags ≤23cm/ha. The unlogged burned stands had 67.8 ± 11.5 snags >23cm/ha and 100.4 ± 19.7 snags <23cm/ha. Numbers of nesting Black-backed Woodpeckers were significantly reduced in burned, logged stands compared to burned, unlogged stands elsewhere in the Rocky Mountains as well (Harris 1982 and Caton 1996 as cited in Dixon and Saab 2000). In the eastern Oregon Cascades, Cahall and Hayes (2009) found that partial salvage logging did not mitigate adverse effects to Black-backed Woodpeckers. 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 (≥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 (≥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. 14 below).

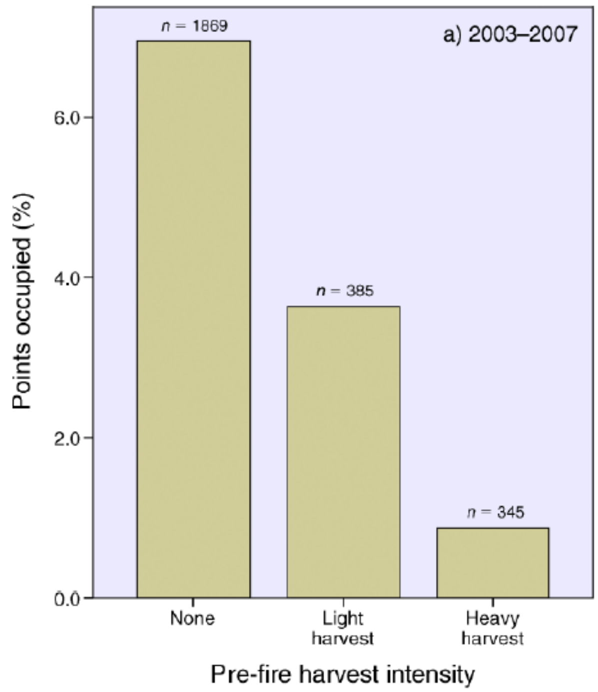

Figure 7. The probability of detecting a Black-backed Woodpecker decreases substantially with intensity of recent pre-fire thinning. From Hutto (2008 at p. 1,830).

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).

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.*, 2012 U.S.App.LEXIS 19769 (9th Cir. August 20, 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[2] 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 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.

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[2] *See* www.fs.fed.us/r5/EcologicalRestoration/pdfs/LeadershipIntent.pdf

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 forests 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. <u>Northwest Forest Plan 1994 Record of Decision</u>

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).

<u>Conclusion</u>: 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) <u>Private Lands</u>

i. <u>California Forest Practices Rules</u>

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 (Pub. Res. Code §§ 21000-21177). However, under what are referred to as Emergency Notices (Pub. Res. Code § 4592) , as well as Exemption Notices (. 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 14 CCR § 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 14 CCR § 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 14 CCR § 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 forseeable 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 (14 CCR § 913.1, 913.2). The uneven age methods involve removal of individual trees or groups of trees. Though occurring over several entries, these methods on private lands also are likely to result in removal of habitat characteristics required by the woodpecker—high densities of trees, and large trees and snags.

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

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

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

Most troubling for Black-backed Woodpeckers is the fact that the Rules governing forest management on private lands in California allow immediate removal of 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. (Pub. Res. Code § 4592; 14 CCR §§ 895.1 (definitions), 1052, 1052.1, 1052.2.) In addition, the sanitation/salvage method is a commonly utilized prescription under the timber planning process and is defined in the Rules as removal of trees that are “insect attacked or diseased trees…[or, for sanitation logging] trees…that are dead, dying, or deteriorating” because of damage from a variety of causes (14 CCR § 913.3 (b)). The 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” (14 CCR §§ 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 (14 CCR § 919.1 (d)) snags near roads and ridge tops (14 CCR § 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 7-9years (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 [Freds FEIS, p. 276]). Under the chosen alternative, Alternative 1, all of this was proposed for post-fire salvage logging on public lands, except three small "snag retention clumps" of 55 acres, 62 acres, and 47 acres, respectively (USDA 2005b [Freds FEIS, p. 278, Table 3-78]). In other words, approximately 95% of the Black-backed Woodpecker habitat was proposed for logging. The Ninth Circuit Court of Appeals ruled that this logging was illegal, but every acre of the planned salvage logging was cut by the time this ruling was issued, given that the district court denied plaintiff's request for a preliminary injunction (which is almost always the case with challenges to post-fire salvage logging within Black-backed Woodpecker habitat in California). *Earth Island Institute v. U.S. Forest Service*, 442 F.3d 1147 (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, Table1.1).

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 during, 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, but has not yet issued a proposed action so the extent of the proposed salvage logging is still unknown. The Chips fire, at about 75,000 acres, is mostly 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, though no proposed action has yet been issued so the extent of the proposed salvage logging is still unknown. 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 one-third of this potential Black-backed Woodpecker habitat). The Modoc National Forest is already proposing to extensively salvage log the Black-backed Woodpecker habitat created by the fire, though exact details remain unclear at this early stage.

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.

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 2012). 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 19th century, prior to fire suppression]).

Nor do most scientific studies indicate that fires are becoming more severe. Only one study, 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 did not provide a methodology explaining why some data were included and some excluded. Hanson and Odion (revision in review 2012) 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), 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 2012) 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%). The results of Hanson and Odion (revision in review 2012) 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. (2012) 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.

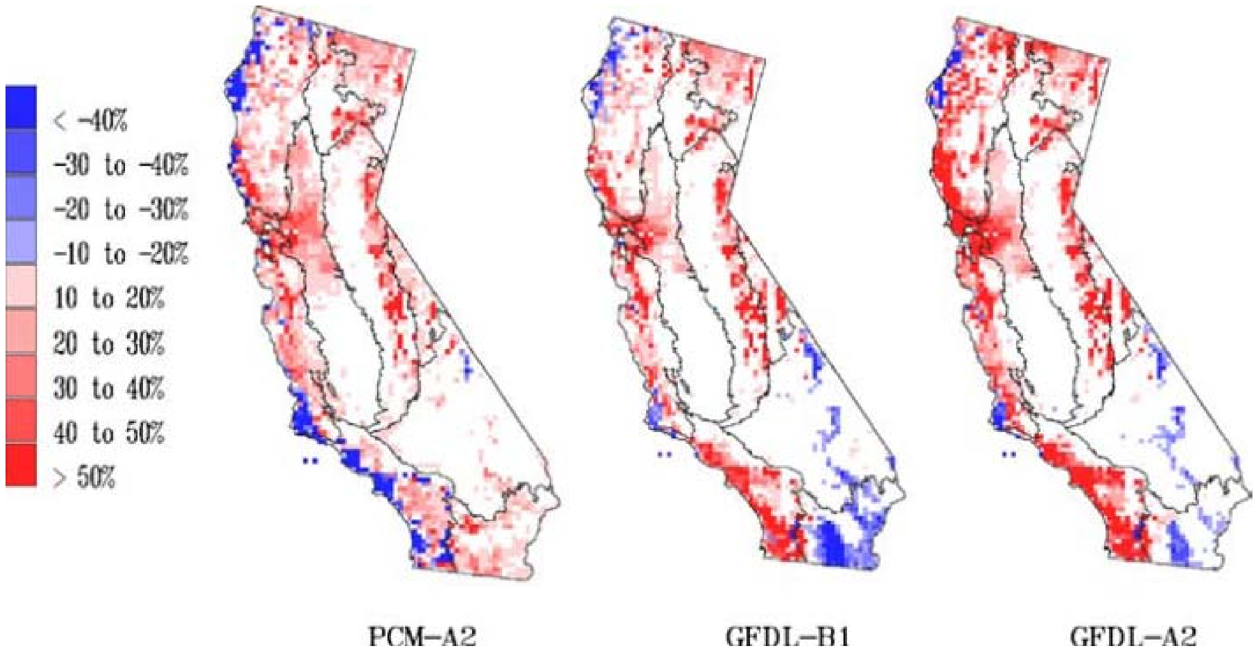

Fig. 8. Projected increases, due to climate change, in wildland fire in alpine/subalpine zones (lodgepole pine and subalpine forest types) by 2070-2099, generally averaging 20-40%, while little or no increases are projected in evergreen conifer forest types, such as mixed-conifer (from Lenihan et al. 2008).

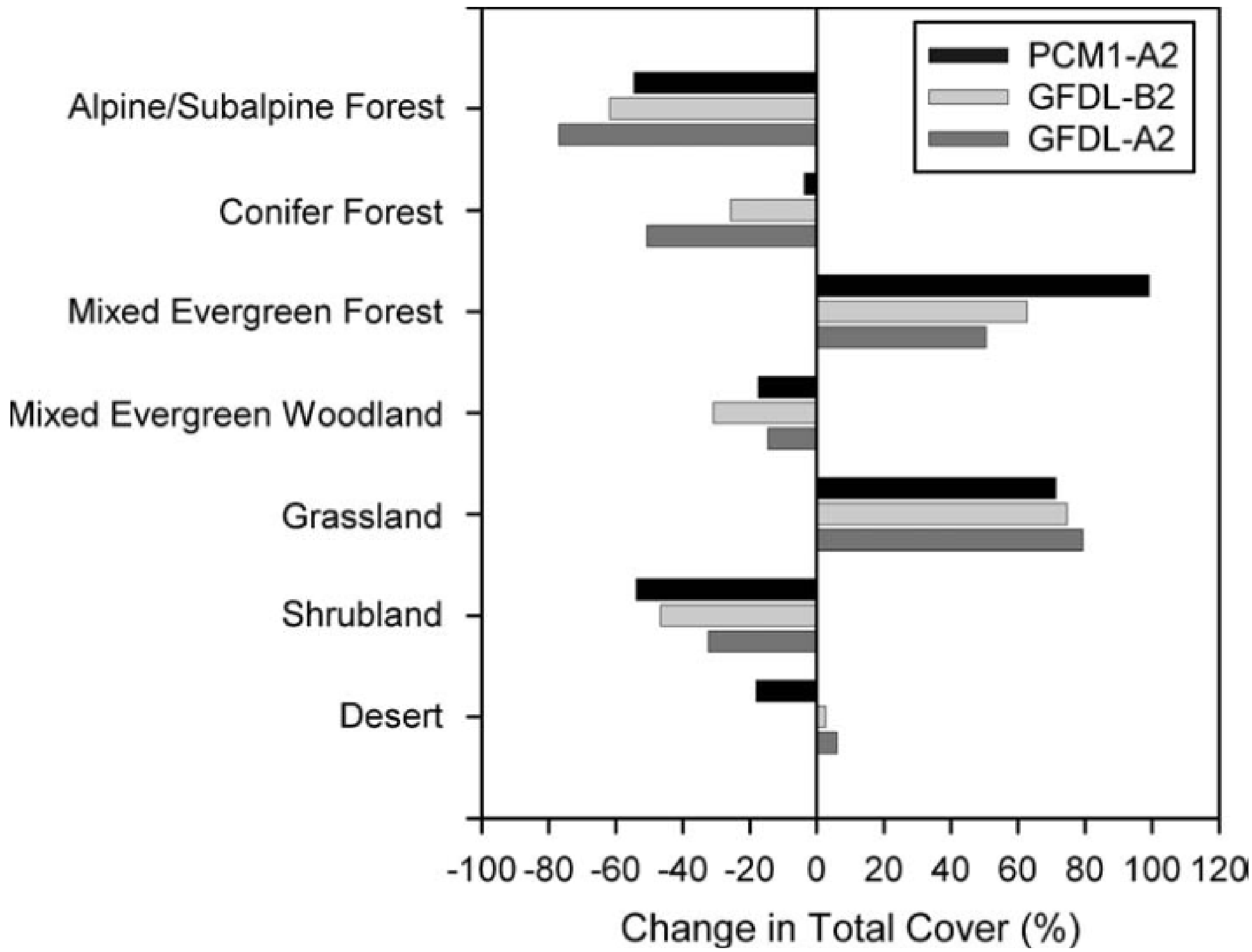

Fig. 9. Projected loss, due to climate change, of approximately 20-60% of forest types in which suitable Black-backed Woodpecker habitat occurs (conifer forest and subalpine conifer forest) by 2070-2099 (from Lenihan et al. 2008). Lenihan et al. (2008) defined alpine/subalpine as including lodgepole 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).

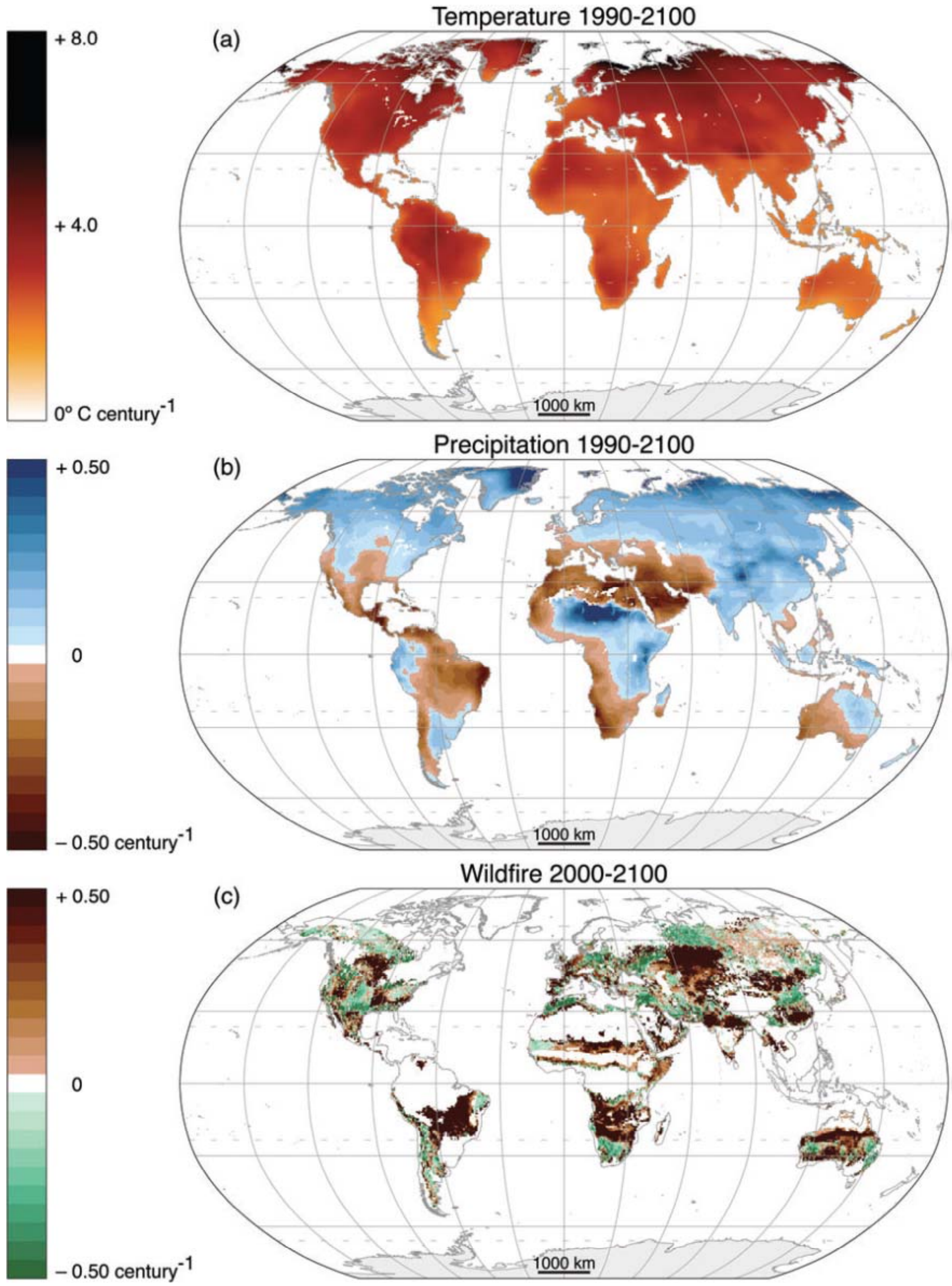

Fig. 10. Projected increases in fire in intermountain rangeland regions, with projected lack of change, or moderate decrease, in the Sierra Nevada and Cascades (from Gonzalez et al. 2010).

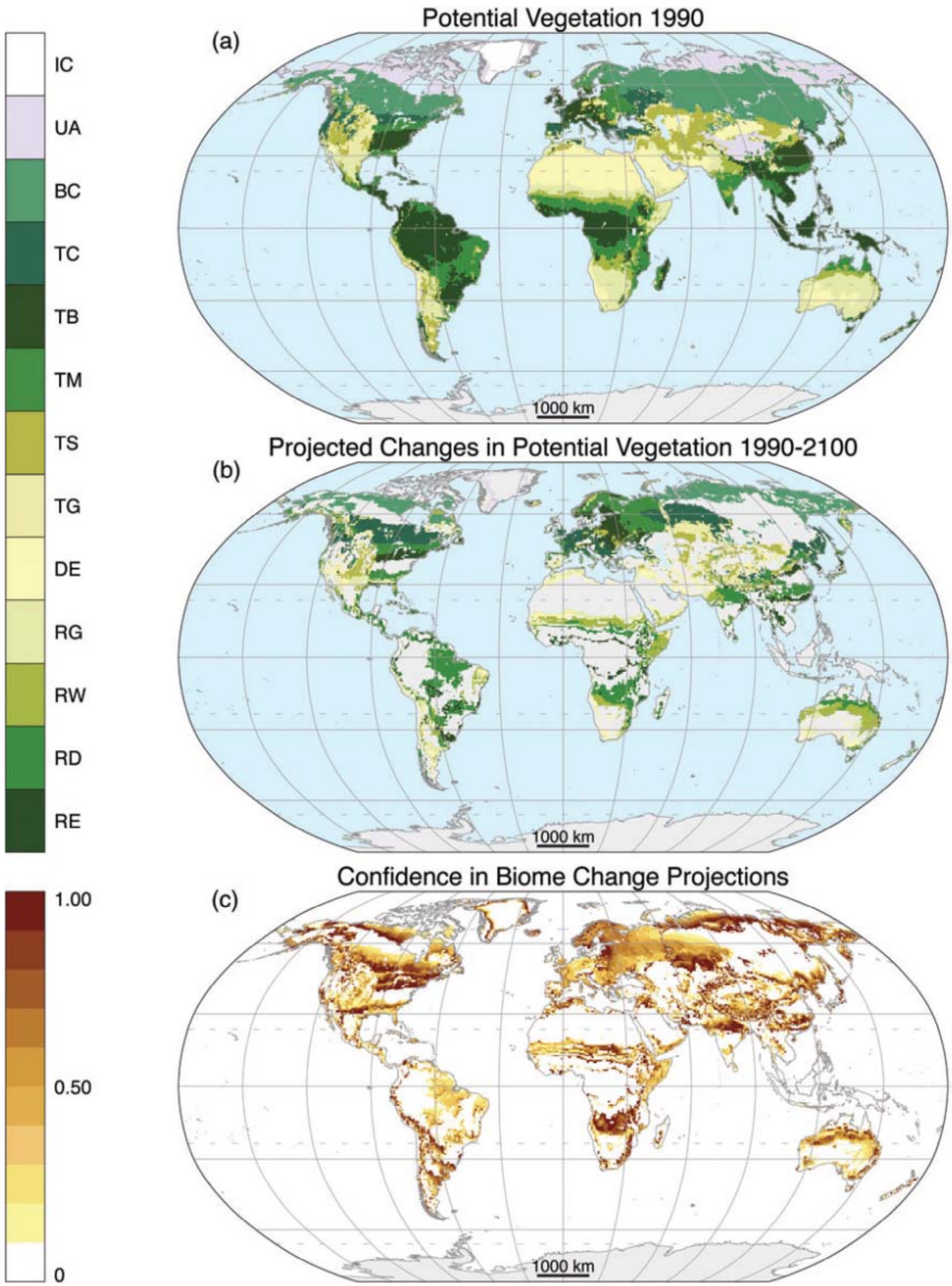

Fig. 11. Projected massive loss of temperate conifer forest (TC, shown in dark teal green) by the end of the century due to climate change (from Gonzalez et al. 2010).

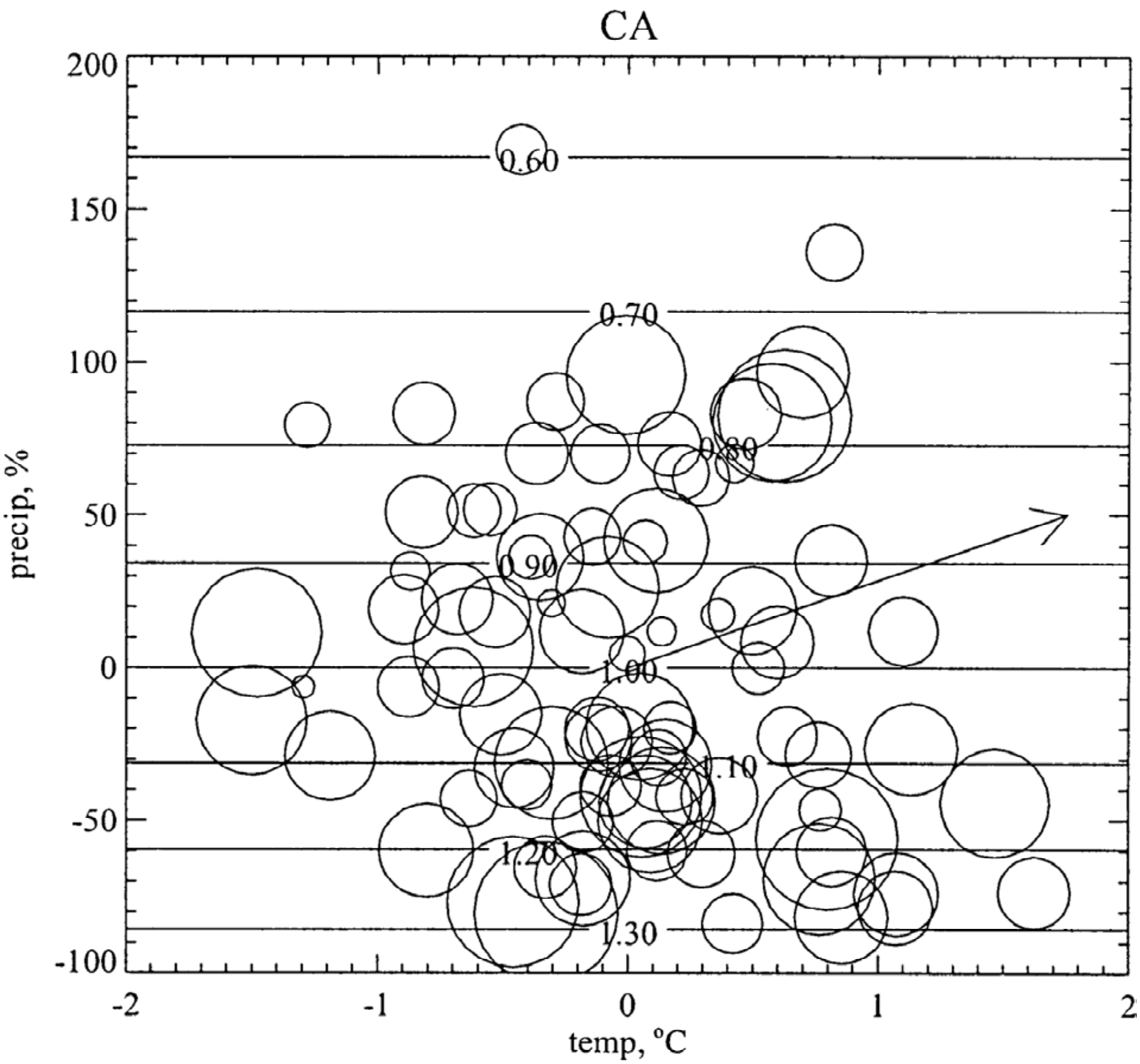

Fig. 12. Fire in California's forests projected to decrease, due to climate change, by about 15% (from baseline of 1.00 to about 0.85 of baseline at the point of the arrow) by 2070-2100, while temperature and precipitation both increase (McKenzie et al. 2004).

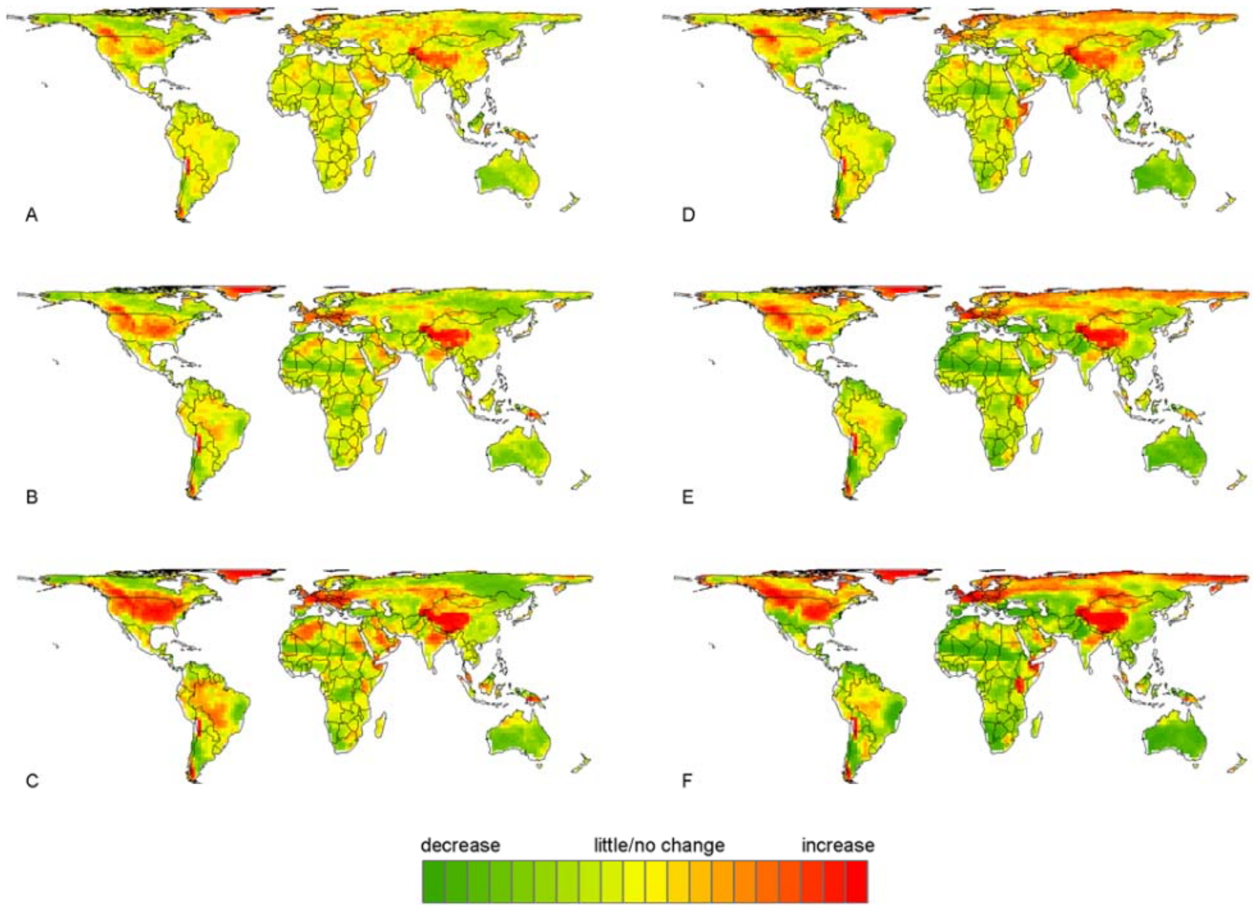

Fig. 13. Climate change projected to result in no change (yellow) in wildland fire in the forests of the Sierra Nevada and eastern Cascades for 2010-2039 (A and D) and 2040-2069 (B and E), and, by 2070-2099, projected to result in either no change on the western slope and a slight increase on the eastern 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. 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. 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. <u>Predation (Which is Exacerbated by Scarcity of Large, Recent High-intensity Fire Patches)</u>

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. <u>Other Natural Occurrences or Human-Related Activities</u>

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. <u>The BBWO is Inherently at High Risk Due to Its Very Small Population Size and the Ephemeral Nature of Its Habitat</u>

a. <u>Burned Forest Habitat</u>

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 for an estimated 20% rate of missed nest sites (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.

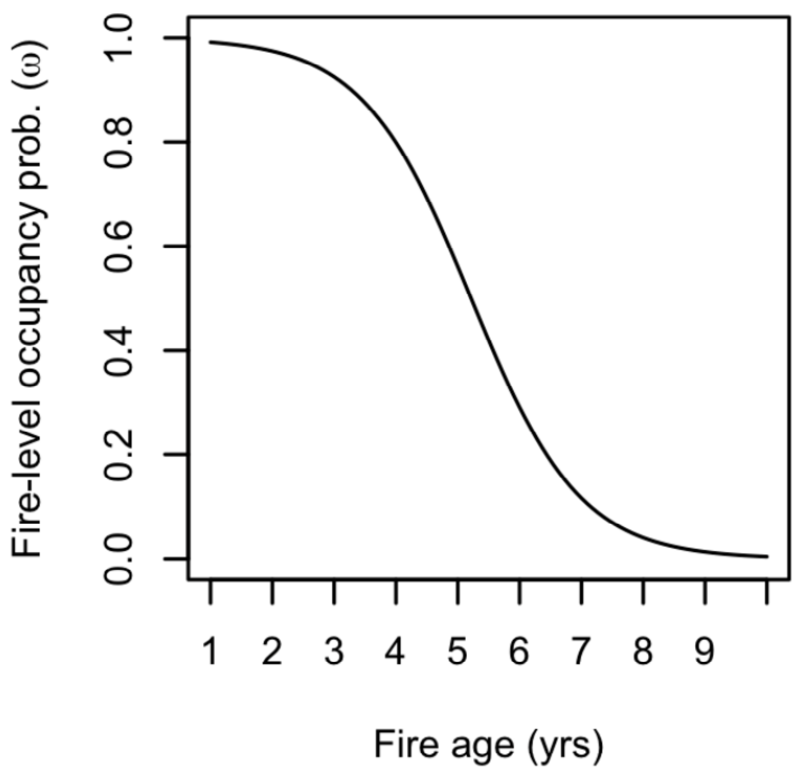

Fig. 14. Dramatic decline in Black-backed Woodpecker occupancy by 6 years post-fire as their food source declines with increasing time since tree mortality (from Siegel et al. 2011).

The analysis herein used the U.S. Forest Service's own fire severity data (www.mtbs.gov; http://www.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. <u>Unburned Forest</u>

A recent study on Black-backed Woodpecker nest densities in burned versus unburned forests used the playback method (through which recorded calls of Black-backed Woodpeckers are played to reliably attract Black-backeds within hundreds of meters around) to detect Black-backeds along 200-meter-wide transects, and then spent up to 90 minutes following the detected birds throughout the forested landscape (not just in the transects) to locate nests (Russell et al. 2009). The study found 21 Black-backed Woodpecker nests in a large burned forest area with substantial high-intensity fire and zero in unburned forest dominated by lodgepole pine and white fir at 1,500–2,000 meters in elevation in the Fremont-Winema National Forest, and on a Nature Conservancy preserve, just north of the California/Oregon border (Russell et al. 2009). Hanson and North (2008), conducted in the Sierra Nevada, found Black-backed Woodpeckers only in high-intensity/unlogged old forest, and found none in unburned forest. Similarly, Burnett et al. (2011 [Table 1]), in the northern Sierra Nevada, found Black-backed Woodpeckers only in large fire areas, and found zero in unburned forest, despite surveying for Black-backeds at several hundred detection stations across a vast area of unburned forest (covering much of the northern Sierra Nevada) over two consecutive years. In Hutto (2008), one of the largest data sets ever gathered for any wildlife species in ecological history, "[o]nly six of 194 [Black-backed] woodpecker detections occurred in something other than a burned forest." The 188 detections in burned forest were out of 3,218 sample points, i.e., Black-backed Woodpecker was present at 6.0% of burned points, while the 6 detections in unburned forest were out of a total of 13,337 points, i.e., Black-backed Woodpecker was present at only 0.045% of unburned points. In other words, in the most comprehensive data base, Hutto (2008) found Black-backed Woodpecker abundance in unburned forest to be 1/133th of their abundance in burned forest.

The Black-backed Woodpecker population estimate in unburned forest from Appendix 2 of Fogg et al. (2012) is based upon the assumption of Black-backeds 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-backeds 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-backeds 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. <u>Overall Population—Burned and Unburned Combined</u>

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 Black-backed Woodpecker 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 Black-backed Woodpeckers 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 in Section II.C.1.d.iv, 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 homes 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

Moreover, 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-backeds are misidentified as Hairies 20% of the time, and Hairies are misidentified as Black-backeds 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-backeds.

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 1st through August 30th.

- 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), and halt current plans to reduce/eliminate high-intensity fire in conifer forest wildlands not adjacent to homes.

- Prohibit insecticide use, and beetle repellant 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 can be salvage logged, 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). 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 can not 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.

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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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