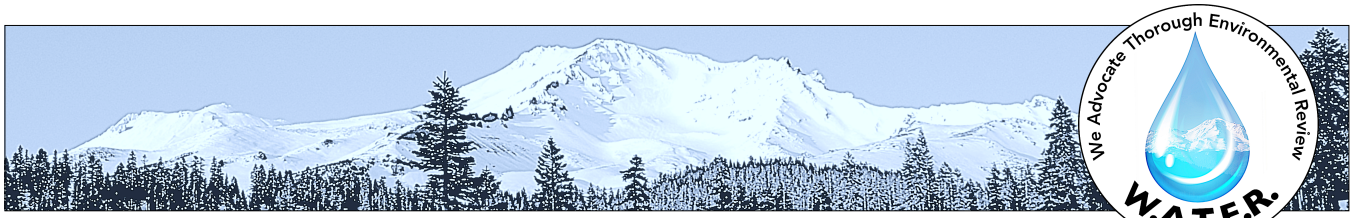

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August 19, 2023

District Ranger Carolyn Napper
USDA-Forest Service
Shasta McCloud Management Unit
204 West Alma Street
Mount Shasta, CA 96067

Comment on the South Fork Sacramento Public Safety and Forest Restoration Project —

We Advocate Thorough Environmental Review, more commonly known as W.A.T.E.R., is a grassroots, nonprofit 501(c)(3) organization dedicated to protecting Mount Shasta's waters and other natural attributes for the benefit of current and future generations. In our ten-plus years as an organization (eight-plus years as a nonprofit) we have focused on protecting our water resources from depletion by extraction and corporate privatization, protecting surface and groundwater from contamination by industrial activity, and protecting the regional environment from other inappropriate and polluting industrial/commercial activities. Our work has clarified for us the following realities:

- The climate crisis is the most urgent existential threat to humanity.
- "Environmentalism" in the 21st century cannot exist without addressing economic and social justice issues.
- Achieving social, economic, environmental, and climate justice requires confronting the dysfunctional economic and political systems that are ruining the planet and stonewalling efforts to change.
- Local issues are not strictly local; they are impacted by what happens regionally, statewide, nationally, and globally. And conversely, what we do in our communities can have far-reaching impacts around the globe.
- It is a moral obligation to protect Mount Shasta's water and other natural attributes.

We believe in the inherent value of all Life. This planet is our only home and each generation has the responsibility to steward the Earth so the biosphere can regenerate and thrive now and for countless generations to come.

The proposed South Fork Sacramento Public Safety and Forest Restoration Project will create significant impacts on the multiple climate, biodiversity and water crises that we are confronted with. The bulk of the Project is predicated on a false premise and the No Action Alternative should be chosen.

The declaration that wildfire risk is growing is fallacious

In the introduction to the Environmental Assessment (EA) of the South Fork Sacramento Public Safety and Forest Restoration Project (SFS Project), it is asserted:

"Wildfires in the West have been growing in size and severity, placing homes, communities, infrastructure, and natural resources at grave and growing risk. Growing wildfire risk is due to past fire exclusion and accumulating fuels, a warming climate, and expanding development in the wildland-urban interface."

This brain-worm meme has infested the public conversation about wildfires and infected the thinking of those who only hear this message and have not investigated the scientific literature on forests and wildfire widely available in this internet age. Contrary to the dire forecast in the introduction to the EA of the SFS Project, scientists who have studied forests and wildfires without having any financial incentives for advocating extractive activities have concluded otherwise about wildfire risk.

> "Projections [to the year 2100] show that under future climate, atmospheric carbon dioxide, and BAU management, an increase in net carbon uptake due to CO_2 fertilization and climate in the mesic ecoregions far outweighs losses from fire and drought in the semiarid ecoregions. **There was not an increasing trend in fire.**[1]" (emphasis added)

The concluding section of the study entitled "Paleoecological Perspectives on Fire Ecology: Revisiting the Fire-Regime Concept" has an excellent summary on the erroneous assumptions engendered by defining too short of a time scale for a fire regime. It is tempting to quote the section in toto but let the following suffice:

> "Current definitions that only consider fire activity over decades or centuries are too short to capture the full range of fire variability in many ecosystems. Definitions of fire regimes that are based on too short a time span may misrepresent underlying fire-fuel linkages and create false impressions about current fire hazard.
>
> Current fire-regime condition classes, which measure the departure of a fire regime from a reference condition, are based on the premise that fire suppression in western U.S. pine forests has moved fire regimes beyond the historical range of variability. Longer tree-ring records and charcoal data in such systems suggest that current fire regimes in some regions are different than 19th century ones, but not beyond the capacity of those forest types. Fire management based on time-since-last-fire statistics overlook long-term patterns that comprise the fire regime. These statistics are at best imprecise and at worst inaccurate.[2]"

Even with the perceived increase in the number and size of wildfires in recent decades, there is still a deficit in the expected amount of fire under historic fire regimes.

> "Despite late twentieth-century increases in area burned, we show that **Pacific Northwest forests have experienced an order of magnitude less fire over 32 yr than expected under historic fire regimes.** Within fires that have burned, severity distributions are disconnected

from historical references. From 1984 to 2015, 1.6 M ha burned; this is 13.3–18.9 M ha less than expected. Deficits were greatest in dry forest ecosystems adapted to frequent, low-severity fire, where 7.2–10.3 M ha of low-severity fire was missing, compared to a 0.2–1.1 M ha deficit of high-severity fire.[3]" (emphasis added)

The Pacific Northwest has also experienced greater amounts of fire in the past due to droughts like the current megadrought[4] occurring.

"Presettlement fire histories indicate a relationship between low precipitation anomalies and widespread fire activity, especially in forests of the western United States. This is consistent with a regional depletion of soil and atmospheric moisture, leading to low moisture in foliage and surface fuels, and ultimately the potential for widespread fire.[5]"

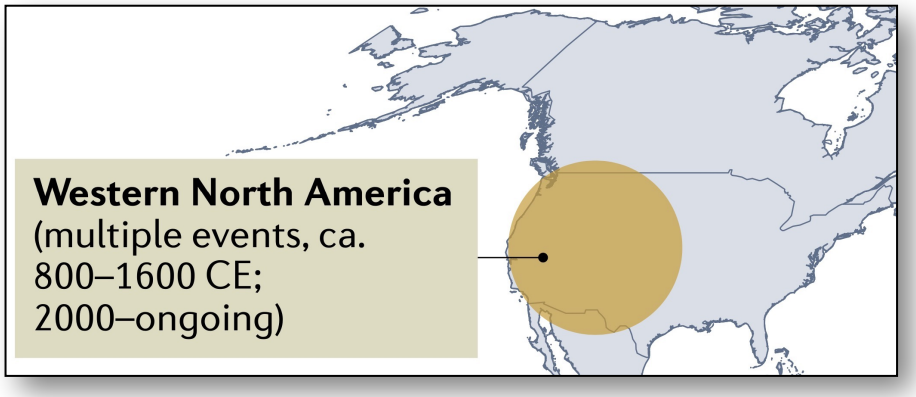

Figure 1 - Common Era Megadroughts[6]

"Higher fire-episode frequency at many sites in the last 2000 years is attributed to greater drought during the Medieval Climate Anomaly [950-1250 CE] and possibly anthropogenic burning. The association between drought, increased fire occurrence, and available fuels evident on several time scales suggests that long-term fire history patterns should be considered in current assessments of historical fire regimes and fuel conditions.[7]"

The behavior of the recent fires that have been occurring may actually have other causes than fire exclusion and accumulating fuels.

"Removal of fire from fire-adapted forests, coupled with other land management practices such as **extensive logging and grazing**, has both changed the severity of fire that has burned and dramatically altered the composition and structure of many forested landscapes. Further, the simultaneous deficit of late seral forests on the landscape could mean that if Fire Regime Groups IV and V forests burned with characteristic amounts of high-severity fire, the forest age and structure distribution might further depart from a natural or historic range of variability.[8]" (emphasis added)

Data since 1926 from the National Interagency Fire Center (Figure 2) corroborates the scientific consensus regarding the wildfire trend. Although there have been several massive fires in California recently — the Camp Fire in 2018 which was the deadliest and most destructive wildfire in California's history burning 153,336 acres[9], and the August Complex Fire of 2020 started by 38 lightning strikes

burning 1,032,648 acres[10] — these fires are eclipsed by the Great Fire of 1910[11] which burned three million acres extending across Northern Idaho and Western Montana with extensions into Eastern Washington and Southeast British Columbia in the summer of 1910. In both 1930 and 1931, over fifty million acres burned across the U.S. far surpassing recent wildfire area totals.

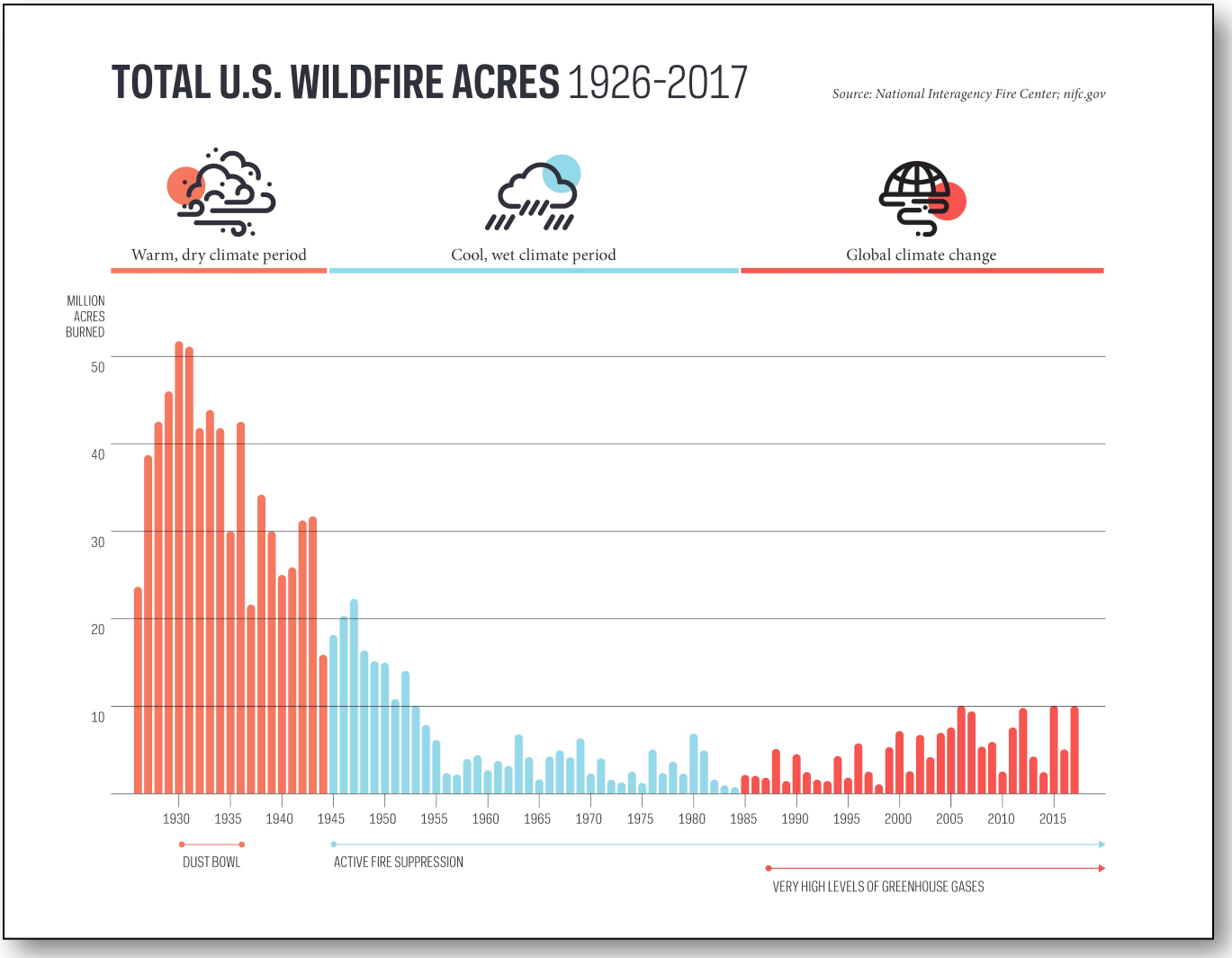

Figure 2 - Data sourced from National Interagency Fire Center — image acquired from cascwild.org[12]

"A warming climate" is mentioned in the SFS Project introduction as a contributing cause to an increase in wildfire, and the congressionally mandated Fourth National Climate Assessment (NCA4) 2017/2018[13] released on November 23, 2018 likewise attributes the recent increase in the cumulative area burned in the western U.S. to climate change.

Volume 1 of the National Climate Assessment, "Climate Science Special Report" (CSSR) was released in October 2017. In the CSSR, researchers reported that "it is extremely likely that human activities, **especially emissions of greenhouse gases**, are the dominant cause of the observed warming since the mid-20th century. For the warming over the last century, there is no convincing alternative explanation supported by the extent of the observational evidence.[14]" (emphasis added)

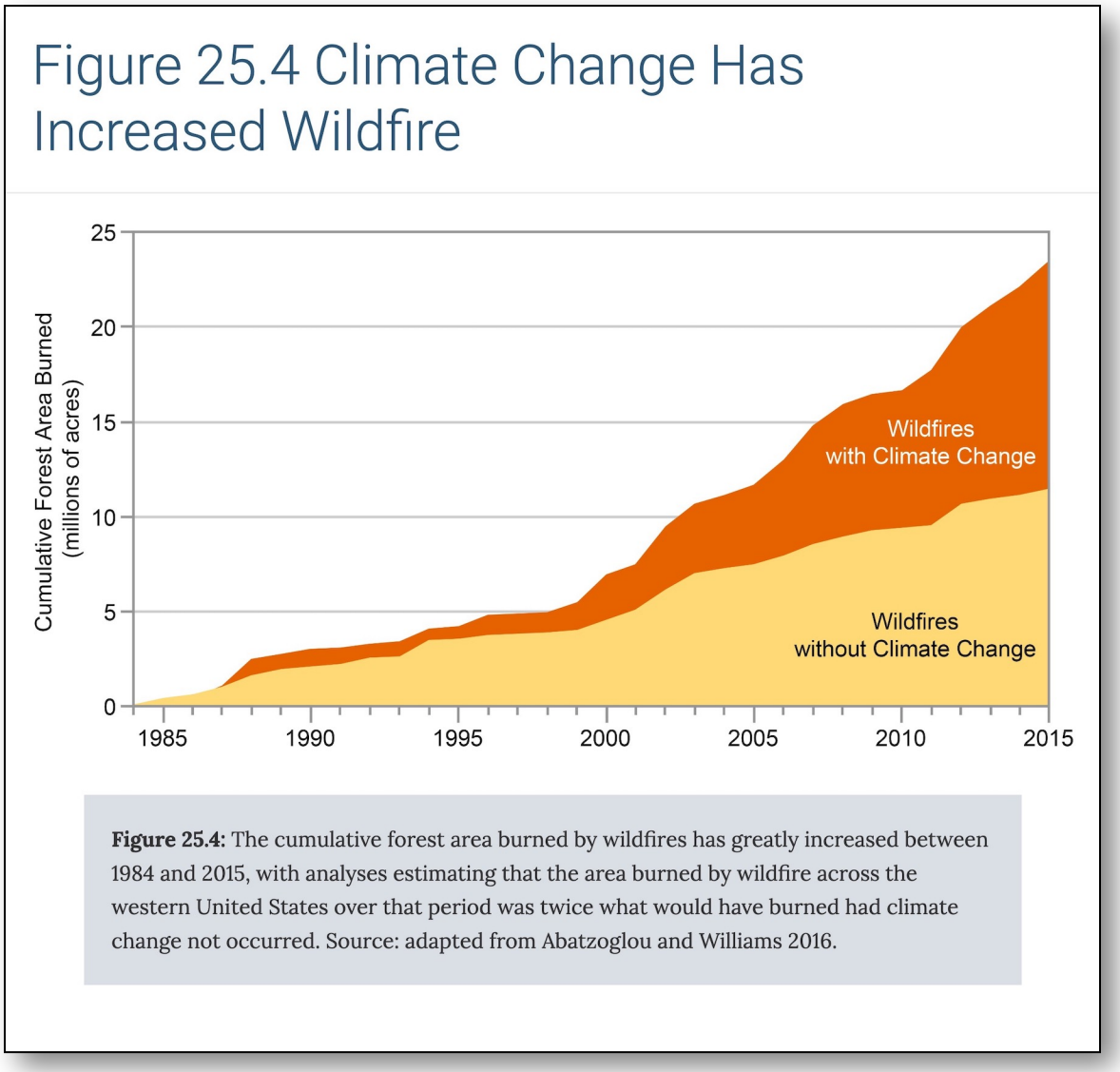

Figure 3 - Image acquired from the Fourth National Climate Assessment, Chapter 25[15]

The impact of "thinning" the forest in the SFS Project

The main thrust of the SFS Project is "thinning" thousands of acres of forest "to increase resiliency to fire" and in the interests of "Public Safety". In a Forest Service publication called "US Forest Service Fire Control Notes" from October, 1956, Clive M. Countryman, then head of fire behavior studies at the Forest Service's Pacific Southwest Forest and Range Experiment Station, in warning against converting forests to wastelands explained the effect thinning and clear-cutting has on forests and the resulting change in fireclimate.

> "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 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. Since the rate of forward spread of fire is largely dependent upon wind velocity, **a much faster rate can be expected**. (emphasis added)
>
> Clear cutting, then, can change fireclimate so that fires start more easily, spread faster, and burn hotter. Partial cutting can increase the severity of the fireclimate enough to materially increase the number of days when disastrous crown fires can occur. (Alternately), the moderating effect that a dense stand has on the fireclimate usually results in slow-burning fires.[16]"

Contrary to the premise that thinning leads to lower intensity wildfires and enhances resiliency, numerous studies are finding the opposite.

> "Using Random Forest ensemble machine learning, we found daily fire weather was the most important predictor of fire severity, followed by stand age and ownership, followed by topographic features. Estimates of pre-fire forest biomass were not an important predictor of fire severity.[17]"
>
> "Overall, closed-forest vegetation had significantly less high-severity fire than the burned landscape as a whole ($Z = -2.19$, $n = 77$, $p = 0.014$). Open forest and non-forest vegetation had considerably more high-severity fire. In our study area, harvest treatments to reduce fire severity based on a model of fuel build-up in the absence of fire would be misdirected because long-unburned areas exhibited the lowest fire severity. The hypothesis that fire severity is greater where previous fire has been long absent was refuted by our study.[18]"
>
> "On the contrary, using over three decades of fire severity data from relatively frequent-fire pine and mixed-conifer forests throughout the western United States, we found support for the opposite conclusion—burn severity tended to be higher in areas with lower levels of protection status (more intense management), after accounting for topographic and climatic conditions in all three model runs.
>
> Thinning without subsequent prescribed fire has little effect on fire severity and, in some cases, can increase fire severity and tree mortality—the effects depend on the improbable co-occurrence of reduced fuels (generally a short time line, within a decade or so) and wildfire activity and can be over-ridden by extreme fire weather.[19]"
>
> "Fuel treatments had previously been applied to several areas within the fire perimeter to modify fire behavior and/or burn severity if a wildfire was to occur. However, the fuel treatments had minimal impact in affecting how the fire burned or the damage it caused. In some cases, treated stands appeared to burn more intensely than adjacent untreated stands, perhaps because of additional surface fuels present as a result of the thinning and higher wind speeds that can occur in open forests compared to those with denser canopies.[20]"

> "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. Numerous articles have cautioned that commercial thinning does not stop wildfires, which are driven mainly by weather and climate factors, and can often increase fire severity by altering a forest's microclimate, increasing sun exposure and wind speeds, and facilitating enhanced growth of more combustible understory grasses and shrubs. A recent theoretical modeling study reported that wildfires are likely to spread faster through thinned forests.[21]"

The Caldor Fire burned down the town of Grizzly Flats despite the assurances given by the Forest Service that recently thinned stands would protect the town from wildfire. The fire proceeded to become the first fire to crest the Sierra Nevada Mountains after burning through heavily managed forest stands.

The Bootleg Fire in Oregon burned over 400,000 acres, also in 2021. An independent analysis of the landscape that burned revealed that tens of thousands of acres of recent extensive thinning, fuel breaks, and other forest management failed to stop or slow the fire's rapid spread.

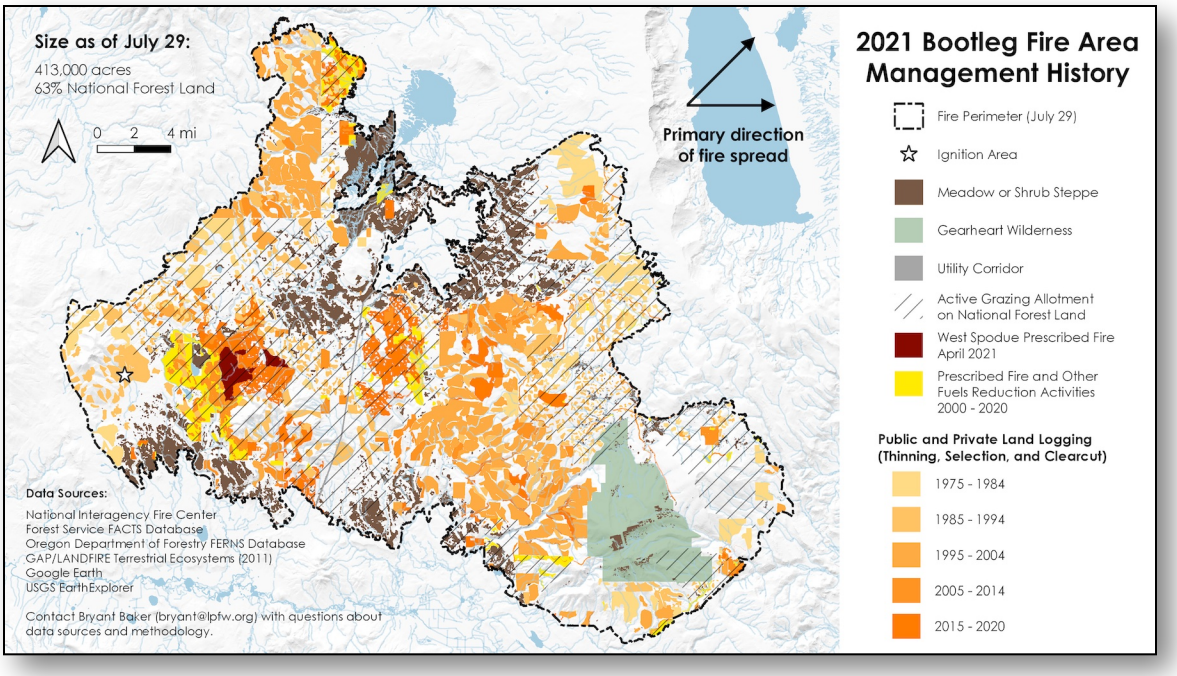

Figure 4 - acquired from Los Padres Forestwatch[22]

After meticulously poring over state and federal logging and livestock grazing data as well as historical satellite and aerial images, a noted cartographer compiled the most extensive forest management history dataset ever released for the area (Figure 4 above). This revealed that during the first six days, it burned through nearly 25,000 acres of national forest subject to thinning, prescribed fire, fuel breaks, and other vegetation removal activities promoted as "fuel reduction" as part of the Black Hills and East Hills projects approved in 2012 and 2018, respectively. During the first several days, the fire

quickly grew to 200,000 acres and officials reported extreme fire weather and fire behavior so intense that firefighters were forced to disengage and retreat.

By analyzing the fire progression data, it was determined that on average the wildfire moved 3.4 miles per day through public and private forest lands that have been logged over the past two decades compared to an average of 2.1 miles per day through unmanaged Wilderness and Roadless Area to the east; a rate of spread 62% greater than in the unmanaged sections.

> "Contrary to fuel reduction claims, the Bootleg Fire has raced through much of the landscape that has been logged in one way or another since the 1970s, including over the last few years," said Bryant Baker, GIS analyst and conservation director of Los Padres ForestWatch.[23]"

Figure 5 below shows a portion of area burned by the Dixie Fire around Lake Almanor. The image on the left shows areas in white where the canopy cover had been thinned to less than 50 percent. The image on the right shows where the Dixie Fire burned at high severity revealing the relationship between "thinning" and high severity fire. The relationship between clear cutting and high severity fire is also obvious and is shown by the patches of clear cuts in the right image.

Figure 5 - acquired from fireadaptednetwork.org[24]

Mounting evidence is disclosing the fallacy that "thinning" forests reduces the severity of wildfire and protects communities. Both the towns of Paradise, which burned down in the Camp Fire of 2018, and Greenville, which burned down in the Dixie Fire of 2021, were also supposed to have been protected by recent fuel treatments conducted nearby.[25,26]

As an aside, the lower deficit of high severity fire also implies an unsurprising relationship to the tree plantations required to be planted after clear cutting by forest practice rules. A number of studies have pointed out the greater incidence of high severity fire both in and adjacent to "industrially managed" forests, i.e. tree plantations.

"The increasing prevalence of high-severity wildfire in forests in the US state of California is connected to past forest management. We found that where fires occurred, the odds of high-severity fire on "private industrial" lands were 1.8 times greater than on "public" lands and 1.9 times greater than on "other" lands (that is, remaining lands classified as neither private industrial nor public). Moreover, high-severity fire incidence was greater in areas adjacent to private industrial land, indicating this trend extends across ownership boundaries. Overall, these results indicate that prevailing forest management practices on private industrial timberland may increase high-severity fire occurrence, underscoring the need for cross-boundary cooperation to protect ecological and social systems.[27]"

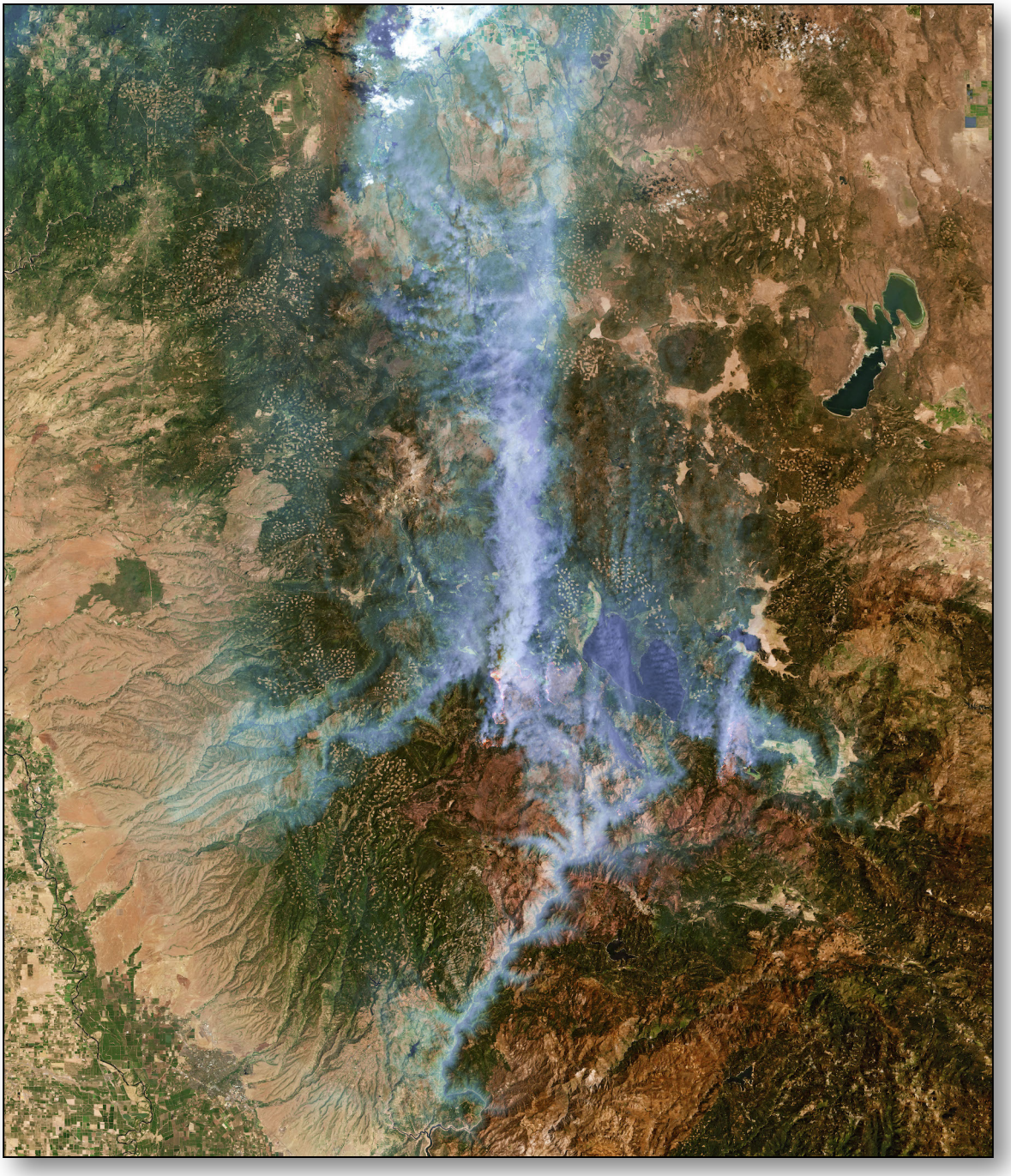

Figure 6 - Satellite view of the Dixie Fire and the greater region[28]

As can be seen in Figure 6 above, the forests of the Northern Sierra Nevada and the Cascades are liberally peppered with clear cuts which might be considered "thinning" on a grander scale. The larger proportion of high severity fire relative to low and moderate severity fire even with the fire deficit is an easily understood consequence of current forestry practices.

The impact of "thinning" on Northern Spotted Owls

Northern Spotted Owls (NSO), an endangered species[29] listed under the Endangered Species Act (ESA), are notoriously intolerant of logging activities in their territories. Three nesting sites are shown in maps depicted by Figures 9 and 10 of the SFS Project EA. A fourth nesting site situated in the project area and previously shown in a presentation during a Forest Service South Fork Collaborator Meeting on July 21, 2022 is not fully represented on these maps although there is a suggestion of it. The arrow in Figure 7 below identifies the nesting site which is more apparent in EA Figures 11 and 12.

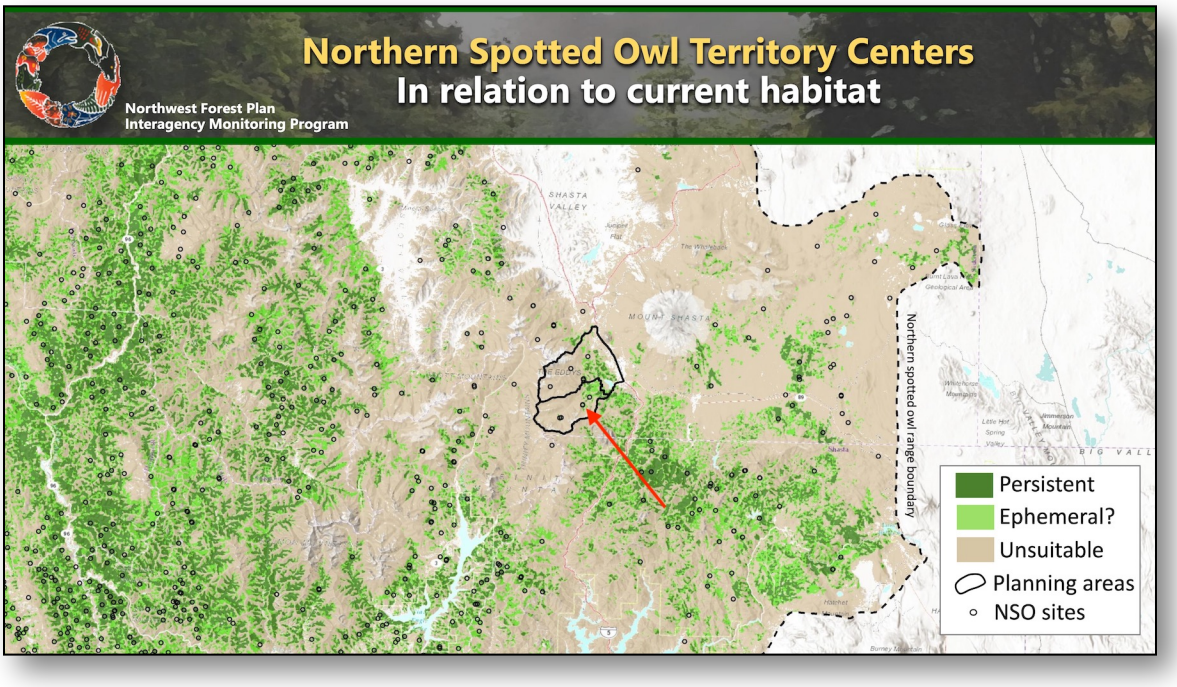

Figure 7 - Northwest Forest Plan Monitoring Overview by Raymond Davis

The map for the preferred project alternative (Figure 12) shows disturbing indications of very aggressive logging in the locations of the NSO nesting sites. Stands extremely near the vicinity of the southwestern-most nest are even marked with 0 basal area — a clearcut! The map also shows major stand reductions right at the locations of the other two nesting sites in the project area.

> "Most (98.3%) of the sites where owls were located were forested with old-growth (>200 years old) conifers or mixtures of mature (100-200 years old) and old-growth conifers. The most serious threat to the spotted owl… is the gradual elimination of its preferred habitat (old-growth and mature forests). When the remaining-forests consisted of extensive areas of young second-growth or heavily thinned timber, however, the owls frequently disappeared.

> On 2 sites where overstory and understory trees were heavily thinned, the spacing between trees in the owl nest areas was increased to 10-20 m as a result of harvest. Canopy closure was reduced to <50%. One of the pairs subsequently disappeared. The other pair shifted their activities to an unlogged old-growth stand bordering the harvested area; a new nest was located in the unlogged area 4 years after harvest of the original nest area.[30]"

A study propounds an extinction debt for spotted owls resulting from historical logging of large trees that consequently continues to yield long-term declines in old-forest species populations even after policies protecting large trees were enacted, highlighting an urgent need to protect existing old-forest habitat and potential large tree refugia. Since logging is prohibited in National Parks, the study found:

> "Owl populations are declining on all national forest study areas, which contain far less large tree/high canopy cover forest in owl territories than national parks where the owl population is stable.[31]"

In another study evaluating responses to landscape fuel treatments:

> "Our results indicate negative CSO responses to treatments, supported by the avoidance of defensible fuel profile zones by foraging owls, larger owl home ranges associated with increasing amounts of treatment within the home ranges, and a 43% decline in the number of territorial CSO sites across the Meadow Valley study area within 3–4 years of the implementation of landscape treatments. In addition to changes in the number of owls, we also observed spatial redistribution of owl sites over time across the landscape.[32]"

Furthermore:

> "The scientific literature has established that the optimal habitat for Spotted Owl nesting, roosting, and foraging is provided by conifer and mixed conifer–hardwood forests dominated by medium (30–60 cm) and large (>61 cm) trees with medium (50–70%) to high (>70%) canopy cover. The populations of all three subspecies have declined due to widespread historical and ongoing habitat loss, primarily from logging mature and old-growth forests favored by the owls for nesting and roosting.
>
> Contrary to current perceptions, recovery efforts, and forest management projects for the Spotted Owl, mixed-severity fire as it has been burning in recent decades does not appear to be an immediate, dire threat to owl populations that require landscape-level fuel-reduction treatments to mitigate fire severity. Empirical studies… demonstrated that wildfires can generally have no significant effect, but effects can include improved foraging habitat and improved demographic rates. Most territories occupied by reproductive Spotted Owl pairs that burn remain occupied and reproductive at the same rates as sites that did not experience recent fire, regardless of the amount of high-severity fire in core nesting and roosting areas.[33]"
>
> "Within each old-growth management area, 400 ha of old-growth forest should be maintained in a relatively natural (unlogged) condition within a 2.5 km radius of the nest of the resident pair

of owls. The 400 ha figure is based on the fact that all of the radio-tagged pairs we studied had more than 396 ha of old-growth within their home ranges (the home range of a pair included the combined home ranges of the male and female). We believe that 400 ha of old-growth will provide adequate habitat for individual pairs, assuming the most extreme scenario in which all surrounding areas are covered by intensively managed second-growth forests <80 years old (a likely situation in the future).[34]"

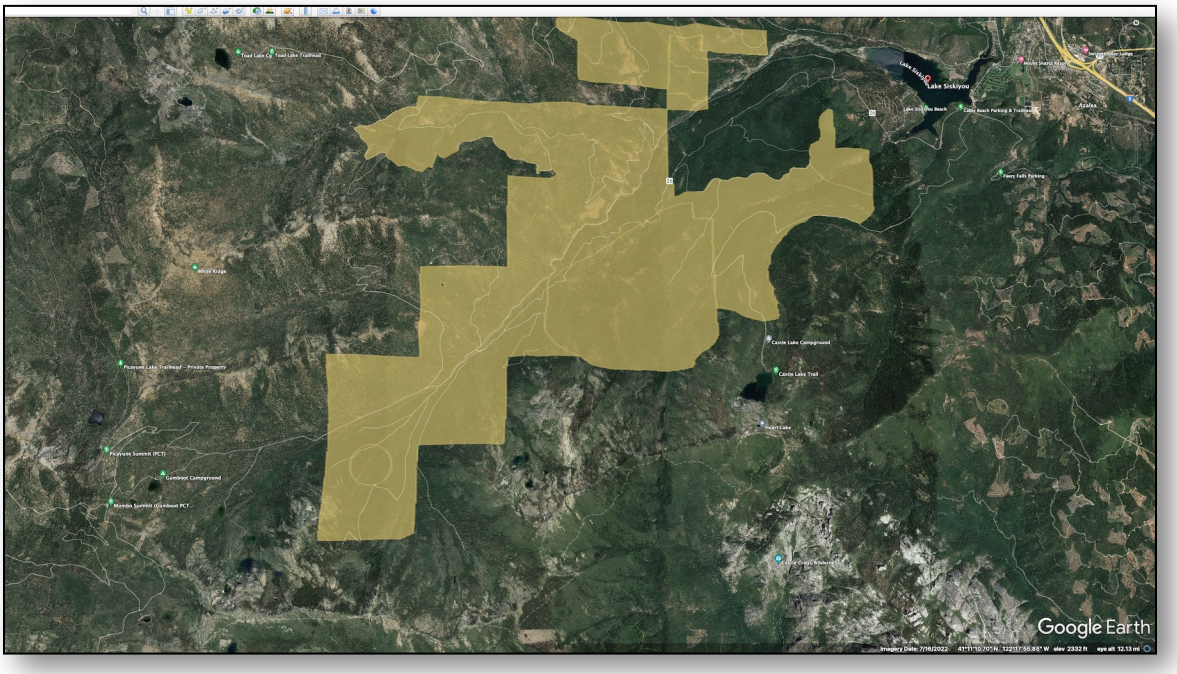

Figure 8 - Screenshot of the NSO Critical Habitat Overlay[35]
showing the SFS Project area on Google Earth

"Adverse impacts from commercial thinning may be caused by removal of key habitat elements and creation of forests that are more open than those likely to be occupied by spotted owls. Over 40 years, habitat loss would be far greater than with no thinning because, under a "best case" scenario, thinning reduced 3.4 and 6.0 times more dense, late-successional forest than it prevented from burning in high-severity fire in the Klamath and dry Cascades, respectively. Even if rates of fire increase substantially, the requirement that the long-term benefits of commercial thinning clearly outweigh adverse impacts is not attainable with commercial thinning in spotted owl habitat. It is also becoming increasingly recognized that exclusion of high-severity fire may not benefit spotted owls in areas where owls evolved with reoccurring fires in the landscape.[36]"

The nonnative Barred Owl expanding into the geographical range of NSO habitat is a larger aggressive competitor implicated in the continuing decline of NSO populations. The geographic range of the Barred Owl now completely overlaps that of NSO.

"Barred owl presence on spotted owl territories was the primary factor negatively affecting apparent survival, recruitment, and ultimately, rates of population change (of NSO). While landscape habitat components reduced the effect of barred owls on these rates of decline,

> they did not reverse the negative trend. Our analyses indicated that northern spotted owl populations potentially face extirpation if the negative effects of barred owls are not ameliorated while maintaining northern spotted owl habitat across their range.[37]"

"Thinning" the forest in the SFS Project will disadvantage NSO vis-à-vis the Barred Owl. The habitat currently in the project area is more favorable for NSO but opening the forest by thinning will alter the stands in favor of the Barred Owl.

> "Spotted owls spent a disproportionate amount of time foraging on steep slopes in ravines dominated by old (>120 yr) conifer trees. Barred owls used available forest types more evenly than spotted owls, and were most strongly associated with patches of large hardwood and conifer trees that occupied relatively flat areas along streams. Spotted and barred owls differed in the relative use of old conifer forest (greater for spotted owls) and slope conditions (steeper slopes for spotted owls), but we found no evidence that the 2 species differed in their use of young, mature, and riparian-hardwood forest types.
>
> Availability of old forests and associated prey species appeared to be the most strongly limiting factors in the competitive relationship between these species, indicating that further loss of these conditions can lead to increases in competitive pressure.[38]"
>
> "Areas used by barred owls within home ranges differed from availability for all the habitat characteristics we analyzed. Topographic position and slope showed the strongest patterns of selection, with the lowest topographic position and the gentlest slopes being used in proportions more than twice their availability.[39]"
>
> "Our results suggested that while both species used tall canopy areas more often than low canopy areas, spotted owls were more commonly found in areas with lower tree cover, more developed understory, and steeper slopes. This is the first evidence of fine-scale partitioning based on structural forest properties by northern spotted owls and barred owls.[40]"

Further indirect effects of "thinning' on NSO:

> "Thinning reduces the abundance of some tree-dwelling rodents, especially Northern Flying Squirrels (Glaucomys sabrinus) and Red Tree Voles (Arborimus longicaudus), that are important prey species for Northern Spotted Owls (Strix occidentalis caurina). Spotted owl home-range size has been shown to decrease with increasing flying squirrel densities, suggesting that understanding habitat needs for owl prey may be critical to the recovery of spotted owls and their habitat across the region.[41]"

The "Revised Recovery Plan for the Northern Spotted Owl" from the U.S. Fish and Wildlife Service recognizes the importance of **maintaining and restoring high value habitat** for the recovery and long-term survival of the spotted owl.[42] Since canopy closure exceeded 70% in most nest areas[43], this would preclude thinning in these areas. (emphasis added)

"There is no question, as firmly recognized by the Supreme Court, that the ESA strips courts of at least some of their equitable discretion in determining whether injunctive relief is warranted." Cottonwood Env't L. Ctr., 789 F.3d at 1090. In particular, the third and fourth Winter factors—the balance of equities and the public interest—"**always tip in favor of the protected species.**" Id. at 1091.

The public interest is not synonymous with popularity, and Congress—the branch of government expected to be responsive to the will of the people—made the call many decades ago that **protecting listed species was the paramount concern by enacting the ESA**." Center for Biological Diversity v. United States Forest Service, No. CV 22-91-M-DLC, 39, 41 (D. Mont. Mar. 21, 2023). (emphasis added)

The impact of "thinning" on Pacific Fisher

Fishers have been extirpated from more than 50% of their previous range and only two native populations survive in California, one near the California-Oregon border and one in the southern Sierra Nevada. Fishers in northern California and southern Oregon have been kept from being listed under the ESA due to several conservation partnerships between the U.S. Fish and Wildlife Service and state and private timber companies.[44]

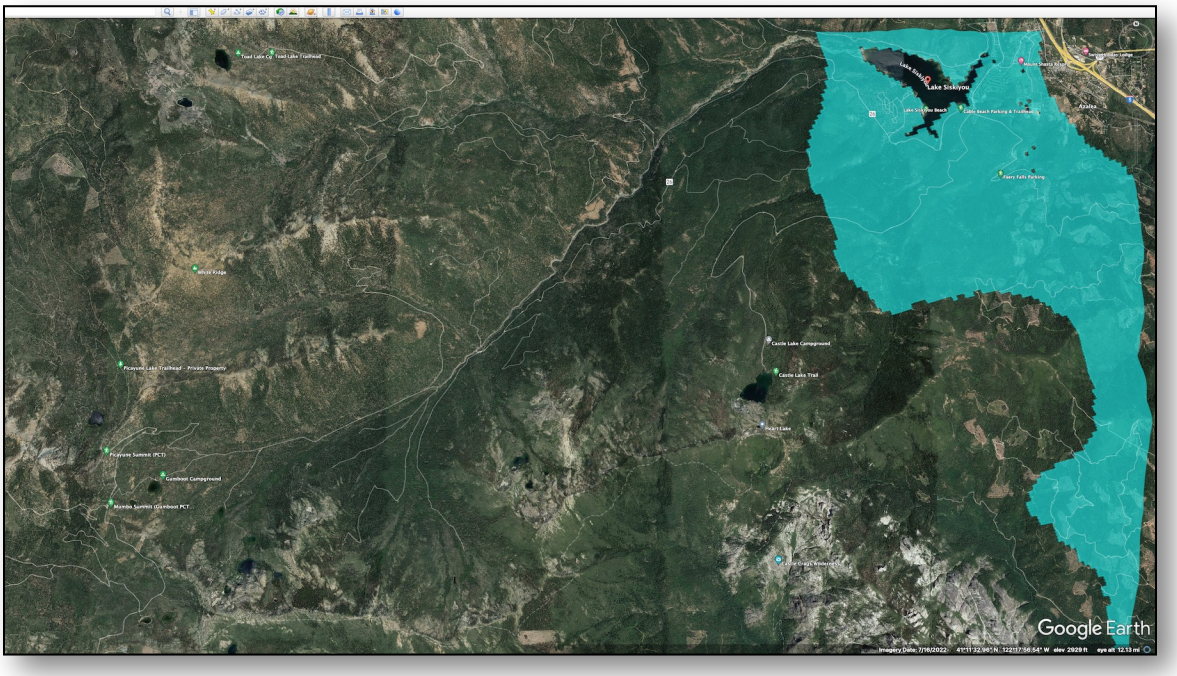

Figure 9 - Screenshot of the Pacific Fisher Core Habitat Overlay[45]
showing the SFS Project area on Google Earth

Northern California and Oregon fisher populations in 2008 were estimated at 4,018 and Sierra Nevada populations were estimated at 598. These numbers were halved by 2016. The southern Sierra Nevada fisher population was listed as a threatened species by the California Fish and Game Commission in August 2015 and listed as endangered under the Endangered Species Act in 2020.[46]

Conservation groups within Northern California have filed a lawsuit against the U.S. Fish and Wildlife Service to have the Northern California and Oregon fisher populations also listed as endangered under ESA.[47]

The precipitous decline in Pacific Fisher populations forcefully argues for special effort to preserve habitat for the Fishers even though studies to determine habitat features are few.

> "Fishers selected sites for resting that had steeper slopes, cooler microclimates, denser overhead cover, a greater volume of logs, and a greater prevalence of large trees and snags than were generally available.[48]"

Unfortunately Fisher habitat is being heavily logged between Mt. Shasta City south to Castella as is visible in Figure 9. The combined areas delineated as NSO critical habitat or Pacific Fisher core habitat comprise the majority of the SFS Project area.

Under the Endangered Species Act, the Forest Service has been tasked with identifying threatened and endangered species and providing protections for such species.

> "In addition, the legislative history...reveals an explicit congressional decision to require agencies to afford **first priority to the declared national policy of saving endangered species.** The pointed omission of the type of qualifying language previously included in endangered species legislation reveals a conscious decision by Congress to **give endangered species priority over the 'primary missions' of federal agencies.**"
> Tenn. Valley Auth. v. Hill, 437 U.S. 153, 185 (1978). (emphasis added)

It can not be any more explicit as noted in two instances above that habitat suitable for listed species must be preserved and protected. In terms of the SFS Project, NSO and Pacific Fisher habitats must not be disturbed and degraded by extensive and massive "thinning".

The impact of "thinning" on soils

Soils face many threats while the knowledge of soil biodiversity is currently limited with only an inkling of the complexity in soil's biological systems. Very little is known about soil organisms or their functional roles, niche partitioning and interactions. Some of the major threats are known. In a partial list and in descending order based on expert assessment, they are: intensive human exploitation, soil organic matter decline, habitat disruption, soil compaction and soil erosion.[49]

Soil organisms exist in underground mycorrhizal fungal networks that continue a more than 400 million year old partnership with plants crucial to the functioning of global ecosystems. The importance of these mycorrhizae for plant nutrition is well established but their role in transporting carbon into soil remains under explored. Around 75 percent of all terrestrial carbon is stored belowground at any one time — more carbon than in the atmosphere and plant biomass combined — thanks to the role of mycorrhizal fungi as the entry point of carbon into soil food webs. Mycorrhizal fungi may also potentially play an important role in mitigating global warming.

"Mycorrhizal tissue has been estimated to comprise a significant fraction of soil organic matter and below-ground biomass in a range of systems. The current body of literature indicates that in many systems exposed to elevated CO_2, mycorrhizal fungi might sequester increased amounts of C in living, dead and residual hyphal biomass in the soil. Through this process, the fungi might serve as a negative feedback on the rise in atmospheric CO_2 levels caused by fossil fuel burning and deforestation. The mycorrhizal fungi in particular might play an important role in the sequestration of C in soil under elevated CO_2 and N deposition. This group, which symbiotically colonizes plant roots, forms associations with 80% of plant species and is found in nearly every habitat in the world.[50]"

"More carbon is stored globally in soils than biotic and atmospheric pools combined. As such, the biogeochemical processes affecting the amount of C sequestered in soil have major implications for global climate change. Despite the fact that most plants associate with mycorrhizal fungi and allocate significant amounts of C to these symbionts in order to gain access to soil nutrients and water, the input of mycorrhizal fungal biomass, its turnover, and potential contribution to C sequestration in soil organic matter has been largely overlooked until recently. The significance of mycorrhizal fungal inputs, however, was convincingly demonstrated by Clemmensen et al. (2013), who used bomb carbon-14 modeling coupled with biomarker analysis to show that the majority of C stored in soil organic matter in a boreal forest system was of root and fungal origin.[51]"

"Terrestrial ecosystems significantly buffer global warming by sequestering a quarter of anthropogenic emissions of CO_2 (0.8 Pg C year)1) of which half results from the accumulation of refractory soil organic matter substances in soils (0.4 Pg C $year^{-1}$). The future capacity of terrestrial ecosystems to act as a C sink depends on the soil sink potential and the factors controlling soil C accumulation. C storage in terrestrial ecosystems depends on the ability of ecosystems to sequester more nutrients. The presence of several microbial types and their interactions seems to be a pre-requisite for ecosystem persistence.[52]"

Logging, and especially clear cut logging, has very negative impacts on soils. The heavy machinery used compacts the soil and crushes the structures in the upper soil layers, damaging the mycorrhizal networks. The removal of stumps and preparation for the planting of seedlings for a plantation after clearcutting destroy the delicate mycelia. In particular, the ectomycorrhizal (ECM) fungi associated with the roots of living trees are adversely affected.

"Three years after harvesting, the proportion of ECM fungal species had decreased proportionally to the extent of tree removal. In clear-cuts, ECM fungal relative abundance had decreased by 95%, while ECM fungal species richness had declined by 75%, compared to unlogged plots. ECM species richness declined linearly with decreasing level of tree retention. With 60%, 30% and 0% of the trees retained, the average number of detected species per plot had declined to 70%, 50% and 25% of that in the unlogged plots 3 years after logging.[53]"

The planet's fungal networks are being destroyed at an alarming rate. Based on current trends, more than 90% of the Earth's soil will be degraded by 2050. As we destroy the mycorrhizae, we sabotage our efforts to limit global heating.[54]

Logging, even if masquerading as "thinning", destroys biodiversity in the soil and removes the biomass from the land. With the SFS Project proposing to remove the slash generated by "thinning" activities, 100 percent of the biomass will be removed depriving any newly regenerating plants of the nutrients the logged trees would have provided over time as they deposited leaf and branch litter, died, toppled and eventually decayed. The decrease in canopy cover as a result of the "thinning" will also produce two more impacts.

The first impact is an increase of insolation on the soil in the "thinned" stands that will raise the temperature of the soil. A recently published study details the loss of soil organic carbon (SOC) from subsoil likely from the increase in temperature due to global warming, specifically the loss of SOC from woody plant biomass, leaf and woody plant biomass and the pyrogenic carbon produced during incomplete combustion. Given that it is these compounds that have been proposed for long-term carbon sequestration, it is worrisome that they were rapidly lost in the warmed soils of the experiment.

> "In this Article, we made use of one of the first multi-year, whole-soil-profile warming experiments, located at the University of California Blodgett Experimental Forest, to assess warming effects on the composition and degradation of SOC pools at different depths. In warmed plots, vertical heating rods inserted to 2.4 m soil depth provided continuous warming of the soil profile to 1 m depth, in concert with diurnal and seasonal temperature variations. The target warming magnitude was +4 °C based on Representative Concentration Pathway 8.5 predictions for the study region by 2100. Previous work at the study site demonstrated substantial loss of bulk SOC stocks (by 33%) in the subsoil, and soil respiration was consistently increased at all depths over 4.5 years of warming. (I)n subsoil from 20 to 90 cm soil depth, soil warming led to a loss of polymeric carbon, highlighting the vulnerability of subsoil carbon to decomposition under climate change.[55]"

Given that the opening of the forest canopy from "thinning" will likely increase temperatures in the stands by some 5° C, the results of this study show a loss of 33 percent of soil carbon would occur within a decade, not in 2100.

> "Most studies of the impact of reafforestation consider relatively short periods of 1–10 years. However, time presumably matters in the forest–water relationship. As other authors have concluded, ecosystem regeneration can take long periods of time. Soil properties may take the longest to recover. Diochon et al. (2009)[56] find that postharvest soil carbon storage first reaches a minimum after 32 years of growth – at a level only 50% of the soil carbon storage in intact forests – and reaches 100% only after 100 years.[57]"

The second impact of the decrease in canopy cover from "thinning" is the increased probability of flooding. Loss of forest cover is associated with more frequent extreme flooding, as well as more frequent floods of any size, according to new University of British Columbia research.

While it's widely thought that loss of forest cover is strongly linked to increased flooding, most studies have suggested that the impact is limited to smaller floods. The lead author of the study, Robbie Johnson stated:

> "When only 21 percent of trees in the watershed were harvested, using clearcut logging, the average flood size increased by 38 percent in the Deadman River and a staggering 84 percent in Joe Ross Creek. As well, floods that used to happen only once every 10, 20, 30, 40 and 50 years are all becoming much more common.[58]"

From the study:

> "Consequently, the 7-year, 20-year, 50-year, and 100-year flood events became approximately two, four, six, and ten times more frequent in both watersheds. Contrary to conventional wisdom, harvesting influenced small, medium, and very large flood events, and the sensitivity to harvest increased with increasing flood event size and watershed area.[59]"

Logging produces an large pulse of sedimentary pollution into streams. The increased flooding entailed by the "thinning" proposed for the SFS Project will cause continued sedimentary pollution of the Sacramento River in following years as the chaotic nature of the increasingly obvious climate transformation brings extreme precipitation events causing soil degradation and reduced fertility.

NSO territory as fire refugia

The SFS Project claims concern for the safety of recreationists and proclaims the project will be an integration with fuel reduction and fuel break activities around Mount Shasta City. The massive amount of forest "thinning" proposed in the project extends to almost sixteen kilometers away from what could be considered as the greater Mount Shasta City area. The nearest residence outside of the project is over 300 meters away from the project boundary, far beyond even the extended zone (60 meters) recommended for home fire hardening. Homes complying with these guidelines have over a 90 percent survival rate even though firebrands are capable of traveling several kilometers.[60]

Yet what is overlooked throughout the project proposal are the numerous studies refuting the implicit premise that "thinned" forest stands burn at lower intensities than dense stands. Studies have also concluded that the dense stands selected by NSO tend to be fire refugia.

> "Under most wildfire conditions, the microclimate of interior patches of suitable nesting forests likely mitigated fire severity and thus functioned as fire refugia (i.e., burning at lower severity than the surrounding landscape). With changing climate, the future of interior forest as fire refugia is unknown, but trends suggest older forests can dampen the effect of increased wildfire activity and be an important component of landscapes with **fire resiliency**.
>
> Some open-canopied forests and younger even-aged and densely stocked stands 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.

Suitable nesting forests for northern spotted owls tend to burn at **lower severity** than the surrounding landscape and thus may be **more resilient** to increasing trends of wildfire.[61]" (emphasis added)

"Pre-fire nesting/roosting habitat had lower probability of burning at moderate or high severity compared to other forest types under high burning conditions. Our results indicate that northern spotted owl habitat can buffer the negative effects of climate change by enhancing biodiversity and resistance to high-severity fires, which are predicted to increase in frequency and extent with climate change. Within this [Klamath-Siskiyou ecoregion], protecting large blocks of old forests could be an integral component of management plans that successfully maintain variability of forests in this mixed-ownership and mixed-severity fire regime landscape and enhance conservation of many species.[62]"

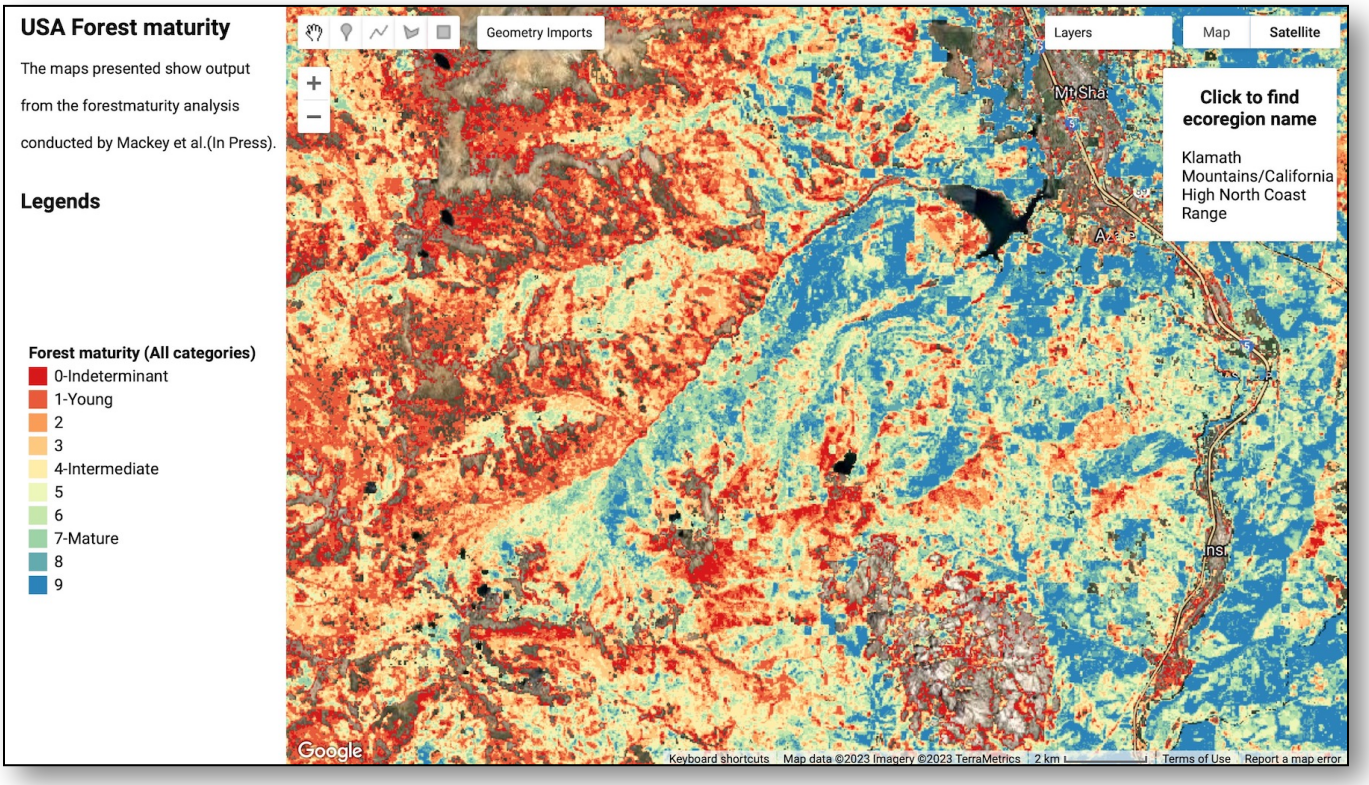

Figure 10 - Mature Forest Map acquired from matureforests.org[63]

"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. Other recent research indicates that forests with less environmental protection and more tree removal tend to burn more severely.[64]" (emphasis added)

A team of scientists developed a program to map mature forests world-wide using satellite telemetry. The results are viewable online. Figure 10 above displays the area of the SFS Project showing a high

level of maturity (and older) for much of the project area. The basis of categorization is tree height and canopy coverage. One of the scientists stated the Mature and Old-Growth Forest Report[65] released in April catalogued a greater extent of mature and old-growth forests than the program; accordingly the amount of mature trees in the SFS Project area may actually be more extensive than depicted.

A study conducted by a renowned and outspoken proponent of forest thinning compared results on the most commonly used silvicultural systems and reserves on federal, state, and private lands in the western United States and found that the conditions in old-growth and young-growth reserves were far more effective at reducing tree mortality from fire. Young-growth reserves were defined as stands harvested in the early 1900s naturally regenerated by the remaining seed trees. The dominant and co-dominant trees are 80–100 years old; a very apt description for much of the SFS Project.

The young-growth stands had the best results under 97.5th percentile fire weather conditions and indeed in all fire weather conditions. Mortality during 97.5th percentile fire weather conditions for trees >51 cm DBH, a diameter commonly used to designate mature trees, was 8 percent with trees >76 cm DBH having less than 3 percent mortality. Overall mortality under the 97.5th percentile fire weather conditions was 62 percent — a moderate severity fire with almost all of the mature trees surviving, along with a slow rate of spread and fireline intensity.

This study concluded:

> "The majority of the traditional silvicultural systems used in the Sierra Nevada over the last several decades do not produce forests that can incorporate fire without high levels of tree mortality. Reserves preformed better than most of the silvicultural systems investigated in this work.[66]"

There is no need to "thin" the forest.

A question of historical forest density

The SFS Project EA declares "Previously, the forests were generally more open and dominated by fire resistant ponderosa/Jeffrey pine, cedar, Douglas fir and oak. …and tree densities are much higher than they were historically."

There are numerous historical accounts describing forest structure and densities quite to the contrary. Examples include entries in the account of John C. Fremont's Third Expedition.

> "We continued to travel through the forest, in which the road was rendered difficult by fallen trunks, and obstructed by many small trees, which it was necessary to cut down...A laborious day, which had advanced us only six miles..."
>
> October 21, 1845, Expedition of Jon C. Fremont and Kit Carson, Blue Mountains, Oregon

> "The trail passed sometimes through very thick young timber, in which there was much cutting to be done; but, after travelling a few miles, the mountains became more bald..."
>
> October 22, 1845, Expedition of Jon C. Fremont and Kit Carson, Blue Mountains, Oregon[67]

There are many accounts containing descriptions of the forests, wildlife and scenery in the diaries of overland travelers to California. Most of the accounts describe the gold country from Mariposa in the south up to the land around the Klamath and Trinity Rivers.

> "These accounts most often described forest conditions as "dark," "dense," or "thick," rather than "open" or "park like." Perhaps the best description by a forty-niner was by J. Goldsborough Bruff, who traveled the western slopes of the Feather River drainage between 1849 and 1851. He kept a detailed diary and clearly distinguished between open and dense forest conditions. He recorded the latter six times more often than the former. One thread common to most accounts was awe at the immensity and grandeur of the trees in the forest, especially the sugar pines.[68]"

Fire regimes created a heterogenous and highly dynamic forest landscape in pre-colonial times comprised of different seral stages of forest growth up to climax conditions. Since they were never logged, examination of Lassen Volcanic, Yosemite and Sequoia and Kings Canyon National Parks concluded that 55% of the modern forested landscape was in old-growth status and the rest was seral leading to the deduction that the past forest was equally constituted.[69]

A study using data from paleoecological, dendroecological, and historical sources concluded:

> "Simulation results demonstrated that the expectation of a landscape mosaic dominated by large patches of old forest is consistent with fire history of the Oregon Coast Range. Old-growth forests usually occupied at least 40% of the landscape. At least one old-growth patch larger than 200,000 ha was present on the landscape at all times, along with a large number of small mature and old-growth patches that were distributed in areas of younger forests. Both of these pattern elements are ecologically significant.[70]"
>
> "Low-severity regimes are most often associated with dry forest types which experience frequent and predominantly low-severity fires where loss of biomass due to fire is low, and <30% mortality of trees is typical. This disturbance regime results in stands with open canopies and an understory dominated by sprouting and rhizomatous shrubs and herbaceous plants, which are described in historical accounts as open, parklike forests. The extent of these forest types was often **overrepresented in historical records** due to the ease of traveling through them and the opportunities for pleasing photographs.[71]" (emphasis added)

Even so, a search of the internet for images of "old-growth forest" yields copious amounts of old photographs which certainly cannot be described as showing open and park like forest stands. A couple of such photographs are shown below.

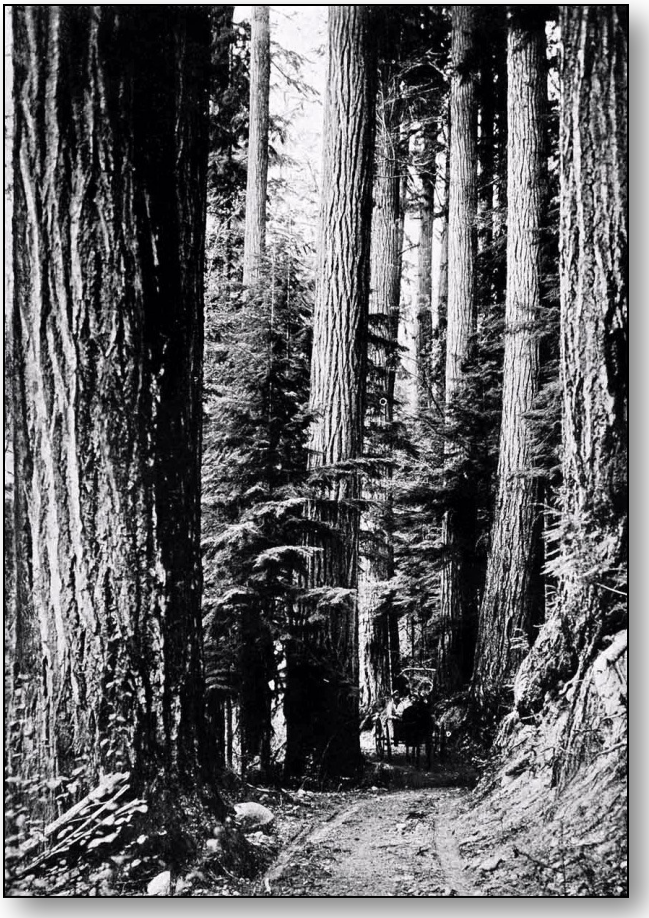

Figure 11 - Road among the Douglas Firs 1912

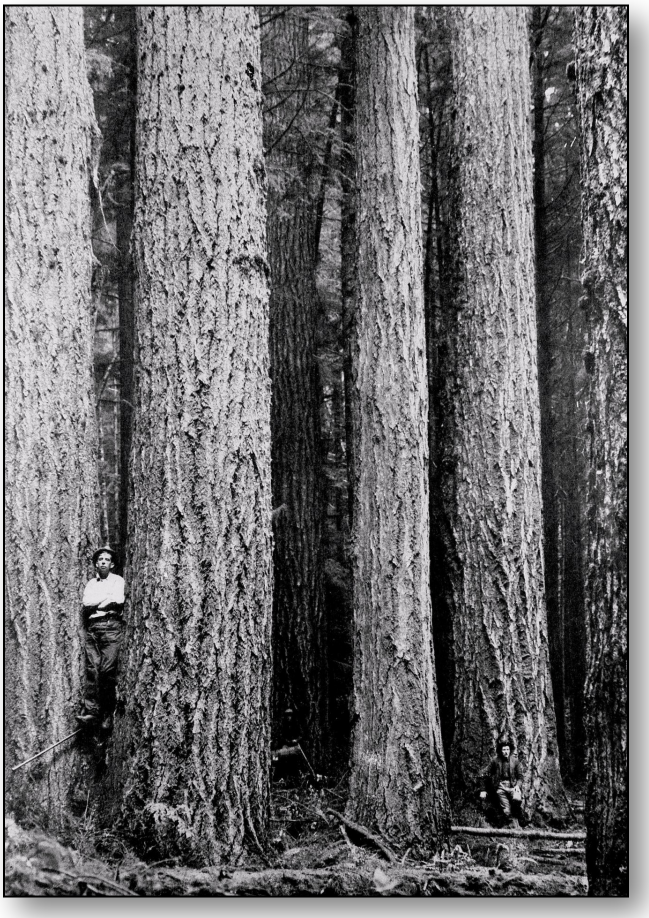

Figure 12 - Old-growth timber in Coos County OR

With a minority of historical accounts describing forests as being open and park like and with innumerable photographs showing otherwise, it is a far stretch to conclude that forests were "generally more open".

The importance of large-diameter trees

The Mature and Old-Growth Forests Inventory[65] released this past April identified 32.7 million acres that had old-growth forests on U.S. Forest Service (FS) and Bureau of Land Management (BLM) land. Mature forests, stands of trees 80 - 150 years old, were found on another 80.1 million acres. These inventoried old-growth forests are only 4 percent of U.S. forested land. The mature forest stands identified date after the European colonization of the Pacific Northwest and are at best second growth. Almost all of the other old-growth trees that had been standing on these lands at that time have been logged unless they were inaccessible.

In our area, the McCloud River Lumber Company in its various incarnations logged the plentiful Ponderosa Pines and Sugar Pines in the vicinity. The sawmill complex expanded greatly through the years, eventually becoming one of the biggest sawmills ever to operate in the state of California. An extensive railroad system connected the wood operations in the mill with the extensive logging

operations which produced the logs needed to keep the sawmill running. In 1963, the company was sold to U.S. Plywood Corp. which continued the operation. In 1979 the mill was closed as it had been built as a "Big log" mill and the large trees had all been cut down.[72,73]

Figure 13 - McCloud River Railroad steam locomotive #6 1920

Leading climate and biodiversity experts recently concluded that we must tackle the intertwined Climate and Biodiversity Crises together to protect a livable future for all of earth's inhabitants including the creatures we share the Earth with. Only by considering climate and biodiversity as parts of the same complex problem, which also includes the actions and motivations and aspirations of people, can solutions be developed that avoid maladaptation and maximize the beneficial outcomes.[74]

The report makes clear that our best bet of passing on a maximally livable planet to future generations requires a profound shift in how we look at nature and breaking with destructive ideas around economic progress. In short, we need to prioritize protecting and restoring nature and dismantling the economic systems driving carbon emissions.[75]

> "Large-diameter trees dominate the structure, dynamics, and function of temperate forest ecosystems and are of considerable scientific and social interest. They comprise a large fraction of forest wood volume, biomass and carbon stocks, and modulate stand-level leaf area, transpiration, and microclimates. Large-diameter trees contribute disproportionately to reproduction, influence the rate and pattern of tree regeneration and forest succession, and originate further disturbance by crushing or injuring neighboring trees when they fall to the ground. Arboreal wildlife species preferentially occupy large trees as habitat, and the greater structural complexity of large tree crowns supports habitat for obligate wildlife species, unique epiphyte communities, and soil development and water storage within the forest canopy.

> Large-diameter trees continue to contribute disproportionately to forest ecosystem structure and function after they die. Dead large-diameter trees persist as standing snags for many years, providing additional wildlife habitat. In temperate forests large-diameter logs may persist on the forest floor for centuries, where they continue to provide habitat for diverse assemblages of vertebrates and invertebrates and microorganisms, store carbon and other nutrients, serve as substrates for tree regeneration, and play numerous other functional roles.[76]"
>
> "The largest 1.4% of trees accounted for 49.4% of aboveground biomass, underscoring the importance of large trees for providing **the ecosystem service of carbon storage**.[77]" (emphasis added)

The importance of snags

The EA touches on the dying trees that have been observed in the region correctly attributing the previously mentioned drought that is occurring. Even though this winter was above average in precipitation, it was not sufficient to overcome the soil water deficit. The dying trees became vulnerable to attack by bark beetles due to the drought stress they endured. While it is evidence of the lack of bountiful snow and rainfall like this region often gets, it is also a demonstration of evolution with the trees more suitably adapted to withstand drought surviving. The extensive "thinning" proposed in this project will be removing these surviving genetically superior trees indiscriminately. The die-off of the impacted trees can be thought of as a process of the forest's own self-thinning.

> "Vegetation is adapting to the new realities of warmer temperatures, extreme drought, and variable precipitation. So we find that drought, insects, and even wildfires are killing trees. But this reduces the density of stands and selects for individuals with greater resilience to these natural mortality factors. This is precisely what you would want to see. It's evolution at work.
>
> Fuel reductions (i.e., thinning and logging) interfere with this natural evolutionary process by indiscriminately removing trees from the landscape. The loggers have yet to learn which trees have a genetic trait that might enable them to resist bark beetles or survive drought. And logging assuredly removes carbon from the forest and releases it into the atmosphere, ironically contributing to even more significant climate warming that creates new " historic" conditions.[78]"

Although the die-off is fundamentally due to drought, endemic bark beetle infestation is the proximate agent responsible but this process actually provides benefits. In the absence of more fire-killed trees due to fire suppression and salvage logging, these dying trees become important habitat for many species especially for cavity nesting birds.

> "Endemic and epidemic bark beetle outbreaks are important sources of structural heterogeneity and biodiversity in the conifer forests of western North America. Bark beetles are parts of many forest food webs and can be associated with a large number of organisms. They can be hosts for parasites and food for a variety of animals, including spiders, birds, and other

beetles. Bark beetles have far-reaching effects on ecological structures and biodiversity, which, when considered across scales from individual trees to entire landscapes, reveal their important roles as ecosystem engineers.

Bark beetles themselves are an important food source for a diverse group of arthropods and vertebrates, including birds such as woodpeckers that are highly adapted to digging out larvae of wood-boring insects. In general, a bark beetle outbreak initializes a release of resources that, in the short term, promotes the growth of populations of insectivorous birds. Overall, approximately twice as many bird species have increased, as opposed to decreased, in forests with bark beetle outbreaks.

At the scale of forest stands, tree mortality caused by bark beetles increases structural heterogeneity through the creation of canopy gaps and enhanced growth of understory plants, which is likely to create a favorable habitat for many invertebrates and vertebrates. Outbreaks create snags that may be used by various birds and mammals, including woodpeckers, owls, hawks, wrens, warblers, bats, squirrels, American martens (Martes americana), and lynx (Lynx canadensis). Populations of cavity-nesting birds often increase following bark beetle outbreaks.[79]"

"Cavity-nesting bird (CNB) density increased in proportion to snag density on 7 study plots. CNB density declined 77% after snag removal on a burned plot, but 2 CNB species nested in remaining stumps. Density of CNB varied from 19 to 65 pairs/40 ha on 6 other plots and was most strongly correlated with density of snags >38 cm dbh. Overall, 72 nests were in standing dead trees (snags), whereas only 7% of available standing trees were dead. Snags should be managed as dispersed clumps rather than as isolated individuals to meet nesting and feeding requirements. Providing sufficient numbers of large-diameter snags on managed stands often will require retention of trees and selected stands beyond the usual rotation period or retention of existing patches of old-growth timber.[80]"

"In accordance with other studies, we found increases in occurrence for cavity-nesting species immediately after the MPB epidemic, suggesting that these species use beetle-killed pine during the timeframe that logging operations are likely to occur. Thus, maintaining stands of beetle-killed trees is likely to provide valuable resources for these species.

Our species turnover results suggest that western landbird communities may be resilient to novel disturbances, provided patches of varying habitat types are available. Maintaining biodiversity is critical for harnessing this resilience and may be achieved by providing a mosaic of disturbed conifer, intact live conifer, and adjacent aspen forests that support a variety of western landbirds.[81]"

"The broad taxonomical indicator species approach led to the general implication that early successional ecosystems after bark beetle infestation provide some of the most species-rich natural habitats in the montane forests of Central Europe. The ecological explanation for this high diversity is likely a combination of biological legacies, pioneer species, opportunists and habitat specialists. The finding that closed and open forests with high amounts of dead wood

both provide important habitats for species with apparently contrasting requirements implies that management for biodiversity should promote extremes of canopy openness in a patchy landscape.[82]"

Besides the benefit snags provide in providing habitat for many species, snags do not cause any increase in high severity fire due to the evaporation of the volatile and flammable terpenes which are the main flammability drivers.[83]

"Despite the widespread public perception that forests affected by recent mountain pine beetle (MPB) outbreaks are more likely to burn, we find that the annual area burned across the western United States is unaffected by MPB infestation. Our results show that the area burned in red-stage and/or gray-stage MPB infestation during the three peak years of widespread fire following a widespread MPB outbreak was equivalent to the expected area burned independent of MPB activity.[84]"

"Contrary to common assumptions of positive feedbacks, recent forest insect outbreaks actually dampen subsequent burn severity at multiple time lags across the US Pacific Northwest. Indeed, by altering forest structure and composition from forest stand to regional scales, these native insects contribute to landscape-scale heterogeneity, potentially enhancing forest resistance and resilience to wildfire. In addition, by dampening subsequent burn severity, insect outbreaks could buffer rather than exacerbate some fire regime changes expected due to global change (e.g., climate warming, drought, invasive species) and forest response to land use (e.g., fire exclusion, timber harvest, livestock grazing).[85]"

"Importantly, bark beetle outbreaks not only reduce foliar moisture content, modify foliar chemistry, and increase the volume of dead wood, which can promote several aspects of wildfires; outbreaks also reduce canopy density, which reduces the amount of available fuel and can thereby decrease the probability of active crown fires and reduce the likelihood of large, severe fires. The relative importance of these contradictory effects during different phases of outbreaks continues to be an active area of research. Empirical studies of fuels immediately following outbreaks and retrospective studies of fires in forests recently affected by outbreaks suggest that outbreaks do not substantially increase—and may actually decrease—the risk of high-severity fires, even during and immediately following outbreaks. Likewise, there is general scientific agreement that the risk of active, high-severity crown fires decreases in the years to decades following outbreaks because of reduced canopy bulk density.

The current state of knowledge does not support the common assumption that increases in bark beetle activity have resulted in increased wildfire activity. Therefore policy discussions should focus on societal adaptation to the effects of the underlying driving factor of increased tree mortality from insects and from burning: **climate warming**.[86]" (emphasis added)

"In a comprehensive review of western forests, insect outbreaks actually decreased live vegetation susceptible to wildfire by reducing subsequent burn severity. Importantly, surviving young trees in dry pine, mixed conifer forests of western USA may possess genetic adaptations that confer unique adaptations and resilience. However, silviculturists have no way of

identifying these trees in the field or in their marking guidelines. Weakening environmental laws to allow more logging for beetle control is a maladaptive strategy because of uncertainties in efficacy of the treatments, high financial costs, impacts to other values, and the possibility that in the long-run logging may interfere with adaptive resilience to climate change.[87]"

The impact of deforestation on climate

> "Humans are changing the climate "by cutting down forests […] and by releasing large amounts of steam and gas at the centers of industry"
> Alexander von Humboldt, 1843
>
> From a talk given by Professor Stefan Rahmstorf at the EPA Climate Change Lecture, Dublin Mansion House, April 19, 2023[88]

We obviously have been amply warned about climate change for 180 years now, yet even with the more strident alerts increasingly being voiced, business as usual (BAU) keeps rolling on and even accelerating. Greenhouse gas emissions from the energy industry continued to increase last year despite record growth in wind and solar power with fossil fuels continuing to make up 82 percent of the world's total energy consumption in 2022 as the world used more energy overall.[89]

Deforestation is the second largest anthropogenic source of CO_2 to the atmosphere, after fossil fuel combustion. Along with forest degradation from such practices as selective logging, deforestation produces CO_2 emissions from the combustion and decomposition of forest biomass and the loss of soil carbon from the damage caused by logging or from the clearing of land for agricultural expansion.

Despite our impressions of Brazil's deforestation from news reportage, the United States leads the world in industrial roundwood production, the wood used for all marketable products. The United States has also been the world's largest consumer of industrial roundwood throughout a 53-year span of data from 1961 to 2013, only recently losing a percentage of world production due to increased production in Russia and New Zealand.[90]

The Pacific Northwest region contains some of the highest carbon density forests in the world with a concomitant timber industry. In Oregon during 2001 - 2015, the timber industry produced over 32 percent of the state's carbon emissions with similar figures likely in California's Klamath region. Proposed bioenergy and biomass fuel production would increase cumulative emissions even further. Additional increased harvest through proposed thinning practices in the region will elevate emissions for decades to centuries regardless of product end use.[91]

It has been well documented (Figure 14 below) that only a small fraction of the sequestered carbon in a tree is stored in wood products. Deck boards, for example, often are discarded after a few decades — prior to the amount of time it would take to regrow the timber they were made from — resulting in further increases of atmospheric carbon. The use of logging residue and roundwood for wood pellets for bioenergy is even worse with over 100 percent of the tree carbon emitted when transportation and manufacturing emissions are included in the calculations. Compounding the bioenergy from wood

problem is the lower energy density of wood pellets resulting in 65 percent more CO_2 emitted per megawatt-hour when used for power generation compared to a modern coal-fired power plant.[92]

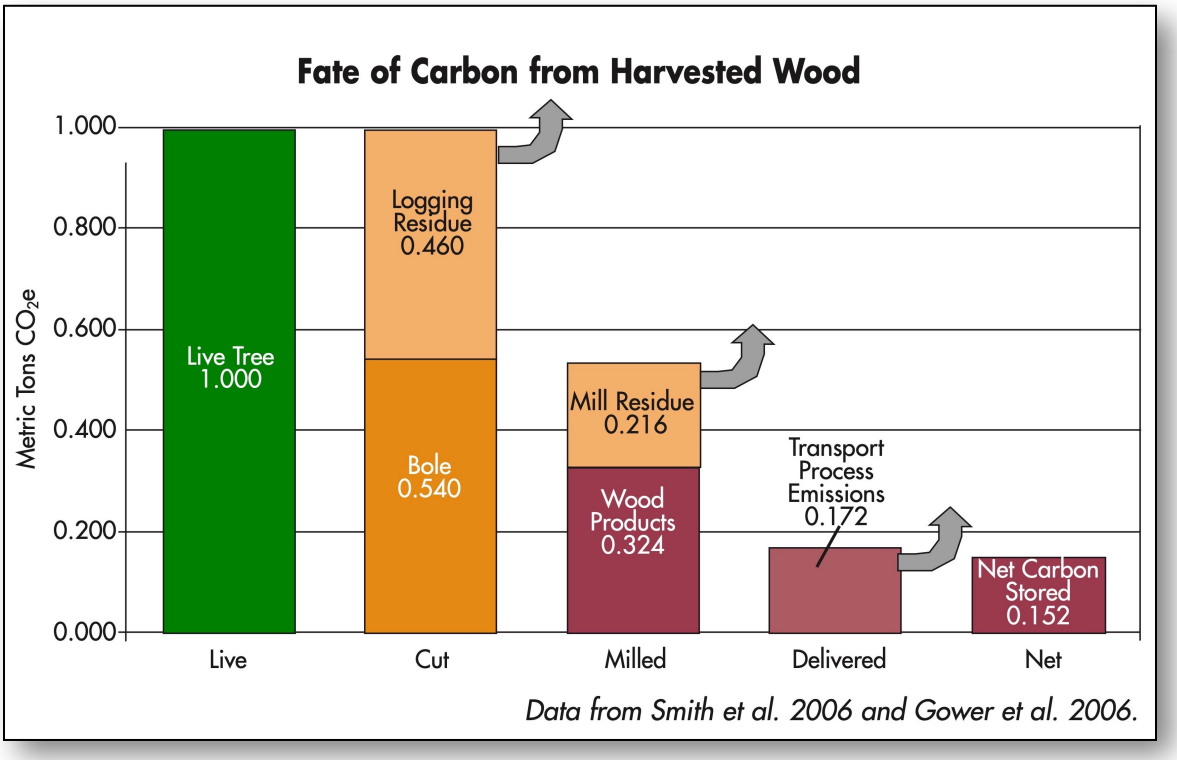

Figure 14 - Net carbon sequestered in wood products from live trees

Over the past eight or nine millennia, the global number of trees has fallen by approximately 46 percent since the start of human civilization.[93] In California, by comparing historic (1930s) and contemporary (2000s) surveys of forests, it has been documented that across 120,000 km^2, large trees have declined by up to 50 percent, corresponding to a 19 percent decline in average basal area and associated biomass, despite large increases in small tree density.[94] Globally, the amount of forest biomass has been reduced by more than half.

Even so, the 4 billion hectares of global forest ecosystems still store large reservoirs of carbon, together holding more than double the amount of carbon in the atmosphere.[95] Given their degraded and diminished state, this represents a huge potential. Although dependent on the decarbonization of the global economy, protecting and preserving forests could create negative emissions that along with the oceans would draw down atmospheric carbon levels. Although it would take centuries, if forests are protected and allowed to regrow to their fullest potential and the economy converted to near zero carbon emissions, atmospheric CO_2 levels could be reduced below 350 parts per million returning to the safe climate zone for human civilization. Trees are currently the only known method capable of capturing CO_2 from the atmosphere at the scale required without the need for any additional energy.

Given the state of the Earth's climate that we find ourselves living with and the urgent necessity to decarbonize the global economy to address the precariousness of the situation, every effort must be

implemented for reducing incremental carbon emission increases that cannot be justified. Changes to forestry practices like reforestation, afforestation, lengthened harvest cycles on private lands, along with proforestation and restricting harvest on public lands could increase the net ecosystem carbon balance 56 percent by 2100[96] demonstrating the potential forests hold for restoring the climate.

Early Warning Signs of Climate Catastrophe

On August 3rd, the news was released that data from the the Copernicus Climate Change Service showed the month of July was between 1.5°C and 1.6°C hotter than the average[97] before the widespread use of fossil fuels. Although we have officially only warmed 1.1°C - 1.2°C on a years-long basis, headlines from the previous day gave a preview of what the world will be like in the future climate state when the Earth becomes 1.5°C warmer. Two of the headlines were extremely concerning for possibly being early warning signs of an impending collapse of the Atlantic Meridional Overturning Current (AMOC). One reported an ocean surface temperature of 101.1 °F off the coast of Florida[98] and the second reported record extremely low amounts of sea ice around Antarctica.[99]

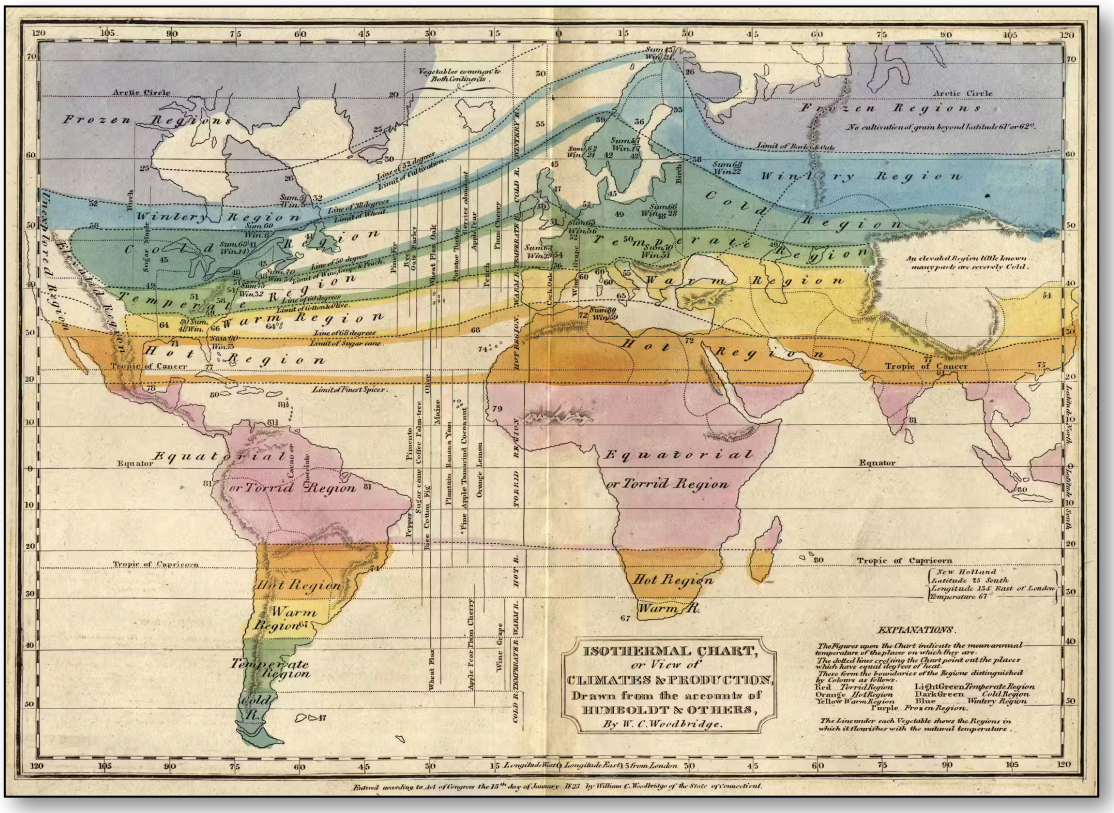

Figure 15 -1823 Isothermal Map based on the accounts of Alexander von Humboldt[100]

Recent studies concerning the AMOC, a major mechanism for heat redistribution on our planet, are very troubling in their description of the significant slow down in the ocean circulation currents driving the Gulf Stream.

"There is evidence that the AMOC is slowing down in response to anthropogenic global warming—as predicted by climate models—and that the AMOC is presently in its weakest state for more than 1,000 years.[101]"

The Gulf Stream is part of this system, bringing warmth to the northern latitudes of Europe. Due to the warmth imparted by the Gulf Stream, London, England has had a more temperate climate than Vancouver, British Columbia despite being at a more northerly latitude.[102,103] This effect has been known since the early nineteenth century (Figure 15 above).

As the AMOC current slows down, more water will accumulate along the US east coast leading to enhanced sea level rise. Less warmth would be transferred to the temperate and polar latitudes causing heat to intensify farther south leading to large changes in tropical rainfall and monsoons.[104]

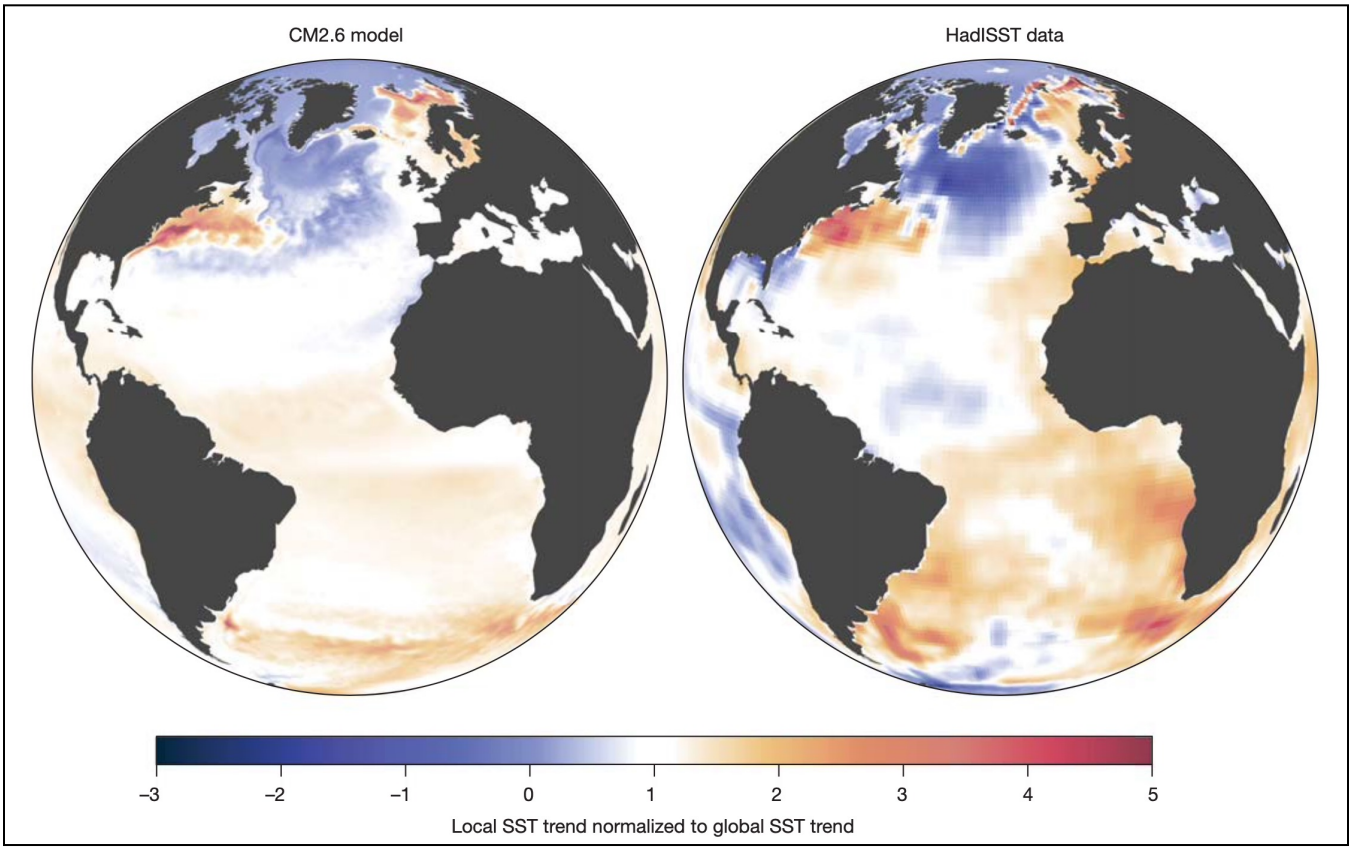

Figure 16 - Comparison of normalized Sea Surface Temperature (SST) trends.[105] Left, linear SST trends during a CO2-doubling experiment using the GFDL CM2.6 climate model. Right, observed trends during 1870–2016 (HadISST data).

"Weakening of the AMOC is revealed by a characteristic spatial and seasonal sea-surface temperature 'fingerprint'—consisting of a pattern of cooling in the subpolar Atlantic Ocean and warming in the Gulf Stream region— and is calibrated through an ensemble of model simulations from the CMIP5 project. We find this fingerprint both in a high-resolution climate model in response to increasing atmospheric carbon dioxide concentrations, and in the

temperature trends observed since the late nineteenth century. The pattern can be explained by a slowdown in the AMOC and reduced northward heat transport, as well as an associated northward shift of the Gulf Stream. Comparisons with recent direct measurements from the RAPID project and several other studies provide a consistent depiction of record-low AMOC values in recent years.[106]"

Reconstruction of the Atlantic multidecadal variability, the anomalously warm and cold sea surface temperatures relative to the global average, over the past millennium reveal a significant early warning sign for an approaching tipping point as is shown in Figure 16 above. Tipping occurs when a critical threshold, or tipping point, is crossed, leading the system into a different dynamical regime.[107]

A full collapse of the AMOC is one of the most feared of the irreversible tipping points threatened by continued global warming. This event would cause pronounced cooling across the northern hemisphere leading to stormier winters and drier summers in Europe with extreme heat waves such as Europe has already been experiencing this year, vividly demonstrated by the intensifying wildfires in Southern Europe[108]. It is further thought that this collapse could occur suddenly and unpredictably.

"Earth's climate does not respond to forcing in a smooth and gradual way. Rather, it responds in sharp jumps which involve large-scale reorganization of Earth's system. If this reading of the natural record is correct, then we must consider the possibility that the main responses of the system to our provocation of the atmosphere will come in jumps whose timing and magnitude are unpredictable. Coping with this type of change is clearly a far more serious matter than coping with a gradual warming.[109]"

The most recent study on the AMOC actually predicts this collapse will occur rather soon; much sooner than previously predicted by the IPCC.

"Tipping to an undesired state in the climate is, however, a growing concern with **increasing greenhouse gas concentrations**. Predictions based on observations rely on detecting early-warning signals, primarily an increase in variance (loss of resilience) and increased autocorrelation (critical slowing down), which have recently been reported for the AMOC. Here we provide statistical significance and data-driven estimators for the time of tipping. We estimate a collapse of the AMOC to occur around **mid-century under the current scenario of future emissions.** (emphasis added)

Using t0 = 1924, the optimal fit is the same as the moment method, tc = 2057, with a 95% confidence interval 2025–2095.[110]"

As described above, the weakening and possible collapse of the AMOC is being driven by carbon emissions which must be reduced and stopped as rapidly as possible. Carbon must remain sequestered to refrain from adding even more emissions to the atmosphere. Unfortunately, greenhouse gas emissions from the energy industry continued to increase last year despite record growth in wind and solar power with fossil fuels continuing to make up 82 percent of the world's total energy consumption in 2022 as the world used more energy overall.[111]

> "To halt global warming, the emission of carbon dioxide into the atmosphere by human activities such as fossil fuel burning, cement production, and **deforestation** needs to be brought all the way to zero. The longer it takes to do so, the hotter the world will get. Lack of progress towards decarbonization has created justifiable panic about the climate crisis.[112]" (emphasis added)

The sharp increase in north Atlantic surface temperatures over the past three months[113] has prompted fears among veteran climate scientists that the world's climate has entered a more erratic and dangerous phase with the advent of an El Niño event exacerbating human-made global heating.[114] The 1.5°C limit adopted in the Paris Agreement of 2015 is expected to be breached in at least one year between 2023 and 2027.[115]

> "We're taking colossal risk with the future of civilization on earth. We're degrading life support systems that we all depend on. We're actually pushing the entire earth system to a point of destabilization; pushing earth outside of the state that has supported civilization since we left the last ice age 10,000 years ago. This requires a transformation to safe and just earth system boundaries for the whole world economy.
>
> Dear friends, scientifically this is not a climate crisis. We are now facing something deeper — mass extinction, air pollution, undermining ecosystem function. Really putting humanity's future at risk. **This is a planetary crisis.**" (emphasis added)
>
> Johan Rockström, speaking at the World Economic Forum, Davos 2023[116]

Forests as potentially the major method of stopping and reversing Global Warming

On his first day in office, President Biden signed an order to rejoin the Paris Agreement declaring climate change a "global, existential crisis.[117]" The Agreement calls for a 50 percent reduction in Greenhouse Gas (GHG) emissions by 2030 and achieving net-zero emissions by 2050.[118] A week after his inauguration, President Biden also issued Executive Order 14008 pledging "to achieve the goal of conserving at least 30 percent of our lands and waters by 2030.[119]"

Last year on Earth Day, April 22, 2022, the Biden Administration issued Executive Order 14072 directing the Secretary of the Interior, with respect to the Bureau of Land Management (BLM) and the Forest Service branch of the U.S. Department of Agriculture, to "define, identify, and complete an inventory of old-growth and mature forests on Federal lands" within one year.[120] This year in time for Earth Day, the Mature and Old-Growth Forest Report[121] was released identifying 32.7 million acres of old-growth forest and 80.1 million acres of mature forest on BLM and Forest Service lands.

The old-growth forests identified amount to only 4 percent of the over 800 million forested acres in the US.[122] Adding the mature forest land identified, the sum of mature and old-growth forest in both BLM lands and National Forests encompasses less than 14 percent of forested land while more than half of US forests are privately owned.[123] Mature and old-growth forests hold the promise of helping address

simultaneously the climate, biodiversity and water crises that confront us by sequestering the carbon from CO_2 emissions[124], conserving habitat for wildlife[125,126] and regulating the water cycle.[127]

It is imperative that the 91,813,380 acres of mature and old-growth forest on the lands managed by the US Forest Service be completely protected from any logging or other management and preserved. Beyond the 2050 goal of net-zero GHG emissions, atmospheric CO_2 levels thereafter need to be further reduced to 350 parts per million or less (negative emissions) to stay within the safe climate zone for human civilization. Trees are the major known method currently capable of capturing CO_2 from the atmosphere at the scale required without the need for any additional energy. Globally, forests now absorb about 30 percent of all CO_2 emissions from fossil fuel burning and net deforestation and store large reservoirs of carbon, holding more than double the amount of carbon in the atmosphere.[128]

> "Despite regional negative effects of climate change on the net amount of carbon removed from the atmosphere annually by land ecosystems, their removal of carbon dioxide from the atmosphere has remained fairly constant over the last 60 years at about 31% of emissions, with **forests contributing the most.**[129]" (emphasis added)

Reversing the degree to which forests have been removed and degraded globally actually provides a tremendous potential for addressing climate warming through proforestation and reforestation should decarbonization be achieved.

> "(I)n the Pacific northwest USA, an analysis of inventory and remote sensing data indicated that the current carbon storage on forest land is half of the potential, and it could increase by 15% over the next several decades if allowed to grow and accumulate carbon. This can potentially result in hundreds of additional years of forest carbon accumulation.[130]"

Additionally, Mature and Old-Growth forests must be preserved and more recruited as it is these stands that amass and sequester CO_2 faster than younger, managed forest stands.

> "Ecosystem services accrue as forests age for centuries. Far from plateauing in terms of carbon sequestration (or added wood) at a relatively young age as was long believed, older forests (e.g., >200 years of age without intervention) contain a variety of habitats, typically continue to sequester additional carbon for many decades or even centuries, and sequester significantly more carbon than younger and managed stands. Temperate forests in particular have the highest CO_2 removal rates and overall biological carbon sequestration.
>
> In sum, proforestation provides the most effective solution to dual global crises — climate change and biodiversity loss.[131]"

Even viewed on an individual tree level, it is the larger trees that sequester the most CO_2, continually increasing their rate of sequestration for centuries or even millennia.

> "A single large tree can add the same amount of carbon to the forest within a year as is contained in a single mid-sized tree of the same species. The relationship between large-

diameter trees and overall forest biomass suggests that forests cannot accumulate aboveground carbon (AGC) to their ecological potential without large trees. Overall, as trees grow larger, each additional centimeter of stem diameter corresponds with a progressively larger increase in tree carbon storage.

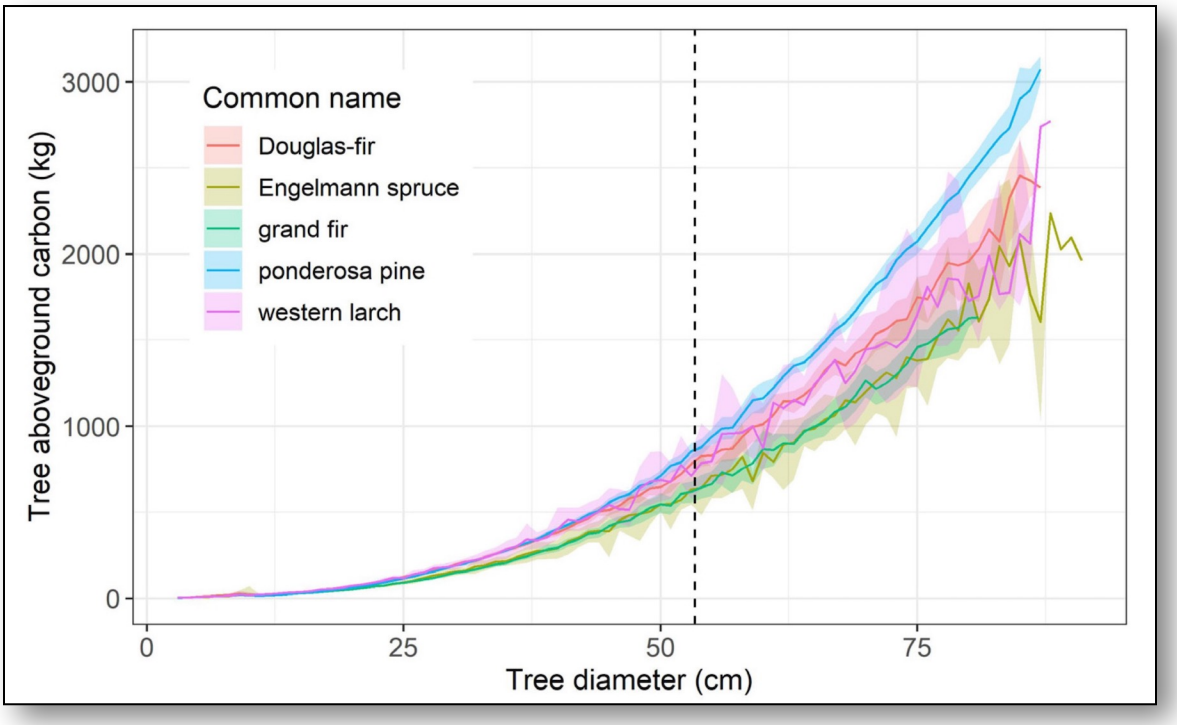

Figure 17 - Average tree aboveground carbon vs. Tree diameter [132]

The sharp increase in carbon storage with increasing tree diameter (Figure 17) speaks to the importance of preserving mature and old large trees to keep this carbon stored in the forest ecosystem where it remains for centuries.[132]"

"Old-growth forests accumulate carbon for centuries and contain large quantities of it. We expect, however, that much of this carbon, even soil carbon, will move back to the atmosphere if these forests are disturbed. Because old-growth forests steadily accumulate carbon for centuries, they contain vast quantities of it. They will lose much of this carbon to the atmosphere if they are disturbed, so carbon-accounting rules for forests should give credit for leaving old-growth forest intact.[133]"

Moreover, undisturbed forest lands annually sequester 67 percent more carbon per hectare compared to managed timberlands.[134] (See table 4)

"Thinning forests to reduce potential carbon losses due to wildfire is in direct conflict with carbon sequestration goals, and, if implemented, would result in a net emission of CO_2 to the atmosphere because the amount of carbon removed to change fire behavior is often far larger than that saved by changing fire behavior, and more area has to be harvested than will ultimately burn over the period of effectiveness of the thinning treatment.

Managing forest carbon should consider other ecosystem values and services, and ecosystem sustainability in the face of climate change, allowing for natural adaptation to climate change (e.g., landscape connectivity for migration and minimizing impacts of management on species ability to survive in a new climate).[135]"

Forests are becoming even more important for carbon sequestration as global warming is reducing the ability of the world's oceans to store carbon.

"Our results suggest that predicted future increases in ocean temperature will result in reduced CO_2 storage by the oceans. Based on the observed relationship, future increases in ocean temperature will likely lead to shallower remineralization of particulate organic carbon and hence reduced storage of CO_2 by the ocean.[136]"

"The recent Intergovernmental Panel on Climate Change report on impacts, mitigation, and adaptation found, and member countries agreed, that maintaining the resilience of biodiversity and ecosystem services at a global scale is "fundamental" for climate mitigation and adaptation, and requires "effective and equitable conservation of approximately 30 to 50% of Earth's land, freshwater and ocean areas, including current near-natural ecosystems." Our key message is that many of the current and proposed forest management actions in the United States are not consistent with climate goals, and that preserving 30 to 50% of lands for their carbon, biodiversity and water is feasible, effective, and necessary for achieving them.

As to the effectiveness and likelihood that thinning might have an impact on fire behavior, the area thinned at broad scales to reduce fuels has been found to have little relationship to area burned, which is mostly driven by wind, drought, and warming. A multi-year study of forest treatments such as thinning and prescribed fire across the western U.S. showed that about 1% of U.S. Forest Service treatments experience wildfire each year. The potential effectiveness of treatments lasts only 10–20 years, diminishing annually. Thus, the preemptive actions to reduce fire risk or severity across regions have been largely ineffective. It is understandable that the public wants action to reduce wildfire threats, but **false solutions that make the problem worse and increase global warming are counterproductive**. (emphasis added)

Preserving and protecting mature and old forests would not only increase carbon stocks and growing carbon accumulation, they would slow and potentially reverse accelerating species loss and ecosystem deterioration, and provide greater resilience to increasingly severe weather events such as intense precipitation and flooding.

The strategic reserves defined within each ecoregion would protect carbon, water, and biodiversity, and recognize the value of forested landscapes that are diverse in structure and function. An example is the Klamath Mountains ecoregion in Oregon and California, which has high biodiversity partly because of its unique geology. It is one of the top four temperate coniferous forests in species richness globally. Its vulnerability to forest fires should not disqualify it from protecting the rich diversity of plant and animal species from human degradation.[137]"

> "Thinning also has an inherent carbon cost that increases as larger trees are harvested, thereby putting thinning of larger trees in conflict with carbon goals because it takes so long to replace the harvested biomass. Climate science makes clear that we do not have time to wait for regrowth after logging to accomplish these important ecosystem services.[138]"

> "Immediate and effective action is essential to address accelerated warming, water shortages and biodiversity losses, which includes animals, plants, and ecosystems. Biodiversity loss, degradation and transformation of ecosystems are already worse than predicted due to past global warming and will continue to escalate with increased warming. Safeguarding biodiversity and ecosystem services depend on effective conservation of about 30–50% of Earth's land, freshwater and ocean areas, including currently near-natural ecosystems. Protecting mature and old forests on federal lands fulfills an urgent need for protection and provides a low-cost way to simultaneously meet national and international goals.[139]"

We no longer have the luxury of wasting time before beginning to address the climate crisis.

Other aspects of the South Fork Sacramento Public Safety and Forest Restoration Project

The SFS Project proposes to enlarge the capacities of the parking area at Castle Lake and also of the campground nearby as well as increasing camping by developing sites at the Old Nordic Center. While increasing public access to this beautiful area is a generous and laudable impulse, the increased number of people this action would allow contradicts the supposed "Public Safety" enhancement purpose of the project. While the EA goes on to express concern about the dense vegetation creating hazardous fuel conditions and the high flame lengths that would then ensue in a fire, it does not recognize the hazard that a chaotic attempt at evacuation from a fire would result in.

In the town of Paradise in 2018 and in Lahaina, Hawaii last week, news articles reported how people panicked when attempting to flee from the fires burning the towns.

In Paradise:

> "Fire surrounded the evacuation route and drivers panicked, some crashing and others abandoning their vehicles to try their luck on foot. Many residents said traffic jams developed as they left as panicked people fled, some abandoning their cars to try to escape on foot, clutching pets and babies. Sheriff's officials in Northern California said at least five people were found dead in vehicles on a main thoroughfare heading out of Paradise.[140]"

People died because of the traffic gridlock.

In Lahaina:

> "The fire hit the coastal town so quickly and caught officials so off-guard that emergency sirens didn't sound. Many panicked residents were unable to flee on the town's one clogged highway and took boats or swam to safety, if they were able to escape at all.[141]"

This is how people react. Facilitating an increase in the numbers of "recreationists" around Castle Lake may actually jeopardize them further. The lack of capacity could actually be quite beneficial for public safety in this instance.

On another matter related to visitor density, the director of the Limnology Lab at Castle Lake, Sudeep Chandra, related that with the current number of visitors at the lake, the trail around the lake is becoming so eroded that much more sediment is noticeably washing into the lake reducing the quality of aquatic habitat. He also described the greater amount of garbage strewn about and said there are no garbage receptacles or garbage service. It's unfortunate that more people don't espouse the "pack it in, pack it out" ethos, but there you have it.

The forty-seven miles of hiking and bicycle/e-bicycle trails proposed in this project creates another fire related concern. These trails would provide access farther into the forest and increase the probability of a fire start in a more remote and inaccessible area. Material provided online in support of this project noted that in the most recent decade, most of the fire starts in the project area were human caused. A recent study evaluated over 1.5 million government records of wildfires that had to be extinguished or managed by state or federal agencies from 1992 to 2012, and examined geographic and seasonal extents of human-ignited wildfires relative to lightning-ignited wildfires.

> "Human-started wildfires accounted for 84% of all wildfires, tripled the length of the fire season, dominated an area seven times greater than that affected by lightning fires, and were responsible for nearly half of all area burned. National and regional policy efforts to mitigate wildfire-related hazards would benefit from focusing on reducing the human expansion of the fire niche.[142]"

> "We found that human-caused ignitions were concentrated close to roads, in high road density areas, and near the wildland-urban interface (WUI). In contrast, lightning-caused ignitions were concentrated in low road density areas, away from WUI, and in low population density areas.[143]"

> "Managers concerned about fires can close and decommission roads that contribute to human-caused fire ignitions .[144]"

Fuelbreaks have also being proposed for the project despite their lack of effectiveness in the event of a high severity fire. Firebrands are capable of lofting and traveling for miles, far beyond the width of a firebreak. In the Camp Fire that burned the town of Paradise down, firebrands started spot fires over a mile in advance of the main fireline (Figure 18 below) and ignited residences, many of which burned down while trees lining subdivisions remained unburned (Figure 19 below).

Figure 18 - The Camp Fire about four hours after ignition showing the fire spreading miles ahead of itself via long-range spotting. The fire is about fifteen miles wide at this point. Acquired from fireadaptednetwork.org[24]

Figure 19 - Homes leveled by the Camp fire at the Ridgewood Mobile Home Park retirement community in Paradise, Calif., in 2018. (Noah Berger / Associated Press)[145]

Fuelbreaks can also cause strips of forest to convert to more non-native and invasive grasses and weeds (Figure 20 below).

> "The primary vector for long-distance movement of noxious weeds is vehicle traffic. Because vehicles used for fire suppression came from across the United States, there is potential for introduction of new noxious weed species into these areas.[146]"

Figure 20 - The native vegetation was eliminated here (by bulldozer) and the result was invasion by highly flammable cheatgrass. Photo by George Wuerthner[147]

The proposal to install a gate blocking the road in to Cliff Lake in order to protect the Port Orford Cedars growing there is a good one. The only concern is whether the gate would be effective. Over time drivers of motorcycles, ATVs and even 4x4 vehicles may circumvent the barrier if it is not placed in a suitable location.

The restoration of the meadow proposed in the EA is not a straightforward issue. If the meadow was originally formed after a stand-replacing fire, the forest stand may just be restoring itself to its original extent.[148] The land and the forests are dynamic and changing, not static and unchanging. On the other hand, the restoration of the meadow might be better engineered by releasing problem beavers into the meadow instead of building artificial beaver dams. The transformation of the meadow to beaver habitat would greatly enhance biodiversity while providing more fire refugia.

> "Beavers, being ecosystem engineers, are among the few species besides humans that can significantly change the geomorphology, and consequently the hydrological characteristics and biotic properties of the landscape. In so doing, beavers increase heterogeneity, and habitat and species diversity at the landscape scale. Beaver foraging also has a considerable impact on

the course of ecological succession, species composition and structure of plant communities, making them a good example of ecologically dominant species (e.g. keystone species).[149]"

The beavers would most likely remove the encroaching conifers and maintain their dams in perpetuity without need for intervention. Decommissioning the logging road to the meadow would also help.

On a positive note, the installation of an ALERT Wildfire Camera is an excellent idea, especially if it could be coupled with a remotely operated emergency warning siren to alert visitors near Castle Lake to evacuate if they haven't noticed smoke yet.

Omissions

Executive Order 1834 stipulates that government agencies "are instructed to track and report on greenhouse gas (GHG) emissions and reductions.[150]"

On January 9, 2023, the Council on Environmental Quality (CEQ) issued interim guidance to assist agencies in analyzing greenhouse gas (GHG) and climate change effects of their proposed actions under the National Environmental Policy Act (NEPA).

> "CEQ is issuing this guidance as interim guidance so that agencies may make use of it immediately while CEQ seeks public comment on the guidance. CEQ intends to either revise the guidance in response to public comments or finalize the interim guidance.
>
> The United States faces a profound climate crisis and there is little time left to avoid a dangerous—potentially catastrophic—climate trajectory. Climate change is a fundamental environmental issue, and its effects on the human environment fall squarely within NEPA's purview.
>
> This guidance applies longstanding NEPA principles to the analysis of climate change effects, which are a well-recognized category of effects on the human environment requiring consideration under NEPA.
>
> To ensure that Federal agencies consider the incremental contribution of their actions to climate change, agencies should quantify the reasonably foreseeable direct and indirect GHG emissions of their proposed actions and reasonable alternatives (as well as the no-action alternative) and provide additional context to describe the effects associated with those projected emissions in NEPA analysis.
>
> (In defining GHGs) Also, for purposes of this guidance, ''emissions'' includes release of stored GHGs as a result of land management activities affecting terrestrial GHG pools such as carbon stocks in forests and **soils**, as well as actions that affect the future changes in carbon stocks.[151]"

The SFS - Climate Change Mitigation Specialist Report attempts to comply with the GHG assessment required but fails to even discuss carbon loss amounts from impacted soils. There is also an omission

of the specific amounts of CO_2 emissions from equipment usage and transportation involved with the project with only the statement:

> "Carbon emissions will occur from the operation of heavy machinery… but these emissions tend to be low."

The Report also fails to provide a valid assessment of GHGs produced by the substitution of biomass for generating energy or conversion to liquid fuel. Although three studies are cited in support, there is the inane statement:

> "In fact, removing carbon from forests for human use can result in a lower net contribution of GHGs to the atmosphere than if the forest were not managed."

Analysis of CO_2 emissions from the use of wood pellets to power electricity generation completely contradicts this inanity.

> "Due to the inefficiencies of biomass energy, bioenergy power plants emit approximately 65 percent more CO_2 per MWH than modern coal plants, and approximately 285 percent more than natural gas combined cycle plants. In the case of forest timber turned into wood pellets for bioenergy use, the IPCC further indicates that the process produces higher CO_2 emissions than fossil fuels for decades to centuries. The burning of wood pellets emits much higher levels of carbon than if the wood was left to decay in the forest because the harvesting, transport, processing, and burning of wood all emit carbon dioxide.[152]"

Technically, carbon will be re-sequestered by the continued regeneration and growth of forests over time but the greater sequestration rates that could have been provided by mature and old-growth trees that are cut will have been lost in the interim.

> "Given the slow dynamic of forest carbon, life cycle analysis needs to account for pre-existing forest conditions, since carbon neutrality (i.e., net ecosystem carbon balance of forests is zero) can take at least a century to achieve in many cases. GHG emission policies will need to account for emissions associated with bioenergy, which is currently not considered internationally. Thus, GHG emissions resulting from substitution for fossil fuels will have to be more accurately represented if their true impact is to be understood. To determine whether GHG targets are met, there is a need to improve the accuracy of estimates of forest carbon budgets by using scientifically based measurement approaches that account for uncertainty.[153]"

The EA states:

> "This proposed project would affect a relatively small amount of forest land and carbon on the Shasta-Trinity and might temporarily contribute a small quantity of GHG emissions relative to Forest carbon storage."

A very recent court ruling declares:

> "Without some articulated criteria for significance in terms of contribution to global warming that is grounded in the record and available scientific evidence," an agency's conclusion that the Project's carbon impacts will be "minor" is insufficient.
>
> Ultimately, "greenhouse gas reduction must happen quickly" and removing carbon from forests in the form of logging, even if the trees are going to grow back, will take decades to centuries to re-sequester. Put more simply, logging causes immediate carbon losses, while re-sequestration happens slowly over time, **time that the planet may not have**. ("It is recognized that global research indicates the world's climate is warming and that most of the observed 20th century increase in global average temperatures is very likely due to increased human-caused greenhouse gas emissions."). (emphasis added)
>
> While the USFS did address climate change in the EA through the Forest and Project Carbon Plans, merely discussing carbon impacts and concluding that they will be minor does not equate to a "hard look." NEPA requires more than a statement of platitudes, it requires appraisal to the public of the actual impacts of an individual project. With all in agreement that climate change as a result of carbon emissions is an increasingly serious national and global problem, the USFS has the responsibility to give the public an accurate picture of what impacts a project may have, no matter how "infinitesimal" they believe they may be. They did not do so here. Accordingly, the agency failed to take a "hard look" at the Project's carbon emissions, violating NEPA."
> Ctr. for Biological Diversity v. U.S. Forest Serv., CV 22-114-M-DWM (D. Mont. Aug. 17, 2023)

The SFS - Climate Change Mitigation Specialist Report is incomplete, inaccurate and contains fallacies.

A second omission is the lack of any baselines for basal area. The maps for the project alternatives show sections with basal areas (some as low as 0) remaining after "thinning" and Table 1-1 tabulates basal area targets for different treatments. For example, the FMZ sections will be "thinned" to 60-80 ft^2ac^{-1}. Nearby forest stands are known to contain stands with basal areas of 266 ft^2ac^{-1} or more[154]. A reduction to a basal area of 60 ft^2ac^{-1} would result in a chainsaw produced mortality of over 77 percent — equal to a high severity fire. An actual fire of any severity in these "thinned" sections would then produce an even higher cumulative mortality raising the question of whether the cure is worse than the disease.

The baseline basal areas of the different sections of the project are not enumerated precluding the public assessment of the extent of various treatments in violation of NEPA.

In conclusion -

The climate crisis is elevating the importance of forests globally as vital resources in combatting excess CO_2 concentrations in the atmosphere.

"The recent 1.5 Degree Warming Report of the Intergovernmental Panel on Climate Change (2018) was dire and direct, stating the need for "rapid, far-reaching and unprecedented changes in all aspects of society." We find that growing additional existing forests as intact ecosystems, termed proforestation, is a low-cost approach for immediately increasing atmospheric carbon sequestration to achieve a stable atmospheric carbon dioxide concentration that reduces climate risk.

Forests are essential for carbon dioxide removal (CDR), and the CDR rate needs to increase rapidly to remain within the 1.5 or 2.0 °C range (Intergovernmental Panel on Climate Change, 2018) specified by the Paris Climate Agreement (2015). Growing existing forests to their biological carbon sequestration potential optimizes CDR while limiting climate change and protecting biodiversity, air, land, and water. Natural forests are by far the most effective.

Newly planted forests require many decades to a century before they sequester carbon dioxide in substantial quantities. neither of these two practices is as effective quantitatively as proforestation in the next several decades when it is needed most.[155]"

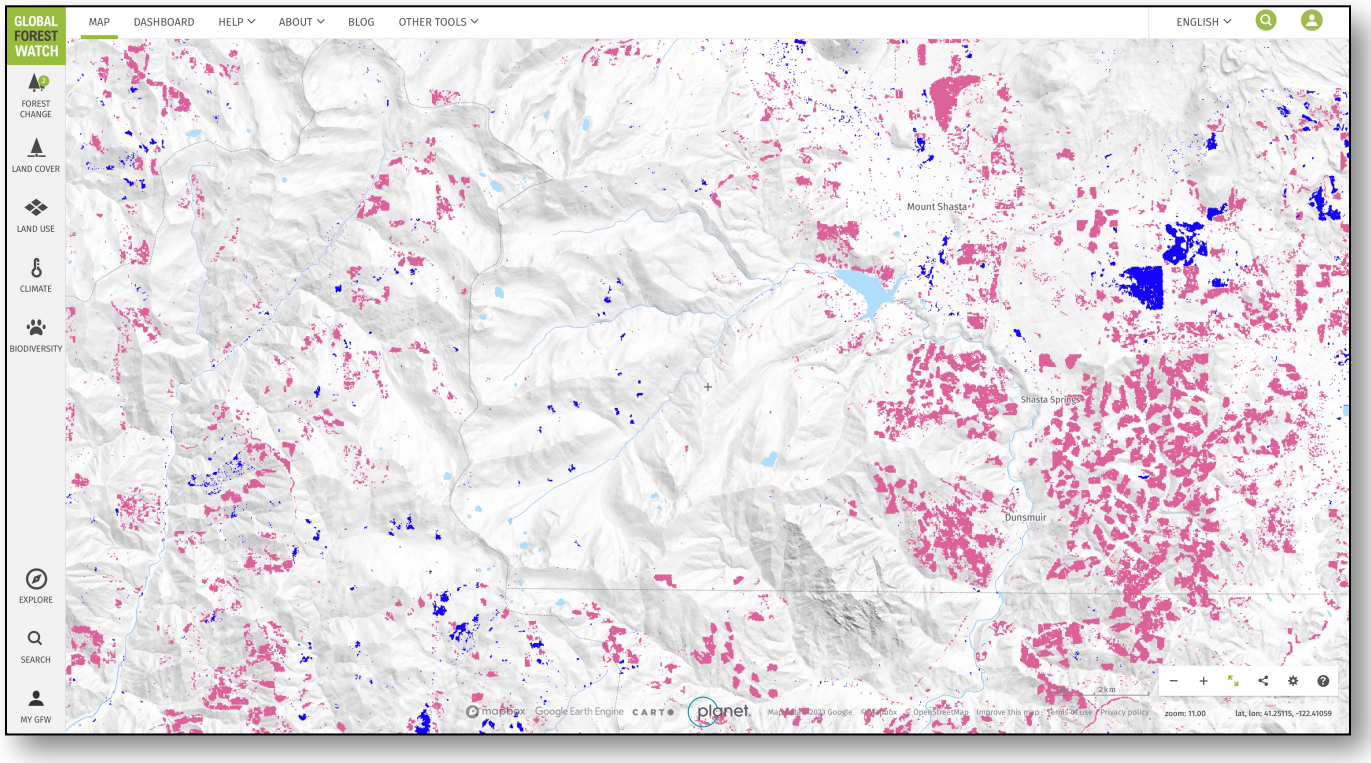

Figure 21 - View of the SFS Project area Pink - Forest loss, Blue - Forest gain acquired at Global Forest Watch[156]

Viewing the image of Figure 21 showing the project area surrounded by clear cuts causes the question to arise whether the area was targeted because of it's striking unmarked condition. This is followed by the question whether this project is being advanced ahead of any final rulemaking on Mature and Old-Growth Forests to evade the protection this forest deserves.

This project will have severe impacts on the forest, listed endangered species, soils and water. If this project proceeds, this forest will only be restored to its previous logged state from which it has been regenerating for decades instead of being allowed to contribute to necessary carbon sequestration to counteract global warming and develop further into an old-growth forest providing habitat for biodiversity.

The South Fork Sacramento Public Safety and Forest Restoration Draft Environmental Assessment and Draft Finding of No Significant Impact contains omissions, inaccuracies and fallacies and is incapable of justifying the project or supporting any of the alternatives except No Action.

The complex and contentious issues arising from analysis of this project require an in-depth Environmental Impact Statement be conducted to determine if this project can be allowed to proceed.

Thank you for your attention,

Frank Toriello
President
We Advocate Thorough Environmental Review

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