Sierra Forest Legacy
Protecting Sierra Nevada Forests and Communities

May 18, 2017

Randy Moore
Regional Forester
USDA Forest Service
Attn: Trestle Forest Health Project
1323 Club Drive
Vallejo, CA 94592

Sent via email to: objections-pacificsouthwest-regional-office@fs.fed.us

Re: Objection to the Proposed Trestle Forest Health Project

Dear Randy Moore:

Over the past several years we attended numerous site visits and office meetings with Eldorado National Forest staff to discuss reducing project-related effects to spotted owls and providing resilient forest conditions within the proposed Trestle Forest Health Project area. We sincerely thank the Eldorado National Forest staff for working closely with us on this project. Collaboratively, we developed the environmentally preferred alternative, an alternative that would increase forest resilience and best provide for spotted owl persistence and sustained reproduction in the project area. Unfortunately this alternative was not selected. We contend that: (1) the Final Environmental Impact Statement (FEIS) and revised Terrestrial Biological Evaluation (BE) did not take a hard look at the best available science on California spotted owl, (2) the selected alternative includes habitat modifications that are likely to decrease spotted owl reproductive potential and increase the probability of breeding dispersal that are wholly unnecessary from a wildfire fuels, forest health, and community protection perspective, and (3) the selected alternative violates the management intent of the 2004 Sierra Nevada Forest Plan Amendment as it pertains to the California spotted owl.

Sierra Forest Legacy hereby submits this objection to the Forest Service's selection of Alternative 5 of the Trestle Forest Health Project Environmental Impact Statement. The Trestle Forest Health project is proposed on the Placerville Ranger District of the Eldorado National Forest. The responsible official is Laurence Crabtree, Forest Supervisor, Eldorado National Forest. The reviewing officer was not identified in the cover letter for the draft Record of Decision. Attached to this cover letter we provide Statement of Reasons that present specific reasons for our objection to the proposed decision, the related evidence and rationale on why the decision violates applicable laws and regulations, and the specific relief requested in response to our concerns.

As required by 36 CFR 218.8(d), the objector is:

Ben Solvesky
Wildlife Ecologist
Sierra Forest Legacy
PO Box 244
Garden Valley, CA 95633
Phone: 928/221-6102

Thank you for your time and attention. Please direct any questions or comments to Ben Solvesky (ben@sierraforestlegacy.org; 928-221-6102).

Sincerely,

Ben Solvesky
Wildlife Ecologist

Susan

Susan Britting
Executive Director

Statement of Reasons

1. The FEIS and BE did not Take a Hard Look at the Effects of the Action to the California Spotted Owl

The revised BE and FEIS cite Tempel et al. (2016) to suggest that converting high canopy cover habitat to moderate canopy cover habitat would provide a "benefit" to California spotted owls in the project area. Tempel et al. (2016) was published in the fall of 2016, more than a year after the Draft EIS was released for public comment. Therefore, we have not had an opportunity to comment on the use of this paper in the context of the Trestle project. Additionally, two other important papers on the California spotted owl in the Sierra Nevada were published in the interim between the release of the DEIS and the FEIS that were not included in the FEIS, Gutierrez et al. (in press) and Conner et al. (2016).

(a) Conner et al. (2016) and Tempel et al. (2016)

To contextualize and apply the findings of Tempel et al. (2016) to a logging project, one must first consider and disclose two important findings of Conner et al. (2016) and Tempel et al. (2014a). Specifically, it must be recognized that Conner et al. (2016) and Tempel et al. (2014a) each found that occupancy declined significantly on Forest Service-managed land and trends in occupancy have recently diverged from the trends abundance on all four of the Sierra Nevada demographic study areas. Because the BE did not consider or acknowledge these results, the results of Tempel et al. (2016) were inappropriately applied to Trestle and should not have concluded that Alternative 5 (the selected alternative) would benefit the species.

From 1993 to 2013, spotted owl **abundance** declined by over 40% on the Lassen and over 30% on the Sierra study areas, and increased by 22% on the Sequoia-Kings Canyon National Park study area (Conner et al. 2016). In comparison to abundance, **occupancy** declined by about 25% on the Lassen and more than 10% on the Sierra demographic study areas during the same period; while occupancy at Sequoia-Kings Canyon National Park remained stable during the study period. On the Eldorado study area, Tempel and Gutiérrez (2013) found that occupancy declined by about 30% during the study period, compared to a loss of abundance of about 50% during the study period (Tempel et al. 2014a).

The differences between abundance and occupancy on the study areas is not limited to the final difference in these parameters over the study period. The trend in occupancy and trend in abundance diverge on all of the Sierra Nevada study sites. For example, the realized change in abundance on the Lassen continues to decline, while the realized change in occupancy appears to be stabilizing, at least momentarily. This is consistent with recent findings on the Eldorado study area (Tempel et al. 2014a). To explain why the trends in occupancy and abundance are diverging on all of the demographic study areas, Tempel et al. (2014a) and Conner et al. (2016) suggest that because the occupancy model does not discriminate between a territory occupied by a single individual owl and a territory occupied by a pair of owls, **the divergent trends in occupancy and abundance on the Lassen, Sierra, and Eldorado study areas are due to an increase in the number of territories occupied by single owls, while the number of territories occupied by pairs of breeding owls continues to decline.** This situation suggests that the Forest Service-managed study sites have become population sinks. In contrast, occupancy on the Sequoia-Kings

Canyon National Park study area has stabilized, but abundance has increased due to an increase in the number of territories occupied by potentially reproductive pairs. This suggests that the National Park study area is a source population.

Only after it has been recognized that: (A) occupancy declined throughout much of the study period on the Eldorado, Lassen, and Sierra National Forest study areas (Tempel and Gutiérrez 2013, Conner et al. 2016, and Jones et al. 2016), and (B) occupancy appears to have recently stabilized on the study areas, but abundance has continued to decline on the National Forests, can the results of Tempel et al. (2016) be used to help analyze potential effects of a logging project on spotted owls. In light of these recent demographic findings, it is clear that a foundational assumption of the equilibrium occupancy modeling used in Tempel et al. (2016) cannot be met. Equilibrium occupancy modeling requires that one assume that occupancy was stable during the study period (Tempel et al. 2016). We know with certainty that occupancy was not stable on the three National Forest study areas (Tempel and Gutiérrez 2013, Conner et al. 2016). Again, occupancy on the Eldorado demographic study area declined by about 30% from 1993 to 2010, over 30% on the Lassen and over 10% on the Sierra study areas from 1993 to 2013. It is necessary that occupancy be stable if the results of such a study are to be used to define habitat conditions that provide for stable occupancy. If occupancy is declining, which is the case for all study areas managed by the Forest Service, then the results from Tempel et al. (2016) should not be used to define conditions that will provide for stable occupancy. For example, emulating the habitat conditions from the Eldorado demographic study area in other locations could very well lead to declines in occupancy of 30% and declines in abundance of 50%, as was the case within the Eldorado study area. Due to the design of this study, it is not appropriate to use the results as direct support for habitat conditions that provide for occupancy or to suggest that canopy cover modifications would “benefit” the species, when such conditions could create a population sink.

The fact that occupancy has been decoupled from abundance on all of the Sierra Nevada demographic study areas, with potential population sinks on the National Forests and a population source on the National Park, is also important to consider in applying the results of Tempel et al. (2016) to a project effects analysis. Even if occupancy were stable on the demographic study areas and the statistical assumptions of Tempel et al. (2016) were not violated, designing logging projects based on the results of Tempel et al. (2016) could very well result in a loss of abundance due to a decline in the number of territories occupied by pairs and an increase in the number of territories occupied by single individuals, a situation that would increase the likelihood a project area would become a population sink. Such an effect would not benefit the species.

Tempel et al. (2016) only considered the effects of logging within the previous 3 years, finding that on average less than 1% of each territory was logged within the previous 3 years. Therefore, with respect to logging, their results can only be used to suggest that significant adverse effects on occupancy would be unlikely when less than 1% of a territory was logged. Tempel et al. (2014b), Seamans and Gutiérrez (2007), Gallagher (2010), Stephens et al. (2014), and Tempel et al. (2015) studied how modifying canopy cover, almost exclusively through timber harvest, affected demographic parameters. All of these studies identified significant adverse effects. These studies remain the best available science on modifications to canopy cover on spotted owl demographics. The results of Tempel et al. (2016) do not negate what these studies found.

We ask that the issues we outline above regarding the applicability of Tempel et al. (2016) to the Trestle project be recognized and addressed in the environmental analysis for the project. Alternative Four is designed to provide levels of high quality habitat that are more likely to support reproductive owls compared to the selected alternative. Alternative 4 also minimizes the reduction in dense canopy cover that can lead to abandonment of an owl territory. This information supports the finding that Alternative 4 is the environmentally preferred alternative since it lessens the impacts to spotted owls while allowing actions that increase habitat resilience and reduce the potential for habitat loss due to uncharacteristic fire.

(b) Cause of the CSO Population Decline, Interim Recommendations for the Management of California Spotted Owl Habitat on National Forest System Lands, and Gutiérrez et al. (in press)

Because there was little to no high severity fire or drought-related bark beetle tree mortality within any of the Forest Service-managed study areas during the study periods, the observed declines in abundance and occupancy on the demographic study areas cannot be attributed to these disturbance factors. The Trestle BE and FEIS both cite Keane (2014) to suggest that, "factors driving these [California spotted owl] population trends are not known (Keane 2014) and the causation factors are not known." (FEIS, p. 104) However, neither the BE or FEIS chose to use the best available science and speculate as to what threat factors are likely causing the declining trend.

It is technically true that it is unknown what is causing the spotted owl decline on the demographic study areas, because the study design is not capable of establishing causation. Implementing a study capable of establishing causation would be monetarily and logistically prohibitive and would likely require that the species incur significant adverse effects at regional scales. Therefore, the **best available science** on the decline of spotted owls is limited to correlation. In the absence of large patches of high severity fire, activities correlated with adverse effects to California spotted owl include:

- Alteration of 50 acres or more of mature conifer forest (conifer forest with >70% canopy cover dominated by medium [30.4-60.9 cm dbh] and large [>60.9 cm dbh] trees) within 0.7 mile of a spotted owl territory center was correlated to an increase in breeding dispersal probability (Seamans and Gutiérrez 2007).
- Spotted owls avoided foraging in Defensible Fuel Profile Zones (i.e., a wide shaded fuel break) in the first 1 to 2 years after treatments and the number of occupied territories declined by more than 40% within 4 years of logging (Stephens et al. 2014a).
- Home range sizes increased as the number of thinned acres increased within the home range (Gallagher 2010).
- Modest amounts of medium-intensity timber harvests, consistent with Forest Service thinning treatments, were negatively related to reproduction, with reproduction predicted to decline from 0.54 to 0.45 when 20 hectares were treated (Tempel et al. 2014b). More than 90% of medium intensity harvests converted high-canopy forests into lower-canopy vegetation classes, suggesting that landscape-scale fuel treatments of such stands could have negative effects on spotted owl populations (Tempel et al. 2014b).
- Reductions in canopy cover to <70% were associated with reductions in survival and colonization rates and increased territory extinction rates (Tempel et al. 2014b).

- The effects of implementing fuels treatments decreased average habitat suitability, with negative effects still present after 30 years (Tempel et al. 2015).

In our DEIS comments we asked that the spotted owl SNAMP study results be considered. The FEIS (Appendix C, p. 40) response to our comment states that the EIS considered these results. We were unable to locate a discussion of the SNAMP study results in the BE or FEIS. The SNAMP spotted owl study results were later published as a journal article, Tempel et al. (2015). Tempel et al. (2015) found that Forest Service logging projects in the Eldorado demographic study area decreased average habitat suitability, with negative effects still present after 30 years. The study also modeled the effects of Forest Service logging projects within the Last Chance study area. Within the Last Chance study area were four spotted owl territories. It is critical to recognize that logging only occurred in one of the four spotted owl territories in the Last Chance study area. However, the only spotted owl territory that included logging was modeled to include more high severity fire post-treatment than pre-treatment. Nevertheless, the model did show that the treatments that occurred outside of the three untreated territories were effective at reducing the amount of high severity fire within the untreated territories. These results suggest that landscape resilience can be achieved by implementing treatments outside of spotted owl territories and that treatments do not necessarily provide for resilience on the acres that receive treatment.

In May 2015 the Forest Service published the Interim Recommendations for the Management of California Spotted Owl Habitat on National Forest System Lands (IRs). The IRs are final and have been sent to all of the National Forests in the Sierra Nevada to consider in project development. The IRs were developed by owl scientists and other forest scientists. Based on recently published literature correlating the loss of high canopy cover from logging to negative demographic effects to the species, the IRs developed a stop-gap strategy to assure that sufficient spotted owl habitat is maintained during logging projects in an attempt to arrest the ongoing spotted owl decline. Clearly, the scientists that developed the IRs considered Forest Service logging to be a likely contributing factor to the ongoing decline of the species.

The IRs were based on the findings of a draft version of Gutiérrez et al. (in press) and were designed to reduce risks from logging by using the best available science to determine an appropriate amount and quality of habitat needed to reduce territory abandonment and maintain or increase reproduction. The recommendations designate 500-1400 acres[1] of spotted owl habitat within each territory for which management should “maintain or improve habitat conditions for the spotted owl in the short-term (1-5 years)” with “key features of desired conditions (i.e., multi-layered structure, diversity of diameter classes, moderate to high tree canopy cover) retained or enhanced as a result of forest management actions.” (IRs, p. 17)

The IRs encourage actions that would reduce fire risk within designated and non-designated habitat and recognize that mechanical treatment may be necessary, stating, “In instances where mechanical thinning in designated habitat is warranted, we recommend that silvicultural prescriptions be informed by and follow to the degree possible the concepts in GTR-220 and 237, and parameters described for non-designated habitat (below) while being consistent with the objective of short-term habitat improvement for the spotted owl.” (Ibid.) The greatest

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[1] The amount of designated habitat is scaled to territory and home range size which vary geographically throughout the species range.

management flexibility is provided in areas outside designated habitat[2] with an emphasis on increasing forest heterogeneity and improving resilience (Ibid., p. 18-19); this is consistent with the recommendations in Gutierrez et al. (in press).

In the summer of 2016, the Forest Service issued an "in press" version of a new California spotted owl conservation assessment. Gutiérrez et al. (in press) was written by a team of spotted owl scientists and forest ecologists and considered the results of Tempel et al. (2016). Of relevance to the Trestle project and the effects of logging to California spotted owl, Gutierrez et al. (in press) state:

- "[F]uel reduction and forest restoration strategies that reduce canopy cover, the complexity of forest structure, or large tree density have the potential to impact spotted owl populations negatively in both the short- and long-term." (p. 217)
- "[T]he expansion of treatments that simplify forest structure and decrease forest tree canopy cover in owl habitat could exacerbate population declines and increase the probability of extirpation of owls from the region." (p. 218)
- "[C]onserving and promoting a sufficient amount of forest dominated by large trees, complex forest structure, and closed canopies at sites known to be used by spotted owls – particularly in nest stands, activity centers and territories – is likely to enhance owl habitat and populations." (p. 218)
- "[I]t is a well-established principle of wildlife management ('Declining Population Paradigm') that halting and reversing substantial recent population declines of a species of concern, like the spotted owl, is an essential component a conservation program (Caughley 1994)." (p. 218)
- "Restoring low- to moderate-severity fire regimes to the mixed-conifer zone could help achieve both spotted owl conservation and forest restoration goals." (p. 219)
- "The scales of greatest importance are the owl's activity center, territory, and home range, embedded within the broader forested landscape. In general, owl territory occupancy and demographic rates are likely to fare better with a gradient of less intensive to more intensive forest management activities within owl habitat as a function of distance from activity centers." (p. 220)
- "Maintaining existing nesting habitat (particularly at sites that have a history of use) is likely to promote viable populations while forest and restoration treatments designed to reduce risks from high-severity fire and other environmental stressors are implemented at larger spatial scales." (p. 220)
- "Forest structural characteristics known to be important at [the activity center] scale are more likely to be maintained or even enhanced through low-intensity vegetation treatments when forest management is implemented with the intent of reducing the risk of high-severity fire and drought-induced large tree mortality." (p. 221)
- "Within territories, spotted owl occupancy and fitness appear to be positively related to the acreage of high quality habitat (i.e., forests dominated by large trees and particularly higher canopy cover), and a landscape populated by territories containing a sufficient amount of these habitat conditions is likely to promote viable spotted owl populations." (p. 221)

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[2] Approximately 20% of a spotted owl home range is designated habitat under the IRs.

- "At [the home range] scale, there is an opportunity to place greater emphasis on fuels management and forest restoration, particularly approaches that enhance forest resilience, landscape heterogeneity, and spotted owl foraging habitat. Maintaining and increasing the prevalence of large trees could be particularly effective for restoring forest resilience and improving owl foraging habitat at this scale." (p. 221)

These recommendations support the idea that reductions in high canopy cover forest through Forest Service logging are related to the ongoing spotted owl population decline and do not support the idea that reductions in high canopy cover forest would benefit the species, even after the authors considered the findings of Tempel et al. (2016). These findings are contrary to conclusions in the BE about the "benefit" of logging on spotted owls. This information should be addressed in the environmental analysis for the Trestle project.

2. The Selected Alternative Includes Unnecessary Logging that is likely to Decrease Spotted Owl Reproductive Potential and Increase the Probability of Breeding Dispersal.

In our comments on the DEIS, we suggested that for several units prescribed fire could be used as a treatment alternative to logging. We asked that areas that have been logged within the past 20 years not be re-logged because there were very few ladder fuels and therefore logging is unnecessary from a wildfire fuels perspective. To support our comment, we cited the findings of Collins et al. (2011a, see below for more specifics on the findings of this paper). The response to our comments on this issue (FEIS, Appendix C, p. 18) was that our comment was simply our opinion; the results of Collins et al. (2011a) could be incorrect due to assumptions the authors made about pretreatment stand structure, intensity of thinning, or surface fuels; and our opinion was not supported by Safford (2013), without actually defining what Safford (2013) found that contradicts our "opinion".

Safford (2013) is a literature review. We ask that the Forest Service identify the literature cited in Safford (2013) and the specific results from the cited literature finding that it is necessary to remove trees larger than 12 to 16 inches dbh to achieve wildfire resilience. We also note that our opinion was affirmed many times by Forest Service staff that attended site visits with us, including the Fire and Fuels Specialist for the Placerville Ranger District. The FEIS response to our comments also affirms there are areas within the project that prescribed fire could be used to achieve fuels objectives (FEIS, Appendix C, p. 20): "While theoretically prescribed fire can be used in most of the project area, several areas would not be expected to meet desired conditions for several prescribed fire entries, which would not allow the project to be accomplished during a reasonable timeframe." Such a statement acknowledges that there are areas where prescribed fire could be used to achieve fuels objectives in a single entry.

The DEIS also affirms our opinion that the previously thinned units, not to be confused with units where prescribed fire is proposed for the initial treatment, could be burned in a single entry and achieve desired fuel conditions (DEIS, p. 57, emphasis added): "Many areas previously thinned and/or burned during previous projects are ready for reentry burning. Depending on the date of the last treatment and the conditions surrounding the recent prescribed burn, **these units may take one or two prescribed burn entries to reach the desired fuel conditions.**" This does not support the response to our comment suggesting that the forest canopy must be modified to achieve desired fuel conditions.

The DEIS (p. 57) also supports the idea that prescribed fire alone is capable of achieving desired fuel conditions in previously untreated stands:

> "Units where prescribed burning would be the initial treatment would reduce surface fuel loads initially; however, overtime dead fuels would expect to increase as dead material from the initial burn entry fall to the ground and accumulate. A second entry utilizing hand treatments (such as handcutting, or pile burning) or another prescribed understory burn would then reduce those fuels and the process would once again occur. A third entry may be required depending on the remaining fuels after the second entry. Overall, it is expected that the area would have increased canopy base heights enough that additional dead over-story fuels resulting from prescribed fire activities would be minimal. Nonetheless, after each prescribed burn, surface fuel loadings, and resulting fire behavior from a wildfire during 90th percentile weather fuel conditions, would decrease compared to the current condition."

The response to our suggestion about converting all recently thinned stands to "burn only" also suggested that growth rates and fuel accumulations are simply too high to use prescribed fire to achieve or maintain desired conditions (FEIS, Appendix C, p. 18): "The assertion that removal of any larger saw timber is not warranted and that project goals could be accomplished with only the use of prescribed fire is the opinion of the commenter and is not supported by the available information on resilient landscape conditions based on NRV (Safford et al. 2013). The area of the Trestle project is high site for timber growth, meaning trees grow quickly in this forest site and therefore retreatment to maintain or continue to move stands toward desired conditions are needed more often, or more intensely than poorer sites that support less growth." Yet, no evidence was provided to support this claim. The premise of this response suggests that areas with high growth rates would have been unable to achieve or maintain resilience naturally, a situation that is not supported by the presence of many large stumps from trees that predate logging.

The basis of the argument provided in the FEIS for why mechanical entry is a preferred management tool to prescribed fire centers around mostly non-ecologically based constraints to using prescribed fire, rather than the effectiveness of prescribed fire at achieving fuel objectives. The response to our suggestion that previously thinned units receive prescribed fire only also raises this issue (FEIS, Appendix C, p. 20): "By replacing mechanical treatments in all previously thinned stands with prescribed fire as suggested by the commenter would defer the burning of areas outside of these anchor stands until they were sufficiently treated and would continue to extend the period of time where this landscape will continue to be at higher risk of loss to wildfire." This excuse for not limiting treatment to "burn only" in previously treated stands is also not supported. The Forest Service has put considerable time and money into timber cruising and marking the previously thinned units for harvest. The contract work, bidding process, and the time that will elapse between when the project sells and when it is implemented will also consume considerable time and money, quite possibly taking years to complete. Had the agency simply proposed these units for prescribed fire only, burning would likely be feasible in the fall of 2017. It is unclear how this would delay the ability to complete the project in a timely manner.

The response to our comments on the ability to achieve fuels objectives without re-logging areas that were logged within the past 20 years also included the idea that stands must be restored to reference conditions by modifying canopy fuels in order for such stands to be resilient to wildfire, citing Lydersen et al. (2013), Collins et al. (2011b), Knapp et al. (2013), and North and Lydersen (2012). Below, we identify scientific information that is contrary to the rational provided in this response to comments provided in the FEIS.

(a) The Cited Papers Do Not Support Claims about Removal of Large Trees to Improve Fire Resilience

We were unable to locate the results in Lydersen et al. (2013), Collins et al. (2011b), Knapp et al. (2013), and North and Lydersen (2012) finding that trees larger than 16 inches must be removed to achieve fire resilient forest conditions. We ask that such results be identified and it be explained how such results apply to stands where a ladder fuel component is relatively absent (i.e., few trees less than 16 inches dbh), as is the case for all units treated within the past 20 years. At the beginning of May 2017, we visited the Trestle project area to see what trees were marked for removal and struggled to identify more than one or two trees per acre less than 16 inches dbh marked in previously treated stands.

Despite the unsubstantiated assertion in the EIS that canopy cover **must** be modified for fuels purposes, we are not aware of any scientific results demonstrating this is the case. There is however scientific evidence that it is not necessary to significantly reduce canopy cover or remove trees greater than 16 to 20 inches dbh to increase forest resilience to wildfire:

- According to the Forest Service (http://www.fs.fed.us/postfirevegcondition/index.shtml), for all fires over 20,000 acres in the Sierra Nevada that burned from 2008 to 2015 outside of wilderness and within Forest Service boundaries, more evergreen open canopy forest burned at high severity than evergreen closed canopy forest (Attachment A). This is substantial empirical evidence that fire resilience is not achieved by reducing canopy cover.
- Collins et al. (2011a, p. 84) compared the effectiveness of three different diameter limits on flame length across a landscape over a 30 year period (Figure 1, below). The results indicated that across the landscape, there was virtually no difference in conditional burn probability between stands that had a 12 inch, 20 inch, or 30 inch diameter limit over a 20 year period. This means that thinning limited to removing trees 12 inches or less in size was as effective in reducing the risk of sever fire.

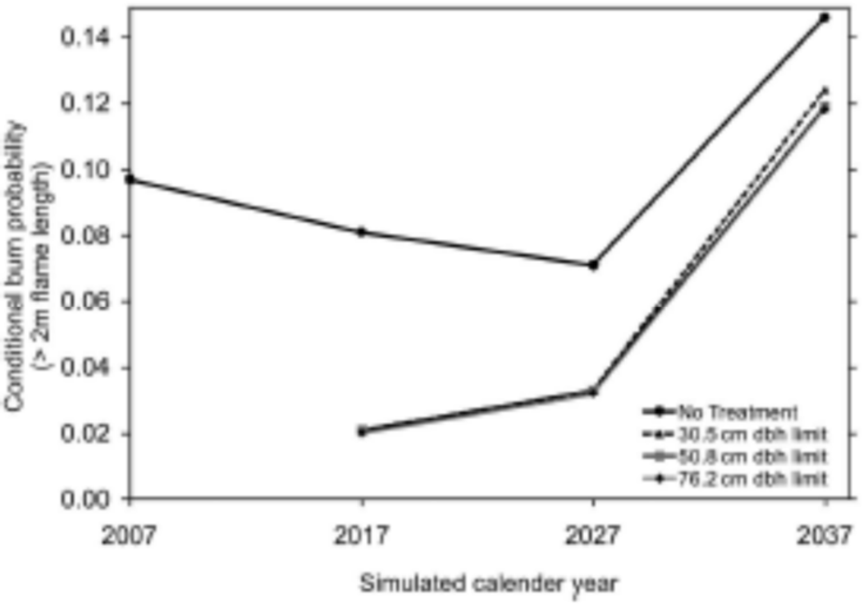


Figure 1. “Mean conditional burn probabilities across the Last Chance landscape for which simulated flame lengths are >2 m. Three diameter-limited thinning scenarios along with a no treatment scenario are reported. Each scenario was modeled into the future based on output from the Forest Vegetation Simulator, using our 2007 field inventory plot data as a baseline. Probabilities are based on 5,000 randomly placed ignitions simulated using RANDIG (see Methods for explanation). **Note that the [results of the] three thinning scenarios are nearly indistinguishable**, with the exception of a slight departure for the 30.5-cm scenario in 2037.” (From Collins et al. 2011a, p. 84, emphasis added).

- Agee and Skinner (2005, p. 9) state: “Some effective fuelbreaks had only surface fuels and ladder fuels treated, with residual canopy cover exceeding 60–70%. Even though canopy bulk density was insignificantly reduced, fire severity was significantly reduced, suggesting that reductions in canopy bulk density are not always needed to reduce wildfire severity.”
- Thompson and Spies (2009, p. 1690) found that (Figure 2), “Open tree canopies with high levels of shrub-stratum cover were associated with the highest levels of tree crown damage, while closed canopy forests with high levels of large conifer cover were associated with the lowest levels of tree crown damage.”

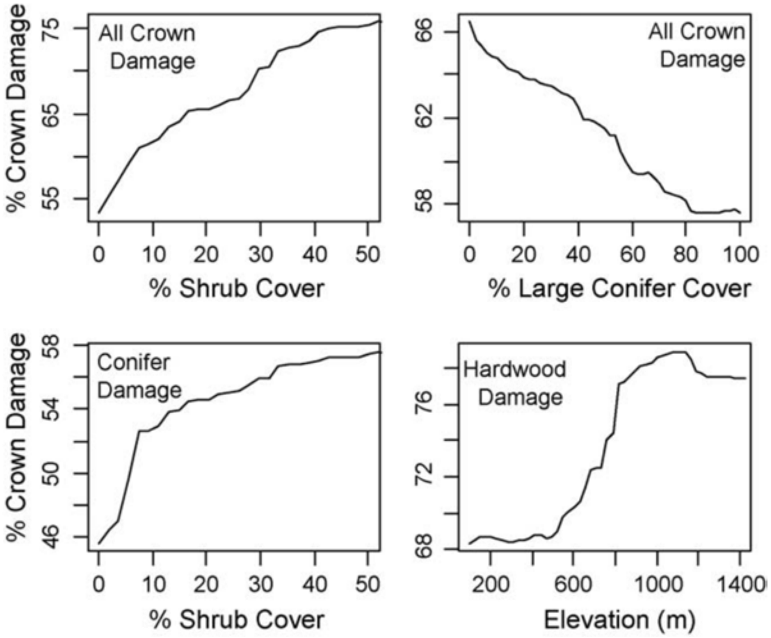
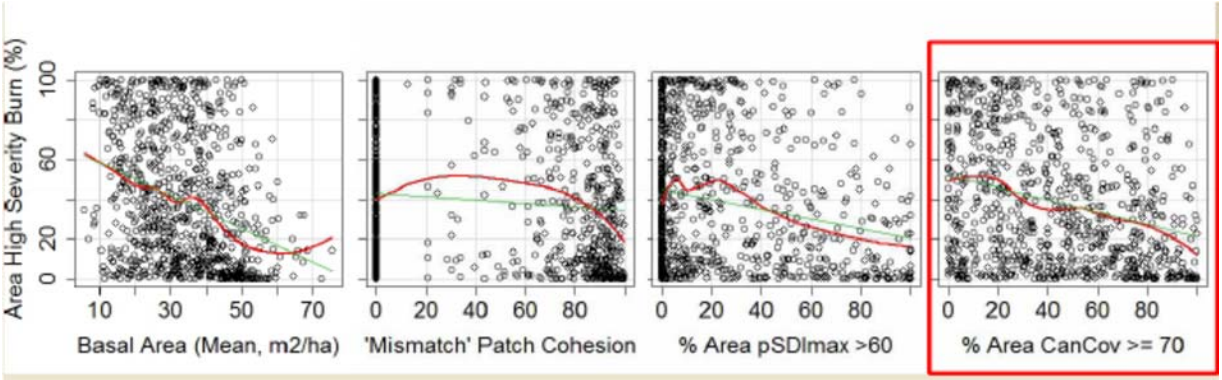


Figure 2. Partial dependence plots from random forest predictions of total crown damage on percent shrub cover; total damage on large conifer cover; conifer damage on percent shrub-stratum cover, and hardwood damage on elevation. Partial dependence is the predicted value of the response based on the value of one predictor variable after averaging out the effects of the other predictor variables in the model. From Thompson and Spies (2009, p. 1690)

- Fry et al. (2015) found that the higher canopy cover forests of the Sugar Pine study area were more resilient to fire than the lower canopy cover forests of the Last Chance study area. Treatment of 29% of one of the study areas, which included a 16 inch diameter limit for tree removal applied to a significant portion of the treatment area, reduced modeled fire size from 3,200 acres to about 123 acres and conditional burn probability was reduced by about half after treatment.
- North et al. (2009, p. 24, emphasis added) states: "What is achieved by thinning intermediate sized (20- to 30-in d.b.h.) trees? Some research suggests that for managing fuels, most of the reduction in fire severity is achieved by reducing surface fuels and thinning smaller ladder-fuel trees (see summaries in Agee et al. 2000, Agee and Skinner 2005, Stephens et al. 2009). What is considered a ladder fuel differs from stand to stand, but typically these are trees in the 10- to 16-in d.b.h. classes. If trees larger than this are thinned, it is important to provide reasons other than for ladder-fuel treatment."
- Spencer et al. (2016) show, in the panel below, that as the amount of high canopy cover forest and mean basal area in a fisher home range increases the observed proportion of high severity fire tends to decrease:



The best available science information overwhelmingly shows that modifying canopy cover and removing trees larger than 16 inches is unnecessary to improve fire resilience and effective fire resilience can be achieved by removing surface and ladder fuels. In fact, fire-suppressed open canopied forests experience high severity fire at a similar rate as fire-suppressed closed canopied forests. Medium and large trees contribute disproportionately to canopy cover compared to smaller trees and reductions in canopy cover have been correlated with adverse effects to the spotted owls. These data also suggest that mechanical fuels treatments, regardless of treatment intensity, have a similar and short-term effect on reducing wildfire hazard (approximately 15 years; Collins et al. 2011a, p. 84). The environmental analysis should acknowledge these findings and all treatment units that were logged within the past 20 years and are likely to have adverse effects on spotted owl reproduction should be treated through prescribed fire only.

(b) Rarely is Logging Capable of Achieving Restored Forest Conditions

The idea that logging in the Trestle project area will result in restored forest conditions is fundamentally incorrect. Single-entry logging can only be used to return canopy cover and total tree density to reference conditions. Such a “restoration” strategy allows high quality spotted owl habitat to be degraded while achievement of forest attributes known to be important to spotted owls— such as significant amounts of large trees, large snags, and structural complexity—cannot be realized for many decades. For example, California spotted owls are associated with forest stands characterized by greater than average basal area and higher than average number of trees greater than 24 inches dbh. However, Dolanc et al. (2014) found that throughout much of the Sierra Nevada there are far fewer trees greater than 24 inches dbh and far more trees less than 12 inches dbh compared to 1930.[3] Similarly, North et al. (2007) found that the basal areas of contemporary unrestored forests were consistent with historical forest conditions. In effect, mechanical treatments that reduce canopy cover and tree density to reference conditions will often result in post-treatment forest conditions that are outside of reference conditions for basal area and remain deficient of large trees. We also note that due to the high site quality of many of the units in the Trestle project area, as recognized in the response to comments, these areas would have naturally have had much higher than average tree densities and canopy cover.

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[3] As cited in Dolanc et al. (2014), by 1930 “Logging had already removed most old-growth forest from lower elevations of the west slope and all of the Lake Tahoe basin by that time (Beesley 1996).” The authors also note that some of the 1930 data was collected from sites that had recently been logged or burned. This suggests that their large tree estimates are likely lower than what occurred prior to European settlement.

(c) Low Confidence and Lack of Applicability of Reference Parameters

In addition to the adverse effects associated with logging to achieve reference conditions and the inability to actually achieve reference conditions through logging in a single entry, there is considerable cause for concern about the level of confidence or the applicability of some of the estimates of reference parameters described in the literature. First and foremost, in order to be representative of the Natural Range of Variation (NRV), the data should provide meaningful insight to a time before the alteration of ecosystem processes by Europeans. Recent research by Taylor et al. (2016) found that fire patterns (i.e., extent and frequency) in the Sierra Nevada were dramatically altered with the arrival of the Spanish missionaries around 1775. Additionally, according to Safford's (2013, p. 20) summary of NRV for the yellow-pine and mixed conifer forests of the Sierra Nevada: "In the last decades of the 1800s, there was a general decrease in overall fire frequency, but an increase in large destructive fires in many parts of the Sierra Nevada, from shepherds, miners, loggers, and other forest users (Sudworth 1900, Leiberg 1902, Vankat and Major 1978, Kilgore and Taylor 1979, Turrentine et al. 1982, Barbour et al. 1993, Cermak 2005)." Some recent studies of "historical conditions" in the Sierra Nevada have focused on timber survey data collected in 1911. In consideration of the findings about fire patterns and increased fire severity during the "historic" period, we suggest that the data collected in 1911 and analyzed by Collins et al (2011b), Hanson and Odion (2016), Collins et al. (2015), and Stephens et al. (2015) are not representative of conditions present prior to European influence.

Studies have also attempted to use reference sites to provide insight into NRV. Although such studies provide valuable insight on within-stand patterns, the applicability of larger landscape-scale parameters outside the study area may not be appropriate. For instance, the estimates of fire extent and fire severity distributions derived from the Illilouette Basin, an area that was never logged and has had a restored fire regime for over 40 years (Collins and Stephens 2010 and Collins et al. 2016) are not appropriate to apply at a landscape scale outside of the study area. Illilouette Creek Basin is relatively small (approximately 37,000 acres) and is almost completely isolated by high elevation granite and there are numerous and scattered unvegetated granitic outcrops protruding into the forested areas. The isolated nature of the study area and the scattered granitic outcrops markedly limit the ability of any wildfire from becoming large and disrupt fire spread. These are factors that do not occur throughout much of the spotted owl's range in Sierra Nevada.

Some scientists have even looked to the Jeffrey pine forests of Baja California, Mexico, more than 350 miles south of the southern Sierra Nevada, to gain an understating of forest structure where logging and fire suppression never occurred (e.g., Dunbar-Irwin and Safford 2016). However, the climate of Baja California Jeffrey pine forests is more consistent with the east side of the Sierra Nevada, not the west side, and the topography is also quite different from both the west- and the east-side of the Sierra Nevada. Topography and climate play critical roles in fire behavior, vegetation composition and structure, and the scales at which ecosystem heterogeneity occur. Accordingly, differences in these critical factors are cause to question the applicability of NRV derived from Mexican Jeffery pine forests to anywhere in the Sierra Nevada.

Although useful from an ecosystem process perspective, the appropriate application of estimates for specific fire severity percentages and patch sizes, tree diameter distributions, forest and shrub patch sizes, and canopy cover percentages derived from most studies attempting to describe aspects of NRV in the Sierra Nevada are questionable. For the reasons we outline above, it would be reckless to simply choose several studies from the list of studies, log to a subset of these conditions in the name of forest "restoration", and expect to halt or reverse the spotted owl population decline or provide historical forest conditions.

(d) Fire, without Logging, is Capable of Providing Resilient Forest Conditions.

Prescribed and managed wildfire, in the absence of logging, have been shown to effectively increase forest resilience to future wildfires (Vaillant et al. 2009, Stephens et al. 2014b) and drought-related tree mortality (van Mantgem et al. 2016, Boisrame´ et al. 2016, Hood et al. 2015). Fires occurring under relatively cooler temperatures, higher humidity, and lower wind speeds with moderate fuel moisture levels are likely to result in low or mixed-severity fire effects consistent with forest restoration objectives (Miller et al. 2012, Meyer 2015).

Miller et al. (2012) found that, compared to surrounding Forest Service managed lands, wildfires in Yosemite National Park were smaller, had a lower proportion of high severity fire, and smaller high severity fire patches and that these differences were due to differences in management activities. Yosemite National Park does not allow logging or mechanical reductions in canopy cover, yet the forests of Yosemite National Park were found to be more resilient to wildfire than nearby National Forests "perhaps due to their extensive use of prescribed fire" (Miller et al. 2012, p. 12), indicating that fire alone is capable of providing more resilient forest conditions than logging.

In a study on the effectiveness of prescribed fire at increasing forest resilience, Vaillant et al. (2009) state: "Post-treatment fire type was 100% surface fire for both fire weather scenarios [90th percentile and 97th percentile] for all nine sites." (p. 171) The authors also found that (p.171):

> "Several studies in ponderosa pine and mixed-conifer forests document the effectiveness of prescribed fire in reducing future fire severity (Weaver 1943; Biswell et al. 1973; Kilgore and Sando 1975; Kauffman and Martin 1989; vanWagtendonk 1996; Stephens 1998; Miller and Urban 2000; Pollet and Omi 2002; Finney et al. 2005; Knapp et al. 2005; Stephens and Moghaddas 2005a, 2005b; Stephens et al., in press). Most prescribed fires in the current study reduced surface fuel loads, as well as killed shrubs and small-diameter trees, effectively reducing ladder fuels, confirming the assertions made in the previous studies. Understory burning can also raise canopy base height by scorching lower branches and needles."

Resilience to drought-induced bark beetle outbreaks can also be achieved by managing fire for ecological benefits. Bark beetles are native forest insect pathogens, a number of which kill trees in the process of completing their lifecycle. The bark beetle species with a demonstrated ability to alter spotted owl habitat at the landscape scale in the Sierra Nevada are the western pine beetle, mountain pine beetle, and fir engraver. In the Sierra Nevada, the western pine beetle kills ponderosa pine, mountain pine beetles are associated with sugar, lodgepole, and ponderosa pine, and the fir engraver kills white and red fir. Jeffrey pine beetle also occurs in the Sierra Nevada, but populations have yet to reach an outbreak phase. In the southern Sierra Nevada, western pine beetle has had the most significant effect on spotted owl habitat during the recent extreme drought event, but tree mortality by mountain pine beetle and fir engraver have compounded the effects of tree mortality by western pine beetle.

It was not until the recent extreme drought event that bark beetle populations in the Sierra Nevada occurred in an outbreak phase. Prior to this time and throughout recorded history, bark beetle populations in the Sierra Nevada have occurred at non-outbreak levels, attacking stressed, damaged, or weakened trees, with population flare-ups in response to drought. In fact, the U.S. Fish and Wildlife Service's 2003 and 2006 California spotted owl 12-month findings did not address drought-related bark beetle mortality in the threats analysis.

Bark beetle outbreaks occur when key thresholds are surpassed, resulting in a positive feed-back loop. There is relatively little information on western pine beetle outbreaks, because very few have been observed anywhere and certainly none as extensive or severe as the recent outbreak in the southern Sierra Nevada. However, there is a large body of scientific literature on mountain pine beetle outbreaks. In order for a bark beetle outbreak to occur, there must be an adequate population of host trees and a trigger (Bentz et al. 2010). In the case of the mountain pine beetle, the triggers are warm temperatures and drought (Preisler et al. 2012). Based on the recent outbreak in the southern Sierra Nevada coinciding with an extreme drought event and warming temperatures, temperature and drought also appears to be triggers for a western pine beetle outbreak. Warm temperature and drought allow bark beetle populations to amplify. Once bark beetle abundance, extent, and density cross a threshold an outbreak ensues. Population amplification becomes self-perpetuating because natural tree defenses to bark beetle attack are weakened by drought, warm temperatures increase the annual number of lifecycles completed, and an uncharacteristically high number of beetles are able to overcome tree defenses at a landscape scale (Boone et al. 2011).

California has just experienced the most intensive drought in more than 1,200 years (Giffin and Anchukaitis 2014), a drought that coincided with increasing temperatures associated with anthropogenic-caused climate change. While there have been bark beetle population responses to previous California droughts, past droughts were not nearly as severe, did not trigger an outbreak, and therefore did not result in tree mortality levels that modified forest canopy cover at the spotted owl home range, territory, or activity center scales.

Forest Service managers throughout the Sierra Nevada often call for reductions in forest stand density to levels that do not provide high quality spotted owl nesting and roosting habitat in the name of increasing resilience to future bark beetle outbreaks. It is hypothesized that thinning reduces competition between trees for water, nutrients, and light, enhancing tree vigor, and thus hardening residual tree defenses against beetles. Studies on the effectiveness of thinning in response to the onset of outbreaks, with the goal of reducing tree mortality to the outbreak, indicate that thinning may not protect stands (Klenner and Arsenault 2009, Preisler and Mitchell 1993).

Although studies have found that thinning can increase within-stand resistance to bark beetle infestations during non-outbreak conditions (Fettig et al. 2007 and Egan et al. 2010), virtually no studies exist that have examined the effectiveness of thinning prior to an outbreak (Six et al.

2014). One of the only large fully-replicated long-term studies on bark beetle responses to thinning from non-outbreak to outbreak to post-outbreak phase (Six and Skov 2009) found that mountain pine beetle populations were low in all treated areas prior to the outbreak, but increased in some controls and burn treatment treatments as the outbreak developed. Although more trees were killed overall in control units during the outbreak, all controls retained a greater number of residual mature trees than the thinned stands post-outbreak (Six et al. 2014). Several studies have also found that untreated stands were likely to return to pre-outbreak stocking levels sooner than treated stands (Olsen et al. 1996, Diskin et al. 2011, Collins et al. 2011c, and Kayes and Tinker 2012).

Since regional bark beetle outbreaks are associated with drought and warm temperatures, and the Sierra Nevada just experienced the most intensive drought in more than 1,200 years coupled with warm temperatures, all of the trees that survived and stands that incurred low to moderate tree mortality are verifiably resilient to such conditions. This is not hypothetical resilience; this is proven resilience to extreme conditions that trigger bark beetle outbreaks. This also suggests that density thresholds defined by forest managers based on studies designed to quantify within-stand bark beetle ***resistance***, not to be confused with ***resilience***, during non-outbreak conditions are not representative of actual landscape-scale resilience to bark beetle outbreaks. Although poor forest health likely results in higher levels of tree mortality and potentially a more extensive outbreak, one would expect that the most intensive drought event in 1,200 years would trigger the most intensive bark beetle mortality event in 1,200 years. That is to say, a bark beetle outbreak in the Sierra Nevada would likely have occurred regardless of the past 150+ years of logging and fire suppression. Although some drought-related bark beetle tree mortality did occur in the Trestle project area, the bark beetle population did not reach the outbreak phase and all of the surviving trees are resilient to a 1,200 year drought event.

It is possible that the density of trees within different diameter classes have a disproportionate effects on drought resilience. However, there is little information available on how thinning of different tree diameter classes affects drought resilience. To this idea, North et al. (2009, p. 23) states:

> "Clusters of intermediate to large trees (i.e., >20 inches diameter at breast height [d.b.h.]) are sometimes marked for thinning with the belief that they are overstocked and thinning would reduce moisture stress. Some evidence, however, suggests these groups of large trees may not be moisture stressed by within-group competition because they have deep roots that can access more reliable water sources including fissures in granitic bedrock (Arkley 1981, Hubbert et al. 2001, Hurteau et al. 2007, Plamboeck et al. 2008)."

We are only aware of one study on the effectiveness of forest treatments on resilience to a regional drought-related tree mortality event in the Sierra Nevada. **van Mantgem et al. (2016) found that stands that experienced prescribed fire more than 6 years before the drought, without logging, were more resilient to drought and beetle mortality than unburned stands.** This response was detected even though the more resilient burned stands had more trees per acre and higher basal area than the less resilient stands. The results of Boisramé et al. (2016) also suggest that a restored mixed severity fire regime in the Sierra Nevada can increase forest resilience to a regional bark beetle outbreak.

A potential explanation for the findings of van Mantgem et al. (2016) and Boisramé et al. (2016) are the results of **Hood et al. (2015), finding that trees with fewer resin ducts were more likely to be killed by bark beetles, low severity fire increased ponderosa pine resin duct development, and resin duct defense were relaxed in the absence of fire. Their results demonstrate that frequent low-severity fire can result in a long-lasting bark beetle defense that increases tree survival.** Not only do their findings demonstrate that forest resilience to bark beetles can be increased through the use of low severity fire, their results demonstrate that resilience can be increased without removing larger trees.

The finding that resilience to bark beetles without removing larger trees is important to consider in light of a strong push by forest managers to reduce tree density, including larger trees, to increase drought resistance. The studies used to support tree density dependent bark beetle resistance were not conducted under outbreak conditions and overwhelmingly occurred in areas that have experienced decades of fire exclusion. If fire were restored to the system, the density thresholds for stand-level bark beetle resistance would likely allow for higher densities of trees. These studies also did not consider how different diameter classes affect resistance. It must also be noted that there has yet to be a correlation established between Forest Service logging and resilience to the recent regional drought-related bark beetle tree mortality event in the southern Sierra Nevada. Clearly, landscape-scale bark beetle resilience is much more complicated than a simple stand density equation.

It is clear that wildfire and drought resilience could be significantly increased in the absence of logging trees larger than 16 inches, and Alternative 4, the environmentally preferred alternative, was designed with this in mind. We ask that the information we have provided on the effectiveness of fire as a management tool for increasing fire and drought resilience, in the absence of logging trees greater than 16 inches dbh, be recognized in the environmental analysis.

3. The Selected Alternative Violates the Management Intent of the 2004 Sierra Nevada Forest Plan Amendment as it pertains to the California Spotted Owl

According to the Record of Decision for the 2004 Sierra Nevada Forest Plan Amendment, Final Supplemental Environmental Impact Statement (p. 46, emphasis added), within spotted owl Home Range Core Areas: "Arrange treatment patterns and design treatment prescriptions to avoid the highest quality habitat (CWHR types 5M, 5D, and 6) wherever **possible**." As we have demonstrated in our comments above, it is **possible** throughout the project area to achieve wildfire and drought resilience without degrading spotted owl habitat by limiting tree removal to trees that are less than 16-20 inches dbh or by limiting treatment to prescribed fire only. Such treatments would not reduce canopy cover beyond what is necessary to achieve desired fuel conditions in any portion of the project area that occur in HRCA-designated habitat that is mapped as 5M, 5D, or 6. According to North et al. (2009), it is not necessary to remove trees larger than 16 to 20 inches for fuels purposes. The DEIS and fuels report are also clear, prescribed fire would achieving desired fuel conditions in a single entry on many of the retreatment units and it is **possible** to achieve desired fuel conditions through several prescribed fire entries on untreated units throughout the project area. The ability to achieve resilient forest conditions through the removal of smaller trees and surface fire is also demonstrated through the project's proposed use of hand thinning and prescribed fire on other parts of the Trestle project area, including in the WUI Defense Zone adjacent to the community of Grizzly Flats and Leoni Meadows. We ask that a map depicting the location of HRCAs and CWHR 5M, 5D, and 6 habitat be included in the environmental analysis. We also ask that the project avoid logging CWHR 5M, 5D, and 6 habitat types within HRCAs or limit treatments in those habitat types to actions that do not change the assigned CWHR type.

4. Conclusion

Logging to reduce fuels is not by itself sufficient to create fire resilient landscape conditions (North et al. 2015) and in many instances conflicts with spotted owl viability. When mechanical treatments are deemed necessary to achieve fire resilience, there is considerable scientific evidence that resilience can be achieved through the removal of surface and ladder fuels with little reduction in habitat quality or quantity.

California spotted owl abundance and occupancy have declined on all U.S. Forest Service demographic study areas throughout the range of the species. The observed declines have not been caused by or correlated with high severity fire or drought-related tree mortality. Adverse effects to spotted owl demographics have been correlated with logging high canopy cover forests dominated by medium and large trees. There is overwhelming scientific agreement that returning ecologically beneficial fire to the forest ecosystem inhabited by spotted owls at a landscape-scale would benefit the species and meet restoration objectives (Gutierrez et al. in press).

The conclusion to our DEIS comments remains relevant: We cannot, nor should we, expect mechanical fuel treatments to replace fire as the primary natural disturbance process in the mixed conifer forests of the Sierra Nevada. Perpetually degrading spotted owl habitat to generate revenue and subsidize the timber industry is a failed strategy that compromises species viability and has already placed the California spotted owl on a path to extirpation from the region. Prescribed fire is a reasonable, feasible, and cost-effective tool with a demonstrated ability to adequately reduce fuels, increase forest health, reduce wildfire risks to communities, and maintain spotted owl viability.

Based on the information presented above and in prior comments, we ask that you direct Forest Supervisor Crabtree to adopt Alternative 4, the environmentally preferred alternative, by revising the draft Record of Decision. Alternative 4 achieves a better balance in the improvement of forest resiliency, while providing for high quality habitat conditions to support reproductive spotted owls and reducing fire risk for the adjacent community.

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