January 12, 2018

Submitted Via Email (VegetationTreatment@bof.ca.gov) and Fed-Ex

Board of Forestry and Fire Protection
ATTN: Edith Hannigan, Board Analyst
VTP Draft PEIR Comments
PO Box 944246
Sacramento, CA 94244-2460

Re: Vegetation Treatment Program Recirculated Revised Draft Program Environmental Impact Report

To Whom It May Concern:

The Center for Biological Diversity (the "Center") submits the following comments on the Recirculated Revised Draft Program Environmental Impact Report ("DEIR") for the State's proposed Vegetation Treatment Program ("VTP") prepared by the California Department of Forestry and Fire Protection ("Cal Fire"). The Center incorporates by reference here comments submitted by the Center for Biological Diversity on May 31, 2016. The Center also joins, and incorporates by reference here, comments submitted by Richard Halsey of the California Chaparral Institute dated January 12, 2018 and and comments submitted by Shute, Mihaly, and Weinberger dated January 11, 2018.

The Center is a non-profit organization with more than 1.6 million members and online activists and offices throughout the United States, including in Oakland, Los Angeles, and Joshua Tree, California. The Center's mission is to ensure the preservation, protection and restoration of biodiversity, native species, ecosystems, public lands and waters and public health. In furtherance of these goals, the Center's Climate Law Institute seeks to reduce U.S. greenhouse gas emissions and other air pollution to protect biological diversity, the environment, and human health and welfare. Specific objectives include securing protections for species threatened by global warming, ensuring compliance with applicable law in order to reduce greenhouse gas emissions and other air pollution, and educating and mobilizing the public on global warming.

The Recirculated Revised DEIR has not addressed or corrected the numerous deficiencies found in the March 2016 DEIR that we identified in our May 31, 2016 comment letter. As such, we find that the DEIR fails to comply with the California Environmental Quality Act ("CEQA"), Public Resources Code § 21000 et seq., and the CEQA Guidelines, title 14, California Administrative Code, § 15000 et seq. As detailed in our May 31, 2016, comment letter, the DEIR violates CEQA on numerous counts: (1) the DEIR provides an inadequate analysis of the Program's environmental impacts; (2) Standard Project Requirements are actually mitigation

1212 Broadway, Suite 800 . Oakland, CA 94612 . *Phone:* 510-844-7100 . *Fax:* 510-844-7150

measures and must be treated as such; (3) the DEIR fails to provide an accurate, stable, and finite project description; (4) the DEIR does not consider a reasonable range of alternatives; (5) the DEIR's justification for the VTP is not based on substantial evidence; (6) key objectives of the VTP are not based on substantial evidence; (7) the DEIR fails to adequately disclose, analyze, assess the significance of, and propose mitigation for impacts to biological resources caused by the Program; and (8) the DEIR fails to meet CEQA's requirements with regard to the analysis of greenhouse gas ("GHG") emissions. Thus, the California State Board of Forestry and Fire Protection cannot lawfully approve the VTP based on this EIR.

These comments supplement our May 31, 2016 comment letter in submitting new scientific studies providing further evidence that the DEIR fails to provide an adequate description of the project's environmental setting and fails to provide substantial evidence to support the key objectives of the VTP, as detailed below.

I. The Key Objectives of the VTP Are Not Based On Substantial Evidence.

The DEIR states that the purpose of the VTP is "lowering the risk of damaging wildfire in the SRA by managing wildland fuels through the use of environmentally appropriate vegetation treatments." DEIR at E-3 at 2-2. The "governing goal of the Program" is to "modify wildland fire behavior to help reduce losses to life, property, and natural resources." DEIR at E-3. This governing goal is based on the "primary assumption… that vegetation treatments can affect wildland fire behavior through the manipulation of wildland fuels." DEIR at 2-5. Specifically, the DEIR asserts that fuel treatment activities can effectively reduce wildfire intensity and severity. DEIR at 1-5, Objective 4 at 2-5. However, the DEIR fails to provide substantial evidence to support these assertions for fuel reduction in California's pine and mixed conifer forests.

Recent studies highlight the limitations of fuel reduction approaches in altering fire behavior, particularly because (a) fuel treatments are largely ineffective under extreme fire weather conditions that create the largest fires and the vast majority of annual area burned, (b) there is a low probability that areas receiving fuels treatment will overlap with wildfires, and (c) fuel treatments are costly and often infeasible to implement widely. As summarized by DellaSala et al. (2017): "On public lands, current fire policy promotes thinning over large landscapes (e.g., USDA Forest Service 2002, US Congress 2003, USDA Forest Service 2009, US Congress 2015), which is costly (Schoennagel and Nelson 2011), infeasible over large areas (Calkin *et al.* 2013, North *et al.* 2015*a*, Parks *et al.* 2015), and largely ineffective under extreme fire weather conditions (Lydersen *et al.* 2014, Cary *et al.* 2016)."[1] Similarly, Zachmann et al. (2018) found: "The combination of transient treatment effects, variability in the effectiveness of different treatment methods (Kalies and Yocom Kent, 2016; Martinson and Omi, 2013; Prichard et al.,

[1] Dellasala, D.A. et al. 2017. Accommodating mixed-severity fire to restore and maintain ecosystem integrity with a focus on the Sierra Nevada of California, USA. Fire Ecology 13: 148-171.

2010), and operational and funding constraints (North et al., 2015) limits the practicality of frequent treatments at the landscape scale; and there is growing recognition that fuels reduction alone may not be able to effectively alter regional wildfire trends (Schoennagel et al., 2017)."[2] In addition, a recent study by Bradley et al. (2016) conducted across pine and mixed conifer forests of the western US indicates that forests with the highest levels of protection from logging tend to burn least severely.[3]

Due to the limitations of fire suppression and fuel treatment approaches, many fire ecologists and managers are recommending allowing more naturally ignited fire to burn in remote regions and focusing fire suppression more narrowly to lands surrounding towns in combination with the creation of defensible space around structures. For example, DellaSala et al. (2017) made the following recommendations, consistent with other recent studies:

> [W]e concur with others that active management approaches could include more natural fire ignitions (Calkin 2013, Meyer 2015, North *et al.* 2015*b*) or resource objective wildfires (Meyer 2015) in which fire is put back on the landscape to hasten the process of forest restoration (Moritz *et al.* 2014, Moritz and Knowles 2016). This would also help to meet fire and fuels objectives and allow managers to better accommodate mixed-severity fire effects for ecosystem integrity (Meyer 2015, Dunn and Bailey 2016).
>
> [W]e concur with others (e.g., Moritz *et al.* 2014, Ingalsbee and Raja 2015, Dunn and Bailey 2016, Moritz and Knowles 2016, Schoennagel *et al.* 2017) that suppression could be focused narrowly to lands surrounding towns and used in combination with defensible space management nearest homes (Cohen 2000, 2004) so that more wildland fires can burn safely in the backcountry.[4]

Zachmann et al. (2018) recommended incorporating "prescribed natural regeneration" into forest management planning to increase forest resilience—that is, deliberately allowing natural processes to proceed unimpeded in some areas, which "is often ignored as a viable land-use option." This study found that the structure and fuel variables of mixed conifer forest stands in the Lake Tahoe basin that were treated with prescribed fire appeared to be "moving in a similar direction" as stands that were untreated and left to natural regeneration. Both treated and long-unaltered, untreated areas experienced declines in tree density, increases in the size of the average individual, and losses of surface fuels in most size classes, although the number of large

---

[2] Zachmann, L.J. et al. 2018. Prescribed fire and natural recovery produce similar long-term patterns of change in forest structure in the Lake Tahoe basin, California. Forest Ecology and Management 409: 276-287.
[3] Bradley, C.M. et al. 2016. Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western United States? Ecosphere 7:e01492.
[4] Dellasala, D.A. et al. 2017. Accommodating mixed-severity fire to restore and maintain ecosystem integrity with a focus on the Sierra Nevada of California, USA. Fire Ecology 13: 148-171.

trees increased in untreated areas and decreased in treated areas. The results “suggested that untreated areas may be naturally recovering from the large disturbances associated with resource extraction and development in the late 1800s [even while exposed to a changing climate and longterm fire suppression], and that natural recovery processes, including self thinning, are taking hold.” The study concluded that “incorporation of natural regeneration into forest management planning can greatly reduce the cost and resource requirements of large-scale restoration efforts (Chazdon and Guariguata, 2016; Nunes et al., 2017), while also providing habitat for fire-dependent and undisturbed old forest dependent species (Roberts et al., 2015).”

The DEIR also fails to provide substantial evidence for its governing assumption that fuel treatment activities will protect homes and structures in the WUI. DEIR at 1-5. Instead, scientific studies indicate that the most effective way to protect structures from fire is to reduce the ignitability of the structure itself (e.g., fireproof roofing, leaf gutter guards) and the immediate surroundings within about 100 feet from each home, e.g., through thinning of brush and small trees adjacent to the homes. In a California-focused study, Syphard et al. (2014) found that structures were more likely to survive a fire with defensible space immediately adjacent to them, although housing density and distances to major roads were also important in explaining structure destruction.[5] According to Syphard et al. (2014): “The most effective treatment distance varied between 5 and 20 m (16–58 ft) from the structure, but distances larger than 30 m (100 ft) did not provide additional protection, even for structures located on steep slopes. The most effective actions were reducing woody cover up to 40% immediately adjacent to structures and ensuring that vegetation does not overhang or touch the structure.” As a result, efforts to promote large-scale thinning in areas far away from buildings are often wasteful, expensive, inefficient, carbon-releasing, ecologically-damaging, and relatively ineffective, compared to efforts that focus on buildings and the defensible space in their immediate vicinity (Scott et al. 2016).[6]

II. The DEIR’s Justifications for the VTP Are Not Based on Substantial Evidence and Result in an Inaccurate Description of the Program’s Environmental Setting.

The DEIR’s justifications for the VTP are predicated on assertions that are not supported by the best available science, and lead to an inaccurate description of the Program’s environmental setting, as described below.

First, a key objective of the VTP is to reduce fire severity based on the unsupported claim that fire severity is increasing in California’s forests. DEIR at E-2, E-3. However, the DEIR fails

[5] Syphard, A.D. et al. 2014. The role of defensible space for residential structure protection during wildfires. International Journal of Wildland Fire 23:1165-1175.
[6] Scott, J.H. et al. 2016. Examining alternative fuel management strategies and the relative contribution of National Forest System land to wildfire risk to adjacent homes – A pilot assessment on the Sierra National Forest, California, USA. Forest Ecology and Management 362: 29-37.

to acknowledge the large body of studies that have found no significant trends in fire severity in California's forests in terms of proportion, area, and/or patch size, including recent studies by Picotte et al. 2016 (California forest and woodland) and Keyser and Westerling 2017 (California forests).[7] Most recently, Keyser and Westerling (2017) tested trends for high severity fire occurrence for western United States forests, for each state and each month. The study found no significant trend in high severity fire occurrence during 1984-2014, except for Colorado. The study also found no significant increase in high severity fire occurrence by month during May through October, and no correlation between fraction of high severity fire and total fire size. Furthermore, Parks et al. (2016) projected that even in hotter and drier future forests, there will be a decrease or no change in high-severity fire effects in nearly every forested region of the western U.S., including California, due to reductions in combustible understory vegetation over time.[8]

Second, the DEIR suggests that there is currently an excess of high-intensity fire in California's forests that is ecologically detrimental. However, research indicates that there is currently less fire in California's pine and mixed conifer forests, including less high-severity fire, compared with historical conditions,[9] and that many species depend on the unique habitat created by mixed-intensity fires, including high-severity fire patches (Campos and Burnett 2016, Tingley et al. 2016, White et al. 2016, Campos et al. 2017, Fogg et al. 2017).[10]

Third, the DEIR asserts that California's forests are too dense, making them susceptible to more intense fire, as a justification for fuels treatments. DEIR at 2-10. However, this representation does not reflect current science. McIntyre et al. (2015) indicates that California's forests are much less dense in terms of basal area than they were historically.[11] Sierra Nevada

---

[7] Picotte, J.J. et al. 2016. 1984-2010 trends in fire burn severity and area for the coterminous US. International Journal of Wildland Fire 25: 413-420; Keyser, A. and A.L. Westerling. 2017. Climate drives inter-annual variability in probability of high severity fire occurrence in the western United States. Environmental Research Letters 12: 065003.
[8] Parks, S.A. et al. 2016. How will climate change affect wildland fire severity in the western US? Environmental Research Letters 11: 035002.
[9] See references in our May 31, 2016 letter.
[10] Campos, B.R. and R.D. Burnett. 2016. Bird and bat inventories in the Moonlight, Storrie and Chips fire areas: 2015 report to the Lassen and Plumas National Forest. Point Blue Conservation Science, Petaluma, CA; Tingley, M.W. et al. 2016. Pyrodiversity promotes avian diversity over the decade following forest fire. Proceedings of the Royal Society B 283: 20161703; White, A.M. et al. 2016. Avian community response to post-fire forest structure: implications for fire management in mixed conifer forests. Animal Conservation 19: 256-264; Campos, B.R. et al. 2017. Bird and bat inventories in the Storrie and Chips fire areas 2015-2016: Final report to the Lassen National Forest. Point Blue Conservation Science, Petaluma, CA; Fogg, A.M. et al. 2017. Avian Monitoring in Freds and Power fires: Final Report. Point Blue Conservation Science, Petaluma, CA.
[11] McIntyre, P.J. et al. 2015. Twentieth-century shifts in forest structure in California: denser forests, smaller trees, and increased dominance of oaks. PNAS 112: 1458-1463.

forests were estimated to be about 30% less dense, and Tranverse and Peninsular Range forests were 40% less dense, in terms of basal area in the 2000s compared to the 1930s,[12] largely due to past and present logging. Moreover, historically, California's mixed-conifer and ponderosa pine forests had a wide range of densities. For example, Hodge (1906) reported that ponderosa pine forests of the western Sierra Nevada had density ranges generally from about 100 to 1000 trees per acre, and were dominated by smaller trees.[13] A reconstruction of historical forest structure in Sierra mixed-conifer forests based on 1865-1885 survey data suggests that historical forests "were open and park-like in places, but generally dense, averaging 293 trees/ha" with smaller pines and oaks numerically dominant, as indicative of mixed- rather than low-severity fire regimes.[14] An assessment of US Forest Service forest survey data from 1910 and 1911 for central and southern Sierra Nevada ponderosa pine and mixed-conifer forests similarly indicates that historical forests had a high variability in density, again indicative of varied disturbance intensities and frequencies.[15] Moreover, as discussed in our May 31, 2016 comments, the body of empirical studies in California's forests indicates that fire-suppressed forests are not burning at higher fire severity.

Fourth, the DEIR suggests that fuels reduction treatments under the VTP will increase forest resilience, particularly under climate change. DEIR at 1-4, 1-12. However, research suggests that forest management treatments focused on thinning trees to increase resilience to climate change stressors can be counter-productive, and many studies instead recommend restoring natural disturbance processes to increase resilience. Carnwath and Nelson (2016) noted that management activities to reduce tree density with the purpose of increasing stand resilience often target trees that may be the most drought-resilient, producing counter-productive results.[16] Similarly, D'Amato et al. (2013) concluded that "heavy thinning treatments applied to younger populations, although beneficial at reducing drought vulnerability at this stage, may predispose these populations to greater long-term drought vulnerability."[17] Keeling et al. (2006) emphasized the importance of restoring ecological processes, especially wildfire, rather than management

[12] *Id*. at Figure 1a.
[13] Hodge (1906) as cited in Hanson, C.T. and D.C. Odion. 2016. Historical forest conditions within the range of the Pacific fisher and spotted owl in the Central and Southern Sierra Nevada, California, USA. Natural Areas Journal 36: 8-19, at 17.
[14] Baker, W. L. 2014. Historical forest structure and fire in Sierran mixed-conifer forests reconstructed from General Land Office survey data. Ecosphere 5:79.
[15] Hanson, C.T. and D.C. Odion. 2016. Historical forest conditions within the range of the Pacific fisher and spotted owl in the Central and Southern Sierra Nevada, California, USA. Natural Areas Journal 36: 8-19, at 17.
[16] Carnwath, G.C. and C.R. Nelson. 2016. The effect of competition on response to drought and interannual climate variability of a dominant conifer tree of western North America. Journal of Ecology 104: 1421-1431.
[17] D'Amato, A.W. et al. 2013. Effects of thinning on drought vulnerability and climate response in north temperate forest ecosystems. Ecological Applications 23: 1735-1742.

that tries to create specific stand conditions.[18] Keeling's study in ponderosa pine/Douglas-fir communities found that "fire and absence of fire produce variable effects in the understory and different rates of successional change in the overstory across varied landscapes." The authors cautioned "against specific targets for forest structure in restoration treatments, and underscore the importance of natural variability and heterogeneity in ponderosa pine forests." Further, "management may need to emphasize restoration of natural ecological processes, especially fire, rather than specific stand conditions."

Fifth, the DEIR misrepresents the effects of forest wildfire on water flows. For example, a recent study by Boisrame (2016) found that restoring a frequent, mixed severity fire regime to the Illilouette Creek Basin in Yosemite National Park had numerous ecohydrological benefits, including increased soil moisture and streamflow, decreased drought stress, and increased landscape diversity.[19]

Sixth, the DEIR fails to acknowledge key research on the effects of bark beetles on California forests, including findings that trees killed by bark beetles and drought do not increase fire severity or extent; high-severity fire appears to reduce future susceptibility to beetle outbreaks; prior beetle outbreaks may reduce susceptibility to future outbreaks and confer climate change resilience to forests; and thinning does not appear to protect stands from future beetle outbreaks. A recent study by Meigs et al. (2016), conducted in mostly mixed-conifer and ponderosa pine forests of the Pacific Northwest (south to the California border), found the following: "In contrast to common assumptions of positive feedbacks, we find that insects generally reduce the severity of subsequent wildfires. Specific effects vary with insect type and timing, but both insects [mountain pine beetle and western spruce budworm] decrease the abundance of live vegetation susceptible to wildfire at multiple time lags. By dampening subsequent burn severity, native insects could buffer rather than exacerbate fire regime changes expected due to land use and climate change."[20] Specifically with regard to the mountain pine beetle, a native species associated with the current snag recruitment in California's ponderosa pine and mixed-conifer forests, Meigs et al. (2016) found that fire severity was the same between stands with high levels of snags from drought/beetles and unaffected forests, when fires occurred during or immediately after the pulse of snag recruitment, and then fire severity consistently declined in the stands with high snag levels in the following decades (see Figure 3a).

Studies investigating how previous fire affects subsequent bark beetle outbreaks have found that high-severity fire reduces forest susceptibility to future outbreaks (e.g., Veblen et al.

[18] Keeling, E.G. et al. 2006. Effects of fire exclusion on forest structure and composition in unlogged ponderosa pine/Douglas-fir forests. Forest Ecology and Management 327: 418-428.
[19] Boisrame, G. 2016. Wildfire Effects on the Ecohydrology of a Sierra Nevada Watershed. PhD Dissertation. University of California, Berkeley.
[20] Meigs, G.W., et al. 2016. Do insect outbreaks reduce the severity of subsequent forest fires? Environmental Research Letters 11: 045008.

1994, Kulakowski et al. 2012, Black et al. 2013, Seidl et al. 2016).[21] For example, Seidl et al. (2016) concluded that spatial variability in tree regeneration following large high-severity wildfire in Yellowstone National Park dampened and delayed future bark beetle outbreaks. The authors recommended that managers "embrace rather than reduce disturbance-created variability to strengthen negative feedbacks between successive disturbances." The study suggests that thinning/logging is likely to homogenize forests and exacerbate outbreaks: "postdisturbance salvage logging, removal of legacy trees or undisturbed forest patches, and extensive tree planting generally reduce disturbance-induced variability and thus likely weaken negative feedbacks between disturbance events."

Hart et al. (2015) conducted the first broad-scale analysis of how prior bark beetle outbreaks affect susceptibility to future outbreaks.[22] The study found that a widespread, severe spruce beetle outbreak reduced forest susceptibility to spruce beetle infestation 60 years later. Importantly, the study concluded that "failure to incorporate negative feedbacks into prediction of future bark beetle outbreaks is likely to over-predict the extent or severity of future outbreaks and by implication under-estimate forest resistance to altered disturbance regimes under climate change." Three studies also suggest that bark beetles may act as a selective agent that increases forest resilience to climate change by shifting forest stands to those most suited to the prevailing climate conditions (Millar et al. 2007, Millar et al. 2012, Knapp et al. 2013).[23]

Reviews by Black et al. (2013) and Six et al. (2014) found that thinning treatments have mixed results and can fail to protect stands.[24] For example, Black et al. (2013) concluded that "[i]nsect containment measures have yielded mixed results and may pose significant risks to

---

[21] Veblen, T.T. et al. 1994. Disturbance regime and disturbance interactions in a Rocky Mountain subalpine forest. Journal of Ecology 82: 125–35; Kulakowski, D. et al. 2012. Stand-replacing fires reduce susceptibility of lodgepole pine to mountain pine beetle outbreaks in Colorado. Journal of Biogeography 39: 2052–60; Black, S.H. et al. 2013. Do bark beetle outbreaks increase wildfire risks in the Central U.S. Rocky Mountains: Implications from Recent Research. Natural Areas Journal 33: 59-65; Seidl, R. et al. 2016. Spatial variability in tree regeneration after wildfire delays and dampens future bark beetle outbreaks. PNAS 113: 13075-13080.

[22] Hart, S.J. et al. 2015. Negative feedbacks on bark beetle outbreaks: widespread and severe spruce beetle infestation restricts subsequent infestation. PLoS ONE 10(5): e0127975.

[23] Millar, C.I. et al. 2007. Response of high-elevation limber pine (*Pinus flexilis*) to multiyear droughts and 20th-century warming, Sierra Nevada, California, USA. Canadian Journal of Forest Research 37: 2508-2520; Millar, C.I. et al. 2012. Forest mortality in high-elevation whitebark pine (*Pinus albicaulis*) forests of eastern California, USA; influence of environmental context, bark beetles, climatic water deficit, and warming. Canadian Journal of Forest Research 41: 749-765; Knapp, P.A. et al. 2013. Mountain pine beetle selectivity in old-growth ponderosa pine forests, Montana, USA. Ecology and Evolution 3: 1141-1148.

[24] Black, S.H. et al. 2013. Do bark beetle outbreaks increase wildfire risks in the Central U.S. Rocky Mountains: Implications from Recent Research. Natural Areas Journal 33: 59-65; Six, D.L. et al. 2014. Management for mountain pine beetle outbreak suppression: does relevant science support current policy? Forests 5: 103-133.

forested ecosystems." Six et al. (2014) noted that "many studies assessing the efficacy of thinning have been conducted under non-outbreak conditions" and therefore their results do not reflect how stands perform during an outbreak. Furthermore, "failures are often not reported" and "studies conducted during outbreaks indicate that thinning can fail to protect stands." Importantly, Six et al. (2014) cautioned that the pressure to thin forests as beetle treatments, often as a means to provide revenue to the commercial timber industry, without scientific understanding of treatment effects can lead to "more harm than good":

> That pressure, to "do something", might also interact with the uncertainty about which choices are effective and appropriate (as with beetle timber harvest treatments) to create an opportunity for political pressures to force the adoption of particular choices that benefit specific interest groups [143]. It is perhaps no accident that the beetle treatments that have been most aggressively pushed for in the political landscape allow for logging activities that might provide revenue and jobs for the commercial timber industry. The result is that the push to "do something," uncertainty, and political pressures might lead us to act to respond to climate change before we understand the consequences of what we are doing, in the end producing more harm than good.

Conclusion

In sum, the DEIR fails to comply with CEQA and the CEQA Guidelines. Cal Fire cannot approve the VTP on the basis of this DEIR. Rather, Cal Fire must revise both the DEIR and the VTP to comply with the requirements of law and to reflect the physical and ecological realities of California's forests. Please feel free to contact us if you have any questions about these comments.

Sincerely,

Shaye Wolf, Ph.D.
Climate Science Director
(415) 385-5746
swolf@biologicaldiversity.org

Justin Augustine
Senior Attorney

Brian Nowicki
California Climate Policy Director

Attachments: References Cited (uploaded in PDF format on compact disk)

New References Cited and Submitted

Boisrame, G. 2016. Wildfire Effects on the Ecohydrology of a Sierra Nevada Watershed. PhD Dissertation. University of California, Berkeley.

Bradley, C.M. et al. 2016. Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western United States? Ecosphere 7:e01492.

Campos, B.R. and R.D. Burnett. 2016. Bird and bat inventories in the Moonlight, Storrie and Chips fire areas: 2015 report to the Lassen and Plumas National Forest. Point Blue Conservation Science, Petaluma, CA.

Campos, B.R. et al. 2017. Bird and bat inventories in the Storrie and Chips fire areas 2015-2016: Final report to the Lassen National Forest. Point Blue Conservation Science, Petaluma, CA.

Carnwath, G.C. and C.R. Nelson. 2016. The effect of competition on response to drought and interannual climate variability of a dominant conifer tree of western North America. Journal of Ecology 104: 1421-1431.

D'Amato, A.W. et al. 2013. Effects of thinning on drought vulnerability and climate response in north temperate forest ecosystems. Ecological Applications 23: 1735-1742.

Dellasala, D.A. et al. 2017. Accommodating mixed-severity fire to restore and maintain ecosystem integrity with a focus on the Sierra Nevada of California, USA. Fire Ecology 13: 148-171.

Fogg, A.M. et al. 2017. Avian Monitoring in Freds and Power fires: Final Report. Point Blue Conservation Science, Petaluma, CA.

Keeling, E.G. et al. 2006. Effects of fire exclusion on forest structure and composition in unlogged ponderosa pine/Douglas-fir forests. Forest Ecology and Management 327: 418-428.

Keyser, A. and A.L. Westerling. 2017. Climate drives inter-annual variability in probability of high severity fire occurrence in the western United States. Environmental Research Letters 12: 065003.

Knapp, P.A. et al. 2013. Mountain pine beetle selectivity in old-growth ponderosa pine forests, Montana, USA. Ecology and Evolution 3: 1141-1148.

Kulakowski, D. et al. 2012. Stand-replacing fires reduce susceptibility of lodgepole pine to mountain pine beetle outbreaks in Colorado. Journal of Biogeography 39: 2052–60

McIntyre, P.J. et al. 2015. Twentieth-century shifts in forest structure in California: denser forests, smaller trees, and increased dominance of oaks. PNAS 112: 1458-1463.

Meigs, G.W., et al. 2016. Do insect outbreaks reduce the severity of subsequent forest fires? Environmental Research Letters 11: 045008.

Millar, C.I. et al. 2007. Response of high-elevation limber pine (*Pinus flexilis*) to multiyear droughts and 20th-century warming, Sierra Nevada, California, USA. Canadian Journal of Forest Research 37: 2508-2520.

Millar, C.I. et al. 2012. Forest mortality in high-elevation whitebark pine (*Pinus albicaulis*) forests of eastern California, USA; influence of environmental context, bark beetles, climatic water deficit, and warming. Canadian Journal of Forest Research 41: 749-765.

Seidl, R. et al. 2016. Spatial variability in tree regeneration after wildfire delays and dampens future bark beetle outbreaks. PNAS 113: 13075-13080.

Six, D.L. et al. 2014. Management for mountain pine beetle outbreak suppression: does relevant science support current policy? Forests 5: 103-133.

Syphard, A.D. et al. 2014. The role of defensible space for residential structure protection during wildfires. International Journal of Wildland Fire 23:1165-1175.

Tingley, M.W. et al. 2016. Pyrodiversity promotes avian diversity over the decade following forest fire. Proceedings of the Royal Society B 283: 20161703.

Veblen, T.T. et al. 1994. Disturbance regime and disturbance interactions in a Rocky Mountain subalpine forest. Journal of Ecology 82: 125–35.

White, A.M. et al. 2016. Avian community response to post-fire forest structure: implications for fire management in mixed conifer forests. Animal Conservation 19: 256-264.

Zachmann, L.J. et al. 2018. Prescribed fire and natural recovery produce similar long-term patterns of change in forest structure in the Lake Tahoe basin, California. Forest Ecology and Management 409: 276-287.