Coast Range Association Comments
Northwest Forest Plan Amendments (NWFP)
Draft Environmental Impact Statement (DEIS)

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This document contains the comments of the Coast Range Association addressing the Draft Environmental Impact Statement (DEIS) for amending the Northwest Forest Plan (NWFP). Our comments raise issues specific to the Siuslaw National Forest (SNF). Much of what we discuss and recommend is applicable to other 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.

Section 2: Future conditions under a warming climate

Climate warming is a major issue in the DEIS. Current scientific data indicates conditions are rapidly evolving such that events, processes and states are occurring much sooner than previously predicted. And, the mitigation of the atmospheric gases driving climate warming (CO2) is falling far short of international goals.

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 implications 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. Given real world conditions and past and current forest management, we make a set of 13 specific 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 DEIS comments addressing "*Providing a predictable supply of timber and non-timber products and other economic opportunities to support the long-term sustainability of communities located proximate to National Forest System lands and economically connected to forest resources.*"

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 biomass volume, 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 additional 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 implementation will be arbitrary and capricious. The DEIS's broad-brush forest 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 read 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-prgs.ornl.gov/radionuclides/documents/HoldridgeLifeZones.pdf
Here, a map of all 38 Life Zones is displayed as Figure 3 (Page 26). The Life Zone map indicates 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 the forest is allowed for the public, but industrial timber operations are only "restricted" or "limited" in the Oregon Department of Forestry's coastal zones WO-1 & NW-1.

The DEIS has this to say about vegetation classification: "*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).

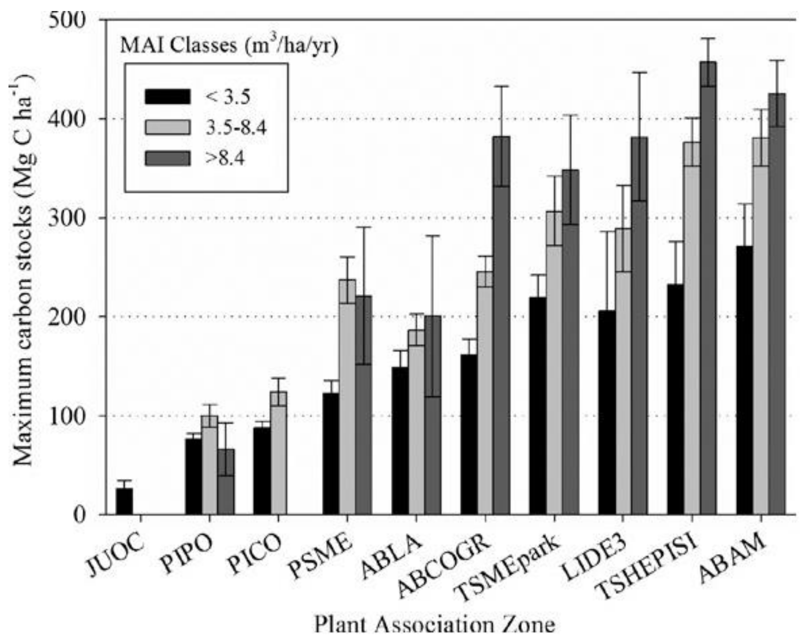
We strongly urge the inclusion of mapped Holdridge life zones into the DEIS and guidance provided for each zone's forest management.

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 of live trees at 196,121 kilograms compared to 177,463 kilograms on the Willamette NF and 158,008 on the Mt. Hood NF. These are huge volumes that not one thing among many, they are forest management defining qualities.

If managed correctly, the SNF and all cool moist forests can contribute significantly to mitigating climate warming due to their enormous potential to sequester atmospheric carbon. The fact is, the SNF's above ground carbon storage volume, per acre, is one of the highest in the world. Current carbon volume, per acre, on the SNF 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 the life zones.



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

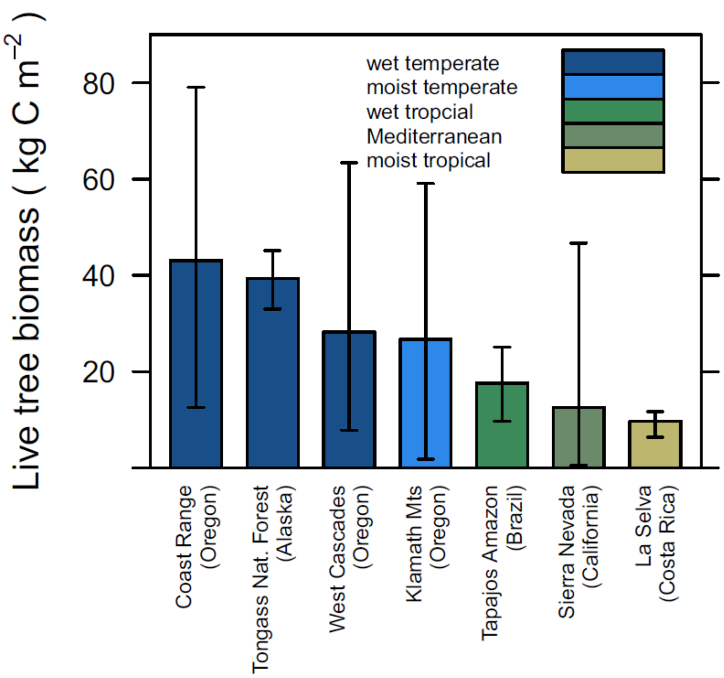
Notes: †Listed most common species make up at least 80% of the live tree carbon in a climax zone. In addition to the species names and codes shown in the first two columns: LAOC, *Larix occidentalis*; PIEN, *Picea engelmanii*; ABMAS, *Abies magnifica* var. *shastensis*; ARME, *Arbutus menziesii*.

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,……*" The addition of Mean Annual Increment (MAI) completes a broad understanding of the SNF's ecological qualities required to justify forest management.

Below, 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 regions in the world.



Law, et al, Fig. S1: "*Live tree biomass in primary forests from Oregon and other regions. Live tree biomass (kg C m−2; aboveground + belowground) for primary forests in Oregon's mesic ecoregions relative to* *primary forests in other parts of the world. Each bar denotes median live tree biomass in a region, while whiskers denote minimum and maximum live tree biomass across a network of plots. Summaries for Oregon and California were derived using data from one of our earlier studies for stands >300 y old (1). Summaries from southern Alaska (2), Brazil (3), and Costa Rica (4) were drawn from the literature, with belowground Biomass estimated using root/shoot ratios for each biome (5) and biomass assumed to be 50% carbon.*" 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

Because the DEIS is not proposing to change the NWFP's Aquatic Conservation Strategy (ACS), we will not comment on the ACS. We must note that past CRA correspondence with the Forest Service and the BLM has stated our belief that ACS implementation under the NWFP is not legally defensible. We have asserted that massive thinning in riparian zones is not done to enhance aquatic conservation values as required under the NWFP, but to generate timber revenues for the agency.

SNF disturbance regime

Five broad categories of disturbance impact ecological processes in the SNF. 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.

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)

The most striking feature of wildfire suppression in moist, wet and rainforests zones is that forest health is not impacted 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 13 to 29 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). In other words, absent wildfire, substantial natural forces are in play creating gaps and driving forest dynamics without modern human intervention.

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 even 75% of estimated maximum carbon storage. As such, forest thinning under the NWFP or tree removal under proposed amendment B are 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.

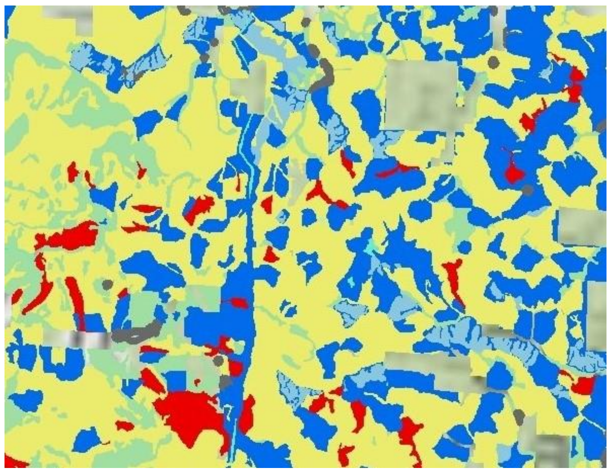
Table 3-16.	Implication for Carbon Storage	Alternative A	Alternative B	Alternative C	Alternative D
Moist Forest Stewardship	Carbon Removal	Treat 48,100 acres per decade in Matrix	Treat 65,000-81,000 acres per decade in Matrix	Treat 32,000-41,000 acres per decade in Matrix	Treat 130,000-163,000 acres per decade in Matrix
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. Over 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 that are 80 to 190 years of age. Throughout the SNF are small areas of old growth.

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 below).



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

Section 1: Key Takeaways

. 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. 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.

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 anticipated. The DEIS does not acknowledge that the mitigation required to reverse climate warming is falling far short of goals.

The childish suppression of climate warming science by the current administration is a dangerous turn of events. Our comments and recommendations are based on 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 date from 2011 and 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 have already been lost at >400 ppm CO2.

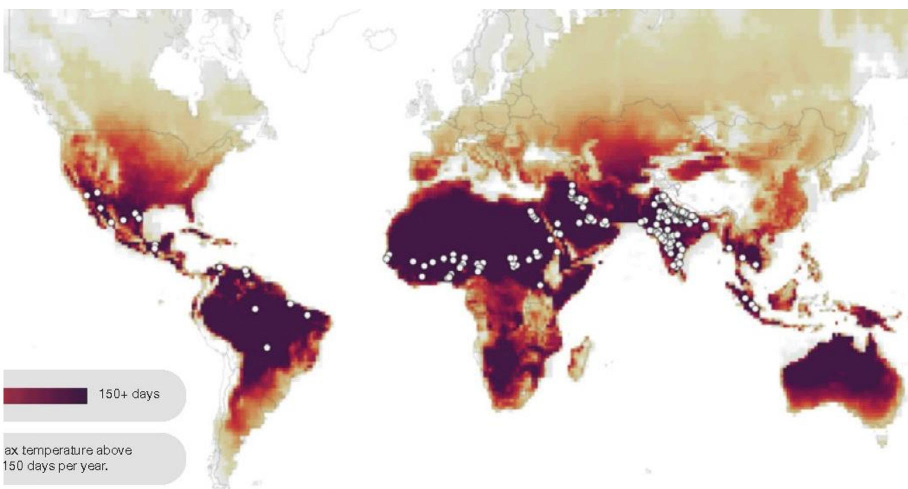
The fact is, the DEIS assessment of climate science is based on outdated data and models that underestimate climate warming. See these references for an expansion on this problem:
The Atlantic, an article by Zoë Schlanger https://www.theatlantic.com/science/a...
New York Times article by Gavin Schmidt 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: **"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 centigrade warmer earth. Such warming will likely make 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.

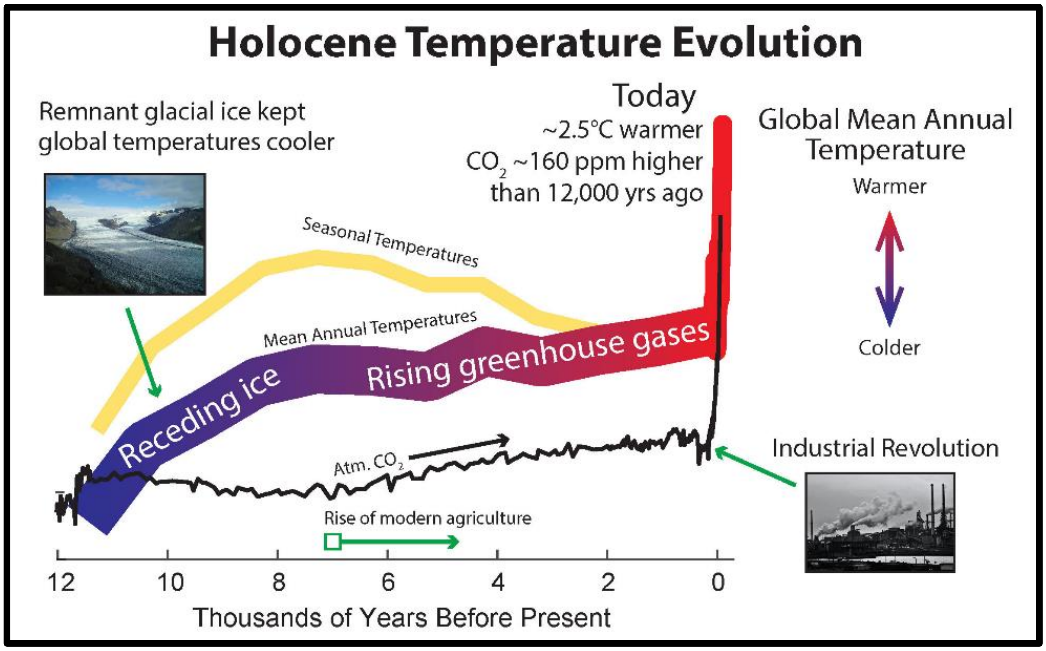


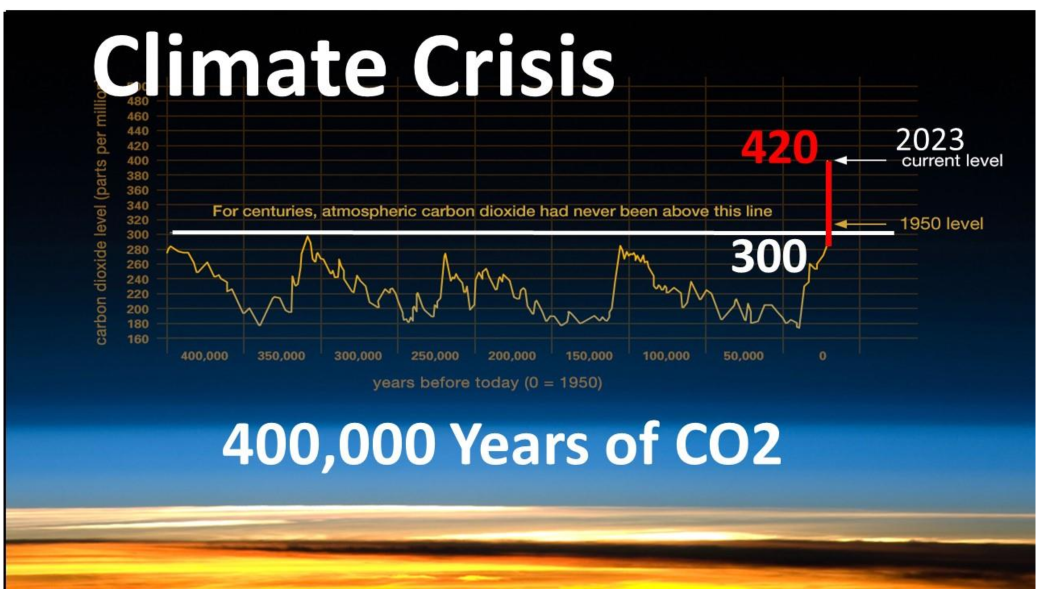
The map above indicates uninhabitable areas of the planet (dark areas) under 3^0 of climate warming. This is a foreseeable future condition that, under the NEPA statute (Not just agency Rule), must be acknowledged in the DEIS.

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

In fact, the graphic depiction of our 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 – Climate & 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 states the Need for Amendments are as follows:

• Improving wildfire resistance and resilience across the NWFP area.

• Strengthening the capacity 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 located 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 "wildfire resilience" in the narrative. These are distinct terms for different phenomena. Wildfire resilience in wet and rainforest regions is a natural feature of the ecosystem. Resilience can be degraded by human disturbance. More importantly, wildfire resistance is an outstanding feature of wet and rain forest zones of the NWFP.

"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."

The above narrative sets the stage for our discussion about the SNF and wildfire.

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. Precipitation projections are more uncertain than those for temperature. For Idaho, Oregon, and Washington, there is potential for a slight increase in precipitation in winter, lower summer precipitation, and more extreme precipitation events." 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. How such changes play out in sub-regional areas or in Holdridge life zones is not clear to us. However, the science 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.

Wildfire and the SNF

The future threat of SNF wildfire 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 best 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 must 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, the tendency of the forest to burn 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 anticipated 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 SNF management. 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 that "*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 wildfire area areas of the forest 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 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 recurrent interval of the SNF, we believe enough qualities of fire refugia areas transition into a characterization for the entire forest for wet and rain forest zones. The question then becomes: under what specific human disturbance 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 findings from the research relevant to the SNF 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 of the above research for forest thinning which we will discuss in Section 3 under SNF management.

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
Siskyou	123,691
Klamath	98,153
Deschutes	49,072

The Forest Service FIA program's forest inventory indicates 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 component 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, it is likely that 33.5 million metric tons of above ground carbon mass is missing from the SNF. The missing carbon is the result of 80 years of SNF forest removal. Admittedly, a percentage of the removed carbon remains sequestered in long-lived wood uses.

A forthright discussion of climate and 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 forest management and climate warming and the science-based solutions offered in our comments.

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.*"

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 extreme 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.

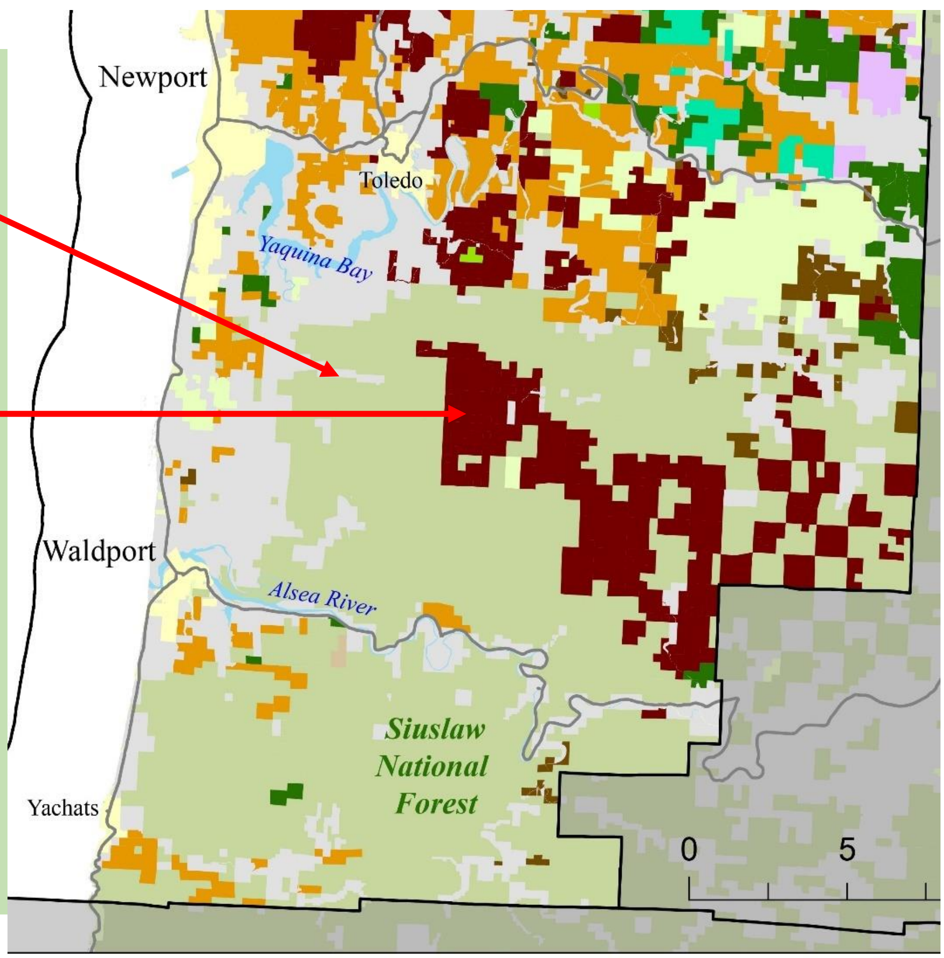
8.d Ecosystem Integrity: Cool, temperate wet and rainforest ecosystem integrity is not supported by commercial timber removal and extensive road networks.

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. Just past federal ownership one emerges into industrial forestland. Look around. where is the forest? The forest is gone– converted into financial return (profits) for global finance capital.

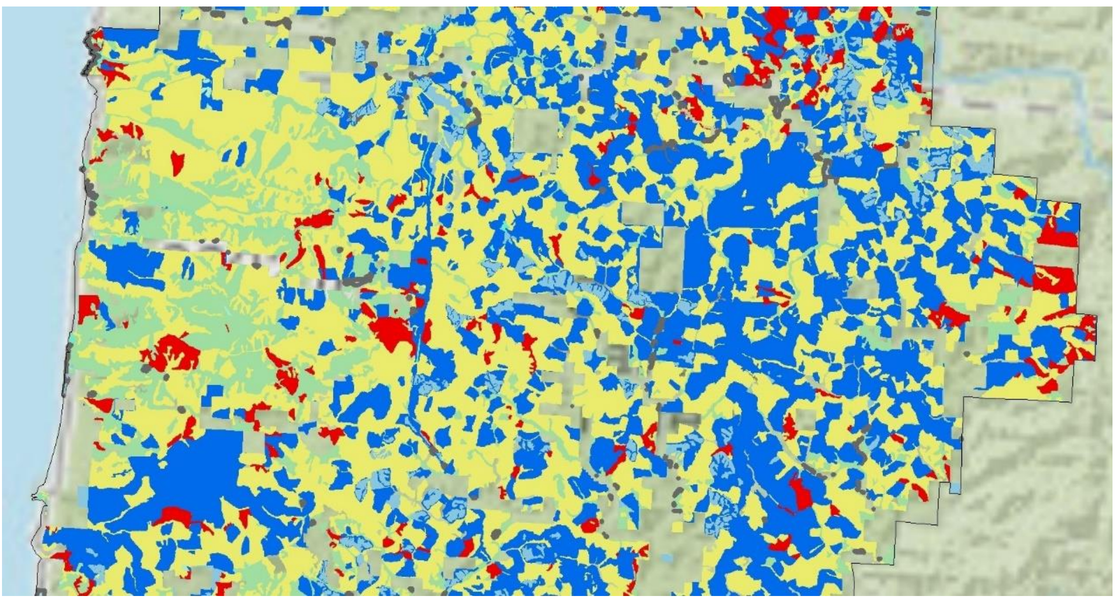
The Siuslaw National Forest is surrounded by a sea of industrial forests managed for financial return.



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 SNF management in a new light. More importantly, given the best available science what is suggested for future SNF management under an amended NWFP?

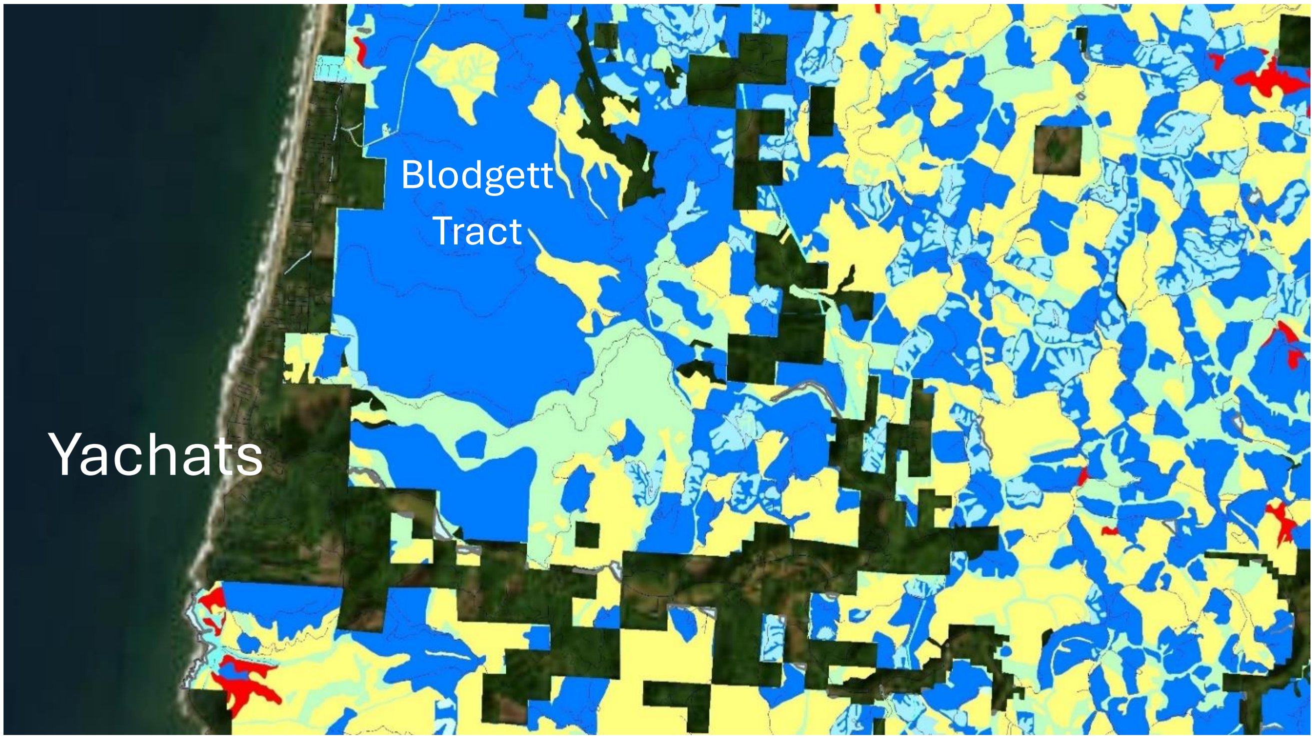
As discussed in Section 1, the disturbance regime of the SNF is, in the near term, made up of natural patch level disturbance from wind, storms, rainfall, pests and disease and the human disturbance in the form of Forest Service tree removal. For the 1945 to 1995 period, the dominant disturbance was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

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 area 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.

The questions we ask about SNF thinning are as follows:
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 recommended fire refugia canopy cover percentage of 70% or greater.

Puettmann, et al, 2016 "**Forest Restoration Using Variable Density Thinning: Lessons from Douglas-Fir Stands in Western Oregon**" identified a 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 70% closure somewhere in the range of 15 to 20 years after harvest.

No one to our knowledge has ever explained the risk of **anthropocentric bias** of 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 observed 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, we must acknowledge the slight tradeoff between stand growth for sequestering carbon vs stand diversity for future species habitat. We are not aware of the DEIS discussing this issue.

All the 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 – there is nothing to discuss!

There is a reason the SNF is 80% LSR under the NWFP. Drive up the North Fork of Beaver Creek Road into the SNF and pass through tremendous SNF forest. Just past SNF ownership one emerges into Weyerhaeuser Company lands. Look around. where is the forest? The forest is gone–converted into financial return (profits) for global finance capital.

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 a assessment template for other regions. The report is an **informally reviewed** document typical of many agency-sponsored reports. For the purposes of our DEIS comments, the report offers little and would require a huge amount of time to unentangle 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 maintain at least 70% canopy cover and preferably more canopy cover when possible.

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

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.

The legacy of past and current forest removal requires Forest Service lands to be managed under the Northwest Forest Plan.

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 appropriate 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 appropriate 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 maintain at least 70% 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.

The Coast Range Association will submit separate DEIS comments addressing "*Providing a predictable supply of timber and non-timber products and other economic opportunities to support the long-term sustainability of communities located proximate to National Forest System lands and economically connected to forest resources.*"

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 maintaining Late Successional Reserve areas. However, we strenuously oppose future 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.

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

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