6 August 2023

Clayton Jordan, Superintendent
Sequoia and Kings Canyon National Park

Dear Superintendent Jordan,

For your consideration, we are submitting the following comments on the Environmental Assessment (EA) for the Park's proposal to consider the possibility of planting sequoia and other conifer seedlings on more than 1,000 acres of high-severity fire areas in several giant sequoia groves and adjacent mixed-conifer forest. Based on the following, we urge you to withdraw this proposal, at least for now, or at a minimum prepare an Environmental Impact Statement to: (a) give the public and independent scientists time to ground truth the Park's 2023 field plot sequoia regeneration data, which has not yet been provided by the Park; (b) more carefully consider the discrepancies between the EA's stated planting threshold regarding sequoia seedling densities and the reference given by the EA (Stephenson et al. 2023) as the source of this threshold; (c) properly assess the disparity between the EA's core assumptions and predictions—i.e., that most (approximately 80% or more) of the year one post-fire sequoia regeneration would die by year two post-fire and that there would be little or no additional year two post-fire sequoia seedlings—and the actual results of 2023 field surveys; (d) allow time to see if year three post-fire data (and year four post-fire data in Board Camp Grove) continues to show substantially more positive results than the EA's assumptions and predictions regarding sequoia seedling survival and new sequoia reproduction; and (e) adequately analyze new, emerging scientific research by independent scientists from the high-severity fire areas in Redwood Mountain Grove (research which includes data and metrics that are not part of the Park's field surveys), and research from high-severity fire areas at 6 years post-fire in the Nelder Sequoia Grove, especially the finding that sequoia reproduction is higher in areas with the highest shrub cover, and the finding that young sequoias are densest and growing by far the fastest in the high-severity fire areas.

I. The Studies Relied Upon by the EA for Its Tree Planting Threshold Do Not Support the EA's Threshold, or Draw a Conclusion about Any Threshold.

The EA asserts on pp. 3-4, 27 that, according to Stephenson et al. (2023) and York et al. (2013), if there are less than 14,112 sequoia seedlings per acre at year two post-fire, sequoias will disappear completely in such areas. However, these sources do not support this assertion.

A. *The Stephenson et al. (2023) study does not support the EA's assertion that sequoia reproduction will disappear if year two post-fire sequoia seedling density is less than 14,112 per acre.*

Stephenson et al. (2023) does not make a conclusion that sequoias will disappear in a particular area if year two post-fire sequoia seedling density is less than 14,112 per acre. Stephenson et al.

(2023) merely reports that, at two years after lower-severity prescribed fires, there is typically an average of 14,112 sequoia seedlings per acre. In fact, Appendix 2 of Stephenson et al. (2023) contradicts the EA's assertion, showing that, even in these lower-severity fire areas (which create poor conditions for sequoia seedlings compared to higher-severity areas), and even in locations with only a few thousand sequoia seedlings per acre, a few hundred per acre, a few dozen per acre, or none per acre at year 2 post-fire, these areas remain populated with sequoias at year 5 post-fire (Stephenson et al. 2023 did not present any data beyond year 5 post-fire), and many of them have substantially *higher* sequoia seedling densities by 5 years post-fire than they did at 2 years post-fire, contrary to the EA's assumption that little or no new sequoia reproduction will occur after 1 or 2 years post-fire.

Stephenson et al. (2023) makes the following speculative comment at the end of its Discussion section regarding recent high-severity fire areas in sequoia groves:

> "Given the preceding considerations, and until any new, compelling evidence might suggest otherwise, we find no reason to believe that the Board Camp Grove and Redwood Mountain Grove seedling densities, which are significantly lower than our reference densities, can be assumed to be adequate to regenerate the locally extirpated sequoia populations."

At most, such a statement stands for the proposition that the authors of Stephenson et al. (2023) have no evidentiary basis to draw conclusions about sequoia reproduction levels and future regeneration. Perhaps more importantly, to the extent that this speculative comment is being used by the EA to assume that sequoias will disappear in areas with less than 14,112 sequoia seedlings per acre in year 2 post-fire, Appendix 2 of Stephenson et al. (2023) contradicts this assumption, showing that 83% (23 of 28) of the fires studied had year two post-fire sequoia seedling densities below 14,112 per acre--most of them far, far below this level--and yet the assumption that sequoia reproduction will disappear in such areas is not supported by the data in Appendix 2.

In fact, in Appendix 2 of Stephenson et al. (2023), for plots where some sequoia regeneration was recorded at some point after the prescribed fires (a minor portion of plots didn't have any seedlings, perhaps because the fire was not sufficiently intense to facilitate seed release), and where the density of sequoia seedlings at year 2 post-fire was ***less*** than the 651 per acre the EA (p. 5) says currently exists in the Board Camp Grove, by year 5 post-fire 3 of the plots fitting the above description had the same or lower density of sequoia reproduction, while 9 had ***higher*** sequoia seedling density by year 5 post-fire. This stands in stark contradiction to the assumptions in the EA that: (a) the great majority of the year 2 post-fire seedlings will be dead by year 5 post-fire; (b) little or no new sequoia reproduction will occur after the first year or two post-fire, and essentially none will occur after year 2 post-fire; and (c) in areas with dozens or hundreds of sequoia seedlings per acre at year 2 post-fire, sequoias will disappear in such locations.

B. *The York et al. (2013) study does not support the EA's assertion that sequoia reproduction will disappear if year two post-fire sequoia seedling density is less than 14,112 per acre.*

Nowhere does York et al. (2013) make a conclusion that sequoias will disappear in areas with less than 14,112 sequoia seedlings per acre at 2 years post-fire. Nor does the "stable population" graph in York et al. (2013), which the EA relies upon on pp. 3-4, support the EA's tree planting threshold. In fact, Table 1 of Subappendix 1 of York et al. (2013) states that the "stable population" graphs shown in Figure 1b of York et al. (2013) are based on two plots totaling 14.7 hectares. Figure 1b of York et al. (2013) shows approximately 6,000 sequoia seedlings on these 14.7 hectares in their stable population distribution figure, which equates to approximately 400 sequoia seedlings per hectare, or about 160 sequoia seedlings per acre, not 14,112 per acre.

C. *The EA's use of post-fire sequoia seedling survival data from low-severity surface fires to make assumptions about seedling survival in high-severity areas is scientifically inaccurate and unsupportable.*

Stephenson et al. (2023) uses data regarding sequoia seedling survival from about two dozen lower-severity surface fires (prescribed fires). However, the studies that the EA itself references (York et al. 2013, Meyer and Safford 2011, and Harvey and Shellhammer 1991) show that sequoia seedling survival is vastly higher in high-severity fire areas than in low-severity surface fire areas. Meyer and Safford (2011), for example, report (p. 12) that sequoia reproduction survival is 7 to 11 times higher in severely burned sites than in low-severity surface fire areas. Meyer and Safford (2011) note the following:

> These results emphasize the importance of periodic high- and moderate-severity fire for giant sequoia regeneration and long- term recruitment (Swetnam 1993, Stephenson 1994).

York et al. (2013) (p. 39) cautioned against assuming that larger high-severity fire patches will impede giant sequoia reproduction or reduce overall sequoia populations:

> Its life history suggests that it may actually increase following extensive high-severity fires, which have been increasing in the recent past.

Figure 3B of York et al. (2013) shows that, by 25 years post-fire, the highest density of young sequoia trees occurs in high-severity fire areas, and York et al. (2013) note that these young sequoias regenerating from high-severity fire areas are the trees most likely to become mature sequoias:

> The differences in regeneration response between disturbance severity and quality are less pronounced when isolating the larger giant sequoias (>140 cm tall and < 30 cm dbh) that regenerated (Figure 3B). Presumably, these are the trees most likely to recruit into the canopy and eventually replace the parent trees.

As acknowledged by these studies, high-severity fire gives sequoias the three things they need to effectively reproduce: i) sufficient heat to allow a sequoia's serotinous cones to release their seeds; ii) an intensity that consumes the thick duff and litter on the forest floor, turning it into a nutrient-rich bed of mineral ash that spurs seedling growth, and allowing seedlings to sink their roots into soil; and iii) killing of most or all canopy trees to give young seedlings the sunlight they need to thrive.

II. The EA's Tree Planting Proposal is Based on Assumptions that Have No Evidentiary Support in the Record.

As discussed above, the EA's planting proposal is predicated on certain core assumptions, e.g.: (a) that most of the 2022 seedlings would be dead by 2023; (b) and that there would be little or no 2023 sequoia reproduction. The EA (p. 27) refers to "mid-June 2023" sequoia reproduction field surveys in Redwood Mountain Grove and Board Camp Grove, but provides no data for the public to assess in order to determine the extent to which the EA's core assumptions remain valid. JMP repeatedly requested the Park's 2023 field data but Park staff declined to provide them during the EA's 30-day comment period, despite the fact that the EA (p. 27 and Fig. 7) clearly states that the Park's ultimate decision on whether to plant, and where to plant, will be based on these 2023 field surveys. The public must have access to the data upon which the Park relies for its decision in order to be able to meaningfully evaluate the degree of consistency between the EA's assumptions and the 2023 field data, as well as to be able to ground truth the Park's field plots and compare the Park's data for each plot to independent findings. There is a compelling need for this type of independent verification here, and such verification is only possible if the Park prepares an EIS or extends the EA comment period.

On June 29, 2023, a team of independent researchers (Chad Hanson, Tonja Chi, Maya Khosla, and Bryant Baker) began field surveys in the high-severity fire areas of Redwood Mountain Grove. They noted that many of the 2023 sequoia seedlings had just emerged from the ground days earlier, and many still had seed coats attached; some were still just under the needlecast. Therefore, mid-June 2023 surveys, conducted two weeks or so earlier, would have been too early and would have missed most of the 2023 sequoia seedlings. There appears to be two additional problems in this regard. Hanson and Baker visited a couple of the Park's field plot locations (the Park provided us with the coordinates of the 2022 field plots about halfway through the comment period) and found an extreme level of trampling by the Park's field crews within the plot boundaries, and extending for 2-3 meters beyond plot boundaries. They could not find a square foot of area that hadn't been severely trampled and essentially denuded in one particular plot, while just outside of this plot there was abundant vegetation cover and abundant sequoia seedlings--tens of thousands per acre--but almost no vegetation cover and no seedlings within the plot. It appears that Park field crews were careful not to trample 2022 sequoia seedlings when field work was conducted in late summer of 2022, but in plots with few sequoia seedlings in 2022, Park field crews heavily trampled plots in mid-June of 2023, before the 2023 sequoia seedlings had emerged from the soil and needlecast. This would have killed most of such seedlings. Normally, in mixed-conifer forests, large field plots are desired (Hanson and Chi 2021), but that is not the case when it comes to a serotinous conifer species like the giant sequoia, where it is common to have thousands or tens of thousands (even hundreds of thousands) of sequoia seedlings per acre. In such cases, field plots with an 11.35-meter radius, like those used by Park field crews in 2022, necessarily require field crews to walk repeatedly over most or nearly all of the ground within the plot, as opposed to counting seedlings from outside the plot, as can be done with smaller circular plots, or variable radius plot methods. The impacts of this are particularly serious when field crews sample the very same plot areas the very next year, after the plots had been severely trampled by the crews just several months earlier. The trampling of the plots by Park field crews is likely highly significant, leading to a marked under-counting of sequoia seedling density, since a large portion of the total current sequoia seedling density in the high-severity fire areas in Redwood Mountain Grove are comprised of 2023 seedlings, based on the surveys conducted by Hanson, Chi, Khosla, and Baker (see attached Redwood Mountain Grove 2023 Field Data spreadsheet; and see Appendix 1). Moreover, with the limited time we had during the comment period on the EA, after receiving the coordinates and data for the Park's 2022 field plots, we have visited several of the Park's Redwood Mountain Grove plots so far and a troubling pattern seems to be emerging, wherein plots for which Park staff found very few sequoia seedlings in 2022 seem to have been surveyed in 2023, along with extensive evidence of trampling and boot prints, while plots with high densities of sequoia seedlings in 2022 appear not to have been visited in 2023, based on the absence of any boot prints, such as REMO_10, visited by Maya Khosla and Tom Conlon. This suggests that biased sampling of plots may be occurring in 2023, which is a major concern since the nature of such bias would lead to a large under-reporting of sequoia seedling density for 2023. This is a serious issue since the EA states that the decision about planting or not planting will be based on 2023 field data gathered by the Park.

In addition, there are dozens of cows grazing in the Wilderness area within the high-severity fire patch of the Redwood Mountain Grove where the Park is expressing concern about sequoia reproduction in the EA. Hanson and Baker took photos and videos of the cows, and cow droppings and soil damage. Some of the droppings are from 2022 and some from 2023, so this has been going on for a long time, yet the Park has not removed the livestock, even as they trample and kill sequoia seedlings.

The foregoing are additional reasons that the comment period needs to be extended, and an EIS prepared. There is a significant need to ground-truth the Park's 2023 field plots, and adjacent untrampled areas, after receiving the Park's 2023 field data, which have not yet been provided. There is also a need to assess the degree of damage, and sequoia seedling loss, due to the Park's failure to remove dozens of cows from the areas now being proposed for planting. The EA fails to address these issues.

III. The Park's Refusal to Provide the Park's 2023 Sequoia Seedling Density Data Violates NEPA.

We requested the Park's 2023 sequoia seedling density data, upon which the EA explicitly relies (on p. 27) for the decision to plant seedlings in the Wilderness areas in question, but Park staff, and the experts upon whom the Park is relying, refused to provide these data for the public to evaluate, scrutinize and ground-truth during the comment period, even as Park staff made clear that they were relying centrally on the Park's 2023 data for the decision to plant trees—a decision that Park staff indicated they had already made well before the end of the public comment period and before comments and submitted evidence had been considered (see Appendix 2, attached). This is a violation of NEPA.

IV. Independent 2023 Field Surveys are Finding Sequoia Reproduction Far in Excess of the EA's Assumptions.

The team of independent scientists, Hanson, Chi, Khosla, and Baker, gathered data in field plots along transects in the large high-severity fire patch in Redwood Mountain Grove in the summer of 2023, and found an average of 27,161 sequoia seedlings per acre, with 41% of this from 2023, and sequoia seedling mortality of less than 3% (see attached Redwood Mountain Grove 2023 Field Data spreadsheet). York et al. (2013) (p. 8), upon which the EA heavily relies, says that sequoia seedlings that survive their first year have a 90% annual survival rate thereafter, and for at least the first two decades post-fire. Therefore, completely aside from the 2023 seedlings, the 2022 sequoia seedlings alone exceed 14,112 per acre and will have very high survival rates. The team could find no evidence to support the comment in the Discussion section of Stephenson et al. (2023), speculating that sequoia cones are incinerated in large high-severity fire patches. We found abundant sequoia cones on the ground in high-severity fire areas and, even in the most intensely burned areas within the large high-severity fire patch, abundant cones are clearly visible atop the crowns of mature sequoia snags.

The team of independent scientists, including Chad Hanson, Tonja Chi, Maya Khosla, Bryant Baker, and Michael Dorsey, also conducted a field plot study in the Nelder Grove in summer of 2023, at 6 years post-fire, finding that: a) sequoia reproduction density was significantly higher in high-severity fire areas; b) sequoia reproduction density was not significantly correlated to proximity to live, mature sequoias and, in fact, some of the highest densities of young, regenerating sequoias were found more than 300 meters from the nearest live, mature sequoia; c) sequoia reproduction density was significantly higher in areas with the highest levels of shrub cover; (d) sequoia seedlings/saplings were growing by far the fastest in high-severity fire areas; and e) sequoia seedlings/saplings comprised by far the highest proportion of total post-fire conifer reproduction in the high-severity fire areas (see attached Nelder Grove 2023 Field Data spreadsheet). Sequoia seedling mortality, conservatively estimated over the previous two years (dead sequoia seedlings/saplings that still retained some foliage) was less than 7% (a little over 3% per year).

These results are generally consistent with those presented in York et al. (2013) and Meyer and Safford (2011), which are relied upon by the EA. Every single study in existence that has addressed post-fire sequoia reproduction in high-severity fire areas versus low/moderate-severity areas, including those cited in the EA, finds far higher, and far faster-growing, sequoia reproduction in the high-severity fire areas. There are no studies in existence that provide empirical evidentiary support to the assumptions made in the EA about loss of sequoias in high-severity fire areas, or that lend support to the notion that high-severity fire areas need to be artificially planted in sequoia groves.

V. The Park's Hesitation about Waiting for More Data, Due to Concern about Shrub Growth, is Unfounded.

The EA repeatedly expresses hesitation about waiting for more data, e.g., until at least summer 2024 field data can be gathered, and expresses the view that perhaps the high-severity fire areas in Redwood Mountain Grove and Board Camp Grove should be planted in fall of 2023, due to the expressed concern over the growth of native shrubs in the high-severity fire areas, and the assumption that shrub cover will impede or adversely impact natural sequoia reproduction or potential for planting. However, the available evidence indicates that this concern is unfounded.

First, as discussed above, the only study to empirically investigate this question found that, by 6 years post-fire, sequoia reproduction density was highest in areas with the the highest shrub cover. No empirical field studies providing contrary conclusions are cited in the EA regarding post-fire sequoia reproduction.

Second, the EA itself (p. 37) contradicts this concern:

> The assumption of the need to remove other vegetation is based in the idea that this vegetation competes with the planted seedlings for light, water, or other needed resources. The conditions present in the large high severity areas proposed for replanting in this project may not meet this assumption. First, based on field observations completed to date, the proposed planting areas contain large patches of bare ground. These openings would be targeted for planting of seedlings. Second, given the complete removal of overstory canopy, these sites are at greater risk for high heat and soil erosion (surface erosion models showed high likelihood of significant soil loss). ***Shrub and forb cover has been shown to reduce surface temperatures, increase relative humidity, and improve seedling survival, and reduce soil erosion, all of which could increase survivorship of planted seedlings (Marsh et al. 2023; Marsh et al. 2022; Holmgren et al. 2012).***
>
> (emphasis added)

Third, York et al. (2013) (p. 14), upon which the EA heavily relies, contradicts this concern:

> Fire-induced nitrogen volatilization could be at least partially compensated for following fires by rapid establishment of nitrogen fixing species (primarily Ceanothus spp.)…

Therefore, the evidence suggests that the precautionary principle should apply here and the Park should, at a minimum, hold off on this proposal at least until more and better data can be gathered at year 3 post-fire (and year 4 post-fire for Board Camp Grove), in the summer of 2024.

VI. The Proposed Tree Planting Project Would Have Significant Impacts Not Disclosed in the EA, or Improperly Minimized in the EA.

- The EA states (pp. 17, 28) that 100 to 400 nursery-grown seedlings would be planted per acre in the areas in question, with undisclosed proportions of several tree species, only one of which would be giant sequoia. In our 2023 field data in the high-severity fire areas of Redwood Mountain Grove, 98% of the conifer seedlings are giant sequoias, similar to our findings at 6 years post-fire in high-severity fire areas of the Nelder Grove (See Redwood Mountain and Nelder Grove data spreadsheets). Currently, sequoias have a profound competitive advantage over non-sequoia tree species in the high-severity fire areas, unlike the low/moderate-severity areas, where non-sequoia species heavily dominate. Therefore, the EA proposes to undermine the dominance of giant sequoias in the high-severity fire areas by planting an undisclosed percentage of non-sequoia trees that would unnaturally compete with the naturally-regenerating sequoias, and undermine and impact natural succession and growth of natural sequoia seedlings in ways that the EA does not address, divulge, or acknowledge. The EA references planting plans which have not even been written yet, which means the public does not even yet know, based on the EA, what is actually being proposed where, and what the impacts would be.

- The EA does not meaningfully address or quantify the potential for the dozens of field staff and mules, walking and camping for several weeks in the high-severity fire areas, to trample and kill as many if not more naturally-regenerating sequoia seedlings per acre than the several dozen to a few hundred per acre the EA proposes to plant.
- The EA (pp. 10, 29) acknowledges that nursery-grown tree seedlings have the potential to infect native forest sites with harmful and deadly root pathogens when seedlings are planted, but claims that there is no potential here to infect these sequoia groves with any invasive root pathogens, and therefore there is no significant impact that would require an EIS, ostensibly because a series of safety protocols would be followed that would eliminate any risk of such infections, citing Griesbach et al. (2012) for this proposition. However, the EA misrepresented Griesbach et al. (2012), which does not say that the risk of infection is eliminated by the protocols; rather, Griesbach et al. (2012) clearly states that significant risk of infection still remains, even with the protocols, which merely reduce the degree of the risk somewhat (the study says the goal "isn't perfection" but, rather, is merely "risk reduction"). Other studies on these root pathogens (see attached studies), which are spread to native forests from nursery-grown seedlings, indicate that the infection of native forest sites from these pathogens is common, even when protocols are followed, and the pathogens can kill natural seedlings, can severely stunt the growth of natural seedlings, and can in some circumstances lead to substantial mortality of mature conifers in the locations where planting occurs, which in this case could include mature sequoias. For example, Dobbs et al. (2023) notes that invasive pathogens from nursery-grown seedlings "can devastate hosts in natural stands after these pathogen species are carried on nursery stock and introduced into novel landscapes (Frankel et al., 2020)", and, "Once introduced, these pathogens are difficult to manage…" Another, James (2005), found that "Some level" of infection of native forest sites with invasive, harmful and deadly tree pathogens is "inevitable" when nursery-grown seedlings are planted. The EA improperly minimizes and downplays this major potential impact.
- The EA (p. 18) outlines a type of genetic engineering scheme, proposing that up to 20% of the sequoia seedlings would come from outside of the groves where the planting would occur. The EA minimizes the impact of this on the unique genetic structure of each grove by citing to Aitken and Whitlock (2013) for the proposition that there would be no potential for disruption of the unique genetic character of each grove if the outside-grove seedlings were kept to 20%. But the EA misrepresents this study too. Aitken and Whitlock (2013) does not say that this 20% figure avoids potentially significant risk. It merely mentions (on p. 379 of the study) that another study used the 20% threshold as a means to avoid one adverse genetic impact, called "genetic swamping" (the loss of local genetic diversity), with the Florida panther, but does not say that this would be appropriate for a tree species like the giant sequoia. And, more importantly, the authors identify additional major genetic impacts, aside from genetic swamping, that are not minimized or addressed by the 20% threshold. In fact, the study says that any level of

planting of individuals from other subpopulations creates a significant risk of "outbreeding depression", which can undermine the unique genetic character and health of the subpopulation (each individual sequoia grove, in the case at hand), and "disrupt local adaptation to nonclimatic factors". The authors of the study state that "Outbreeding depression may result from chromosomal differences between populations that cause partial or complete sterility (Frankham et al. 2011)." Aitken and Whitlock (2013) states that these severe adverse genetic impacts are particularly likely "if source and recipient populations have been long isolated". The study states that any attempt to avoid such serious genetic risks and impacts must be based on an extensive study and assessment: "To weigh the risks of AGF…we need to know the species' extent of local adaptation to climate and other environmental factors, as well as its pattern of gene flow." None of this extensive required assessment and analysis, including the extent and length of genetic isolation of the groves from each other and the level of gene flow, is analyzed or divulged in the EA, and there is no indication that this essential analysis has been conducted at all. Moreover, Aitken and Whitlock (2013) make clear that their suggestions about potential benefits of such genetic engineering experiments (which they call "assisted gene flow") is based on a hypothetical model and "simulations", making the impacts of the scheme highly controversial, with serious unknown risks. Another reason the "assisted gene flow" theory is highly controversial scientifically is that, when it is applied to real world populations, it can severely harm the genetic health and fitness of that population by introducing rare, deleterious alleles from other, normally isolated subpopulations (Hedrick and Garcia-Dorado 2016)—another impact that the EA does not mention, and which is unrelated to the EA's suggested 20% threshold.

VII. The EA Fails to Consider a Reasonable Range of Alternatives.

Given the foregoing, the EA failed to consider a reasonable range of action alternatives, which should have included an alternative to defer any planting until at least after 2024 field plot data could be completed, beginning no earlier than July 2024 in order to ensure that new, 2024 sequoia seedlings do not get missed or trampled before becoming visible.

VIII. The Proposed Tree Planting, Tree Cutting, Use of Explosives and Helicopters, and Potential Future "Thinning" and Herbicide Spraying is Inconsistent with the Wilderness Act.

The EA's proposed action, in addition to hundreds of acres of artificial tree planting (and its associated impacts—see above), would involve numerous clearcuts in multiple Wilderness areas to create helicopter landings to drop tree planting supplies and equipment, including use of chainsaws and explosives to create these landings, as well as dozens of helicopter trips into the Wilderness Areas. These actions are inconsistent with the Wilderness Act. Moreover, the planting proposal starts the Park down a slippery slope regarding Wilderness, with numerous comments in the EA's discussion of other alternatives (pp. 33-41) referencing the possibility that the Park may subsequently engage in "thinning" and herbicide spraying of shrubs to facilitate potential future, additional tree planting, depending on the outcome of the current planting proposal, if it was implemented.

IX. The Proposed Planting Would Undermine and Preclude a Once-In-A-Century Scientific Research and Discovery Opportunity.

The planting proposal, which covers nearly all of the larger high-severity fire patch areas in multiple sequoia groves, with the exception of some marginal sites, would prevent scientists from discovering how giant sequoias respond, in terms of natural succession, to larger high-severity fire patches over the next decade or two, and beyond. Large, landscape-scale wildfires are far from unprecedented in giant sequoia ecosystems; for example, very large wildfires spanning the entire Kaweah Watershed, and burning through many sequoia groves, occurred multiple times during the 1800s, prior to fire exclusion policies (Caprio 2016). But there were no scientists studying sequoia regeneration in such areas during the 1800s and, since then, fire has been excluded from the great majority of grove acres until recent wildfires, 2015-2021. Giant sequoia reproduction has not previously been researched in large high-severity fire patches like the one in the southern portion of Redwood Mountain Grove, or in groves that burned mostly at high-severity, such as Board Camp. This is quite literally a once-in-a-century scientific research and discovery opportunity—one that would be fundamentally undermined and lost if the planting proposal goes forward now.

X. The Proposed Planting in the Mixed-Conifer Areas Outside of the Sequoia Groves is Also Scientifically Unsupported by the EA.

With regard to the several hundred acres of mixed-conifer forests outside of the sequoia groves where the Park is also proposing tree planting, the EA's 14,112 seedlings per acre threshold is also unsupported, given that the studies cited by the EA pertain to sequoias, not mixed-conifer tree species, and given that the government's own scientists and university scientists recommend natural post-fire conifer regeneration at the level of dozens per acre to low hundreds of conifer seedlings per acre (Owen et al. 2017, North et al. 2019), not 14,112 per acre, and mixed-conifer reproduction often does not even begin until 3 or more years post-fire in high-severity fire areas (Hanson and Chi 2021).

Moreover, the EA asserts that planting in these mixed-conifer forests is needed ostensibly to ensure future conditions for the ESA-listed Pacific fisher. However, the EA fails to recognize that Pacific fishers actively, and even preferentially (for females, in particular), forage/hunt in the complex early seral forest habitat created by high-severity fire patches, since such habitat has the highest levels of the small mammal prey upon which the fisher depends for survival and reproduction (Hanson 2013, Hanson 2015). The EA fails to recognize the unique importance of this complex early seral forest habitat phase of natural succession as key foraging habitat for the fisher, and the EA's planting proposal could shorten the temporal duration and spatial area of this fisher habitat, causing unknown impacts to fishers that are not analyzed in the EA.

Sincerely,

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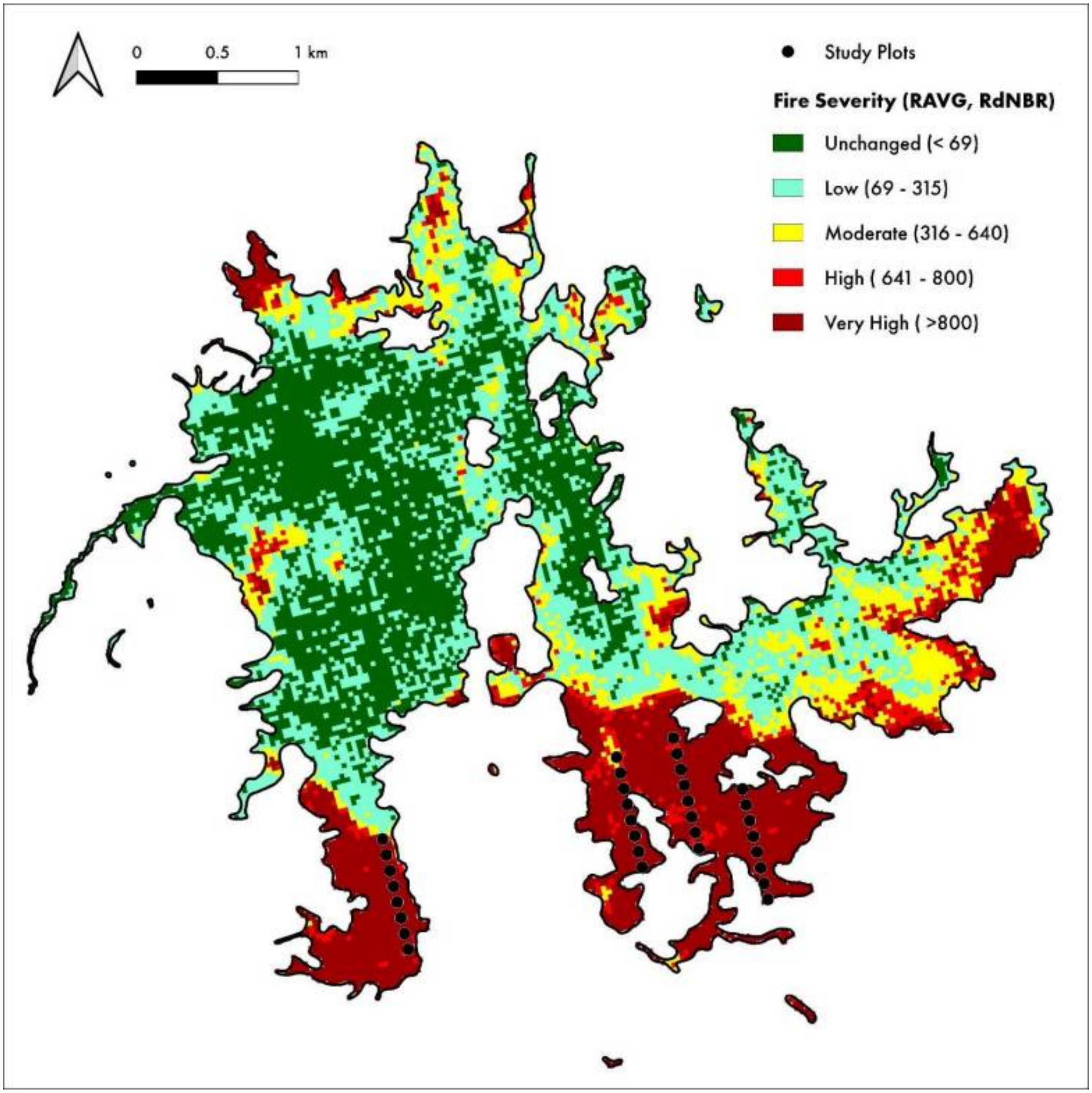
Appendix 1

Maps and Photos

Below you can find pertinent maps and several photos captured within the Redwood Mountain Grove in late June through early August. Coordinates and a description are provided for each photo. Photos fall into the

Map 1. Fire severity classifications based on RdNBR collected via RAVG in the Redwood Mountain Grove. Severity classes are based on the thresholds in Miller and Thode (2007). A "Very High" class was added based on the 800 RdNBR threshold above which the National Park Service claims sequoia regeneration will be lower.



Map 2. Locations of photos (see below) in relation to fire severity in the Redwood Mountain Grove.

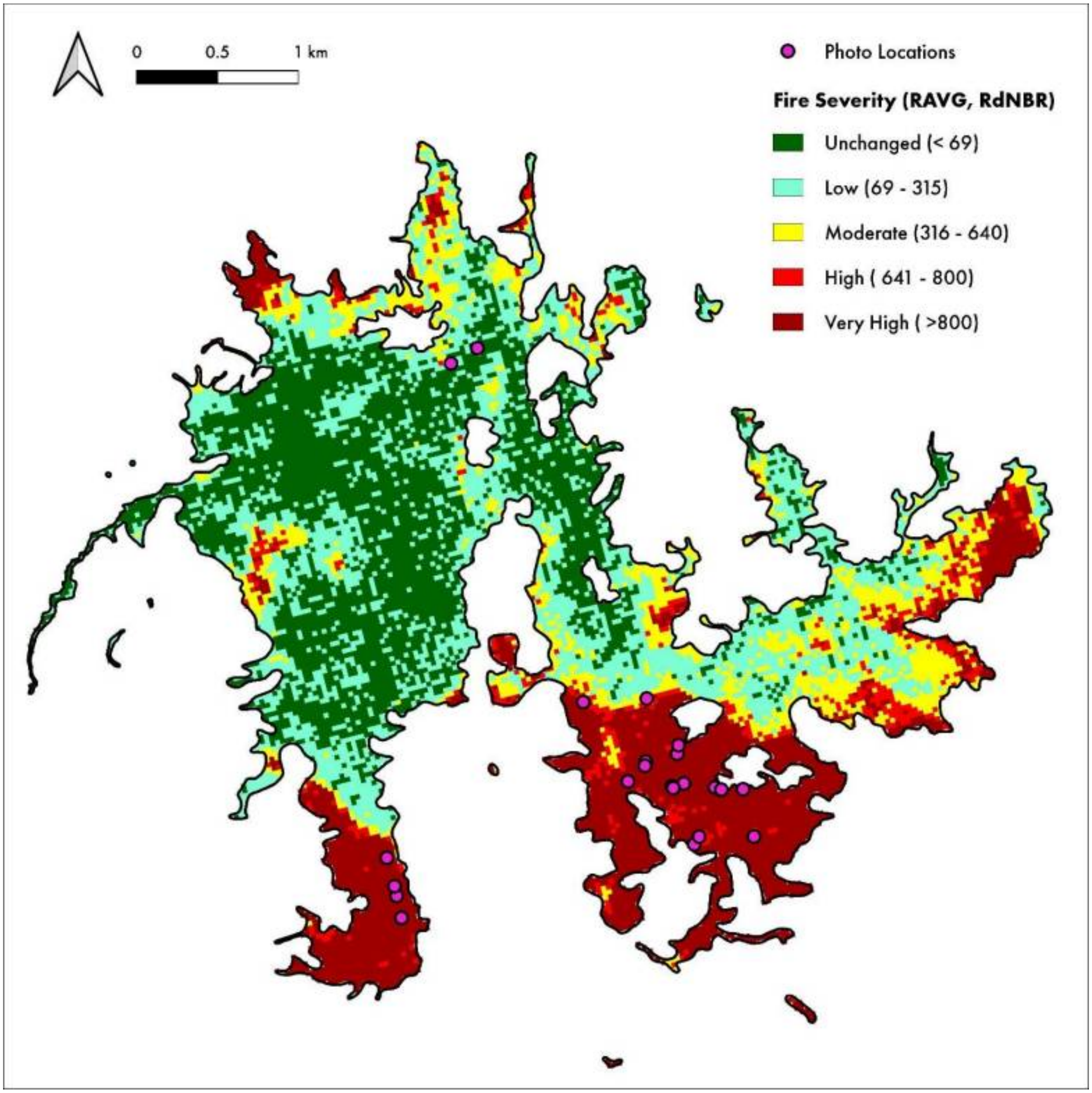


Photo 1. Large, dense patch of 2022 sequoia seedlings (36.68982166666667, -118.91234166666666).

Photo 2. Sequoia seedlings and lupine (36.686465, -118.90806333333333).

Photo 3. Sequoia seedlings (36.686233333333334, -118.90811166666667).

Photo 4. Dense patch of sequoia seedlings (36.681826666666666, -118.90475666666667).

Photo 5. Dense patch of sequoia seedlings (36.68225, -118.90441166666666).

Photo 6. Sequoia seedlings (36.686883333333334, -118.90586666666667).

Photo 7. Sequoia seedlings (36.687353333333334, -118.90577).

Photo 8. Sequoia seedlings (36.689975, -118.90793166666667).

Photo 9. Sequoia seedlings growing among ceanothus (36.685028333333335, -118.90616833333333).

Photo 10. Sequoia seedlings growing among ceanothus (36.685225, -118.90542166666667).

Photo 11. Sequoia seedlings (36.68497833333333, -118.90327666666667).

Photo 12. Sequoia seedlings (36.68485666666667, -118.90283666666667).

Photo 13. Sequoia seedlings (36.68486333333333, -118.90132166666666).

Photo 14. Sequoia seedlings in one of our study plots (36.68222333333333, -118.90060166666666).

Photo 15. NPS Plot REMO_18, which appeared to be heavily trampled from sampling in June (36.68512267, -118.9063095).

Photo 16. NPS Plot REMO_18, which appeared to be heavily trampled from sampling in June (36.68512267, -118.9063095).

Photo 17. Tall 2022 sequoia seedlings (36.68485, -118.90287500000001).

Photo 18. 2023 sequoia seedlings next to larger 2022 seedling (36.67914444444444, -118.92543611111111).

Photo 19. 2023 sequoia seedlings (36.67968666666667, -118.92557666666667).

Photo 20. 2023 sequoia seedlings (36.68127666666667, -118.92609166666666).

Photo 21. 2023 sequoia seedlings (36.67792333333333, -118.92511833333333).

Photo 22. Cattle on national park land in Redwood Mountain Grove (36.709588333333336, -118.91941166666666).

Photo 23. Cattle manure on national park land in Redwood Mountain Grove (36.708758333333336, -118.92125277777778).