Coast Range Association **Comments–A**

Fire Resistance and Resilience, Forest Stewardship, and Climate Change

Northwest Forest Plan Amendments (NWFP)

Draft Environmental Impact Statement (DEIS)

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This Comments-A document contains the comments of the Coast Range Association (CRA) addressing the Draft Environmental Impact Statement (DEIS) for amending the Northwest Forest Plan (NWFP). While our comments raise issues specific to the Siuslaw National Forest (SNF), what we discuss and recommend applies to all cool moist national forests. Our comments are broken into three sections. They are:

Section 1: The Siuslaw National Forest – A temperate coastal forest

The SNF's proximity to the Pacific Ocean is its most defining characteristic. We review the bioregional climate and forest characteristics of the SNF. Importantly, we discuss the moist-dry forest distinction and believe it to be inadequate.

Section 2: Future conditions under a warming climate

Climate is a major issue in the DEIS. Current scientific data shows conditions are evolving such that events, processes and states are occurring much sooner than previously predicted and the mitigation of atmospheric gases (CO_2) driving climate warming is falling far short of required levels.

Section 3: SNF management and the path forward in the plan amendment process

Against a backdrop of Sections 1 & 2, we address current SNF management under the NWFP and its implication for the DEIS. Our conclusion is that SNF management, although exemplary in many ways, is not managed appropriately to real-world climate trends and the science of wildfire resistance. We make a set of 15 recommendations.

We incorporate by reference all tribal related recommendations contained in the **Federal Advisory Committee**'s Report found at: fseprd1181977.pdf

The Coast Range Association will submit separate comment documents addressing Sustainable Communities (**Comments-B**) and Cumulative Effects (**Comments-C**).

Section 1: Siuslaw National Forest (SNF) in the context of the Coast Range region.

The SNF's proximity to the marine environment and the marine influence on air temperature, fog related moisture, rainfall, lightning, wind, storm events and wildfire all result in the SNF having a unique set of **disturbance regimes**. All NWFP moist forests share the SNF's outstanding characteristics for high biomass volume, rapid vegetation growth and fire resistance and resilience.

The Coast Range Bioregion.

Foremost among the SNF features is its location in the Coast Range bioregion.
The SNF is relatively low in elevation and graced with deep, well-drained fertile soils.
The forest's proximity to the Pacific Ocean provides abundant rainfall and added moisture due to coastal fog in drier months. Coast Range forests are some of the most scientifically studied temperate forests in the world.

Forest and aquatic research in the Coast Range region has been addressed in several large efforts. Most notably, the Coastal Oregon Productivity Enhancement Program (COPE) and, post NWFP adoption, the Coastal Landscape Analysis and Modeling Study (CLAMS). From 1987 to 1999, COPE sponsored 60 studies involving 130 researchers from 14 organizations and produced more than 300 publications. For CLAMS See:
https://www.fsl.orst.edu/clams/

Land Type: Moist Forest, Wet Forest or Rainforest?

The DEIS divides NWFP area into two forest types: dry and moist. This classification is **not** adequate and stand level use of forest type is at risk of being arbitrary and capricious. The DEIS's broad-brush scheme goes to the heart of our concerns about the SNF.

Vol. 56 No. 1 of **BioScience** has an article titled *Long-Term Research at the USDA Forest Service's Experimental Forests and Ranges*. The article is written by Forest Service staff stationed across the U.S. The article's **Table 1** is titled: ***National representation of the 14 Holdridge life zones that are present in the experimental forests and ranges network of the USDA Forest Service***.
https://andrewsforest.oregonstate.edu/sites/default/files/lter/pubs/pdf/pub3843.pdf

We quote "*The conterminous United States has 38 Holdridge life zones (Lugo et al. 1999), of which at least 14 contain experimental forests or ranges (table 1).*"

We then see Lugo, et al, 1999 "***The Holdridge life zones of the conterminous United States in relation to ecosystem mapping***" published in the **Journal of Biogeography,** September 1999.
https://epa-dccs.ornl.gov/documents/Holdridge_LifeZones.pdf
Here, a map of all 38 Life Zones is displayed as Figure 3 (Page 26). The life zone map shows the location of national forests in the life zone classification.

Yes, there is a life zone called **cool moist forest.** However, the Willamette NF west of the Cascade crest and **all** the Siuslaw NF are categorized as **Cool Temperate Rainforest** or **Cool Temperate Wet Forest**. North of the city of Newport, the SNF is a cool temperate rainforest. South of Newport the SNF is a cool wet forest. This is not a small point. It explains much about the DEIS's moist forest narrative that is remiss.

The Holdridge Life Zone system is climate informed and empirically and objectively determined. "*Life zones are the main ecological unit for classification, and they define conditions for ecosystem functioning. Life zones are delimited by biotemprature, precipitation, potential evotranspiration ratio, and elevation. Any person using the system and having access to the same data will classify the life zone the same way.*"

The SNF is not appropriately described as a 'moist' forest and the recognition of its life zone qualities have serious implications for management. Such issues as wildfire, forest growth and carbon sequestration must be assessed in a different light than provided in the DEIS. Indeed, the moisture abundance of the coastal zone explains why, during an Oregon Department of Forestry **extreme** fire danger level, no fire use in forests is allowed for the public, but industrial timber operations are only "restricted" or "limited" within Oregon Department of Forestry's coastal zones WO-1 & NW-1.

The DEIS has this to say: "*Various approaches to classifying vegetation exist and their applicability will vary across the NWFP area".* And *"Top-down mapping approaches provide a starting point to support stand and project-level determinations of moist versus dry forests but may not accurately reflect local conditions at these fine-scales*" (Spies et al. 2018). The Holdridge system will be far more accurate.

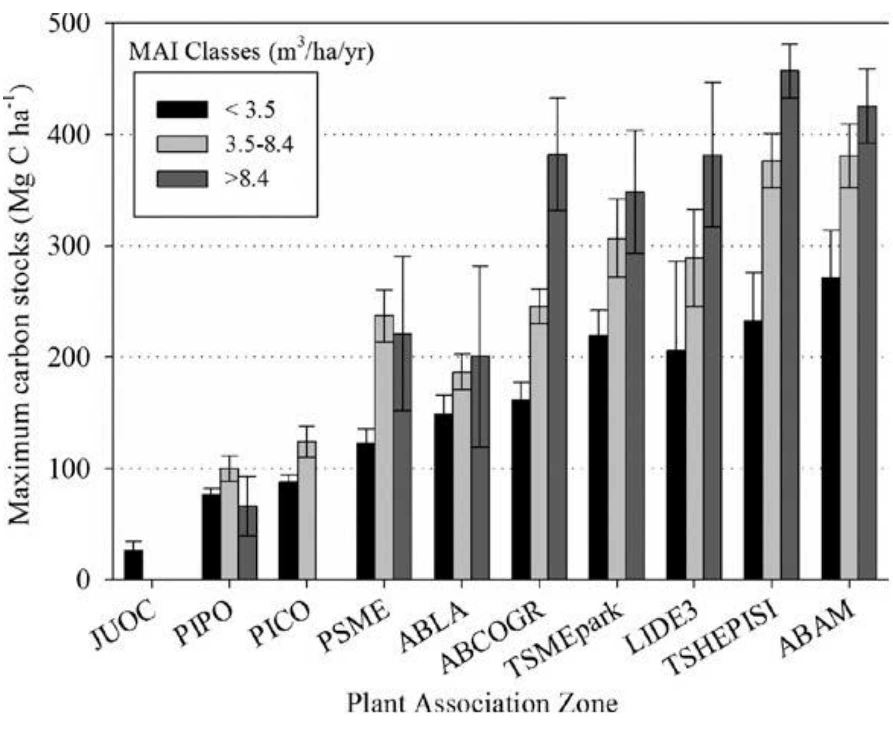
We strongly urge the inclusion of mapped Holdridge life zones into the DEIS and appropriate guidance provided for each zone's forest management.

SNF’s vegetation and the accumulation of forest biomass

The SNF’s average aboveground biomass as of 2015 was 175 tons per acre. This, compared to 158 tons/acre for Willamette NF and 141 tons/acre for the Mt. Hood NF. More significant is the SNF’s average aboveground carbon mass per hectare at 196,121 kilograms/hectare compared to 177,463 kilograms on the Willamette NF and 158,008 on the Mt. Hood NF. These are huge volumes that are not one thing among many, they are forest management defining qualities.

Climax PAZ	Code	N plots	Area (1000 ha)	Reserved land (%)	Most common species (ranked)†
Juniperus occidentalis	JUOC	118	97	1	JUOC, PIPO
Pinus ponderosa	PIPO	1338	1102	2	PIPO
Pinus contorta	PICO	441	416	17	PICO, PIPO, LAOC
Pseudotsuga menziesii	PSME	1260	1212	16	PSME, PIPO
Abies lasiocarpa	ABLA	612	776	40	PSME, ABLA, PIEN, PICO
Abies concolor and *A. grandis*	ABCOGR	1745	1669	14	PSME, ABCOGR, PIPO
Tsuga mertensiana and subalpine parkland	TSMEpark	618	924	63	TSME, ABAM, ABMAS, ABLA, PSME
Lithocarpus densiflorus	LIDE3	186	229	35	PSME, LIDE3, ARME
Tsuga heterophylla and *Picea sitchensis*	TSHEPISI	1691	1742	16	PSME, TSHE
Abies amabilis	ABAM	758	910	35	ABAM, TSHE, PSME

Notes: †Listed most common species make up at least 80% of the live tree carbon in a climax zone. In addition to the species names and codes shown in the first two columns: LAOC, *Larix occidentalis*; PIEN, *Picea engelmanii*; ABMAS, *Abies magnifica* var. *shastensis*; ARME, *Arbutus menziesii*.

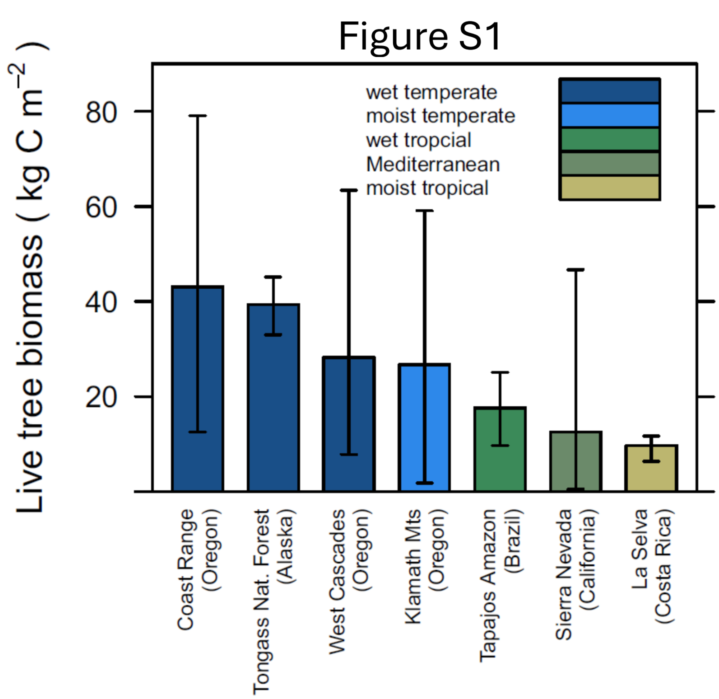


If managed correctly, the SNF and all cool moist, wet and rainforest national forests will contribute significantly to mitigating climate warming due to their enormous potential to sequester atmospheric carbon. The fact is, SNF above ground potential carbon storage, per acre, is one of the highest in the world. Current SNF carbon volume, per acre, ranks either 1st or 2nd among all 154 national forests. Research on Carbon accumulation rates and maximum stand carbon stocks have significant implications for SNF management to achieve DEIS goals. The reason for the SNF's outstanding biomass and carbon volume is a combination of Holdridge life zone (HLZ) qualities and the Plant Association Zones (PAZ) engendered within those life zones.

The above two tables are from Gray, et al, 2016, a paper cited in the DEIS, ***Carbon stocks and accumulation rates in Pacific Northwest forests: role of stand age, plant community, and productivity***. Our takeaway from the paper and similar research is that specific changes to the DEIS are required providing National Forest level **mapping** and **guidance** for HLZ and PAZ in all DEIS options.

Coupled with such long-used, empirically based guides as Hemstrom and Logan's PLANT ASSOCIATION AND MANAGEMENT GUIDE SIUSLAW NATIONAL FOREST, SNF management has powerful tools to implement a corrected DEIS.

We quote from Gray et al, 2016 "*....across all forest* [Plant Association Zones] *PAZ* × [Mean Annual Increment] *MAI classes, stands attained 75% of their estimated maximum C* [carbon] *by age 127 yr. This and changes in ΔLive with stand age indicate that the speed and amounts of potential future annual C accumulation are greatest for forests with a large proportion of young stands......*" Therefore, the addition of Mean Annual Increment (MAI) completes a broad understanding of the ecological factors needed to guide forest stewardship.



We provide Figure S1 from Law, et al, ***Land use strategies to mitigate climate change in carbon dense temperate forests,*** PNAS March 19, 2018. Simply put, the Coast Range bioregion, per acre, has the potential to be the greatest carbon storehouse region in the world.

Law, et al, Fig. S1: "*Live tree biomass in primary forests from Oregon and other regions.*

The only takeaway is that the SNF and other Pacific Northwest (PNW) forest are globally outstanding for carbon sequestration with huge implications for the Plan amendments.

SNF aquatic systems and coastal salmonid populations

The DEIS is not proposing to change the NWFP's Aquatic Conservation Strategy. As such, we have no comments on the ACS. We must note that past CRA correspondence with the Forest Service and the BLM has stated our belief that NWFP ACS implementation is not in line with the Record of Decision. We have asserted that extensive SNF thinning in riparian zones is not done to enhance aquatic conservation values as required, but to generate timber revenues.

SNF disturbance regime

Five broad categories of disturbance impact ecological processes in coast range forest. These are: 1 Wildfire, 2. Canopy gaps and patches from forces such as wind, disease, insects and beavers, 3. Soil disturbance from landslides and floods, 4. Inundation from floods, and 5. Human disturbance in the form of tree removal, road building and the introduction of exotic plants and insects.

For DEIS recommendations, we are only going to discuss wildfire and human disturbance; two issues crucial to fulfilling the DEIS Stewardship objectives.

Wildfire

"*Until the advent of widespread logging and effective wildfire suppression in the middle part of the 20th Century, wildfires were the dominant disturbance in Coast Range forests." Wimberly, et al, 2000 estimates that the amount of Coast Range forest older than 200 years during the past 3,000 years was between 25 and 75 percent*." ***Forest and Stream Management in the Oregon Coast Range***. OSU Press. (Edited by Hobbs, et al, 2002). Other studies suggest longer fire intervals.

The most striking feature of wildfire suppression in moist, wet and rainforests zones is that forest health is not affected by the absence of wildfire. Indeed, for the SNF, particularly in the coastal region, canopy gaps and patches from forces such as wind, disease, insects and beavers may cover over 13% percent of the forest. "*Gaps can form at an annual rate of 0.2 to over 1.0 percent. Thus, a point may experience a gap every 100 to 500 years, or about the same average interval as wildfire of the past*" (Hobbs, et al, 2002). Absent wildfire, substantial natural forces are in play creating gaps and driving forest dynamics without industrial human intervention. Such disturbance will only increase with a warming climate as wind and storm events become more intense.

Human Disturbance – Tree Removal

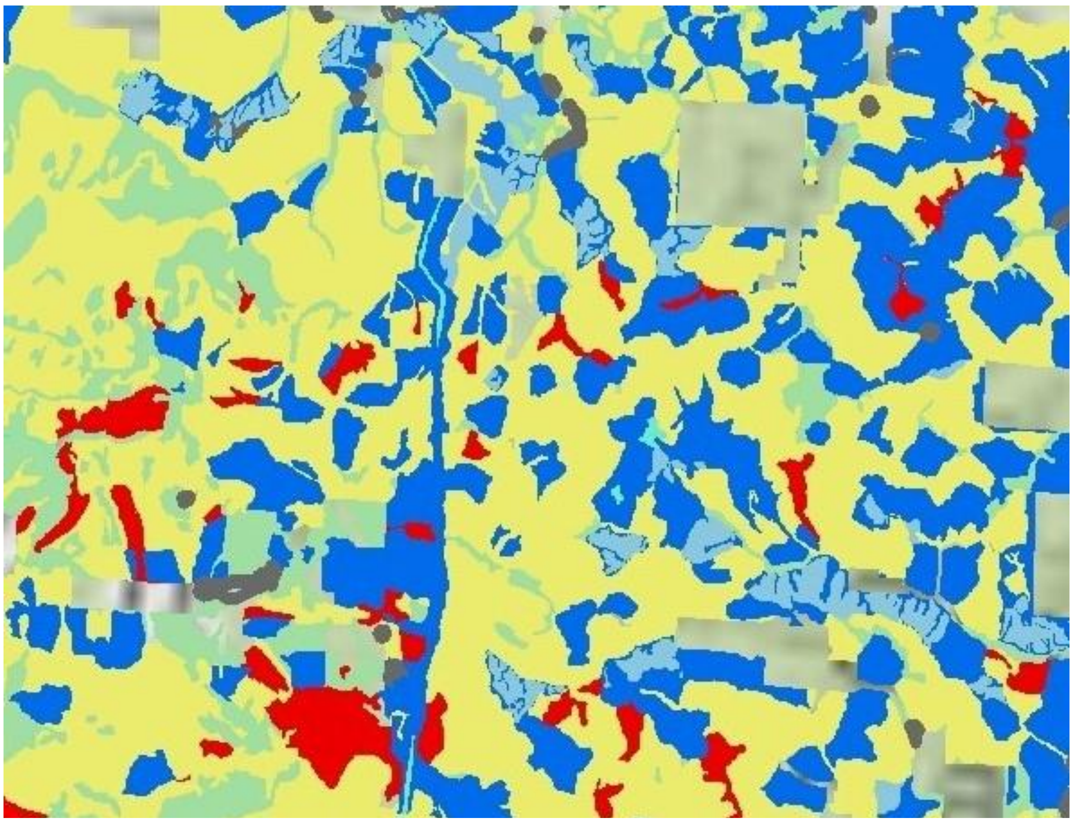
As a rough approximation, the SNF can be divided between past managed stand (33%), unmanaged stands older than 80 years and younger than 119 years (33%) and stands 120 years or older (33%). Therefore almost 66% of the forest has not reached 75% of estimated maximum carbon storage. As such, forest thinning under the NWFP or tree removal under any proposed Alternative is called into question.

We discuss SNF tree removal in Sections 2 and 3. For now, we note the following table in the DEIS indicating proposed forest 'treatments' by DEIS Alternative. **DEIS Table 3-16 Action alternatives' implications for carbon storage (based on treatment/harvest estimates) Plan Component Topic.**

Table 3-16.	Implication for Carbon Storage	Alternative A	Alternative B	Alternative C	Alternative D
Moist Forest Stewardship	Carbon Removal	Treat 48,100 acres per decade in Matrix	Treat 65,000-81,000 acres per decade in Matrix	Treat 32,000-41,000 acres per decade in Matrix	Treat 130,000-163,000 acres per decade in
Fire Resistance and Resilience (Mechanical)	Carbon Removal (All Types)	1,800,000 acres/decade	900,000 acres/decade	900,000 acres/decade	2,200,000 acres/decade
Fire Resistance and Resilience Treatments (Wildland fire)	Carbon Emissions from Combustion	700,000 acres/decade	1,750,000 acres/decade	350,000 acres/decade	2,750,000 acres/decade
Sustainable Communities	Carbon Removal and Storage as Wood Products	212,440 acres/decade (4,446 MMBF)	660,000–810,000 acres/decade (5,900–13,500 MMBF)	171,000–211,000 acres/decade (1,500–3,600 MMBF)	474,000–588,000 acres/decade (4,700–12,200 MMB

The DEIS is busy with stand level treatments. Yet, the most striking feature of the SNF is the amount of past tree removal by the Forest Service through timber sales using clearcutting. Around 200,000 acres of forest were fully removed between 1945 and 1995. After stand removal, the clearcuts were replanted with conifer seedlings.

Due to climate, topography and soils, stand establishment post clearcutting was highly successful. Today, the SNF is a mosaic of plantations less than 80 years of age and naturally recovered forest stands post-19th century fires in the 80–190 year age range. Throughout the SNF are small areas of old growth forest.



Current SNF Human Disturbance

Since 1994, the Forest Service has commercially thinned former clearcut areas for the purpose of enhancing the development of Late Successional forest conditions Below light blues areas on the map above indicate post NWFP 1995 thinning.

We will discuss the SNF's current thinning regime in Sections 2 & 3.

Section 1: Key Recommendations

1. Recognize and incorporate **wet** and **rainforest** life zones, coupled with Plant Association Zones and Mean Annual Increment metrics into a revised set of mapped forest types.

2. Recognize, incorporate and celebrate the world class growth and accumulation of forest biomass – including above ground carbon for all moist, wet and rainforest areas.

3. Ecologically account for past forest removal from the SNF and all national forests.

4. Discard the notions of **fuel load** and **industrial wildfire use** for wet and rainforest life zones. We support the DEIS approach of not using fuel load reduction, a totally unwarranted strategy, for moist, wet and rainforest zones.

5. Consult relevant tribes for proper fire use in wet and rainforest life zones

Section 2: Future conditions under a warming climate

In this section we address future global and regional conditions under a warming climate–a topic discussed in the DEIS. The DEIS does not acknowledge that climate conditions are rapidly evolving such that events, processes and states are occurring much sooner than previously expected. The DEIS does not acknowledge that the mitigation needed to reverse climate warming is falling far short of goals. The DEIS does not acknowledge adequately the potential future carbon storage volumes in moist, wet and rainforest zones of the NWFP.

The childish suppression of climate science by the current administration is a dangerous turn of events. Our comments and recommendations are based on reasonably foreseeable future conditions, not ideological thinking.

World Scientists' Warning of a Climate Emergency 2022 (Ripple et el. Bioscience 72: 1149–1155) states in the first two sentences; "***We are now at "code red" on planet Earth. Humanity is unequivocally facing a climate emergency.***" (Emphasis CRA)
The document goes on to state "*Since this original warning, there has been a roughly 40% increase in global greenhouse gas emissions. This is despite numerous written warnings from the Intergovernmental Panel on Climate Change [IPCC] and a recent scientists' warning of a climate emergency with nearly 15,000 signatories from 158 countries. Current policies are taking the planet to around 3 degrees Celsius warming by 2100, a temperature level that Earth has not experienced over the past 3 million years….*"

The DEIS relies on Spies, et al, 2018 NWFP Science Synthesis and other documents for climate warming characterizations. May we remind the Forest Service that IPCC climate modelling is based on data cycles of seven years. The Spies, et al, Synthesis 2018 likely referenced IPCC modelling and data from 2011 or earlier.

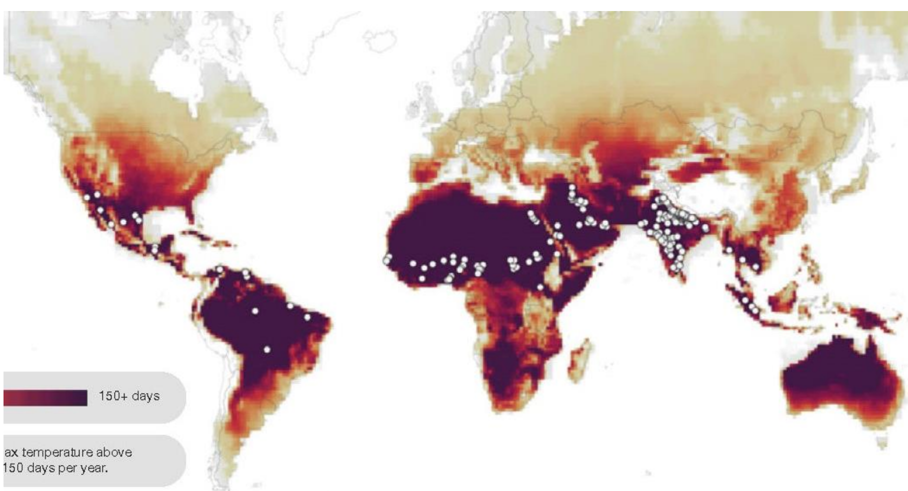
Currently, leading climate scientists are at a loss to explain why climate modelling itself is underestimating current climate trends. Without rapid reductions in atmospheric carbon, the Greenland and West Antarctic ice sheets will be lost at >400 ppm CO_2.

The fact is, the DEIS assessment of climate science is based on outdated data and models that underestimate climate warming impacts. See these references for an expansion on this problem:
The Atlantic, an article by Zoë Schlanger https://www.theatlantic.com/science/a…
New York Times article by Gavin Schmidt and Zeke Hausfather
https://www.nytimes.com/2024/11/13/op… and,
PNAS article on global hotspots https://www.pnas.org/doi/10.1073/pnas…

We quote the PNAS article: **"Abstract** Multiple recent record-shattering weather events raise questions about the adequacy of climate models to effectively predict and prepare for unprecedented climate impacts on human life, infrastructure, and ecosystems. Here, we show that extreme heat in several regions globally is increasing significantly and faster in magnitude than what state-of-the-art climate models have predicted under present warming even after accounting for their regional summer background warming. Across all global land area, models underestimate positive trends exceeding 0.5 °C per decade in widening of the upper tail of extreme surface temperature distributions by a factor of four compared to reanalysis data and exhibit a lower fraction of significantly increasing trends overall. To a lesser degree, models also underestimate observed strong trends of contraction of the upper tails in some areas, while moderate trends are well reproduced in a global perspective. Our results highlight the need to better understand and model the drivers of extreme heat and to rapidly mitigate greenhouse gas emissions to avoid further harm from unexpected weather events."

The current administration's Executive Order 14154 ***Unleashing American Energy*** is exactly the kind of policy agenda that will cause a 3^0 warmer earth. Such warming will likely make whole regions of the planet uninhabitable for a large percentage of Earth's human population.

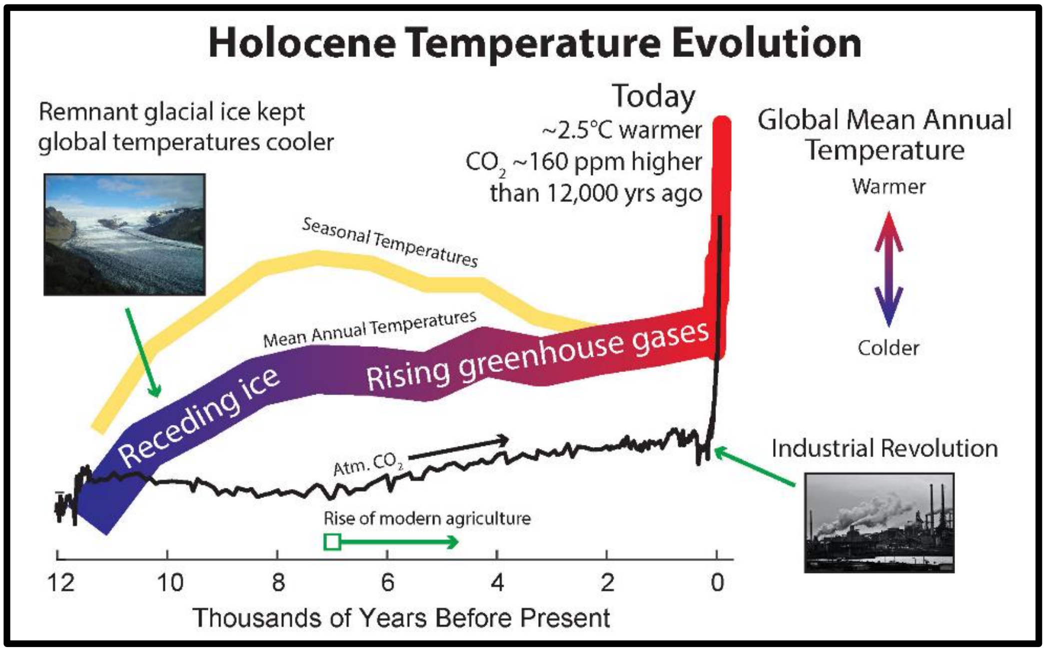
Given the pace of climate warming, episodes of dangerous conditions will increasingly occur in the near-term. If nothing else, huge parts of the built environment will become uninsurable unless insurance is socialized. But we digress.

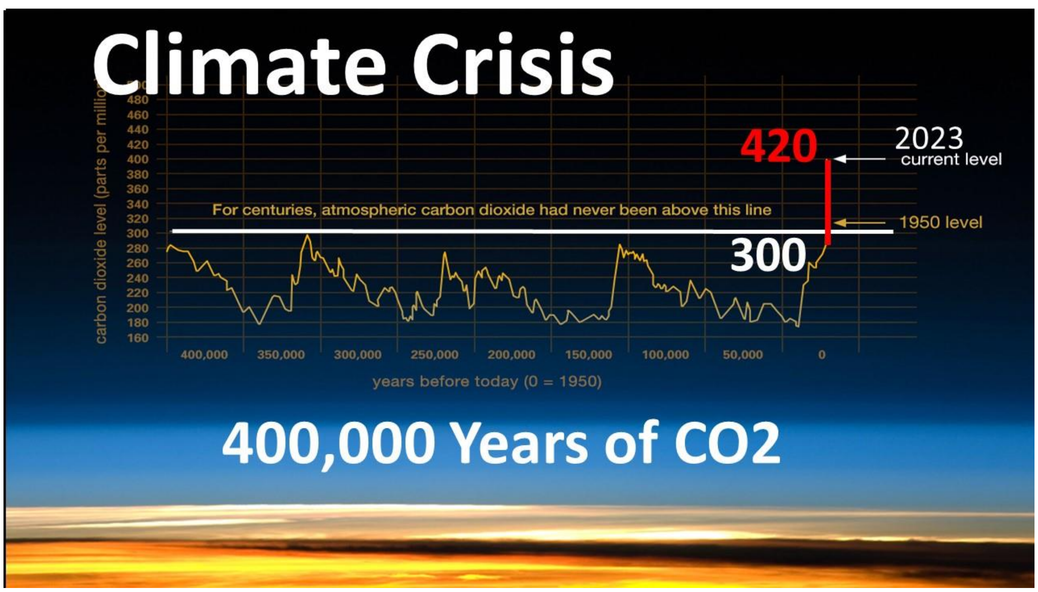


The map above shows likely uninhabitable areas of the planet (dark areas) with 3^0 of climate warming. This is a reasonably foreseeable future condition that, under the NEPA statute (Not just agency Rule), must be acknowledged in the DEIS.

For a current assessment of climate science and the state of the world's climate mitigation efforts we urge the Forest Service to review ***Collision Course: 3-degrees of warming & humanity's future*** published by the Australian based Breakthrough National Centre for Climate Restoration (2 December 2024).
https://www.breakthroughonline.org.au/collisioncourse

The graphic depiction of the climate crisis appears in an endless flow of images provided by scientific, governmental and NGO institutions.





Today, global CO2 readings are in the range of 426 parts per million.

The DEIS – Wildfire

The DEIS states on page iii "*The proposed amendment would update plan components to improve wildfire resistance and resilience, adapt to expected future climate conditions, improve ecological conditions related to old-growth forests, expand tribal inclusion, and support local economies*." The DEIS goes on to say "*......the Forest Service is proposing this amendment to address current conditions and new information; to improve resistance and resilience to wildfire where needed across the NWFP area;*"

The DEIS further says the Need for Amendments are as follows:
• Improving wildfire resistance and resilience across the NWFP area.
• Strengthening the ability of NWFP ecosystems to adapt to the ongoing effects of climate change.
• Improving conservation and recruitment of mature and old-growth forest conditions, ensuring adequate habitat for species dependent upon mature and old-growth ecosystems and supporting regional biodiversity.
• Incorporating Indigenous Knowledge into planning, project design, and implementation to achieve forest management goals and meet the Forest Service's general trust responsibilities.
• Providing a predictable supply of timber and non-timber products and other economic opportunities to support the long-term sustainability of communities found proximate to National Forest System lands and economically connected to forest resources.

DEIS Alternative B

"*Alternative B was developed from the preliminary description in the Notice of Intent and is strongly influenced by the final recommendations provided by the FAC. This alternative provides new or modified direction, and in some cases replaces 1994 NWFP direction. Plan content is organized across themes (i.e., Tribal Inclusion; Forest Stewardship; Fire Resilience; Climate, Ecosystem Integrity, and Carbon; and Support Economic Opportunities and Sustainable Communities).*"

We notice how DEIS direction regarding "wildfire resistance and resilience" becomes only "wildfire resilience" in the narrative. This is especially true for the DEIS cumulative effects section. Resilience and resistance are terms for distinctly different phenomena. Resilience is the ability of an ecosystem to recover from disturbances and return to its original state, while resistance is the capacity to remain unchanged when faced with disturbances.
For wildfire, the term resistance is exactly what it suggests, above ground forest structure does not burn except under extreme circumstances.

Wildfire resistance can be degraded by human disturbance. Wildfire resistance is an outstanding feature of wet and rain forest zones of the NWFP if managed for proper stewardship goals.

The DEIS states "*The 1994 NWFP does not provide specific plan direction related to climate change. Alternative B would provide new and modified plan direction that considers the theme of Climate, Ecosystem Integrity, and Carbon explicitly, with additional direction embedded in the Forest Stewardship plan direction. These would include desired conditions that support adaptation of ecosystems and infrastructure to climate change, goals related to collaborative processes supporting climate adaptation, and guidelines that ensure active consideration of climate vulnerability and adaptation in project planning. Alternative B would also establish desired conditions for carbon stewardship for both dry and moist forests.*"

Alternative B does not commit to climate warming mitigation or substantial carbon sequestration strategies. The adaptation required is not directed toward moist, wet or rainforest type forests, it is required of Forest Service **management to adapt** to climate warming based on known forest qualities. We now discuss wildfire and the SNF.

USDA Northwest Climate Hub writes "*Precipitation trends are changing throughout the region. In Idaho, Oregon, and Washington, recent years have seen a reduction in summer precipitation and an increase in winter and spring precipitation*." And "*Climate change projections for the end of the century suggest an increase in average annual temperature of 4.7–10°F in Idaho, Oregon, and Washington, and 2–15°F in Alaska, with temperature ranges depending on emission scenarios.*" And, *"Along the coast, severe winter storms are also likely to increase and contribute to storm surges, large waves, coastal erosion, and flooding in coastal areas. Changes in atmospheric rivers could cause heavy winds and extreme precipitation events to increase by 50 percent over the century*."

The source for the above estimates is K. Kunkel, L. Stevens and others. 2013. ***Regional Climate Trends and Scenarios for the U.S. National Climate Assessment – Northwest*** at this webpage: https://repository.library.noaa.gov/view/noaa/56802

More recent reports draw the same conclusions. More winter and spring precipitation, often in the form of severe storm events and warmer and drier summers. Research suggests that forest structure and biomass will play a crucial role in retaining moisture from the winter and spring months and releasing moisture during the warm and dry months.

The future threat of SNF and other similar national forests lies at the heart of our DEIS recommendations. As such, it is important to lay out our understanding of SNF wildfire risk under a warmer climate and the required path forward for SNF management.

The SNF is naturally wildfire **resistant**. Natural wildfire resistance is an outcome of the qualities of the **wet** and **rainforest** life zones in which the SNF is located. To those qualities we add the massive biomass accumulation that occurs in the SNF's PAZ zones. Biomass quantities are thoroughly documented in the Forest Inventory and Analysis (FIA) surveys and reports.

On a Siuslaw Collaborative field visit to the Three Buttes wildfire (Summer 2024), the district ranger explained that fuel breaks were not possible because the forest duff was up to five feet deep. The Three Buttes' fire was a ground fire as one would expect in the SNF.

Wildfires are an outcome of an ignition event, forest moisture and weather conditions. Unlike the Cascades, ignition by lightening is infrequent in the Coast Range. When lightening ignitions do occur, the fire often burns out without the Forest Service realizing a ground fire had occurred.

Future SNF management must be based on expected climate conditions, types of likely wildfire occurrence and strategies to increase wildfire **resistance**. We now turn to the science of wildfire refugia.

First, we note that the word refugia is mentioned only twice in Vol I of the DEIS and 10 times in Vol II. Not once does the DEIS mention 'wildfire refugia'. Wildfire refugia science is highly relevant to the DEIS and all moist, wet and rainforest zones. We are at a loss for its neglect. Our discussion is based on the following papers:

Krawchuk, M. A., S. L. Haire, J. Coop, M.-A. Parisien, E. Whitman, G. Chong, and C. Miller. 2016. *Topographic and fire weather controls of fire refugia in forested ecosystems of northwestern North America*. Ecosphere 7(12):e01632. 10.1002/ecs2.1632

Fire Refugia: What Are They, and Why Do They Matter for Global Change? Meddens, et al, BioScience XX: 1–11

Krawchuk, M.A., Hudec, J., Meigs, G.W. 2023. *Manager's brief: Integrating fire refugia concepts and data into vegetation management decisions*. A case study on the Gifford Pinchot National Forest, Little White Salmon Project Area. 20 pages

The 2023 ***Managers brief*** is most instructive to DEIS concerns for wildfire.

Krawchuk, et al, 2016 explains "*Fire refugia, sometimes referred to as fire islands, shadows, skips, residuals, or fire remnants, are an important element of the burn mosaic*." In other words, in any area of wildfire there are areas that do not burn. Scientists want to know why areas do not burn and are there lessons to learn for management? Thus, the science of fire refugia research began. The paper goes on to state "*Catchment slope, local aspect, relative position, topographic wetness, topographic convergence, and local slope all contributed to discriminating where refugia occur, but the relative importance of these topographic controls differed among environments*."

Wildfire may occur during high, moderate or benign fire weather conditions. Inherent forest moisture may be high or low based on prior weather conditions. Long-term drought may result in extremely dry forest conditions. We believe such words must be discussed and defined relative to moist, wet and rainforest zones.

Krawchuk, et al, 2016 states "*Importantly, our fire weather scenario analyses illustrate how the probability of occurrence of a refugium varies under different fire weather conditions, with generally lower probabilities under more extreme conditions. This work corroborates previous studies of topographic fire refugia in both the northern and southern hemispheres (e.g., Camp et al. 1997, Wood et al. 2011, Berry et al. 2015) but adds an important new layer of understanding for how environmental context—here topographic and meteorological conditions—affects the abundance, predictability, and spatial pattern of fire refugia*."

Given the historic fire recurrence interval of the SNF, we believe enough qualities of fire refugia **transition into a characterization for the entire forest in coastal wet and rain forest zones.** The question then becomes: under what human impacts are wildfire resistance qualities degraded? Here is where refugia science provides insight.

A large multi-agency sponsored fire refugia research project is housed at Oregon State University. Its website is a wealth of information. See: https://firerefugia.forestry.oregonstate.edu/home

Key relevant findings from fire refugia research are as follows: *"Contrasting ecoregional refugia dynamics: our models reveal striking ecoregional differences in the patterns of fire refugia and severity probability that emerge from the unique biogeographic expressions of underlying predictors and higher dimensional variable interactions between them. Our models predicted high refugial probability for the non-fire-prone ecoregion under a range of weather conditions. This is consistent with observational evidence from fires in recent* *decades that fire refugia comprise an important component (almost 40%) of total burn area (Meigs and Krawchuk 2018).*"

"Multi-decadal depressions in fire refugia probability, and increases in high-severity fire, resulting from past timber harvest: *Our models showed a clear and lasting imprint of past timber harvest on fire severity probability. Particularly in the non-fire-prone ecoregion, previously harvested areas showed notable decreases in fire refugia probability, and increases in high severity probability, for several decades after harvest. This finding is consistent with other studies of high-severity risk in managed forests of the region (Zald and Dunn 2018, Evers et al. 2021), but adds an important new perspective through the joint evaluation of refugia and high severity fire. This is a critical land use legacy impact that provides context for current fire severity dynamics and can inform future fire refugia and forest management strategies*."

"*Although fire refugia extent in the non-fire-prone ecoregion was greatly reduced under extreme fire conditions, our models identify some consistent areas of refugial persistence. Under extreme fire growth, refugia are strongly constrained to valley bottoms and areas of cold air-pooling, especially in the non-fire-prone ecoregion……" "Biogeographic areas of moderate to high refugia probability existed in portions of the Coast Range, Olympic Peninsula, northwestern Cascades, and portions of the southeastern Cascades.*"

The final report of the OSU-based fire refugia project is here: https://firerefugia.forestry.oregonstate.edu/export/fire_refugia_casc_final_report_fsp_approved.pdf Naficy, C. E., G. W. Meigs, M. J. Gregory, R. Davis, D. M. Bell, K. Dugger, J. D. Wiens, M. A. Krawchuk. 2021. **Fire refugia in old-growth forests—Final report to the USGS Northwest Climate Adaptation Center**. Oregon State University, Corvallis, OR. 39 p. (pdf)

We now turn to the **Manager's brief**.
Link to managers brief.

The Managers brief states the following: "*The geospatial drivers of the most sustainable fire refugia locations for the two model are described below. The two models are 1) Holistic fire refugia and 2) Topo-climatic fire refugia.*"

Relevant to the SNF, are the following fire refugia characteristics.
Model One:
1. fire refugia probability consistently increases at higher levels of biomass,
2. [fire refugia] increases with greater composition of fire-resistant species,
3. [fire refugia] increases with either low (<25%) or high (>75%) canopy cover,

4. [fire refugia] increases at lower topographic positions (consistent with valley bottoms, toe slopes, riparian zones).
Model Two:
5. Topography seems to matter less when broad cool/moist conditions prevail (e.g., a coastal maritime influence).

The DEIS must be seriously revised for Holdridge wet and rainforest life zones and incorporate wildfire refugia science. Absent such revision, adopted plan amendments will lack credibility with the public and face implementation opposition.

There are huge implications in the above research for forest thinning which we discuss in Section 3.

SNF Carbon Sequestration Potential

We now present data from **List of tables** as supplement to: Palmer, Marin; Kuegler, Olaf; Christensen, Glenn, tech. eds. 2018. **Oregon's forest resources, 2006–2015: Ten-year Forest Inventory and Analysis report.** Gen. Tech. Rep. PNW-GTR-971. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 54 p.

Tables 105 through 111 provide comparison numbers for above ground carbon and cubic volume for Oregon's nation forests. **Table 111— Average aboveground carbon mass per hectare of live trees on forest land, by national forest and land status, Oregon, 2006-2015**. The table provides carbon quantities in *Kilograms per hectare* for Unreserved and Reserved Forest and Total Forest.

Forest	Carbon Kilograms /Hectare
Siuslaw	196,121
Willamette	177,464
Mt. Hood	158,008
Umpqua	155,746
Rogue River	137,961
Siskiyou	123,691
Klamath	98,153
Deschutes	49,072

The Forest Service FIA program's forest inventory shows the huge carbon storage capacity of PNW national forests. The SNF ranks No.1 in above ground carbon storage per hectare at 196,121 kilograms. We estimate that 2/3rds of the SNF forest has not achieved even 75% of its full carbon potential.

Table 109—Average net volume per acre of live trees on forest land, by national forest and land status, Oregon, 2006-2015. Numbers are in cubic feet per acre.

Forest	Tree Volume/Acre Unreserved Forest	Tree Volume/Acre Reserved Forest
Siuslaw	**9,141**	**17,148**
Willamette	8,074	
Mt. Hood	6,502	
Umpqua	7,039	
Rogue River	6,114	
Siskiyou	5,453	
Klamath	4,102	
Deschutes	1,916	

For Cascade national forests, cubic tree volume for Reserved lands is not a relevant number since such lands include rocky & high-altitude areas.

The difference between SNF Reserved areas and Unreserved areas is negligible. The growing stock and age class of each category are similar. The hardwood part of forest stands is likely higher in Unreserved Forest.

Using **Table 105: Area of forest land by national forest and land status** and the above referenced **Table 111**; we see that due to past forest management, a huge amount of above ground carbon volume is missing from the SNF. The missing carbon is the result of 80 years of SNF forest removal. Admittedly, a debatable percentage of the removed carbon stays sequestered in long-lived wood uses.

A forthright discussion of climate warming and the need for carbon sequestration should have been part of the DEIS. It has been recognized that "*Public health education campaigns — such as on smoking, AIDS, skin cancer and COVID — have all demonstrated the efficacy of being brutally honest about the problem in order to engage people about the often inconvenient solutions. Climate is no different.*"

While the current administration pursues a fossil fuel vs climate mitigation political strategy (Red states vs Blue states) in favor of Red state fossil fuel economies, the physics of global warming will unceasingly march on. The Coast Range Association will continue to be honest in our advocacy of the required forest management to mitigate climate warming and science-based solutions to issues we address.

Fuels Reduction

The DEIS states "*Fire infrequent systems are characterized by being climate limited; due to high productivity and lack of frequent fire, high fuel loads are consistently available to burn,* *and wildfires are governed by the lack of climatic and weather conditions that propagate large fire growth. However, when climatic limitations are lifted due to periods of drought or local fire weather conditions that favor large fire growth, resultant wildfires can be large with a full suite of low-high fire severity patches. There are approximately 3,768,000 acres within the NWFP area that are identified as fire infrequent ecosystems.*"

The phrase "fire infrequent" should have been **fire resistant** in the DEIS.

We agree with DEIS for not recommending the broad use of fuel reduction in moist forests. Mitchell, et al at http://www.jstor.com/stable/27646006 states "*Forests such as these* [moist, wet and rain forest of the West Cascade & Coast Range] *may actually have little or no need for fuel reduction due to their lengthy fire return intervals. Furthermore, fire severity in many forests may be more a function of severe weather events rather than fuel accumulation (Bessie and Johnson 1995, Brown et al. 2004, Schoennagel et al. 2004). Thus, the application of fuel reduction treatments such as understory removal is thought to be unnecessary in such forests and may provide only limited effectiveness (Agee and Huff 1986, Brown et al. 2004).*"
And,
"*Ecosystems such as the* [PAZ] *western hemlock Douglas-fir forests in the west Cascades and the* [PAZ] *western hemlock-Sitka spruce forests of the Coast Range may in fact have little sensitivity to forest fuel reduction treatments and may be best utilized for their high C sequestration capacities*."

Where some agency staff see the SNF's huge forest floor biomass as a fuel, it could just as easily be seen as a water/moisture storage system providing wildfire resistance. The proper response to wildfire in wet and rainforest ecosystems is to suppress a fire outbreak when possible. When suppression is not possible due to wind, weather conditions and drought, evacuate and wait for fall rains.

Creating fire breaks, tearing up the landscape with bulldozers, dropping toxic fire retardants, backfires and other such responses to unstoppable wildfire only increases the damage.

Section 2: Key Takeaways:

6. We are now at "code red" on planet Earth. Humanity is unequivocally facing a climate emergency.

7. Future climate conditions will likely arrive sooner than the DEIS's climate discussion suggests.

8. DEIS Alternative B listed topics are severely remiss addressing wet and rainforest zones:

8.a Forest Stewardship: Fire resistance, not resilience, must be the goal. The DEIS lacks a fire resistance narrative in light of anticipated climate warming.

8.b Fire Resilience: Is appropriate for human communities. Home hardening, not fuel reduction, is the path to human community resilience.

8.c Climate: Is not one among many issues – it is THE issue for Pacific Northwest forest management.

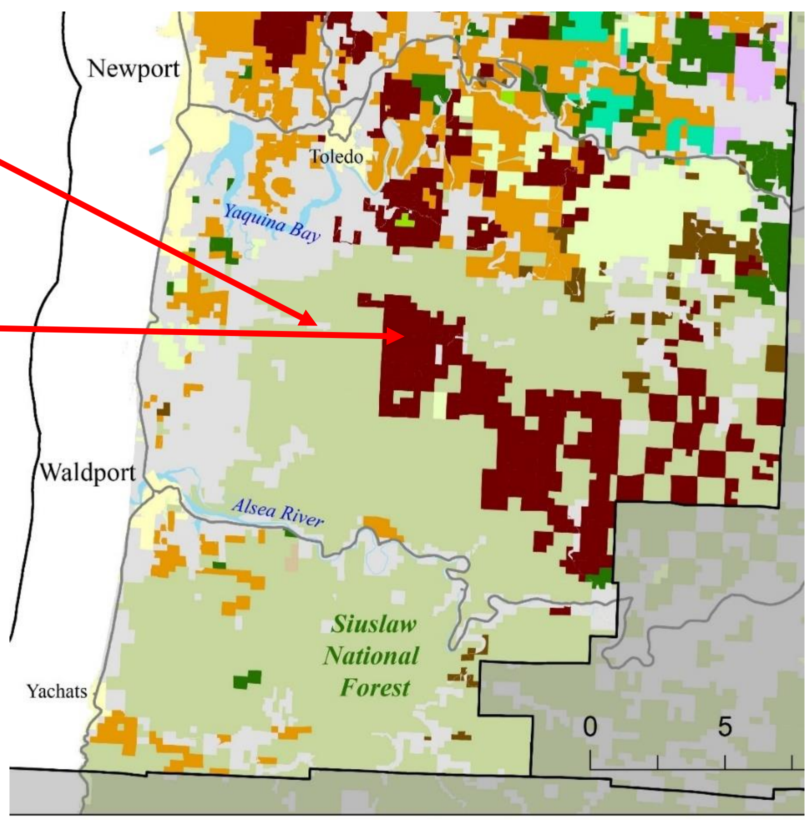
8.d Ecosystem Integrity: Cool, temperate wet and rainforest ecosystem integrity is not supported by commercial timber removal and extensive road networks.

8.e Carbon: World class sequestration of atmospheric CO_2 is a natural outcome of proper forest stewardship when managing for wildfire resistance and ecosystem integrity.

9. The DEIS must be seriously revised for wet and rainforest life zones and incorporate wildfire refugia science for wildfire **resistant** forest management.

There is a reason the SNF is 80% LSR under the NWFP. Drive up the North Fork-Beaver Creek Road into the SNF and pass through tremendous SNF forest. Past federal ownership look around. where is the forest? The forest is gone–converted into financial return (profits) for global finance capital.

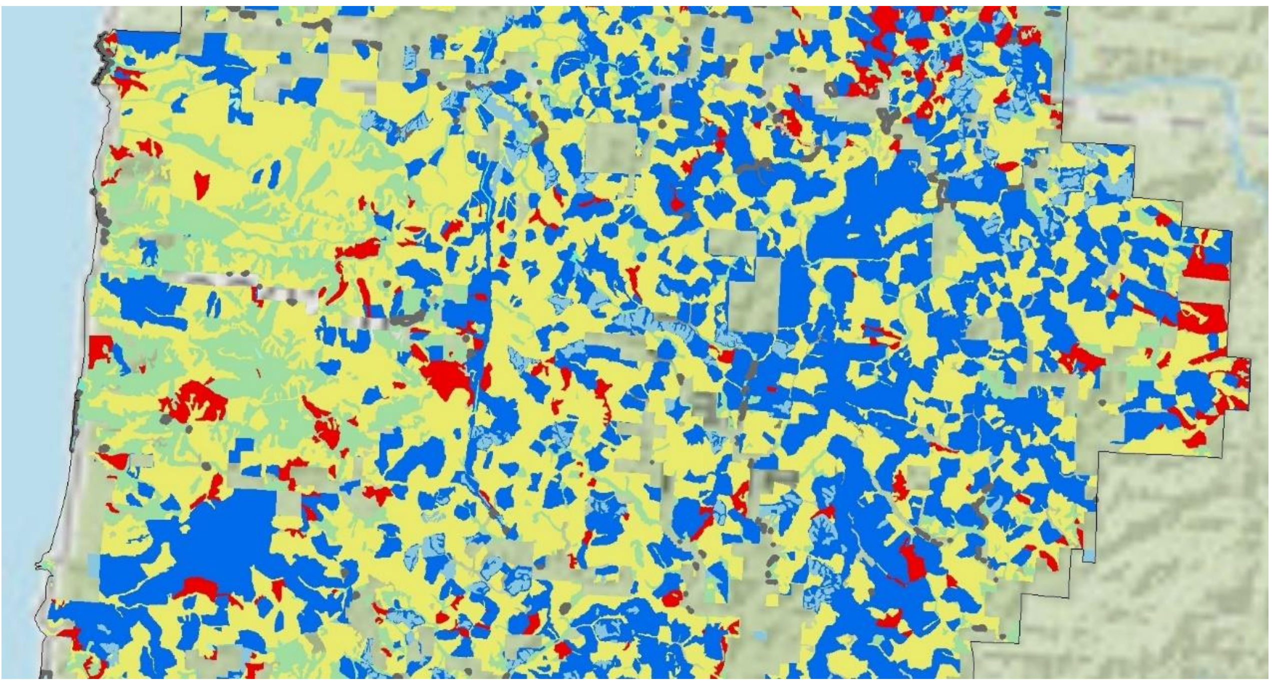
The Siuslaw National Forest is surrounded by a sea of industrial forests managed for financial return.



Section 3: SNF management and the path forward in the plan amendment process

Given information presented in Sections 1 and 2, it is easy to see prior forest management in a new light. More importantly, what is suggested for future SNF and all moist forest management under an amended NWFP?

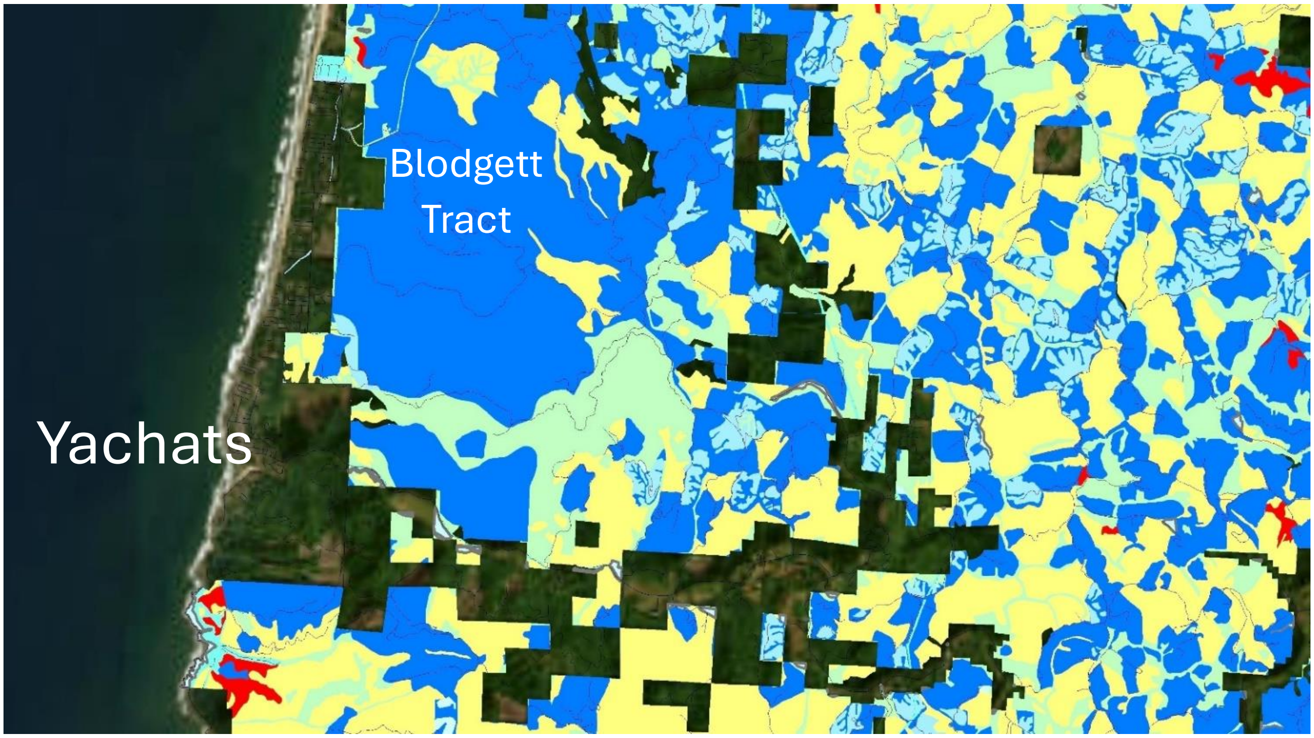
As discussed in Section 1, the disturbance regime of the SNF is, in the near term, made up of natural patch level disturbance from wind, storms, rainfall, pests and disease and the human disturbance in the form of Forest Service tree removal. For the 1945 to 1995 period, the dominant disturbance was timber harvest by way of clearcut harvesting.



Pictured above, the current stand pattern of the SNF with dark blue areas being ‘managed’ stands clearcut prior to the NWFP.

Since 1995, the dominant disturbance regime has been commercially viable forest removal via thinning. Natural disturbance by wind, rain, storms and pests and diseases, if equal to historic fire recurrence intervals, suggests that for the past 30 years natural forest disturbance equaled about 1/3rd of one percent of the forest.

Since 1995, the SNF has conducted tree removal through thinning. The image below is a typical SNF area that happens to be inland from Yachats. The large blue area north of Yachats is the Blodgett Tract, an area with its own distinct story.



Dark Blue: Pre-1995 forest removal. Light Blue: Post-1995 thinning.

One can easily see how busy the Forest Service has been thinning former plantations.

Questions we ask about SNF thinning are as follows: How does thinning impact carbon sequestration? How does current and expected thinning impact wildfire resistance? Which takes us to these questions: How much of the stand is removed? What are the number of remaining trees per acre after thinning? What percent of the canopy was removed?

The **North Fork Smith Project - Draft Environmental Assessment** reports the proposed acreage to be thinned and lower bound of canopy density after thinning. We assume the project is typical of future SNF management for thinning. The project's EA states: "*4,113 (36%) of the 11,307- acres of young plantation in the Project Area would be managed. Density reduction operations would maintain at least 40 percent canopy cover at the cutting unit scale.*" And "*Proposed terrestrial thinning would treat overstocked monoculture 28-73 years-old stands and would target 40, 60, or 80 trees per* *aces (leave trees per acre) based on underlying plant association average from natural stands in the area*." Assuming an even distribution of density reductions, 2/3rds of thinned stands will be outside of minimally recommended fire refugia canopy cover of 75%.

Puettmann, et al, 2016 "**Forest Restoration Using Variable Density Thinning: Lessons from Douglas-Fir Stands in Western Oregon**" found a coast range canopy recovery rate of approximately 1.5% to 2% per year for a 40 tree per acre thin. Which means a 40% canopy will reach 75% closure somewhere in the range of 15 to 20 years after harvest.

No one to our knowledge has ever explained the risk of human **bias** in tree removal vs natural selection mortality due to stand thinning. Like fish hatcheries, there must be genetic impacts.

Nor has the DEIS discussed stand thinning densities in light of far more intense winter storms under a warmer climate.

Pictured above is a typical SNF thinning. Unlike what is planned for the North Fork Smith Project, no understory plantings have occurred. Yet, we have seen understory plantings in other SNF thinning projects.

In summary, current SNF management is focused on:
1. Extensive commercial thinning,
2. Road building and repair for commercial thinning,
3. Conducting restoration projects from the revenues generated by thinning.

The entire thinning enterprise is rationalized via the NWFP for the purpose of accelerating late successional forest characteristics. Now, in the era of climate warming, the DEIS must assess thinning for its impact on sequestering carbon and wildfire – per our earlier discussion of wildfire refugia and the current and foreseeable climate.

Our prior discussion does not address DEIS proposals to harvest timber in SNF naturally regenerated forest stands in LSR's or the Matrix. Such forest management is so far outside of public sentiment and science-based management given real world conditions affecting the SNF – there is little to discuss! Here's why……..SNF's LSR percentage.

There is a reason the SNF has a very high LSR percentage under the NWFP. Drive the North Fork Beaver Creek Road (See map on Page 22) into the SNF and notice the tremendous forest. Just past SNF ownership one appears into industrial forestland. Look around. Where is the forest? The forest has been converted into financial return (profits) for global finance capital. Industrial forest conditions surround the SNF. Please drop tree removal in previously unmanaged stands in all Alternatives.

Lastly, we note the 2024 publication **Climate Change Vulnerability and Adaptation in Coastal Oregon** (Gen. Tech. Rep. PNW-GTR-1024). At 294 pages, the report covers numerous topics of the coastal region and apparently is based on an assessment template used for other regions. The report is an **informally reviewed** document typical of some agency-sponsored reports. For the purposes of our DEIS comments, the report offers little and would require a huge amount of time to untangle a weak bioregional assessment related to climate issues and agency land management.

Section 3: Key Takeaways

10. DEIS Alternative B must base forest thinning for wildfire resistance and the retention and build-up of sequestered carbon for wet and rainforest life zones.

11. Forest thinning must keep at least 75% canopy cover and preferably more canopy cover for wildfire and climate impacts.

12. Commercial thinning must be replaced by Forest Service budget funded thinning.

13. Supportive infrastructure for dispersed recreational activities must be part of the DEIS, an issue not discussed in these comments. We will discuss recreation in our comments on social and economic issues.

14. We applaud the Forest Service for maintaining Late Successional Reserve areas. However, we strenuously oppose future commercial timber harvest as a management practice in LSRs. Option B's proposal to harvest stands in LSRs up to 119 years of age is a dead-in-the-water idea and wrong forest management. Removing trees from previously unmanaged stands is even more egregious.

We applaud the Forest Service for not amending the NWFP Aquatic Conservation Strategy. Pictured above is a portion of Cummins Creek.

The Siuslaw National Forest – The Greatest Forest on the Planet.

Summary of Recommendations to Modify the DEIS

1. Recognize and incorporate **wet** and **rainforest** life zones, coupled with Plant Association Zones and Mean Annual Increment metrics into a revised set of mapped forest types.

2. Recognize, incorporate and celebrate the world class growth and accumulation of forest biomass – including above ground carbon.

3. Ecologically account for past forest removal from the SNF and all national forests.

4. We support the DEIS-Option B's approach of not using fuel load reduction – a totally unwarranted strategy for moist, wet and rainforest zones.

5. Consult tribes for proper fire use in life zones.

6. We are now at "code red" on planet Earth. Humanity is unequivocally facing a climate emergency.

7. Future climate conditions will likely arrive sooner than DEIS's climate discussion suggests.

8. DEIS Alternative B topics are severely remiss addressing wet and rainforest zones:

- **8a. Forest Stewardship**: Fire resistance, not resilience, must be the goal.
- **8.b Fire Resilience**: Is right for human communities. Home hardening, not forest management, is the path to human community resilience.
- **8.c Climate**: Is not one among many issues – it is the issue for PNW forest management.
- **8.d Ecosystem Integrity**: Wet and rainforest temperate ecosystem integrity is not supported by commercial timber removal and extensive road networks.
- **8.e Carbon**: World class sequestration of atmospheric CO_2 is a natural outcome of proper forest stewardship when managing for wildfire resistance and ecosystem integrity.

9. The DEIS must be seriously revised for wet and rainforest life zones and incorporate wildfire refugia science for wildfire **resistant** forest management.

10. DEIS must base forest thinning on wildfire resistance and the retention and build-up of sequestered carbon for wet and rainforest life zones.

11. Forest thinning must keep at least 75% canopy cover after thinning.

12. Commercial forest thinning must be replaced by Forest Service budget funded thinning.

13. Supportive infrastructure for SNF dispersed recreational activities must be part of the DEIS.

14. We incorporate by reference all tribal related recommendations contained in the **Federal Advisory Committee**'s Report at: fseprd1181977.pdf

15. We applaud the Forest Service for keeping Late Successional Reserves. Outside of plantation thinning that retains >75% canopy cover, we strenuously oppose commercial timber harvest as a management practice in LSRs. The harvest of naturally regenerated stands in LSRs within the Siuslaw National Forest, no matter what age, will engender vigorous public opposition. Option B's proposal to harvest stands in LSRs up to 119 years of age is a dead-in-the-water idea and wrong forest management. Traditional tribal tree removal in LSRs is appropriate.

Appendix 1. Images of Plant Association Zone &Holdridge Life Zones

Plant Association Zones (PAZ)

Vegetation zone	Sample size	Dominant tree species
Douglas Fir	747	*Pseudotsuga menziesii*, *Pinus ponderosa*, *Quercus chrysolepis*
Pinyon-Juniper	353	*Juniperus occidentalis*, *Juniperus californica*, *Pinus monophylla*
Foothill Pine-Coulter Pine	71	*Quercus douglasii*, *Pinus sabiniana*, *Quercus wislizeni*
Hardwoods	113	*Quercus garryana*, *Populus fremontii*, *Quercus douglasii*
Jeffrey Pine	106	*Pinus jeffreyi*, *Juniperus occidentalis*, *Pinus ponderosa*
Lodgepole Pine	42	*Pinus contorta*, *Pinus radiata*, *Quercus agrifolia*
Mountain Hemlock	512	*Tsuga mertensiana*, *Abies amabilis*, *Pseudotsuga menziesii*
Parklands	327	*Pinus contorta*, *Abies lasiocarpa*, *Tsuga mertensiana*
Ponderosa Pine	465	*Pinus ponderosa*, *Quercus garryana*, *Juniperus occidentalis*
Port Orford Cedar	20	*Pseudotsuga menziesii*, *Chamaecyparis lawsoniana*, *Lithocarpus densiflorus*
Red Fir	122	*Abies magnifica*, *Pinus contorta*, *Abies shastensis*
Redwood	63	*Sequoia sempervirens*, *Pseudotsuga menziesii*, *Lithocarpus densiflorus*
Silver Fir	786	*Tsuga heterophylla*, *Pseudotsuga menziesii*, *Abies amabilis*
Sitka Spruce	193	*Tsuga heterophylla*, *Pseudotsuga menziesii*, *Thuja plicata*
Subalpine Fir-Engelmann Spruce	310	*Abies lasiocarpa*, *Pinus contorta*, *Pseudotsuga menziesii*
Tanoak	211	*Pseudotsuga menziesii*, *Lithocarpus densiflorus*, *Arbutus menziesii*
Western Hemlock	1767	*Pseudotsuga menziesii*, *Tsuga heterophylla*, *Thuja plicata*
Western Red Cedar	43	*Pseudotsuga menziesii*, *Thuja plicata*, *Larix occidentalis*
White Fir-Grand Fir	1272	*Abies concolor*, *Pseudotsuga menziesii*, *Pinus ponderosa*
Total	7523	

For each PAZ, plot counts and the three most abundant tree species by basal area are listed in descending order.

https://doi.org/10.1371/journal.pone.0302823.t001

Western Hemlock PAZ
Holdridge rainforest zone

Sitka Spruce PAZ
Holdridge wet forest zone