LAW OFFICE OF DONALD B. MOONEY
417 Mace Boulevard, Suite J-334
Davis, CA 95618
530-304-2424
dbmooney@dcn.org

October 2, 2024

VIA ELECTRONIC MAIL AND
FEDERAL EXPRESS
Jeffrey.Thorsby@nevadacountyca.gov

Nevada County Board of Supervisors
950 Maidu Avenue, Suite 170
Nevada City, CA 95959

Re: October 8, 2024 Board of Supervisors Meeting
Alpenglow Timber Use Permit , PLN23-0054; CUP23-0004; EIS24-0004

Dear Supervisors:

This letter supplements Friends of Prosser Truckee's previous comment letters on the proposed Alpenglow Timber Use Permit, PLN23-0054; CUP23-0004; EIS24-0004 ("Project"). Friends of Prosser Truckee continues to object to the Project and objects to the approval of the Mitigated Negative Declaration ("MND") for the Project on the grounds that the MND fails to comply with the requirements of the California Environmental Quality Act ("CEQA"), Public Resources Code section 21000 *et seq*. Friends of Prosser Truckee respectfully request that the Board of Supervisors grant Friends of Prosser Truckee's appeal of the Planning Commissioner approval of the MND and Project and direct County staff to prepare an Environmental Impact Report ("EIR") prior to any further consideration of the Project.

As discussed in those comment letters, the record contains substantial evidence that the Project will have significant impact in a number of these areas, including aesthetics (light pollution), land use, noise, and traffic safety. These comments constitute substantial evidence that supports a fair argument that the Project may have a significant impacts. As such, CEQA mandates the preparation of an environmental impact report.

The attached letter dated September 28, 2024, from Dr. Chad Hanson, an ecologist and expert in wildfire constitutes substantial evidence that supports a fair argument that the Project may have significant impacts regarding the risk of wildfire.[1] As Dr. Hanson points out, the MND failed to address the increase risk of wildfire resulting from the project, including the tree thinning that will take place to support the mill. As demonstrated by Dr. Hanson, the wildfire risk can have highly significant and disastrous consequences to public safety. Not only does Dr. Hanson's letter point out the

---

1 Dr. Hanson's letter contains numerous references to reports and studies. Copies of those reports and studies are provided on a USB flash drive being sent via Federal Express.

wildfire risks have not been address, but is also an expert opinion that constitutes substantial evidence supporting a fair argument that the Project may have significant impacts.

As previously discussed, the County's task is to determine whether the record contains substantial evidence that supports a fair argument that a significant impact may occur and not to weigh the evidence. (Pub. Resources Code, § 21080(c), (d); CEQA Guidelines, § 15064(f).) When the substantial evidence satisfies that low threshold standard, CEQA mandates the preparation of an EIR. As the MND failed to address the potentially significant impacts identified by Dr. Hanson, there is not conflicting substantial evidence in the record. (*See No Oil, Inc. v. City of Los Angeles* (1975) 13 Cal.3d 68, 84 [CEQA creates "a low threshold requirement" for the initial preparation of an EIR and reflects a preference for resolving doubts in favor of environmental review when the question is whether any such review is warranted.].) Even if the County and/or developer provides substantial evidence that disagrees with Dr. Hanson's opinion, CEQA still mandates the preparation of an EIR prior to approving the Project. (*Rominger v. County of Colusa, supra, 229* Cal.App.4th 690 [opinion by traffic expert conflicted with negative declaration's trip generation assumptions]; *City of Carmel-by-the-Sea v. Board of Supervisors* (1986) 183 Cal.App.3d 229, 249 [conflicting opinions by multiple experts on definition and extent of wetlands].)

Based upon the foregoing and the previous comment letters, Friends of Prosser Truckee respectfully requests that the Board grant the appeal and direct County staff to prepare an EIR for the Project.

Sincerely,

Donald B. Mooney
Attorney

cc: Client

Attachment: Letter dated September 28, 2024 from Dr. Chad Hanson

28 September 2024

Kyle Smith
Nevada County Planning Department
950 Maidu Avenue, Suite 170
Nevada City, CA 95959

Re: Alpenglow Timber Use Permit , PLN23-0054; CUP23-0004; EIS24-0004

Dear Mr. Smith,

I was asked by the Law Office of Donald B. Mooney to review the proposed Alpenglow Timber Use Permit, PLN23-0054; CUP23-0004; EIS24-0004, with regard to the wildfire issues. I am a professional fire ecologist with the John Muir Project of Earth Island Institute, and have published several dozen studies in peer-reviewed journals on forests and wildfires, including especially the effects of thinning, post-fire logging, and other logging on wildfire behavior. I have also written three books on the subject. My C.V. is attached.

I have read the proposed Alpenglow Timber Use Permit document, and reviewed it in particular with regard to any analysis of the impact of the proposal on public safety pertaining to wildfires. Pages 74-76 of the proposed Permit briefly discuss fire but only in the context of (a) ingress and egress from the proposed mill site, (b) relative flammability of the structures, including housing, at the proposed mill site, and (c) potential for the construction of the mill development, and associated earth moving for such development, to cause additional flooding or landslides. In my review of the document I found no analysis whatsoever of the impact of the mill on public safety with regard to wildfires. The proposed Permit states would be associated with the removal of a substantial volume of timber from surrounding forests—4.5 million board feet per year, or 45 million board feet per decade, plus 2,000 cords of firewood per year and an unspecified volume of forest biomass that would be burned on site in a wood-fired boiler. As there is relatively little private forestland in the Truckee area, and the area is mostly comprised by the Tahoe National Forest and Lake Tahoe Basin National Forest, this logging would occur mostly or almost entirely on these two national forests. This would be generally in the form of mechanical thinning and post-fire logging, which are by far the two most common forms of logging on national forests of the Sierra Nevada these days. I reviewed the U.S. Forest Service's Cut & Sold Reports for these

two national forests for recent fiscal years and found that 6.3 million board feet were cut on each of these two national forests in Fiscal Year 2023, for a combined total of 12.6 million board feet, and a combined total of 15.1 million board feet and 10.9 million board feet were cut in Fiscal Years 2022 and 2021, respectively (see: https://www.fs.usda.gov/forestmanagement/products/cut-sold/index.shtml). Based on these most recent years, I estimate that the proposed mill would increase logging significantly in the greater Truckee area—by approximately 35%. This would pose a significant impact to public safety in the Truckee area by increasing the threat of wildfire, including loss of homes and potential loss of human lives. As I explain below in detail, with numerous citations to scientific sources, mechanical thinning and post-fire logging, along with other forms of logging, alter the microclimate of forests in ways that create hotter, drier, and windier conditions which intensify wildfire behavior and increase the rate of wildfire spread toward communities. This not only increases the probability that a fire will reach Truckee or nearby communities before the weather changes and dampens the fire, but also significantly shortens the time between fire detection and the potential for fire responders to facilitate safe evacuation of residents. As we have seen in recent years in the northern Sierra Nevada, and as I document below, this has highly significant and disastrous consequences for public safety. These impacts are simply unaddressed in the proposed Alpenglow Timber Use Permit document.

Significant Impacts to Public Safety

The images below, from the Washington Post, show the devastation of the town of Greenville, after the Dixie fire swept up from the southwest, moving rapidly northeast through vast areas that had been mechanically thinned, before destroying most of the towns of Greenville and Canyondam, along with the smaller town of Indian Falls.

A scorched business in central Greenville on Thursday.

STUART W. PALLEY FOR THE WASHINGTON POST

The damaged central business district.

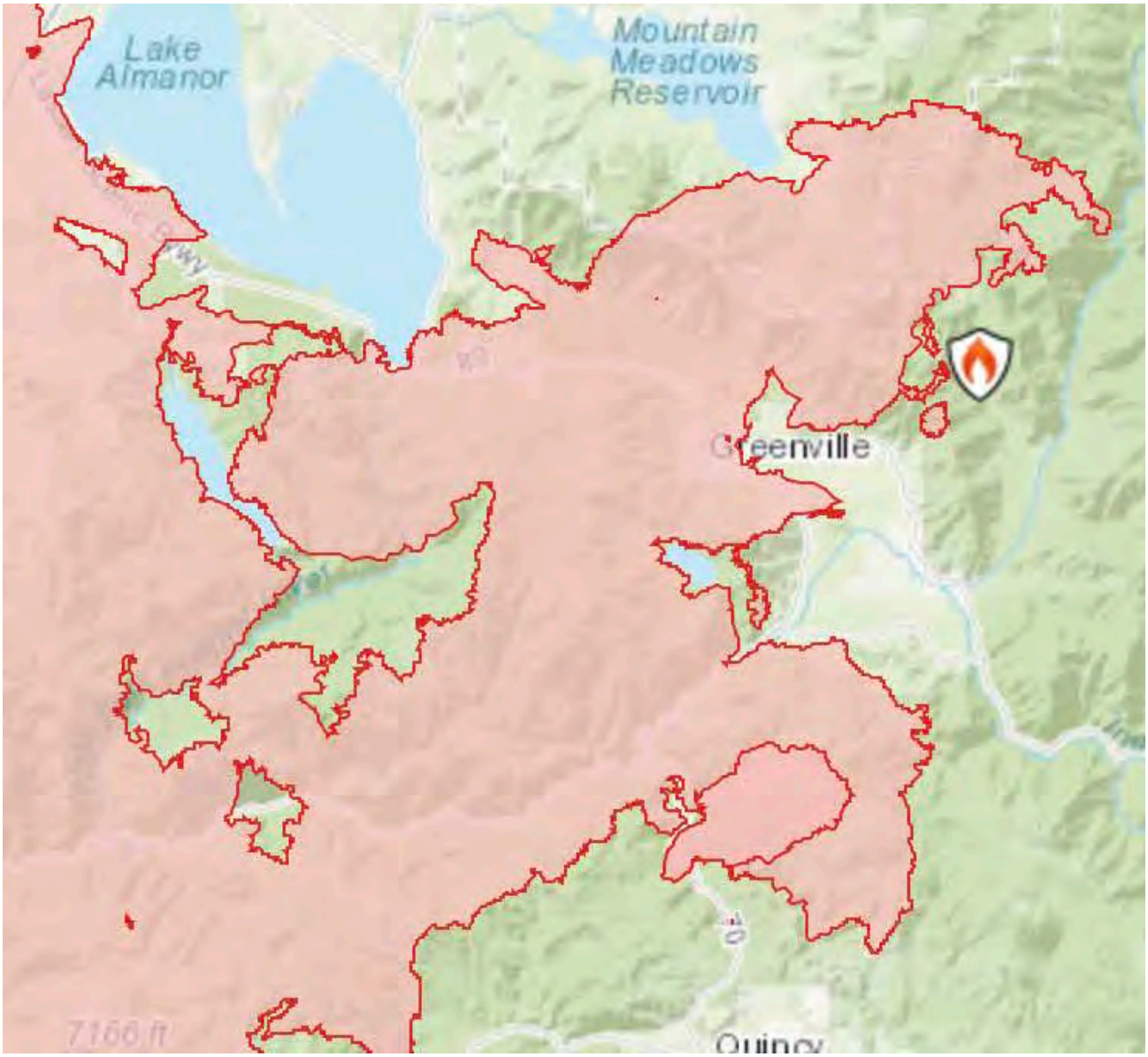
STUART W. PALLEY FOR THE WASHINGTON POST

A burning structure in Greenville late Wednesday.

STUART W. PALLEY FOR THE WASHINGTON POST

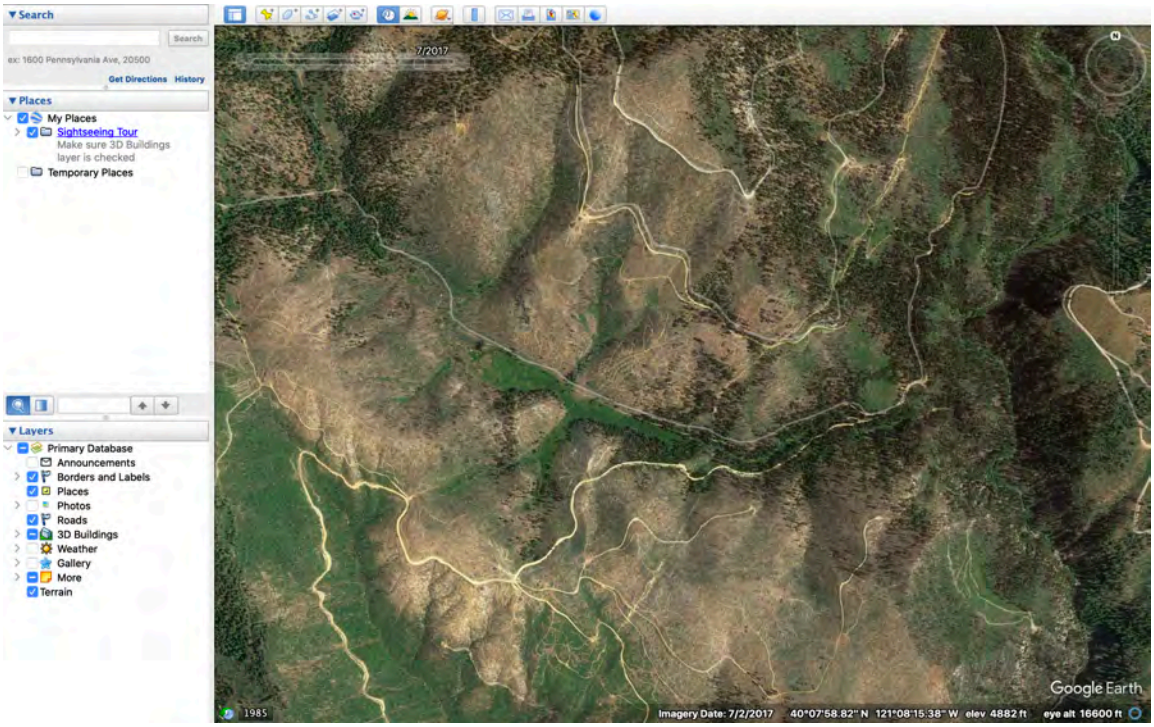
The images below, from Google Earth, show numerous large areas of pre-fire mechanical thinning and earlier post-fire logging (after the 2012 Chips fire around Butt Valley Reservoir) on the Plumas National Forest, southwest, south, and southeast of the Greenville, Canyondam, and Indian Falls areas, through which the Dixie fire swept before destroying most of the homes and businesses. For each location a pair of images is shown—one after mechanical thinning but before the Dixie fire, and the other after the Dixie fire. GPS coordinates of the imagery locations are shown at the bottom right margin of each. Most of the mechanically thinned and post-fire logged forests burned at high intensity, as the post-fire images show.

The images below represent all areas of mechanical thinning and/or post-fire logging of any significant size that could be identified as occurring within 15 years or so prior to the 2021 Dixie fire, and which were within the path of the fire as it approached Greenville, Canyondam, and Indian Falls. As the images show, the Dixie fire burned mostly or entirely at high intensity through all such areas. For spatial context, each of these images shows an area that is several thousand acres in size.



Dixie fire perimeter map showing the area on August 7, 2021, immediately after the fire, moving from the southwest to the northeast, destroyed Greenville and Canyondam. The map is from the inter-agency wildfire site, Inciweb: https://inciweb.wildfire.gov

Image Pair #1: Extensive previous post-fire logging on the Plumas National Forest, northeast of Butt Valley Reservoir, and a short distance southwest of Canyondam. The first image is from July 2, 2017, after post-fire logging, and the second is from August 7, 2021, just one day after the Dixie fire burned through this area and destroyed Canyondam.



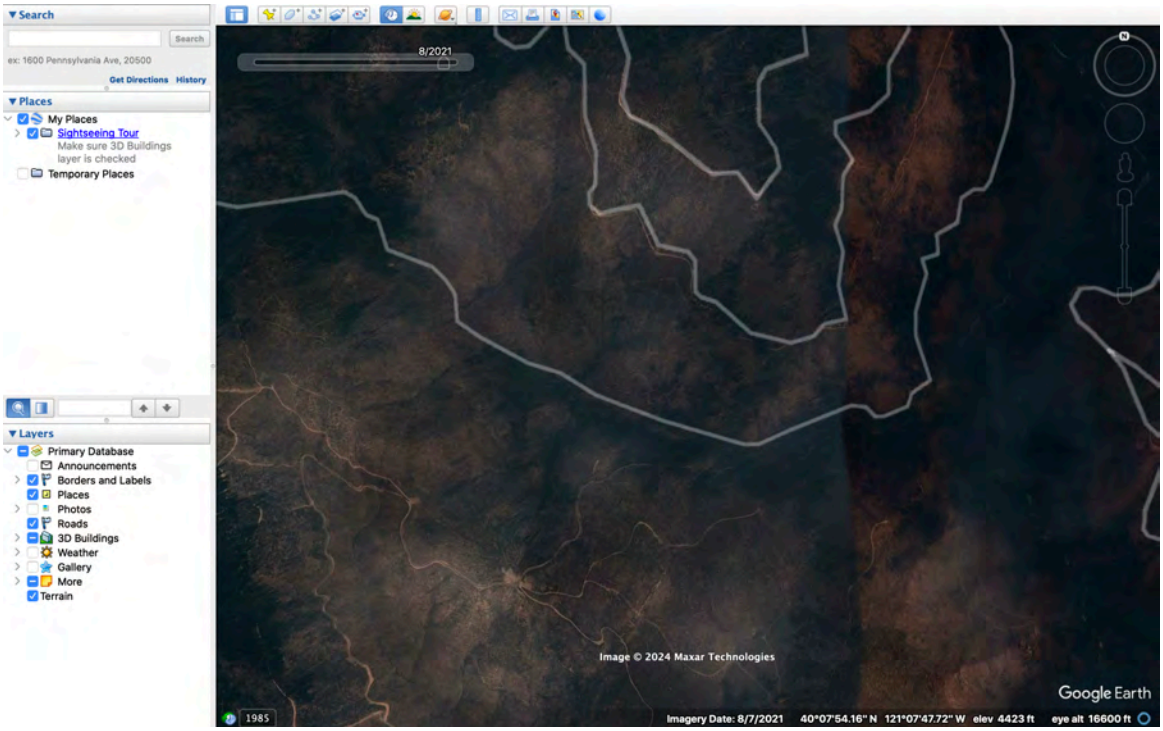
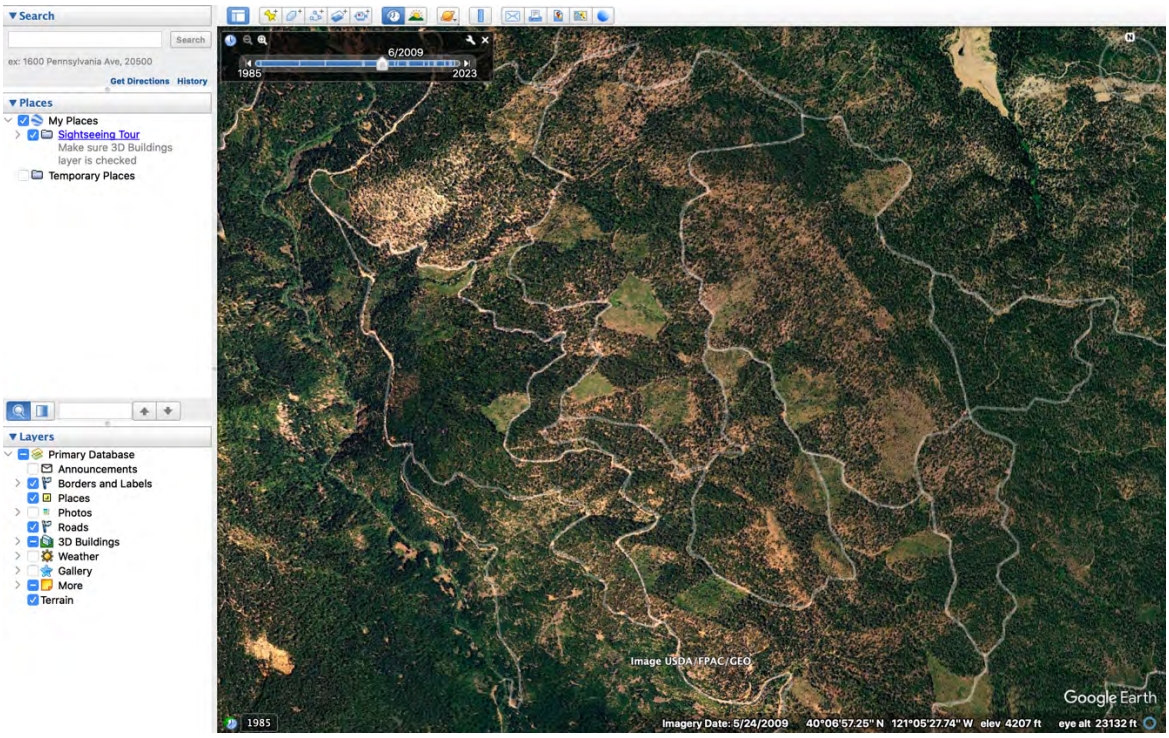


Image Pair #2: A large area that was mechanically thinned south of Canyondam. The first image is from May 24, 2009, after thinning, and the second image is from July 7, 2022 (note the almost total absence of live, green trees remaining in the thinned areas after the Dixie fire).



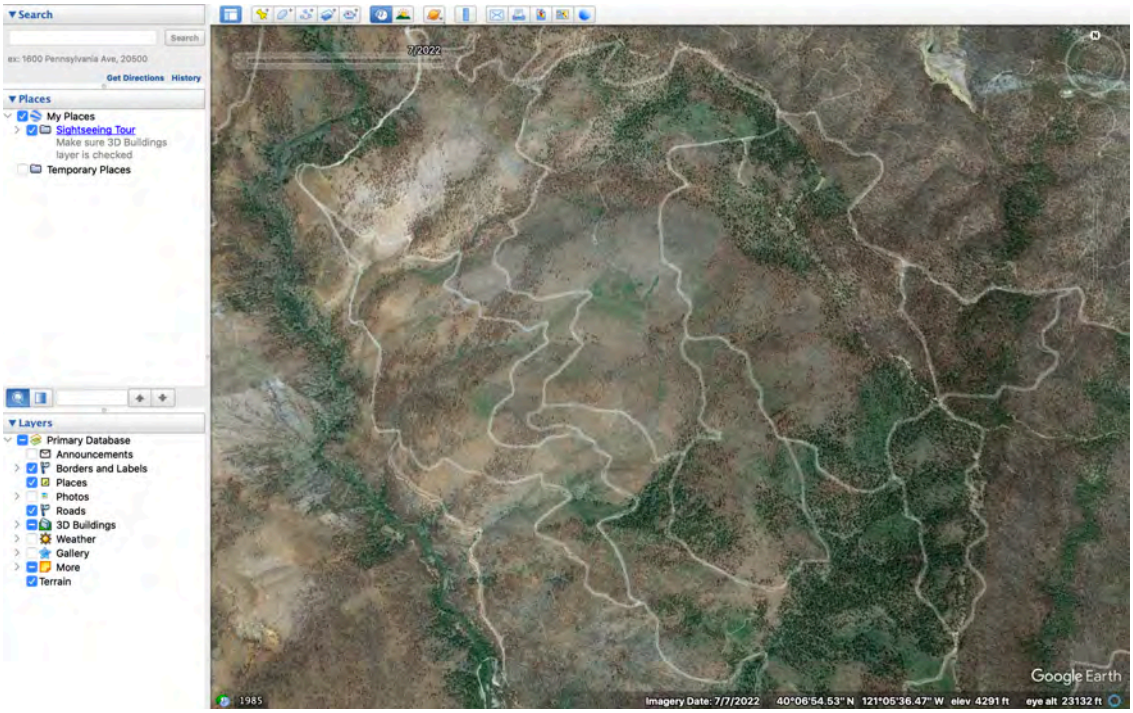
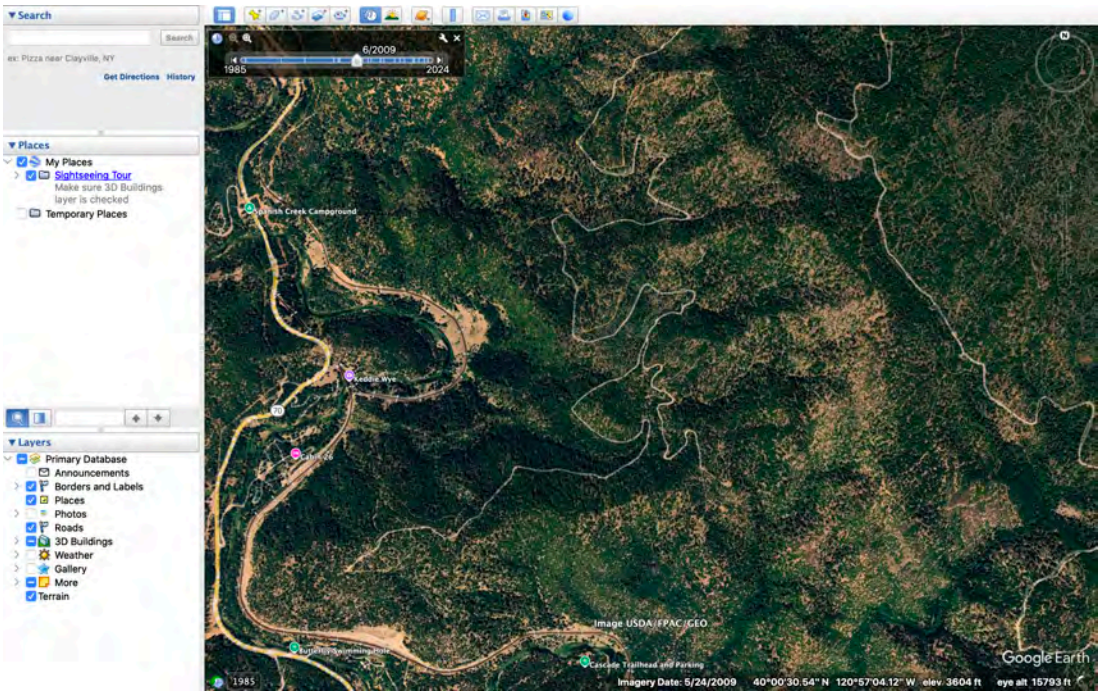


Image Pair #3: Mechanical thinning on the Plumas National Forest, south of Indian Falls. The first image is from May 24, 2009, after thinning, and the second is from July 7, 2022, after the Dixie fire. Note that nearly all of the thinned forest burned at high intensity, with 100% tree mortality in most areas.



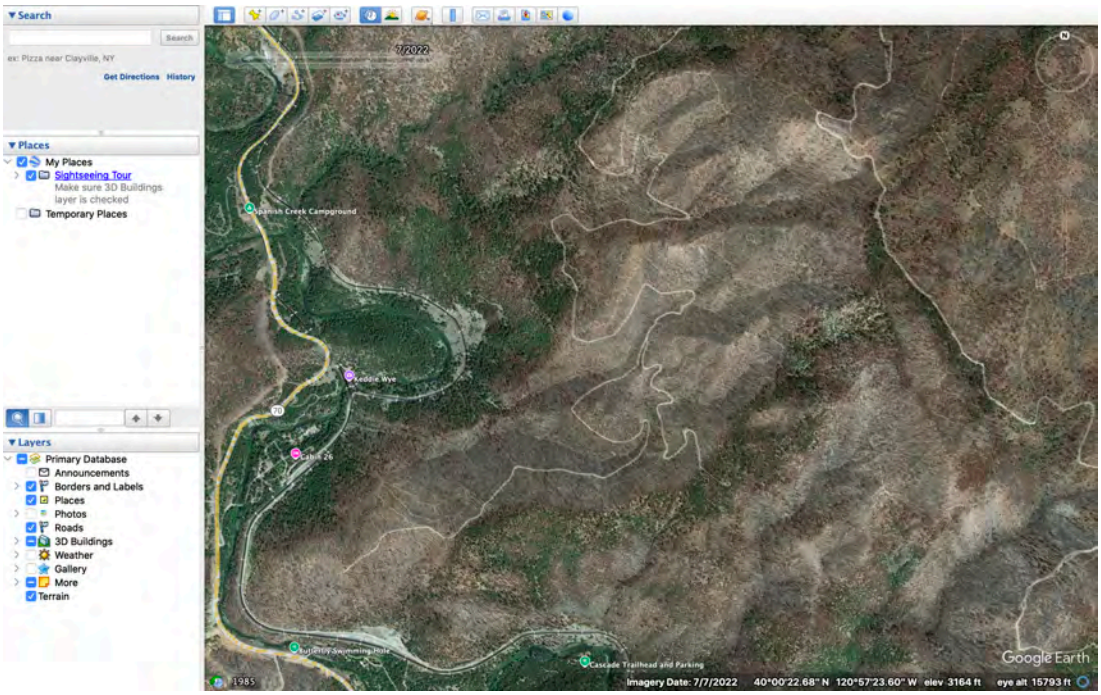
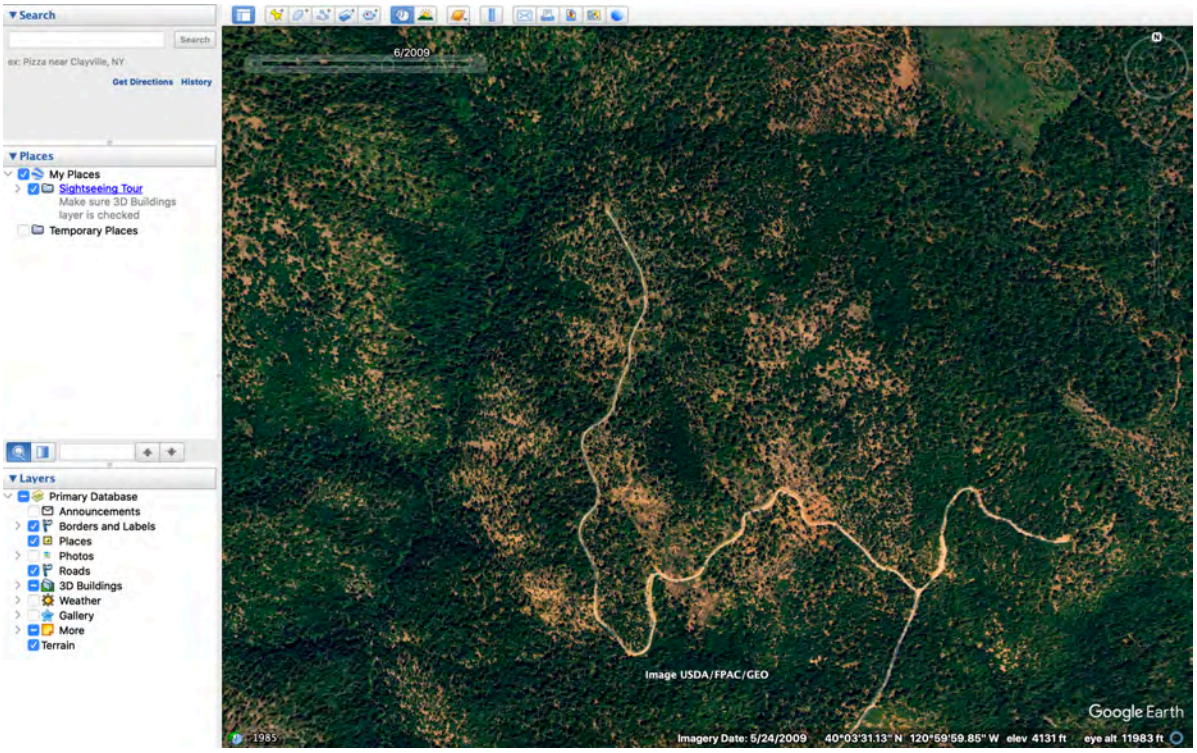


Image Pair #4: Mechanical thinning south of Greenville on the Plumas National Forest. The first image is from May 24, 2009. The second is from July 7, 2022, showing almost complete high-intensity fire effects in the thinned area.



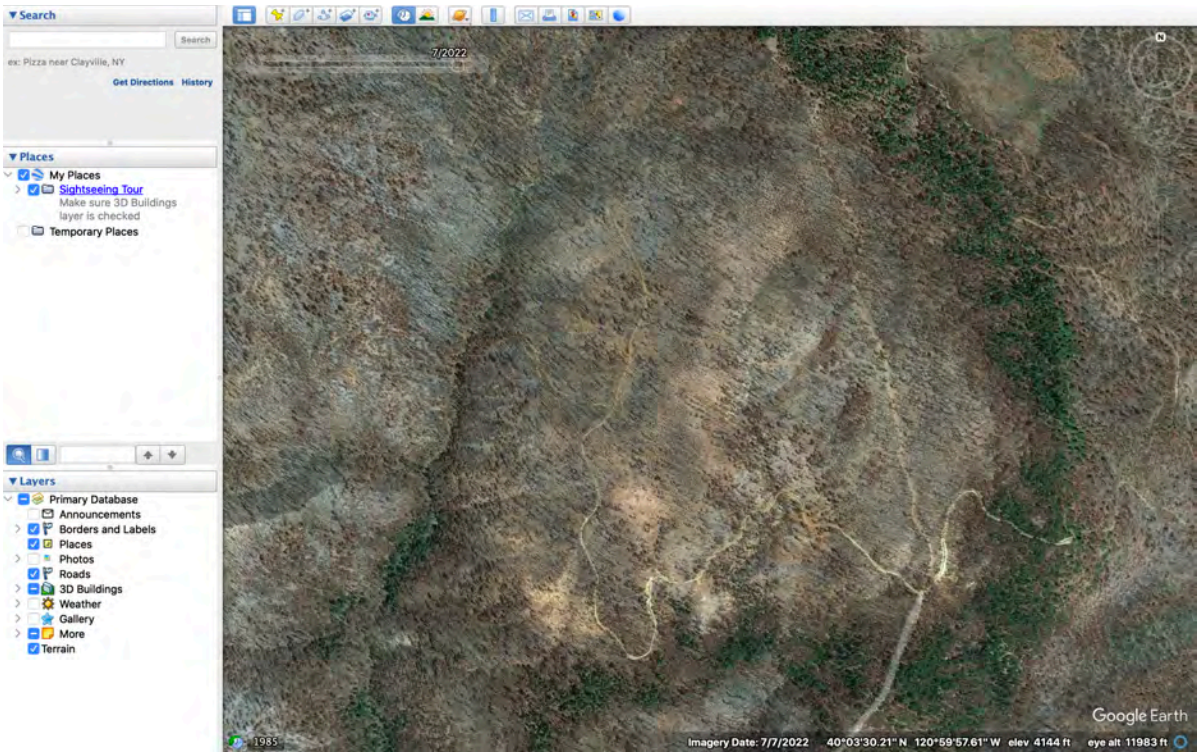
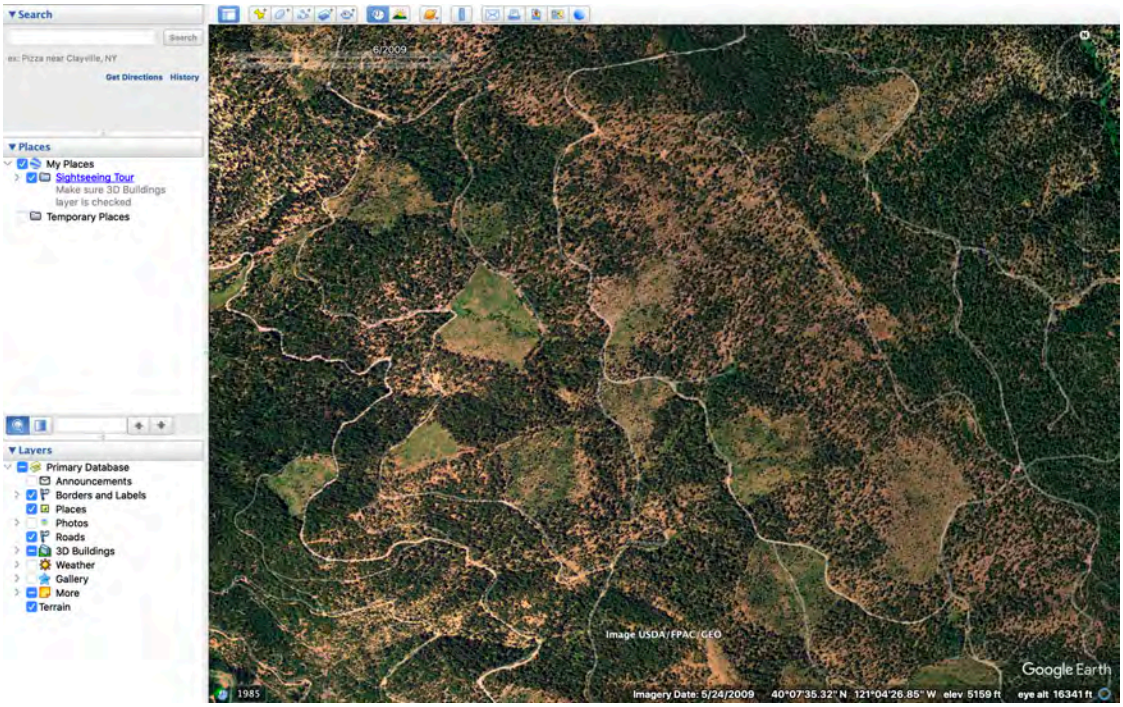


Image Pair #5: Postfire logging and mechanical thinning west of Greenville and south of Canyondam on the Plumas National Forest. The first image is from May 24, 2009, and the second is from July 7, 2022, after the Dixie fire. Once again, note that the thinned area is heavily dominated by high-intensity fire.



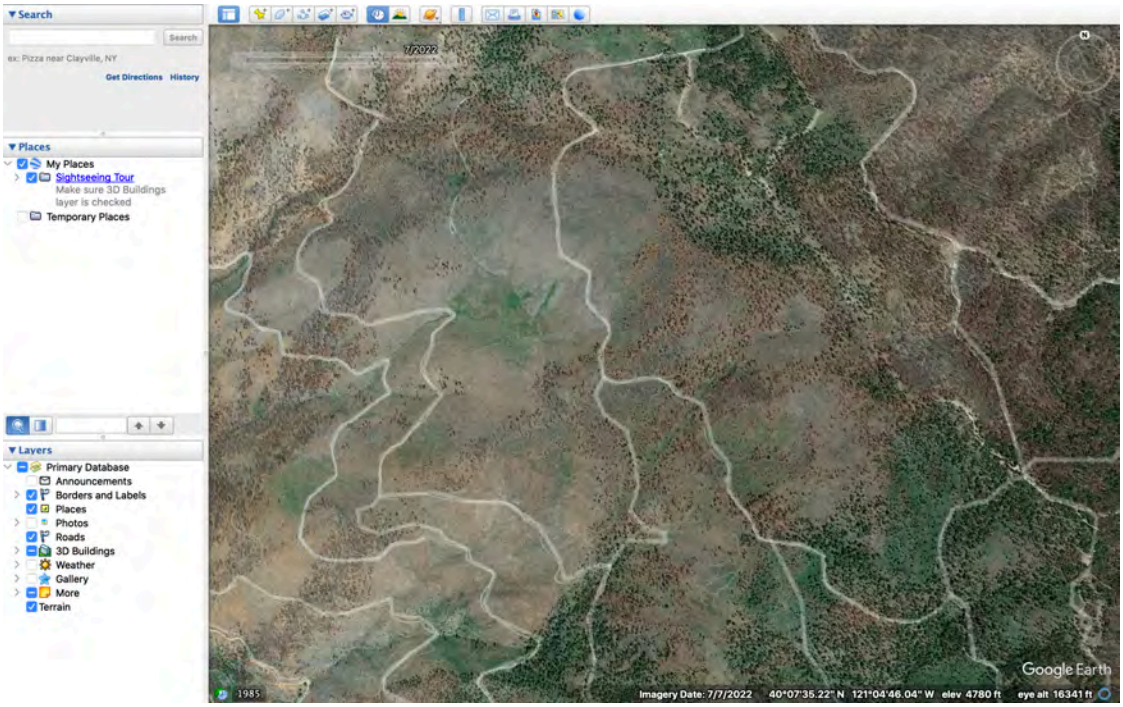
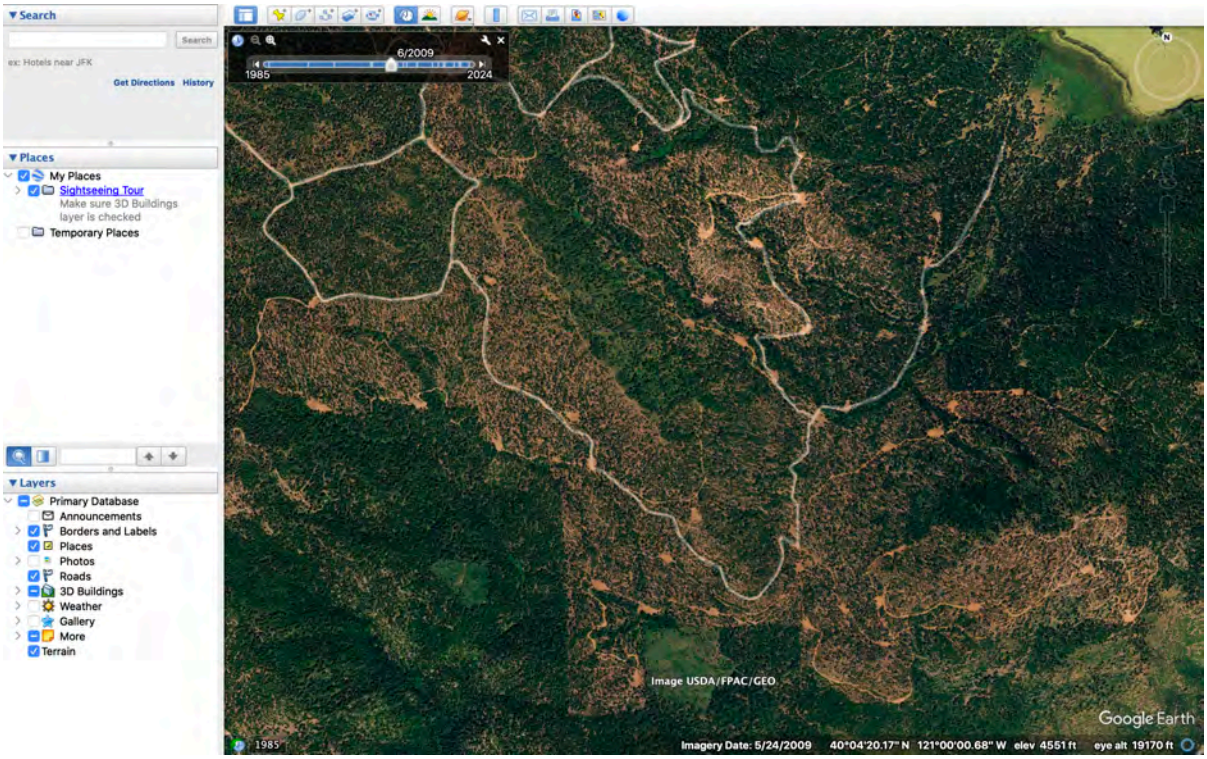
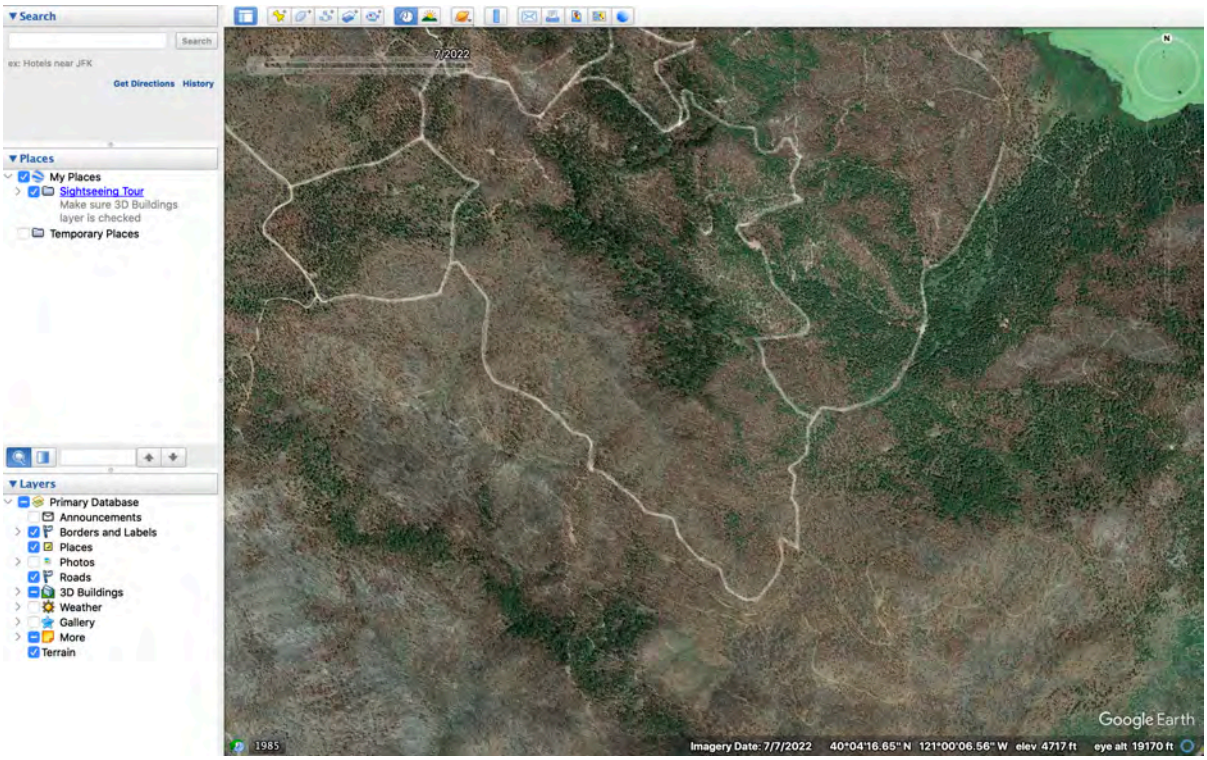
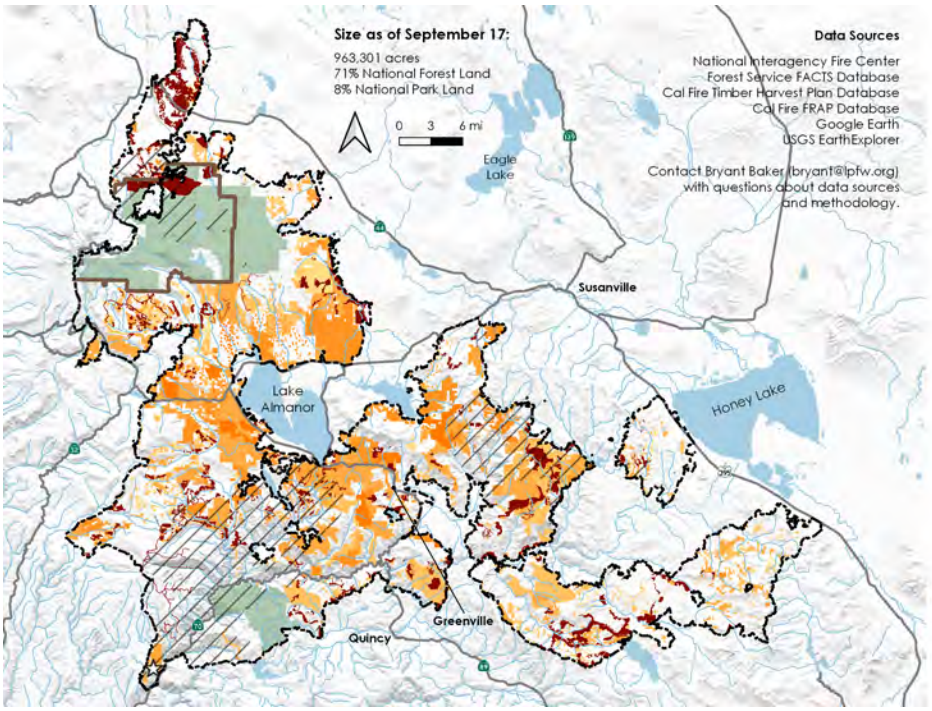


Image Pair #6: Mechanical thinning on private timberlands south of Greenville. The first image is from May 24, 2009, and the second is from July 7, 2022, after the Dixie fire, with the thinned areas heavily dominated by high-intensity fire.





Mechanical thinning and post-fire logging of forest wildlands has significantly increased threats to public safety in recent years, as we have seen in Paradise (Camp fire of 2018), Greenville (Dixie fire of 2021), Grizzly Flats (Caldor fire of 2021), and Berry Creek and Feather Falls (North Complex fire of 2020), among others, where wildfires very rapidly swept through logged areas before destroying towns. Please see the maps below showing large areas of thinning and other so-called fuel-reduction logging around towns that were largely destroyed by the Camp fire, Dixie fire, and Caldor fire, respectively. In stark contrast, defensible space pruning immediately adjacent to homes, which does not involve logging and does not produce wood commodities, is a consistent success, as we saw in Meyers and South Lake Tahoe in the Caldor fire (map below).

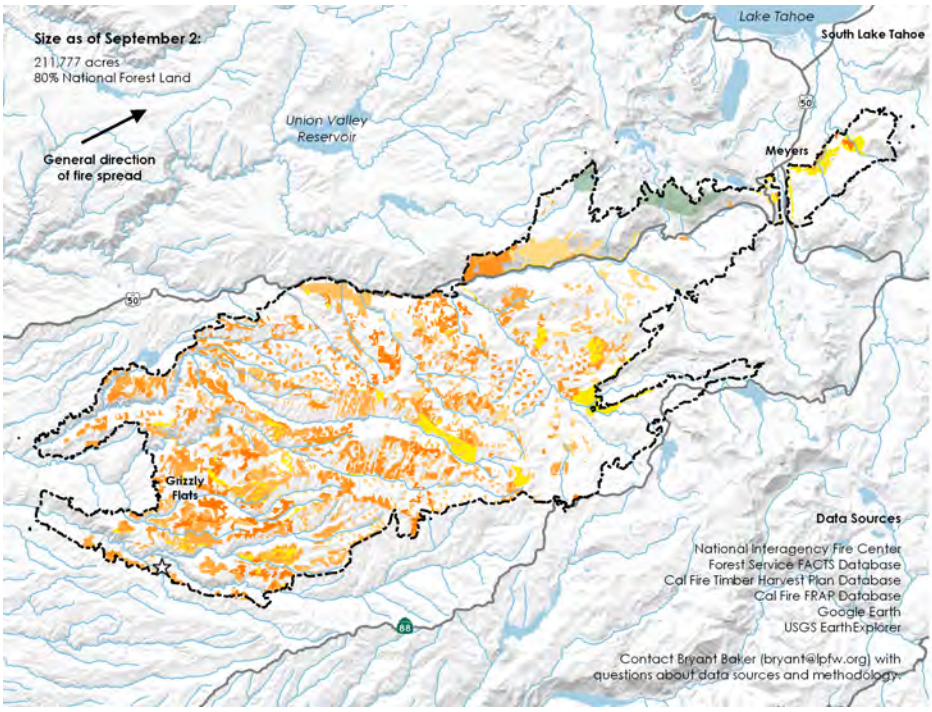


2021 Dixie Fire Area Management History

- Major Road
- Stream
- Fire Perimeter (Sept. 8)
- Ignition Area
- Lassen Volcanic NP
- Designated Wilderness
- Previous Fire (1995 - 2020)
- Prescribed Fire and Other Fuels Reduction Activities 2000 - 2020

Public and Private Land Logging (Thinning, Selection, Clearcut, etc)

- 1975 - 1984
- 1985 - 1994
- 1995 - 2004
- 2005 - 2014
- 2015 - 2020



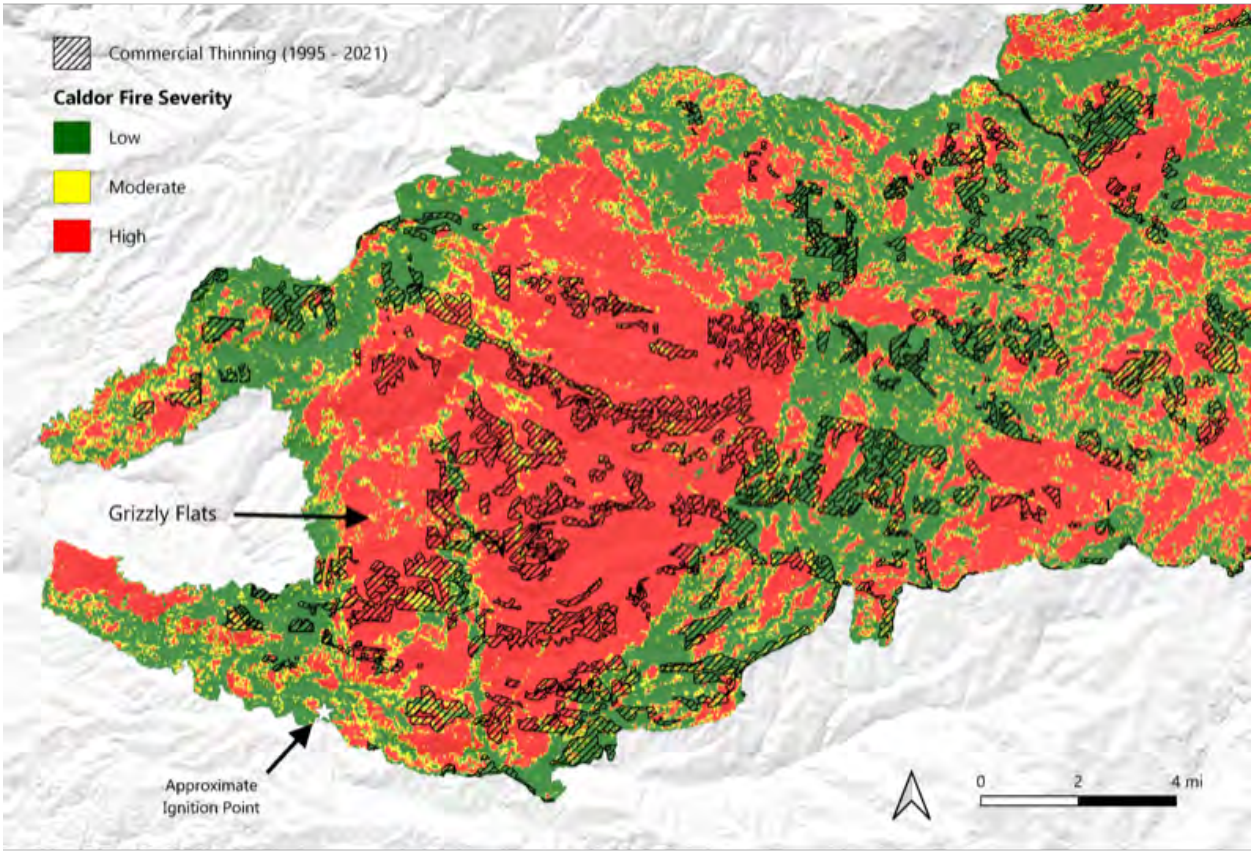
2021 Caldor Fire Area Management History

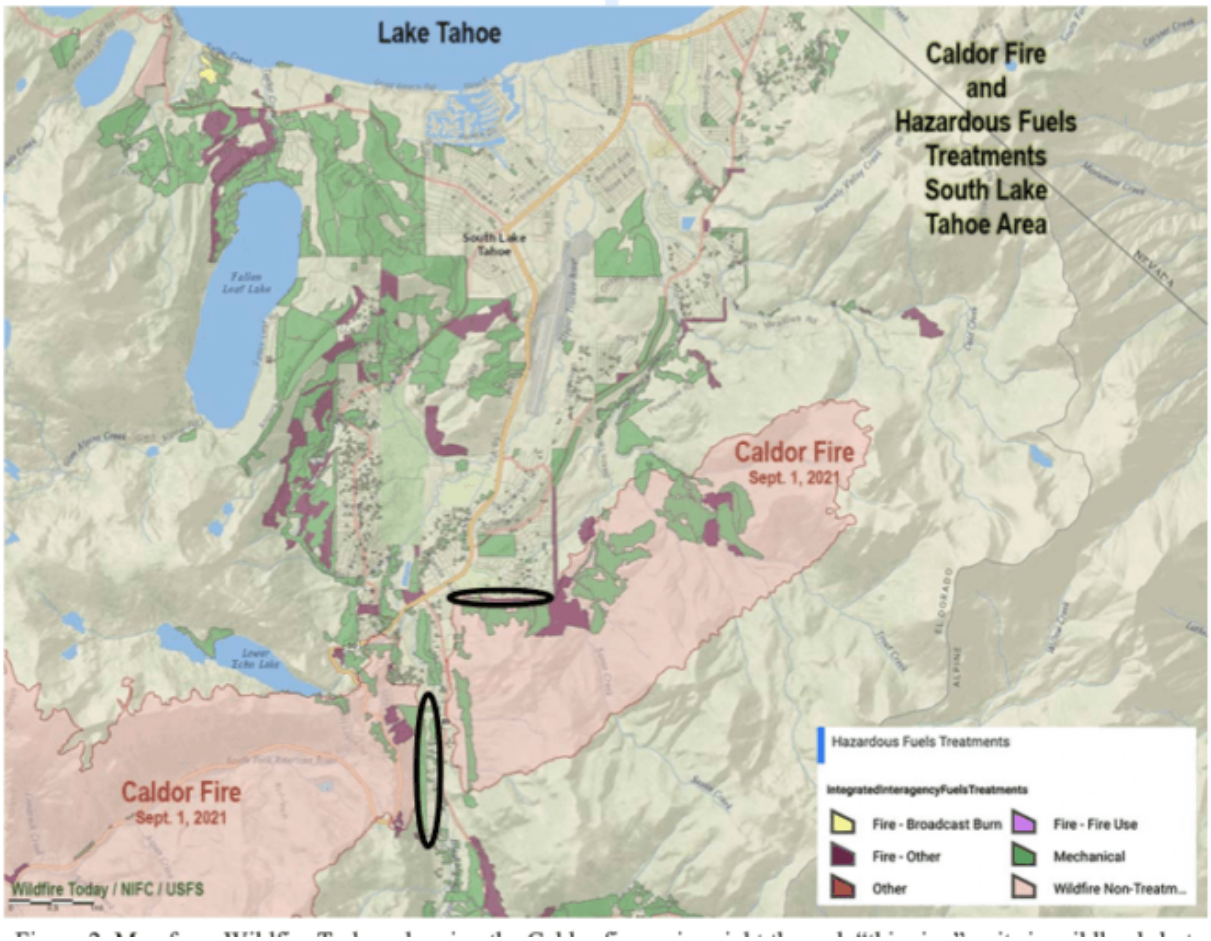
- Major Road
- Stream
- Fire Perimeter (Sept. 2)
- Ignition Area
- Prescribed Fire and Other Fuels Reduction Activities 2002 - 2021
- Desolation Wilderness

Public and Private Land Logging (Thinning, Selection, Clearcut, etc)

- 1975 - 1984
- 1985 - 1994
- 1995 - 2004
- 2005 - 2014
- 2015 - 2021

0 2 4 mi


Commercial Thinning (1995 - 2021)
Caldor Fire Severity
Low
Moderate
High
Grizzly Flats
Approximate
Ignition Point
0
2
4 mi



Map from Wildfire Today, showing the Caldor fire racing right through "thinning" units in wildlands but stopping at or immediately adjacent to private property boundaries, where defensible space pruning had been conducted on private lands and a short distance on to the National Forest. Map accessed here. Black ovals have been added to show where the fire stopped in defensible space areas adjacent to homes.

Court have recognized the significant and highly controversial and highly uncertain nature of thinning and other logging, in terms of potential fire effects to the forest and adjacent communities, such as decision by the Ninth Circuit Court of Appeals in the 2020 *BARK v. U.S. Forest Service* case (https://scholar.google.com/scholar_case?case=8163889612711152072&q=BARK+v+forest+service&hl=en&as_sdt=2006). The Ninth Circuit's reasoning is included here:

> First, the effects of the Project are highly controversial and uncertain, thus mandating the creation of an EIS. *See* 40 C.F.R. § 1508.27(b)(4) & (5) (listing relevant factors for whether an EIS is required, including if the project's effects are "highly controversial" and "highly uncertain"). The stated primary purpose of the CCR Project is to reduce the risk of wildfires and promote safe fire-suppression activities, but Appellants identify considerable scientific evidence showing that variable density thinning will not achieve this purpose. Considering both context and intensity, as required by 40 C.F.R. § 1508.27,

this evidence raises substantial questions about the Project's environmental impact, and an EIS is required. *See, e.g., Blackwood,* 161 F.3d at 1212; *Native Ecosystems Council,* 428 F.3d at 1238-39.

"A project is `highly controversial' if there is a `substantial dispute [about] the size, nature, or effect of the major Federal action rather than the existence of opposition to a use.'" *Native Ecosystems Council,* 428 F.3d at 1240 (alteration in original) (quoting *Blackwood,* 161 F.3d at 1212). "A substantial dispute exists when evidence ... casts serious doubt upon the reasonableness of an agency's conclusions." *In Def. of Animals,* 751 F.3d at 1069 (quoting *Babbitt,* 241 F.3d at 736). "[M]ere opposition alone is insufficient to support a finding of controversy." *WildEarth Guardians v. Provencio,* 923 F.3d 655, 673 (9th Cir. 2019).

The EA explained that the CCR Project will use "variable density thinning" to address wildfire concerns. "In variable density thinning, selected trees of all sizes ... would be removed." This process would assertedly make the treated areas "more resilient to perturbations such as ... large-scale high-intensity fire occurrence because of the reductions in total stand density." Variable density thinning will occur in the entire Project area.

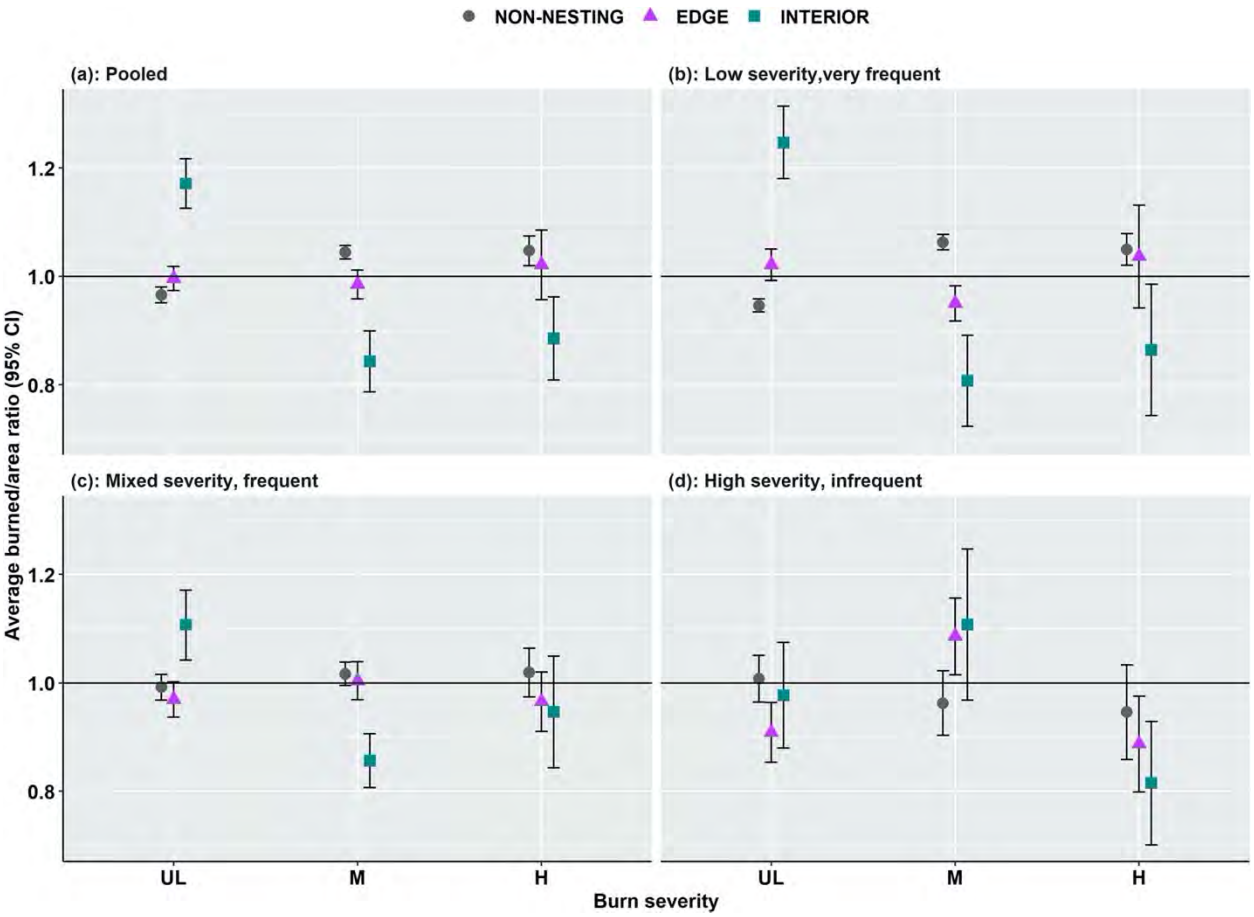
Substantial expert opinion presented by the Appellants during the administrative process disputes the USFS's conclusion that thinning is helpful for fire suppression and safety. For example, Oregon Wild pointed out in its EA comments that "[f]uel treatments have a modest effect on fire behavior, and could even make fire worse instead of better." It averred that removing mature trees is especially likely to have a net negative effect on fire suppression. Importantly, the organization pointed to expert studies and research reviews that support this assertion.

Bark also raised this issue: "It is becoming more and more commonly accepted that reducing fuels does not consistently prevent large forest fires, and seldom significantly 871*871 reduces the outcome of these large fires," citing an article from *Forest Ecology and Management.* Bark also directed the USFS to a recent study published in *The Open Forest Science Journal,* which concluded that fuel treatments are unlikely to reduce fire severity and consequent impacts, because often the treated area is not affected by fire before the fuels return to normal levels. Bark further noted that, while "Bark discussed [during the scoping process] the studies that have found that fuel reduction may actually exacerbate fire severity in some cases as such projects leave behind combustible slash, open the forest canopy to create more ground-level biomass, and increase solar radiation which dries out the understory[,] [t]he EA did not discuss this information."

Oregon Wild also pointed out in its EA comments that fuel reduction does not necessarily suppress fire. Indeed, it asserted that "[s]ome fuel can actually help reduce fire, such as deciduous hardwoods that act as heat sinks (under some conditions), and dense canopy fuels that keep the forest cool and moist and help suppress the growth of surface and ladder fuels...." Oregon Wild cited more than ten expert sources supporting this view.

> Importantly, even the Fuels Specialist Report produced by the USFS itself noted that "reducing canopy cover can also have the effect of increasing [a fire's rate of spread] by allowing solar radiation to dry surface fuels, allowing finer fuels to grow on ... the forest floor, and reducing the impact of sheltering from wind the canopy provides."
>
> The effects analysis in the EA did not engage with the considerable contrary scientific and expert opinion; it instead drew general conclusions such as that "[t]here are no negative effects to fuels from the Proposed Action treatments." Appellants thus have shown a substantial dispute about the effect of variable density thinning on fire suppression. Although it is not our role to assess the merits of whether variable density thinning is indeed effective in the project area to prevent fires, or to take sides in a battle of the experts, *see* *Greenpeace Action v. Franklin*, 14 F.3d 1324, 1333 (9th Cir. 1992), NEPA requires agencies to consider all important aspects of a problem. *See* *WildEarth Guardians*, 759 F.3d at 1069-70. Throughout the USFS's investigative process, Appellants pointed to numerous expert sources concluding that thinning activities do not improve fire outcomes. In its responses to these comments and in its finding of no significant impact, the USFS reiterated its conclusions about vegetation management but did not engage with the substantial body of research cited by Appellants. This dispute is of substantial consequence because variable density thinning is planned in the entire Project area, and fire management is a crucial issue that has wide-ranging ecological impacts and affects human life. When one factor alone raises "substantial questions" about whether an agency action will have a significant environmental effect, an EIS is warranted. *See* *Ocean Advocates v. U.S. Army Corps of Eng'rs*, 402 F.3d 846, 865 (9th Cir. 2005) ("We have held that one of [the NEPA intensity] factors may be sufficient to require preparation of an EIS in appropriate circumstances."). Thus, the USFS's decision not to prepare an EIS was arbitrary and capricious. *See* *Blackwood*, 161 F.3d at 1213 (holding that conflicting evidence on the effects of ecological intervention in post-fire landscapes made a proposed project highly uncertain, thus requiring an EIS).

The Forest Service's own scientists (Lesmeister et al. 2021) recently conducted a massive, landmark 30-year study—a substantial portion of which was conducted in such forests—and found that, in these forest types (most frequent fire regime), the densest forests with the highest biomass, highest canopy cover, and highest tree densities, on average had lower wildfire severities when fires occurred when compared to more open, lower-density forests resulting from mechanical thinning and other logging operations (see Figure 4b from Lesmeister et al. 2021 below). The Forest Service scientists concluded that more open forests with lower biomass had higher fire severity, because the type of open, lower-biomass forests resulting from thinning and other logging activities have "hotter, drier, and windier microclimates, and those conditions decrease dramatically over relatively short distances into the interior of older forests with multi-layer canopies and high tree density..."



(Figure 4 from Lesmeister et al. 2021—values above 1.0 are relatively more likely, and values below 1.0 are relatively less likely)

Notably, Lesmeister et al. (2021) made the same finding in their analysis of more mesic forests, including mesic mixed-conifer forests.

Other Forest Service scientists, in Lydersen et al. (2014), reported the following finding in the 257,000-acre Rim fire of 2013:

> "Density of small to intermediate size trees (20–40 cm dbh in the analysis with all plots and both 40–60 cm and 60–80 cm dbh in the analysis excluding plots burned on a plume-dominated day) were also related to Rim Fire severity, with **plots with a greater small tree density tending to burn with lower severity**."

The very largest scientific analysis ever conducted in dry forests on the subject of tree removal and wildfire severity, Bradley et al. (2016), found that forests completely protected from tree removal had the lowest fire severity, while forests with some limited tree removal allowed had

higher levels of fire severity, and forests with the fewest environmental protections and the most tree removal had the highest fire severity. The authors concluded the following:

> "We found forests with higher levels of protection [from tree removal] had lower severity values even though they are generally identified as having the highest overall levels of biomass and fuel loading. Our results suggest a need to reconsider current overly simplistic assumptions about the relationship between forest protection and fire severity in fire management and policy."

I made similar findings in Hanson (2021) in dry forests in the approximately 380,000-acre Creek fire of 2020 in the southern Sierra Nevada, reporting that, based on the Forest Service's own data, forests with previous logging under the rubric of "fuel reduction"—specifically, mechanical thinning and post-fire logging—had overall higher fire severity than unmanaged forests.

More recently, scientists have begun looking at another key question regarding mechanical thinning and wildfire severity in dry forests, related to overall combined tree mortality from thinning itself and subsequent wildfire, including Baker and Hanson (2022) (pertaining to the Caldor fire of 2021 in the northern Sierra Nevada), and DellaSala et al. (2022) (pertaining to the Wallow fire of 2011 in Arizona). Baker and Hanson (2022) explained why some studies have erroneously reported that mechanical thinning is effective as a wildfire management approach:

> "Despite controversy regarding thinning, there is a body of scientific literature that suggests commercial thinning should be scaled up across western US forest landscapes as a wildfire management strategy. This raises an important question: what accounts for the discrepancy on this issue in the scientific literature? We believe several factors are likely to largely explain this discrepancy. First and foremost, because most previous research has not accounted for tree mortality from thinning itself, prior to the wildfire-related mortality, such research has underreported tree mortality in commercial thinning areas relative to unthinned forests. Second, some prior studies have not controlled for vegetation type, which can lead to a mismatch when comparing severity in thinned areas to the rest of the fire area given that thinning necessarily occurs in conifer forests but unthinned areas can include large expanses of non-conifer vegetation types that burn almost exclusively at high severity, such as grasslands and chaparral. Third, some research reporting effectiveness of commercial thinning in terms of reducing fire severity has been based on the subjective location of comparison sample points between thinned and adjacent unthinned forests. Fourth, reported results have often been based on theoretical models, which subsequent research has found to overestimate the effectiveness of thinning. Last, several case studies draw conclusions about the effectiveness of thinning as a wildfire management strategy when the results of those studies do not support such a conclusion, as reviewed in DellaSala et al. (2022)." (internal citations omitted).

Below is a summary of numerous scientific sources in key subject areas that implicate both the impacted environment as well as public safety. Key findings are quoted and/or summarized, and sources authored or co-authored by U.S. Forest Service scientists are indicated in bold.

The only effective way to protect homes from fire is home-hardening and defensible space pruning within about 100 feet of homes or less.

Cohen, J.D. (**U.S. Forest Service**). 2000. Preventing disaster: home ignitability in the wildland-urban interface. Journal of Forestry 98: 15-21.

> The only relevant zone to protect homes from wildland fire is within approximately 100 feet or less from each home—not out in wildland forests.

Gibbons P, van Bommel L, Gill MA, Cary GJ, Driscoll DA, Bradstock RA, Knight E, Moritz MA, Stephens SL, Lindenmayer DB (2012) Land management practices associated with house loss in wildfires. PLoS ONE **7**: Article e29212.

> Defensible space pruning within approximately 100 feet from homes was effective at protecting homes from wildfires, while vegetation management in remote wildlands was not.

Syphard, A.D., T.J. Brennan, and J.E. Keeley. 2014. The role of defensible space for residential structure protection during wildfires. Intl. J. Wildland Fire 23: 1165-1175.

> Vegetation management and removal beyond approximately 100 feet from homes provides no additional benefit in terms of protecting homes from wildfires.

Tree removal is not necessary prior to conducting prescribed fire or prescribed natural fire (managed wildfire).

Decades of scientific studies have proven that, even in the densest forests that have not experienced fire in many decades, prescribed fire can be applied without prior tree removal, as demonstrated in the following studies:

Knapp EE, Keeley JE, Ballenger EA, Brennan TJ. 2005. Fuel reduction and coarse woody debris dynamics with early season and late season prescribed fire in a Sierra Nevada mixed conifer forest. Forest Ecology and Management 208: 383–397.

Knapp, E.E., and Keeley, J.E. 2006. Heterogeneity in fire severity within early season and late season prescribed burns in a mixed-conifer forest. Int. J. Wildland Fire 15: 37–45.

Knapp, E.E., Schwilk, D.W., Kane, J.M., Keeley, J.E., 2007. Role of burning on initial understory vegetation response to prescribed fire in a mixed conifer forest. Canadian Journal of Forest Research 37: 11–22.

van Mantgem, P.J., A.C. Caprio, N.L. Stephenson, and A.J. Das. 2016. Does prescribed fire promote resistance to drought in low elevation forests of the Sierra Nevada, California, USA? Fire Ecology 12: 13-25.

van Mantgem, P.J., N.L. Stephenson, J.J. Battles, E.K. Knapp, and J.E. Keeley. 2011. Long-term effects of prescribed fire on mixed conifer forest structure in the Sierra Nevada, California. Forest Ecology and Management 261: 989−994.

Stephens, S.L., et al. 2021. Fire, water, and biodiversity in the Sierra Nevada: a possible triple win. Environmental Research Communications 3: Article 081004.

A large and growing body of scientific evidence and opinion concludes that thinning and post-fire logging in wildlands, conducted under the guise of fuel reduction and fire breaks, is an ineffective and counterproductive way to protect communities, and it tends to make wildfires spread faster and often more intensely toward towns, putting nearby communities at greater risk.

Calkin, D.E., Barrett, K., Cohen, J.D., Finney, M.A., Pyne, S.J., and Quarles, S.L. (**co-authored by U.S. Forest Service**). 2023. Wildland-urban fire disasters aren't actually a wildfire problem. Proceedings of the National Academy of Sciences of the United States of America. 120: e2315797120.

> "The best way to make existing wildfire-vulnerable developments ignition resistant is to work within the limited area of the 'home ignition zone'—a home and its surroundings within 100 feet (which may include neighboring homes)."
>
> The authors noted that wildfires are driven by climate and climate change, and criticized the current federal management approach embodied in the 2022 Wildfire Crisis Strategy, and in the 2021 Infrastructure Act and 2022 Inflation Reduction Act, that is focused on thinning tens of millions of acres of public, private, and Tribal forests in the western U.S. The authors concluded that we must recognize that wildfire in forests and other wildlands is not only inevitable, but also there is an "ecological necessity" that wildfires occur for native biodiversity benefits. The scientists concluded that the "best way" to protect homes and lives is to focus attention and resources directly on communities, using proven methods to make them fire safe, noting that the current approach is leading to more, not fewer, losses of homes and lives. They promoted "direct funding and technical assistance to communities", instead of spending many billions of dollars managing forests distant from homes.

USFS (U.S. Forest Service) (2022). Gallinas-Las Dispensas Prescribed Fire Declared Wildfire Review. U.S. Forest Service, Office of the Chief, Washington, D.C.

> **Thinning followed by burning caused a massive fire that destroyed communities.**

Thinning reduced canopy cover, increasing growth of combustible grasses; associated pile burning caused a huge wildfire, spreading rapidly through thinned areas, burning many homes.

Lesmeister, D.B., et al. (**co-authored by U.S. Forest Service**). 2019. Mixed-severity wildfire and habitat of an old-forest obligate. Ecosphere10: Article e02696.

Denser, older forests with high canopy cover had lower fire severity and "buffer the negative effects of climate change" regarding wildfires.

"Thinned forests have more open conditions, which are associated with higher temperatures, lower relative humidity, higher wind speeds, and increasing fire intensity. Furthermore, live and dead fuels in young forest or thinned stands with dense saplings or shrub understory will be drier, making ignition and high heat more likely, and the rate of spread higher because of the relative lack of wind breaks provided by closed canopies with large trees."

Lesmeister, D.B., et al. (**co-authored by U.S. Forest Service**). 2021. Northern spotted owl nesting forests as fire refugia: a 30-year synthesis of large wildfires. Fire Ecology 17: Article 32.

More open forests with lower biomass had higher fire severity, because the type of open, lower-biomass forests resulting from thinning and other logging activities have "hotter, drier, and windier microclimates, and those conditions decrease dramatically over relatively short distances into the interior of older forests with multi-layer canopies and high tree density…"

Reilly, M.J., et al. (**co-authored by U.S. Forest Service**). 2022. Cascadia Burning: The historic, but not historically unprecedented, 2020 wildfires in the Pacific Northwest, USA. Ecosphere 13: e4070.

Weather conditions primarily determined fire severity, and forest density was not a factor.

"We found minimal difference in burn severity among stand structural types related to previous management in the 2020 fires. Adaptation strategies for similar fires in the future could benefit by focusing on ignition prevention, fire suppression, and community preparedness, as opposed to fuel treatments that are unlikely to mitigate fire severity during extreme weather."

North, M.P., S.L. Stephens, B.M. Collins, J.K. Agee, G. Aplet, J.F. Franklin, and P.Z. Fule (**co-authored by U.S. Forest Service**). 2015. Reform forest fire management. Science 349: 1280-1281.

"…fire is usually more efficient, cost-effective, and ecologically beneficial than mechanical treatments."

Lydersen, J. M., M. P. North, and B. M. Collins (**co-authored by U.S. Forest Service**). 2014. Severity of an uncharacteristically large wildfire, the Rim Fire, in forests with relatively restored frequent fire regimes. Forest Ecology and Management 328:326–334.

> In the Rim fire of 2013, the authors found that mature mixed-conifer and ponderosa pine forests with "a greater small tree density tend[ed] to burn with lower severity."

Meigs, G.W., et al. (**co-authored by U.S. Forest Service**). 2020. Influence of topography and fuels on fire refugia probability under varying fire weather in forests of the US Pacific Northwest. Canadian Journal of Forest Research 50: 636-647.

> Forests with higher pre-fire biomass are more likely to experience low-severity fire.

Thompson, J.R., Spies, T.A., Ganio, L.M. (**co-authored by U.S. Forest Service**). 2007. Reburn severity in managed and unmanaged vegetation in a large wildfire. Proceedings of the National Academy of Sciences of the United States of America 104: 10743–10748.

> "Areas that were salvage-logged and planted after the initial fire burned more severely than comparable unmanaged areas."

Thompson, J.R., Spies, T.A. (**co-authored by U.S. Forest Service**). 2009. Vegetation and weather explain variation in crown damage within a large mixed-severity wildfire. Forest Ecology and Management 258: 1684-1694.

> Mature forests with higher canopy cover had lower fire severity.

Thompson, J., and T.A. Spies (**co-authored by U.S. Forest Service**). 2010. Exploring Patterns of Burn Severity in the Biscuit Fire in Southwestern Oregon. Fire Science Brief 88: 1-6.

> "Areas that burned with high severity…in a previous wildfire (in 1987, 15 years prior) were more likely to burn with high severity again in the 2002 Biscuit Fire. Areas that were salvage-logged and planted following the 1987 fire burned with somewhat higher fire severity than equivalent areas that had not been logged and planted."

Graham, R., et al. (**U.S. Forest Service**). 2012. Fourmile Canyon Fire Findings. Gen. Tech. Rep. RMRS-GTR-289. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 110 p.

> Thinned forests "were burned more severely than neighboring areas where the fuels were not treated", and 162 homes were destroyed by the Fourmile Canyon Fire (see Figs. 45 and 46).

Morris, W.G. (**U.S. Forest Service**). 1940. Fire weather on clearcut, partly cut, and virgin timber areas at Westfir, Oregon. Timberman 42: 20-28.

"This study is concerned with one of these factors - the fire-weather conditions near ground level - on a single operation during the first summer following logging. These conditions were found to be more severe in the clear-cut area than in either the heavy or light partial cutting areas and more severe in the latter areas than in virgin timber."

Countryman, C.M. (**U.S. Forest Service**). 1956. Old-growth conversion also converts fire climate. Fire Control Notes 17: 15-19.

Partial cutting (thinning) increases wildfire severity, due to microclimate impacts, regardless of whether or how the slash debris is treated.

"Although the general relations between weather factors, fuel moisture, and fire behavior are fairly well known, the importance of these changes following conversion and their combined effect on fire behavior and control is not generally recognized. The term 'fireclimate,' as used here, designates the environmental conditions of weather and fuel moisture that affect fire behavior. It does not consider fuel created by slash because regardless of what forest managers do with slash, they still have to deal with the new fireclimate. In fact, the changes in wind, temperature, humidity, air structure, and fuel moisture may result in greater changes in fire behavior and size of control job than does the addition of more fuel in the form of slash."

"Conversion which opens up the canopy by removal of trees permits freer air movement and more sunlight to reach the ground. The increased solar radiation in turn results in higher temperatures, lower humidity, and lower fuel moisture. The magnitude of these changes can be illustrated by comparing the fireclimate in the open with that in a dense stand."

"A mature, closed stand has a fireclimate strikingly different from that in the open. Here nearly all of the solar radiation is intercepted by the crowns. Some is reflected back to space and the rest is converted to heat and distributed in depth through the crowns. Air within the stand is warmed by contact with the crowns, and the ground fuels are in turn warmed only by contact with the air. The temperature of fuels on the ground thus usually approximates air temperature within the stand."

"Temperature profiles in a dense, mixed conifer stand illustrate this process (fig. 2). By 8 o'clock in the morning, air within the crowns had warmed to 68° F. Air temperature near the ground was only 50°. By 10 o'clock temperatures within the crowns had reached 82° and, although the heat had penetrated to lower levels, air near the surface at 77° was still cooler than at any other level. At 2:00 p.m., air temperature within the stand had become virtually uniform at 87°. In the open less than one-half mile away, however, the temperature at the surface of pine litter reached 153° at 2:00 p.m."

"Because of the lower temperature and higher humidity, fuels within the closed stand are more moist than those in the open under ordinary weather conditions. Typically, when moisture content is 3 percent in the open, 8 percent can be expected in the stand."

> "Moisture and temperature differences between open and closed stands have a great effect on both the inception and the behavior of fire. For example, fine fuel at 8-percent moisture content will require nearly one-third more heat for ignition than will the same fuel at 3-percent moisture content. Thus, firebrands that do not contain enough heat to start a fire in a closed stand may readily start one in the open."
>
> "When a standard fire weather station in the open indicates a temperature of 85° F., fuel moisture of 4 percent, and a wind velocity of 15 m.p.h.--not unusual burning conditions in the West--a fire starting on a moderate slope will spread 4.5 times as fast in the open as in a closed stand. The size of the suppression job, however, increases even more drastically."
>
> "Greater rate of spread and intensity of burning require control lines farther from the actual fire, increasing the length of fireline. Line width also must be increased to contain the hotter fire. Less production per man and delays in getting additional crews complicate the control problem on a fast-moving fire. It has been estimated that the size of the suppression job increases nearly as the square of the rate of forward spread. Thus, fire in the open will require 20 times more suppression effort. In other words, for each man required to control a surface fire in a mature stand burning under these conditions, 20 men will be required if the area is clear cut."
>
> "Methods other than clear cutting, of course, may bring a less drastic change in fireclimate. Nevertheless, the change resulting from partial cutting can have important effects on fire. The moderating effect that a dense stand has on the fireclimate usually results in slow-burning fires. Ordinarily, in dense timber only a few days a year have the extreme burning conditions under which surface fires produce heat rapidly enough to carry the fire into the crowns. Partial cutting can increase the severity of the fireclimate enough to materially increase the number of days when disastrous crown fires can occur."

SNEP (**co-authored by U.S. Forest Service**). 1996. Sierra Nevada Ecosystem Project, Final Report to Congress: Status of the Sierra Nevada. Vol. I: Assessment summaries and management strategies. Davis, CA: University of California, Davis, Center for Water and Wildland Resources.

> "Timber harvest, through its effects on forest structure, local microclimate, and fuel accumulation, has increased fire severity more than any other recent human activity."

Chen, J., et al. (**co-authored by U.S. Forest Service**). 1999. Microclimate in forest ecosystem and landscape ecology: Variations in local climate can be used to monitor and compare the effects of different management regimes. BioScience 49: 288–297.

> When moving from open forest areas, resulting from logging, and into dense forests with high canopy cover, "there is generally a decrease in daytime summer temperatures but an increase in humidity…"

> The authors reported a 5° C difference in ambient air temperature between a closed-canopy mature forest and a forest with partial cutting, like a commercial thinning unit (Fig. 4b), and noted that such differences are even greater than the increases in temperature predicted due to anthropogenic climate change.

Dombeck, M. (**U.S. Forest Service Chief**). 2001. How Can We Reduce the Fire Danger in the Interior West. Fire Management Today 61: 5-13.

> "Some argue that more commercial timber harvest is needed to remove small-diameter trees and brush that are fueling our worst wildlands fires in the interior West. However, small-diameter trees and brush typically have little or no commercial value. To offset losses from their removal, a commercial operator would have to remove large, merchantable trees in the overstory. Overstory removal lets more light reach the forest floor, promoting vigorous forest regeneration. Where the overstory has been entirely removed, regeneration produces thickets of 2,000 to 10,000 small trees per acre, precisely the small-diameter materials that are causing our worst fire problems. In fact, many large fires in 2000 burned in previously logged areas laced with roads. It seems unlikely that commercial timber harvest can solve our forest health problems."

Hanson, C.T. 2021. Is "Fuel Reduction" Justified as Fire Management in Spotted Owl Habitat? Birds 2: 395-403.

> **Thinning followed by burning and post-fire logged areas had higher overall fire severity.**
>
> "Within the forest types inhabited by California Spotted Owls, high-severity fire occurrence was not higher overall in unmanaged forests and was not associated with the density of pre-fire snags from recent drought in the Creek Fire, contrary to expectations under the fuel reduction hypothesis. Moreover, fuel-reduction logging in California Spotted Owl habitats was associated with higher fire severity in most cases. The highest levels of high-severity fire were in the categories with commercial logging (post-fire logging, private commercial timberlands, and commercial thinning), while the three categories with lower levels of high-severity fire were in forests with no recent forest management or wildfire, less intensive noncommercial management, and unmanaged forests with re-burning of mixed-severity wildfire, respectively."

Baker, B.C., and C.T. Hanson. 2022. Cumulative tree mortality from commercial thinning and a large wildfire in the Sierra Nevada, California. Land 11: Article 995.

> **Thinning followed by burning increases overall fire severity.**
>
> "Similar to the findings of Hanson (2022) in the Antelope Fire of 2021 in northern California, in our investigation of the Caldor Fire of 2021 we found significantly higher cumulative severity in forests with commercial thinning than in unthinned forests, indicating that commercial thinning killed significantly more trees than it prevented from being killed in the Caldor Fire…Despite controversy regarding thinning, there is a body

of scientific literature that suggests commercial thinning should be scaled up across western US forest landscapes as a wildfire management strategy. This raises an important question: what accounts for the discrepancy on this issue in the scientific literature? We believe several factors are likely to largely explain this discrepancy. First and foremost, because most previous research has not accounted for tree mortality from thinning itself, prior to the wildfire-related mortality, such research has underreported tree mortality in commercial thinning areas relative to unthinned forests. Second, some prior studies have not controlled for vegetation type, which can lead to a mismatch when comparing severity in thinned areas to the rest of the fire area given that thinning necessarily occurs in conifer forests but unthinned areas can include large expanses of non-conifer vegetation types that burn almost exclusively at high severity, such as grasslands and chaparral. Third, some research reporting effectiveness of commercial thinning in terms of reducing fire severity has been based on the subjective location of comparison sample points between thinned and adjacent unthinned forests. Fourth, reported results have often been based on theoretical models, which subsequent research has found to overestimate the effectiveness of thinning. Last, several case studies draw conclusions about the effectiveness of thinning as a wildfire management strategy when the results of those studies do not support such a conclusion, as reviewed in DellaSala et al. (2022)." (internal citations omitted)

DellaSala, D.A., B.C. Baker, C.T. Hanson, L. Ruediger, and W.L. Baker. 2022. Have western USA fire suppression and megafire active management approaches become a contemporary Sisyphus? Biological Conservation 268: Article 109499.

Thinning followed by burning increases overall fire severity.

With regard to a previous U.S. Forest Service study claiming that commercial thinning effectively reduced fire severity in the large Wallow fire of 2011 in Arizona, DellaSala et al. (2022, Section 5.1) conducted a detailed accuracy check and found that the previous analysis had dramatically underreported high-severity fire in commercial thinning units, and forests with commercial thinning in fact had higher fire severity, overall.

DellaSala et al. (2022, Section 5.2) also reviewed several U.S. Forest Service studies relied upon by Prichard et al. (2021) for the claim that commercial thinning is an effective fire management approach and found that the actual results of these cited studies did not support that conclusion.

Beschta, R.L.; Frissell, C.A.; Gresswell, R.; Hauer, R.; Karr, J.R.; Minshall, G.W.; Perry, D.A.; Rhodes, J.J. 1995. Wildfire and salvage logging. Eugene, OR: Pacific Rivers Council.

"We also need to accept that in many drier forest types throughout the region, forest management may have set the stage for fires larger and more intense than have occurred in at least the last few hundred years."

> "With respect to the need for management treatments after fires, there is generally no need for urgency, nor is there a universal, ecologically-based need to act at all. By acting quickly, we run the risk of creating new problems before we solve the old ones."

> "[S]ome argue that salvage logging is needed because of the perceived increased likelihood that an area may reburn. It is the fine fuels that carry fire, not the large dead woody material. We are aware of no evidence supporting the contention that leaving large dead woody material significantly increases the probability of reburn."

Morrison, P.H. and K.J. Harma. 2002. Analysis of Land Ownership and Prior Land Management Activities Within the Rodeo & Chediski Fires, Arizona. Pacific Biodiversity Institute, Winthrop, WA. 13 pp.

> Previous logging was associated with higher fire severity.

Donato DC, Fontaine JB, Campbell JL, Robinson WD, Kauffman JB, Law BE. 2006. *Science* 311: 352.

> "In terms of short-term fire risk, a reburn in [postfire] logged stands would likely exhibit elevated rates of fire spread, fireline intensity, and soil heating impacts…Postfire logging alone was notably incongruent with fuel reduction goals."

Hanson, C.T., Odion, D.C. 2006. Fire Severity in mechanically thinned versus unthinned forests of the Sierra Nevada, California. In: Proceedings of the 3rd International Fire Ecology and Management Congress, November 13-17, 2006, San Diego, CA.

> "In all seven sites, combined mortality [thinning and fire] was higher in thinned than in unthinned units. In six of seven sites, fire-induced mortality was higher in thinned than in unthinned units…Mechanical thinning increased fire severity on the sites currently available for study on national forests of the Sierra Nevada."

Platt, R.V., et al. 2006. Are wildfire mitigation and restoration of historic forest structure compatible? A spatial modeling assessment. Annals of the Assoc. Amer. Geographers 96: 455-470.

> "Compared with the original conditions, a closed canopy would result in a 10 percent reduction in the area of high or extreme fireline intensity. In contrast, an open canopy [from thinning] has the opposite effect, increasing the area exposed to high or extreme fireline intensity by 36 percent. Though it may appear counterintuitive, when all else is equal open canopies lead to reduced fuel moisture and increased midflame windspeed, which increase potential fireline intensity."

Cruz, M.G, and M.E. Alexander. 2010. Assessing crown fire potential in coniferous forests of western North America: A critique of current approaches and recent simulation studies. Int. J. Wildl. Fire. 19: 377–398.

The fire models used by the U.S. Forest Service falsely predict effective reduction in crown fire potential from thinning:

> "Simulation studies that use certain fire modelling systems (i.e. NEXUS, FlamMap, FARSITE, FFE-FVS (Fire and Fuels Extension to the Forest Vegetation Simulator), Fuel Management Analyst (FMAPlus), BehavePlus) based on separate implementations or direct integration of Rothermel's surface and crown rate of fire spread models with Van Wagner's crown fire transition and propagation models are shown to have a significant underprediction bias when used in assessing potential crown fire behaviour in conifer forests of western North America. The principal sources of this underprediction bias are shown to include: (i) incompatible model linkages; (ii) use of surface and crown fire rate of spread models that have an inherent underprediction bias; and (iii) reduction in crown fire rate of spread based on the use of unsubstantiated crown fraction burned functions. The use of uncalibrated custom fuel models to represent surface fuelbeds is a fourth potential source of bias."

DellaSala et al. (2013) (letter from over 200 scientists):

> "Numerous studies also document the cumulative impacts of post-fire logging on natural ecosystems, including…accumulation of logging slash that can add to future fire risks…"

DellaSala et al. (2015) (letter from over 200 scientists):

> "Post-fire logging has been shown to eliminate habitat for many bird species that depend on snags, compact soils, remove biological legacies (snags and downed logs) that are essential in supporting new forest growth, and spread invasive species that outcompete native vegetation and, in some cases, increase the flammability of the new forest. While it is often claimed that such logging is needed to restore conifer growth and lower fuel hazards after a fire, many studies have shown that logging tractors often kill most conifer seedlings and other important re-establishing vegetation and actually increases flammable logging slash left on site. Increased chronic sedimentation to streams due to the extensive road network and runoff from logging on steep slopes degrades aquatic organisms and water quality."

Bradley, C.M. C.T. Hanson, and D.A. DellaSala. 2016. Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western USA? Ecosphere 7: article e01492.

In the largest study on this subject ever conducted in western North American, the authors found that the more trees that are removed from forests through logging, the higher the fire severity overall:

> "We investigated the relationship between protected status and fire severity using the Random Forests algorithm applied to 1500 fires affecting 9.5 million hectares between 1984 and 2014 in pine (*Pinus ponderosa*, *Pinus jeffreyi*) and mixed-conifer forests of western United States, accounting for key topographic and climate variables. We found

> forests with higher levels of protection [from logging] had lower severity values even though they are generally identified as having the highest overall levels of biomass and fuel loading."

Dunn, C.J., et al. 2020. How does tree regeneration respond to mixed-severity fire in the western Oregon Cascades, USA? Ecosphere 11: Article e03003.

> Forests that burned at high-severity had lower, not higher, overall pre-fire tree densities.

Moomaw et al. (2020) (letter from over 200 scientists: https://johnmuirproject.org/2020/05/breaking-news-over-200-top-u-s-climate-and-forest-scientists-urge-congress-protect-forests-to-mitigate-climate-crisis/):

> "Troublingly, to make thinning operations economically attractive to logging companies, commercial logging of larger, more fire-resistant trees often occurs across large areas. Importantly, mechanical thinning results in a substantial net loss of forest carbon storage, and a net increase in carbon emissions that can substantially exceed those of wildfire emissions (Hudiburg et al. 2013, Campbell et al. 2012). Reduced forest protections and increased logging tend to make wildland fires burn *more* intensely (Bradley et al. 2016). This can also occur with commercial thinning, where mature trees are removed (Cruz et al. 2008, Cruz et al. 2014). As an example, logging in U.S. forests emits 10 times more carbon than fire and native insects combined (Harris et al. 2016). And, unlike logging, fire cycles nutrients and helps increase new forest growth."

Moomaw et al. (2021) (letter from over 200 scientists: https://bit.ly/3BFtIAg):

> "[C]ommercial logging conducted under the guise of "thinning" and "fuel reduction" typically removes mature, fire-resistant trees that are needed for forest resilience. We have watched as one large wildfire after another has swept through tens of thousands of acres where commercial thinning had previously occurred due to extreme fire weather driven by climate change. Removing trees can alter a forest's microclimate, and can often increase fire intensity. In contrast, forests protected from logging, and those with high carbon biomass and carbon storage, more often burn at equal or lower intensities when fires do occur.

Bartowitz, K.J., et al. 2022. Forest Carbon Emission Sources Are Not Equal: Putting Fire, Harvest, and Fossil Fuel Emissions in Context. Front. For. Glob. Change 5: Article 867112.

> The authors found that logging conducted as commercial thinning, which involves removal of some mature trees, substantially increases carbon emissions relative to wildfire alone, and commercial thinning "causes a higher rate of tree mortality than wildfire."

Evers, C., et al. 2022. Extreme Winds Alter Influence of Fuels and Topography on Megafire Burn Severity in Seasonal Temperate Rainforests under Record Fuel Aridity. Fire 5: Article 41.

The authors found that dense, mature/old forests with high biomass and canopy cover tended to have lower fire severity, while more open forests with lower canopy cover and less biomass burned more severely.

Baker, W.L., C.T. Hanson, M.A. Williams, and D.A. DellaSala. 2023. Countering Omitted Evidence of Variable Historical Forests and Fire Regime in Western USA Dry Forests: The Low-Severity-Fire Model Rejected. Fire 6: Article 146.

A pattern of omissions of peer-reviewed, published reply articles, which refuted and discredited U.S. Forest Service response articles, created a "falsification" of the scientific record regarding historical forest density and fire regimes. The corrected record shows that historical forests were much denser on average than assumed by the Forest Service and were shaped by mixed-severity fire, not merely low-severity fire.

Sincerely,

Chad Hanson, Ph.D., Ecologist
John Muir Project
P.O. Box 897
Ridgecrest, CA 93556
530-273-9290
cthanson1@gmail.com

Curriculum Vitae of Chad T. Hanson, Ph.D.

Research Ecologist, Earth Island Institute
2150 Allston Way, Suite #460, Berkeley, CA 94704, USA
Phone: (530) 273-9290; Email: cthanson1@gmail.com

EDUCATION

University of California at Davis, Ph.D., Ecology, 2007

University of Oregon, Juris Doctorate, 1995

University of California at Los Angeles, Bachelor of Science, 1991

BOOKS

DellaSala, D.A., and C.T. Hanson (Editors). 2024. Mixed Severity Fires: Nature's Phoenix. Second Edition. Elsevier Inc., Waltham, MA, USA.

Hanson, C.T. 2021. Smokescreen: Debunking Wildfire Myths to Save Our Forests and Our Climate. University Press Kentucky, Lexington, KY.

DellaSala, D.A., and C.T. Hanson (Editors). 2015a. The ecological importance of mixed-severity fires: nature's phoenix. Elsevier Inc., Waltham, MA, USA.

BOOK CHAPTERS

Hanson, C.T. 2022. A Decade of Change in the Sierra Nevada: Conservation Implications. In: DellaSala, D.A. (Editor). Imperiled: The Encyclopedia of Conservation. Elsevier Inc., Waltham, MA, USA. https://doi.org/10.1016/B978-0-12-821139-7.00230-0

Lee, D.E., M.L. Bond, and C.T. Hanson. 2021. When scientists are attacked: strategies for dissident scientists and whistleblowers. In: D.A. DellaSala (ed). Conservation Science & Policy for a Planet in Peril: Speaking Truth to Power. Elsevier: Boston.

DellaSala, D.A., and C.T. Hanson. 2015b. Preface: Higher severity fires as nature's phoenix. In: DellaSala, D.A., and C.T. Hanson (Editors). The ecological importance of mixed-severity fires: nature's phoenix. Elsevier Inc., Waltham, MA, USA.

DellaSala, D.A., and C.T. Hanson. 2015c. Chapter 2: Ecological and biodiversity benefits of mega-fires. In: DellaSala, D.A., and C.T. Hanson (Editors). The ecological importance of mixed-severity fires: nature's phoenix. Elsevier Inc., Waltham, MA, USA.

DellaSala D.A., and Hanson C.T. 2015d. Large Infrequent Fires Are Essential to Forest Dynamics and Biodiversity in Dry Forests of Western North America. Reference Module in Earth Systems and Environmental Sciences, Elsevier, Inc. doi: 10.1016/B978-0-12-409548-9.09571-3.

DellaSala, D.A., C.T. Hanson, W.L. Baker, R.L. Hutto, R.W. Halsey, D.C. Odion, L.E. Berry, R. Abrams, P. Heneberg, H. Sitters, A.J. Arsenault. 2015b. Chapter 13: Flight of the phoenix: coexisting with mixed-severity fires. In: DellaSala, D.A., and C.T. Hanson (Editors). The ecological importance of mixed-severity fires: nature's phoenix. Elsevier Inc., Waltham, MA, USA.

DellaSala, D.A., D.B. Lindenmayer, C.T. Hanson, and J. Furnish. 2015a. Chapter 11: In the aftermath of fire: Logging and related actions degrade mixed- and high-severity burn areas. In: DellaSala, D.A., and C.T. Hanson (Editors). The ecological importance of mixed-severity fires: nature's phoenix. Elsevier Inc., Waltham, MA, USA.

Hanson, C.T., R.L. Sherriff, R.L. Hutto, D.A. DellaSala, T.T. Veblen, and W.L. Baker. 2015. Chapter 1: Setting the stage for mixed- and high-severity fire. In: DellaSala, D.A., and C.T. Hanson (Editors). The ecological importance of mixed-severity fires: nature's phoenix. Elsevier Inc., Waltham, MA, USA.

Whitlock, C., D.A. DellaSala, S. Wolf, and C.T. Hanson. 2015. Chapter 9: Climate change: uncertainties, shifting baselines, and fire management. In: DellaSala, D.A., and C.T. Hanson (Editors). The ecological importance of mixed-severity fires: nature's phoenix. Elsevier Inc., Waltham, MA, USA.

JOURNAL ARTICLES

Hanson, C.T., T.Y. Chi, B.C. Baker, M. Khosla, and M.K. Dorsey. 2024. Post-fire Reproduction of a Serotinous Conifer, the Giant Sequoia, in the Nelder Grove, California. Ecology and Evolution 14: e11213.

Hanson, C.T., T.Y. Chi, M. Khosla, B.C. Baker, and C. Swolgaard. 2024. Reproduction of a serotinous conifer, the giant sequoia, in a large high-severity fire area. Fire 7: Article 44.

Baker, W.L., C.T. Hanson, and D.A. DellaSala. 2023. Harnessing Natural Disturbances: A Nature-Based Solution for Restoring and Adapting Dry Forests in the Western USA to Climate Change. Fire 6: Article 428.

Baker, W.L., C.T. Hanson, M.A. Williams, and D.A. DellaSala. 2023. Countering Omitted Evidence of Variable Historical Forests and Fire Regime in Western USA Dry Forests: The Low-Severity-Fire Model Rejected. Fire **6**: Article 146.

Baker, B.C., and C.T. Hanson. 2022. Cumulative tree mortality from commercial thinning and a large wildfire in the Sierra Nevada, California. Land **11**: Article 995.

Harmon, M.E., C.T. Hanson, and D.A. DellaSala. 2022. Combustion of Aboveground Wood from Live Trees in Megafires, CA, USA. Forests **13**: Article 391.

DellaSala, D.A., B.C. Baker, C.T. Hanson, L. Ruediger, and W.L. Baker. 2022. Have western USA fire suppression and megafire active management approaches become a contemporary Sisyphus? Biological Conservation **268**: Article 109499.

Hanson, C.T. 2022. Cumulative severity of thinned and unthinned forests in a large California

wildfire. Land **11**: Article 373.

Hanson, C.T. 2021. Is “Fuel Reduction” Justified as Fire Management in Spotted Owl Habitat? Birds **2**: 395-403.

Hanson, C.T., D.E. Lee, and M.L. Bond. 2021. Disentangling post-fire logging and high-severity fire effects for spotted owls. Birds **2**: 147-157.

Hanson, C.T., and T.Y. Chi. 2021. Impacts of postfire management are unjustified in spotted owl habitat. Frontiers in Ecology and Evolution **9**: Article 596282.

Hanson, C.T., and T.Y. Chi. 2020. Black-backed woodpecker nest density in the Sierra Nevada, California. Diversity **12**: Article 364.

DellaSala, D.A,, and C.T. Hanson. 2019. Are wildland fires increasing large patches of complex early seral forest habitat? Diversity **11**: Article 157.

Baker, W.L., C.T. Hanson, and M.A. Williams. 2018. Improving the use of early timber inventories in reconstructing historical dry forests and fire in the western United States: reply. Ecosphere **9**: Article e02325.

Hanson, C.T. 2018. Landscape heterogeneity following high-severity fire in California’s forests. Wildlife Society Bulletin **42**: 264-271.

Hanson, C.T. 2018. Wildfire in the age of climate change. BioScience **68**: 146-148.

Hanson, C.T., M.L. Bond, and D.E. Lee. 2018. Effects of post-fire logging on California spotted owl occupancy. Nature Conservation **24**: 93-105.

Baker, W.L., and C.T. Hanson. 2017. Improving the use of early timber inventories in reconstructing historical dry forests and fire in the western United States. Ecosphere **8**: Article e01935.

DellaSala, D.A., R.L. Hutto, C.T. Hanson, M.L. Bond, T. Ingalsbee, D. Odion, and W.L. Baker. 2017. Accomodating mixed-severity fire to restore and maintain ecosystem integrity with a focus on the Sierra Nevada of California, USA. Fire Ecology **13**: 148-171.

Bradley, C.M. C.T. Hanson, and D.A. DellaSala. 2016. Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western USA? Ecosphere **7**: article e01492.

Hanson, C.T., and D.C. Odion. 2016a. 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.

Hanson, C.T., and D.C. Odion. 2016b. A response to Collins, Miller, and Stephens. Natural

Areas Journal **36**: 229-233.

Odion, D.C., C.T. Hanson, W.L. Baker, D.A. DellaSala, and M.A. Williams. 2016. Areas of agreement and disagreement regarding ponderosa pine and mixed conifer forest fire regimes: a dialogue with Stevens et al. PLoS ONE **11**: e0154579.

DellaSala, D.A., and Hanson, C.T. Large Infrequent Fires Are Essential to Forest Dynamics and Biodiversity in Dry Forests of Western North America. Reference Module in Earth Systems and Environmental Sciences, Elsevier, 2015. 09-Nov-15 doi: 10.1016/B978-0-12-409548-9.09571-3.

Hanson, C.T. 2015. Use of higher-severity fire areas by female Pacific fishers on the Kern Plateau, Sierra Nevada, California, USA. The Wildlife Society Bulletin **39**: 497-502.

Hanson, C.T., and D.C. Odion. 2015. Sierra Nevada fire severity conclusions are robust to further analysis: a reply to Safford et al. International Journal of Wildland Fire **24**: 294-295.

Hanson, C.T. 2014. Conservation concerns for Sierra Nevada birds associated with high-severity fire. Western Birds **45**: 204-212.

DellaSala, D.A., M.L. Bond, C.T. Hanson, R.L. Hutto, and D.C. Odion. 2014. Complex early seral forests of the Sierra Nevada: what are they and how can they be managed for ecological integrity? Natural Areas Journal **34**: 310-324.

Odion, D.C., C.T. Hanson, C.T., D.A. DellaSala, W.L. Baker, and M.L. Bond. 2014a. Effects of fire and commercial thinning on future habitat of the Northern Spotted Owl. The Open Ecology Journal **7**: 37-51.

Odion, D.C., C.T. Hanson, A. Arsenault, W.L. Baker, D.A. DellaSala, R.L. Hutto, W. Klenner, M.A. Moritz, R.L. Sherriff, T.T. Veblen, and M.A. Williams. 2014b. Examining historical and current mixed-severity fire regimes in ponderosa pine and mixed-conifer forests of western North America. PLoS ONE **9**: e87852.

Hanson, C.T., and D.C. Odion. 2014. Is fire severity increasing in the Sierra Nevada mountains, California, USA? International Journal of Wildland Fire **23**: 1-8.

DellaSala, D.A., R.G. Anthony, M.L. Bond, E.S. Fernandez, C.A. Frissell, and C.T. Hanson. 2013. Alternate views of a restoration framework for federal forests in the Pacific Northwest. Journal of Forestry **111**: 420-429.

Hanson, C.T. 2013. Pacific fisher habitat use of a heterogeneous post-fire and unburned landscape in the southern Sierra Nevada, California, USA. The Open Forest Science Journal **6**: 24-30.

Odion, D.C., and Hanson, C.T. 2013. Projecting impacts of fire management on a biodiversity indicator in the Sierra Nevada and Cascades, USA: the Black-backed Woodpecker. The Open Forest Science Journal **6**: 14-23.

Hanson, C.T., D.A. DellaSala, and M.L. Bond. 2013. The overlooked benefits of wildfire. BioScience **63**: 243.

DellaSala D., M. Bond, W. Baker, D. Odion, and C. Hanson. 2010. A reply to North et al. Wildlife Professional, Summer 2010.

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

Hanson, C.T., and M.P. North. 2009. Post-fire survival and flushing in three Sierra Nevada conifers with high initial crown scorch. International Journal of Wildland Fire **18**: 857-864.

Bond, M.L., D.E. Lee, C.M. Bradley, and C.T. Hanson. 2009. Influence of pre-fire mortality from insects and drought on burn severity in conifer forests of the San Bernardino Mountains, California. The Open Forest Science Journal **2**: 41-47.

Hanson, C.T., D.C. Odion, D.A. DellaSala, and W.L. Baker. 2009. Overestimation of fire risk in the Northern Spotted Owl Recovery Plan. Conservation Biology **23**: 1314-1319.

Hanson, C.T., and M.P. North. 2008. Postfire woodpecker foraging in salvage-logged and unlogged forests of the Sierra Nevada. The Condor **110**: 777-782.

Odion, D.C., and C.T. Hanson. 2008. Fire severity in the Sierra Nevada revisited: conclusions robust to further analysis. Ecosystems **11**: 12-15.

Hanson, C.T. 2007. Post-fire management of snag forest habitat in the Sierra Nevada. Ph.D. dissertation, University of California at Davis. Davis, CA.

Hanson, C.T., and M.P. North. 2006. Post-fire epicormic branching in Sierra Nevada *Abies concolor* (white fir). International Journal of Wildland Fire **15**: 31-35.

Odion, D.C., and C.T. Hanson. 2006. Fire severity in conifer forests of the Sierra Nevada, California. Ecosystems **9**: 1177-1189.

Hanson, C.T., Odion, D.C. 2006. Fire Severity in mechanically thinned versus unthinned forests of the Sierra Nevada, California. In: Proceedings of the 3rd International Fire Ecology and Management Congress, November 13-17, 2006, San Diego, CA.

OTHER PUBLICATIONS

Bond, M.L., and C.T. Hanson. 2014. Petition to list the California spotted owl (*Strix occidentalis occidentalis*) as threatened or endangered under the federal Endangered Species Act. John Muir Project of Earth Island Institute, Big Bear City, CA, USA.

Hanson, C.T., J. Augustine, K. Coulter, and D. Short. 2012. Petition to list the Black-backed woodpecker (*Picoides arcticus*) as threatened or endangered under the federal Endangered Species Act. John Muir Project of Earth Island Institute, Big Bear City, CA, USA.

Hanson, C.T., and B. Cummings. 2010. Petition to the California Fish and Game Commission to list the Black-backed woodpecker (*Picoides arcticus*) as threatened or endangered under the California Endangered Species Act. John Muir Project of Earth Island Institute, Big Bear City, CA, USA.