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3 March 2026

TO: Wallowa-Whitman National Forest
VIA: https://cara.fs2c.usda.gov/Public/CommentInput?Project=68342

Subject: Sufferin' Springs Preliminary EA — comments

Please accept the following comments from Oregon Wild concerning the Sufferin' Springs Vegetation Management Project Preliminary EA, https://www.fs.usda.gov/r06/wallowa-whitman/projects/68342. Oregon Wild represents 20,000 members and supporters who share our mission to protect and restore Oregon's wildlands, wildlife, and water as an enduring legacy. Our goal is to protect areas that remain intact while striving to restore areas that have been degraded. This can be accomplished by moving over-represented ecosystem elements (such as logged and roaded areas) toward characteristics that are currently under-represented (such as roadless areas and complex old forest).

This proposal involves:

- 10,189 acres commercial logging
- 3,048 acres of commercial logging in "other undeveloped areas"
- patch cuts up to 5 acres
- 227 ac of RHCA logging
- 546 ac tethered logging
- 10.9 mi temporary road construction
- 95 miles of closed roads reopened
- 13 new culverts
- 34,267 ac prescribed fire
- 9962 ac non-commercial thinning within commercial thinning commercial units

Contents

14-Day Comment Period Inadequate.

Two weeks (14 days) is far too short of a period for meaningful public comment. There are 4 weekend days during the comment period, so it's really 10 days. When laws like the National Forest Management Act and the National Environmental Policy Act call for "public involvement" they mean something more meaningful than a 14-day comment period on an 10,000+ acre logging project.

Our intent is to provide informed comment on projects like this, which requires reviewing the project record; associated/nearby activities; relevant law, forest plan standards & guidelines, and science; and field review when possible. It is not realistic to get all that done during such a short comment period.

The scoping period back in February 2024 was nice, but we only had 12 pages of information to review at that time. Now we have more than 400 pages. It seems highly irregular to have a longer comment period to consider 12 pages, and a shorter period to review 400+ pages.

The Oregon Wild staff person assigned to comment on the Sufferin' Springs project had 6 other comments due on other federal agency proposals during the 14-day comment period for this project. There were additional projects assigned to other staff.

The FS has had this project under consideration since January 2021. Allowing the public just 2-weeks after the FS has had it for 260+ weeks just seems patently unfair. It signals to the public that our input is not valued.

The Forest Service has official rules governing notice-comment-objection on Forest Service projects implementing forest plans. These rules have not been enjoined or rescinded as far as we are aware. These rules unambiguously require a 30-day comment period after public notice of the availability of Environmental Assessments, 36 CFR § 218.24(b)(4). The Forest Service appears to be trying to extract some new authority to change that requirement from vague language in the Infrastructure bill or the USDA NEPA regulations.

First, the Infrastructure bill, 16 USC § 6592c(d) (Section 40807 B.1.B), waives the objection process for so-called "emergency" projects, but is completely silent on the comment period for EAs.

Second, the vague provisions of the USDA NEPA regulations at 7 CFR § 1b 5 cannot be used to waive the clear requirement of the agency's own notice-comment-objection regulations. Generally speaking, the rules of legal interpretation, state that vague terms cannot override explicit terms.

Third, by exercising the alleged authority for a 14-day comment period in the USDA NEPA regulations, the Forest Service is violating the explicit requirement for a 30-day comment period in its own rules. "[A]n agency cannot exempt itself from duties plainly imposed by law; it cannot decide that only one of two statutes governs its activities when the laws themselves… clearly show that both apply." *Seattle Audubon Soc'y v. Evans*, 952 F.2d 297, 302 (9th Cir. 1991).

The 9th Circuit recently held that there are limits to the agencies' discretion to limit public involvement. Just last year the 9th Circuit Court of Appeals rejected comment periods less than 30 days:

> Although we have not established a minimum level of public comment and participation required by the regulations governing the EA and [Finding of No Significant Impact] process, we clearly have held that the regulations at issue must mean something." *Citizens for Better Forestry v. U.S. Dept. of Agric.*, 341 F.3d 961, 970 (9th Cir. 2003). In *Bering Strait Citizens for Responsible Resource Development v. U.S. Army Corps of Engineers*, we were more concrete, holding that "[a]n agency, when preparing an EA, must provide the public with sufficient environmental information, considered in the totality of circumstances, to permit members of the public to weigh in with their views and thus inform the agency decision-making process." 524 F.3d 938, 953 (9th Cir. 2008). We concluded in *Bering Strait Citizens* that this standard was met where an agency "widely disseminated" information about a proposed mining project, "received a high level of public comment," and "made substantial efforts to provide additional information" explaining the permitting process. *Id.*
>
> To meet [**58] the agency's responsibility "to permit members of the public to weigh in with their views and thus inform the agency decision-making process," the participation period offered for comment must be sufficiently long to permit members of the public to weigh in on the decision in an informed manner. *Id.* The period must be long enough for participants to obtain and absorb the environmental information provided by the agency and then prepare their own analyses and critiques, including consultation with experts where appropriate. In *Fund for Animals v. Norton*, for example, a district court concluded that the agency's provision of a two-week comment period was insufficient, as the comments produced in such a short time period were likely to be inadequate to allow the agency to take a "hard look" at the proposed regulation. 281 F. Supp. 2d 209, 226-29 (D.D.C. 2003).
>
> With respect to the parcels for which BLM offered a 30-day comment period for the Environmental Assessment (the June 2018 Wyoming and Nevada sales, and 124 of the parcels identified by Expressions of Interest in the September 2018 Wyoming sale), there was no NEPA violation. Those Assessments were conducted under the participation provisions of IM 2010-117, which Western [**59] Watersheds agrees were sufficient.
>
> As to the parcels for which the comment or scoping period was less than 30 days (254 parcels offered in the September 2018 Wyoming sale, and all parcels offered in the September 2018 Utah sale), or for which the agency prepared a Determination of NEPA

Adequacy (the September 2018 Nevada sale), we do not decide whether the participation offered was inconsistent with NEPA's requirements when considered in isolation. The statute itself does not impose any substantive measure of adequate participation. And the agency did ultimately receive comments on the Environmental Assessments prepared [*39] for each of the contested sales, as well as protests challenging the parcels included.

A change in policy or in a planned agency action may nevertheless be arbitrary and capricious if the agency fails to provide a "reasoned explanation" for the change. Applying the factors identified in *Fox Television*, we conclude that the Bureau displayed "awareness that it [was] changing position" on lease sale procedures, *Fox*, 556 U.S. at 515-16, by stating that IM 2018-034 "supersede[d] existing policy announced in IM 2010-117." The Bureau's given reason for adopting the new IM—"to simplify and streamline the leasing [**60] process to alleviate unnecessary impediments and burdens," and "to expedite the offering of lands for lease"—indicated that the agency "believe[d]" that the new policy was an improvement upon the old. *Id.*

As to whether simplification and streamlining of oil and gas leasing decisions are "good reasons" for reducing the overall opportunity for public participation, we have noted that "[e]lections have policy consequences," and that an agency may reevaluate the weight it gives to different priorities. *Organized Vill. of Kake v. U.S. Dep't of Agric.*, 795 F.3d at 968. For example, an agency's decision under a new administration to "value[] socioeconomic concerns more highly than environmental protection" may be an acceptable justification for a change of heart. *Id.*

At the same time, the justification offered for a change in policy or agency action cannot be inconsistent with the purpose of the requirement being implemented. Here, the agency's decision to prioritize administrative efficiency and expedition of oil and gas production over deliberative decision-making that takes into account informed public comments is in direct tension with NEPA. NEPA's "twin aims" are to ensure that the agency consider "every significant aspect of the environmental impact [**61] of a proposed action," and "inform the public that it has indeed considered environmental concerns in its decisionmaking process." *Baltimore Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. at 97. BLM failed entirely to acknowledge the potential costs of reducing public participation in leasing decisions, including that shortening the participation opportunity might lead to insufficient consideration of the environmental impacts of its actions. Individuals and groups are unlikely to learn of the decision, research the environmental impacts of each sale—here, numbering in the dozens to hundreds—and compose a formal comment or protest marshalling facts and arguments in little over two weeks. By curtailing the opportunities available for public input in land management decisions for the sole purpose of more expeditious offerings of oil and gas leaseholds, the agency "entirely failed to consider an important aspect of the problem," one embedded in NEPA, the statute IM 2018-034 was implementing. *WildEarth Guardians v. U.S. E.P.A.*, 759 F.3d 1064, 1069-70 (9th Cir. 2014).

Whether the agency's new policy is "permissible under the statute"—as interpreted by the CEQ regulations—is also doubtful when considered in the context of its earlier policy. *Fox Television*, 556 U.S. at 515-16. The agency has provided no explanation as to how a 15-day comment or scoping period [**62] engages the public "to the extent practicable," 40 C.F.R. § 1501.4(b), or to "the fullest extent possible," *id.* § 1500.2(d), where the agency offered a comment period twice as long under IM 2010-117. Similarly, the government does not justify its decision to eliminate participation in the preparation of the Determinations of NEPA Adequacy, when [*40] it previously allowed 30 days for public comment.

> Accordingly, we conclude that the Bureau violated NEPA when it eliminated in some instances and severely shortened in others the various public participation periods for NEPA review during the Phase One lease sales without providing a "reasoned explanation" for the change.

Mont. Wildlife Fed'n v. Haaland, 127 F.4th 1, 38-40 (9th Circ 2025).
https://cdn.ca9.uscourts.gov/datastore/opinions/2025/01/17/20-35609.pdf

Prepare an EIS Due to Significant Impacts

NEPA requires preparation of an EIS when a proposed action *may* have significant impacts. Here, the scope, scale, and intensity of impacts warrants an EIS that analyzes impacts in detail. In particular, the project's impacts—including cumulative impacts—on species habitat and viability, unroaded areas, RHCAs, soils, and potentially on large, old trees are all significant, as will be the impacts from tethered logging and road construction, even if "temporary," and likely violations of substantive requirements such as the LRMP, INFISH, the Eastside Screens, etc.

RHCA Logging (+Roads) Violate PACFISH/INFISH

The PEA (p 39) views dead wood as fuels that threatened riparian resources, without disclosing that dead wood is valuable riparian habitat that will be depleted by logging. Dead wood is far more threatened by logging than fire.

Reducing the likelihood of fire is not a valid rationale for thinning in riparian management areas because the location and timing of fire is impossible to predict. The agency has to guess where fire might occur during the brief period that treatments might be effective at modifying fire behavior. Most times the agency will guess wrong. Therefore, the riparian reserve stands will suffer the adverse consequences of reduced wood recruitment and likely receive no benefits in return.

Since the density reduction actions needed to modify fire near streams will themselves have adverse effects on aquatic resources (e.g. shade and wood recruitment), the agency must show that the probability and effects of logging plus fire are less adverse than the probability and effects of fire alone. Remember – treatments do not eliminate fire, they just tweak the probability at the margins. And not all fires would be adverse to streams. In fact, fire might be good.

To fully disclose the effects requires a probabilistic assessment. Bottom line – it does not pencil out. Ten to 100 acres must be logged in order to protect one acre from fire. For an analogous analysis see — Heiken, D. 2010. Log it to save it? The search for an ecological rationale for fuel reduction logging in Spotted Owl habitat. Oregon Wild. v 1.0. May 2010.
https://www.dropbox.com/s/pi15rap4nvwxhtt/Heiken_Log_it_to_save_it_v.1.0.pdf?dl=0

PACIFISH and INFISH establish clear boundaries for riparian land allocation that requires protection from actions that would harm fish and prevent (or retard) attainment of riparian management objectives, including stream temperatures suitable for cold-water fish, and instream wood that dissipates energy and help create complex habitat. Protection of RHCAs also provides important benefits for wildlife that need protection from extreme weather associated with global climate change. RHCAs also help wildlife move more freely through a landscape

highly modified by logging and roads. The EA does not take a hard look at the fact that logging and roads in RHCAs will likely harm fish and retard attainment of RMOs related to stream temperature and dead wood recruitment, and degrade other important values associated with RHCAs.

The NEPA analysis needs to carefully analyze the trade-offs involved when commercial logging occurs in RHCAs. Logging will remove forest canopy which will reduce shade, increase stream temperatures, and degrade desired microclimate conditions for riparian habitat. Logging will also remove valuable habitat in the form of live green trees, snags, and medium and large down wood. Logging riparian areas will also degrade soil and potentially increase soil erosion and sediment input, and cause instability of streambanks.

Per the requirements of PACFISH/INFISH, if RMOs are already being met, then there is no need for logging.

If RMOs are not being met, then logging is not the answer. Logging is a subtractive endeavor. There is no "bonus wood" from thinning. Even though there may be some additional growth on the few trees that are retained, there will be more forgone current habitat value and future growth on the trees that are killed and removed. There is no way to conclude that logging will enhance dead wood habitat. (And the FS cannot focus just on "large wood" because small wood is functional (i.e., can form pools and trap sediment) in small streams associated with projects like this.) Logging with RHCAs will unavoidably degrade fish habitat and retard attainment of RMOs in violation of PACFISH/INFISH.

RHCAs are a separate land allocation with separate goals, desired conditions, and standards & guidelines. The FS cannot justify applying upland logging prescriptions in RHCAs.

Table 5 in the scoping notice shows commercial logging 25-50 feet from streams, and non-commercial thinning within 0 feet of streams. And upland logging prescriptions applied within 50-150 feet of streams. This approach fails to treat RHCAs as a separate land allocation with different desired future conditions and different standards & guidelines.

The NEPA analysis must analyze whether commercial logging in RHCA within 1 site potential tree distance of streams may violate the PACFISH/ INFISH mandate to avoid actions that will harm fish and *retard* attainment of riparian management objectives related to water temperature, woody structure, floodplain integrity, and bank stability, etc.

Road construction and "maintenance" and use will also likely violate PACFISH/INFISH. The biological opinion issued by the National Marine Fisheries Service for PACFISH2 (USDA Forest Service and USDI Bureau of Land Management 1995) identified roads as a primary cause of salmonid decline, and indicated that roads may have unavoidable effects on streams, <u>regardless of how well they are located, designed, or maintained</u>.

This project also includes extensive renovation of closed roads (95 miles) which can have significant effects. The November 2000 National Forest Roadless Area Conservation FEIS says:

> In addition to posing many of the same risks as road construction, road reconstruction could result in substantial changes in the kinds and amount of human uses in an area. Improvements such as realignment or improving road surfacing or gradient to provide easy access for low clearance vehicles may promote increases in the amount of human disturbances and disruptions to species and habitats, exceeding those previously experienced before reconstruction.

Large Tree Logging

PEA (p 34) seems to say the Forest Service will cut large trees that are excess of the regional definitions for old-growth. This practice is not supported by analysis or science.

- The EA fails to take a hard look at the rationale for removal of large trees.
- Managing for a snap-shot in time fails to recognize the ecological processes that create, maintain, and degrade large tree habitat, large snag habitat, and LOS conditions.
- Logging down to minimum numbers of large trees raises a big concern that logging will remove large trees needed for "replacement old growth," "replacement snags" and for wildlife that need more than the bare minimum number of large trees and snags. Managing for LOS requires managing for snag recruitment throughout the life of the stand. Since snags are ephemeral, this requires retaining significant numbers of green trees to ensure ongoing recruitment of snags. The Eastside Screens' intent statement for snags says: "Most (if not all) wildlife species rely on moderate to high levels of snags and down logs for nesting, roosting, denning and feeding. Large down logs are a common and important component of most old and late structural forests. Past management practices have greatly reduced the number of large snags and down logs in managed stands."
- White fir is a native tree species that provides valuable large tree habitat. That is why the Eastside Screens protects large trees regardless of age or species.
- Concerns that too many large tress are causing increased drought stress on the stand are misplaced. Natural mortality from drought or insects is a self-correcting mechanism because those trees will cease transpiring and reduce stress on surviving trees, and natural mortality improves overall LOS habitat by recruiting snag habitat that is in short supply regionally.
- Any perceived over-abundance of large trees is an illusion. If the agency has a perception that the more than the minimum number of large trees on a given acre, those "extra" large trees help mitigate for the shortage of large trees on vast areas of public and private lands in the region, and those large trees help maintain closer to optimal LOS habitat (e.g., more habitat structure in the form of more trees and greater snag recruitment). This has been recognized throughout the process of applying the Eastside Screens. In 1997, the Regional Forester said cutting large trees to prevent mortality was unwarranted because "small patches of mortality would contribute to LOS species and probably not

significantly affect other objectives. Also, short-term decline of some stands was an understood effect of the screens." Robert Williams, 12-23-97 memo to eastside forest supervisors regarding Review of Forest Plan Amendments of the Regional Forester's Amendment No. 2 for Eastside Forests to Cut 21" Trees. This point was reaffirmed in 1998 when Robert Devlin, 9-10-98 memo to eastside forest supervisors regarding Screens Review, Winema and Fremont NF's said "the principles stressed by the review team included: 1. Trees twenty-one inches and larger cannot be harvested in late- or old-structure (LOS) stands with the intent of reducing the probability of mortality over the long term." And see, notes from 7/21-23/98 Screens trip to Winema and Fremont NFs "Issue: Can some trees over 21" be cut to reduce competition among large trees in LOS stands. There are clumps and patches which are currently too dense in large trees to avoid significant mortality over the next several years to decade. These stands may actually drop below the number of trees required for LOS over the next few years. The Screens have been in place so long that "interim" protection may be resulting in loss through mortality (m LOS) in the next few years. Answer: The Screens will result in some tree mortality. The screens were designed to maintain LOS and keep, if not increase, levels of large dead or dying structure to insure LOS-related species viability. This short term need currently outweighs likely mortality losses in the longer term …"

Please clarify whether the proposed action would authorize the commercial logging of any trees ≥21 inches dbh. The "Comment Consideration" form (p. 4) states that "[l]arge trees are not included in the proposal for commercial harvest." If that is the case, we support that provision. However, the PEA offers conflicting statements, and appears to envision the commercial logging of trees ≥21 inches dbh in certain instances. We strongly oppose any large tree cutting.
The Silviculture Final Report of the Preliminary EA (Appendices p. 33) provides that the project area falls within Scenario A of the Eastside Screens. The Eastside Screens prohibit the cutting of trees ≥21 inches dbh inside or outside LOS under Scenario A (i.e., when either one or both of the LOS stages fall below HRV).

Under the proposed action ("Elements Common to the Proposed Action," PEA p. 49), "[c]ommercial thinning prescriptions generally manage trees in the 7-inch to 21" dbh class." What does "generally" mean? Elsewhere in the PEA (Appendices p. 34), references are made to an evaluation of the "need to harvest trees greater than 21" DBH" in commercial thinning units Please provide us with that evaluation. The PEA (Appendices p. 50) also refers to the retention of "old" trees, i.e., live trees that are ≥21 inches dbh AND 150 years of age or greater. No such provision is made for "large" trees, i.e., those ≥21 inches dbh. Under what authority would the project authorize the cutting of trees ≥21 inches dbh within Scenario A?

To the extent the Project authorizes the commercial logging of trees ≥21 inches dbh, you will be in violation of the Eastside Screens and the National Forest Management Act. 16 U.S.C. § 1604(i). You will also be in violation of the National Environmental Policy Act, 42 U.S.C. § 4332, because the PEA does not analyze the environmental impact of cutting trees ≥21 inches dbh. For example, how many large trees would be cut? Where would such cutting occur? Which fish and wildlife species would be impacted? The PEA (Appendices p. 34) refers to the EA for the 2021 Amendment to the Eastside Screens, but the PEA cannot rely on or tier to that 2021 EA

because it was vacated by the U.S. District Court for the District of Oregon. See *Greater Hells Canyon Council, et al. v. Wilkes*, et al., No. 2:22-cv-00859-HL.

Recent attempts to authorize removal of large trees inside LOS are inconsistent with the long and consistent history on this issue. We object to any attempt to cut large trees inside LOS based on a radical new interpretation of the Eastside Screens. For 25 years, the Eastside Screens prohibited logging trees >21' dbh *inside LOS* stands. This is made clear by a 1995 interpretive memorandum from the Regional Forester, where John Lowe states:

> "… the intent of the screens is to maintain, in the short-term, all features of late and old structure, whether the stand is actually LOS or not. … For additional clarification, the screen direction under Scenario A of the wildlife standard is intended to maintain all live trees >21 inches regardless of tree species and regardless of whether a stand is LOS or not. *The existing wording in Scenario A could be* ***erroneously*** *interpreted to mean that large trees >21 inches "could" be cut in LOS in some instances. We regret the ambiguous wording used in writing Amendment #2.* The intent of Scenario A is as stated above."

John Lowe, Nov 14, 1995, File Code: 2430, USDA Pacific NW Region; "Subject: Regional Forester Amendment #2 Implementation -Umatilla NF Trip."

This policy was reiterated numerous times over the next two decades. In 2025, the PNW Regional Forester rescinded the above interpretive memo (and 11 others!) related to the application and implementation of the Eastside Screens in a misguided effort try to go back to an ERRONEOUS interpretation of the Screens. See Buchanan, J., July 15, 2025 memo to Forest Supervisors Responsible for Implementing Eastside Screens Management Direction. File Code: 1920. Subject: Direction on Implementation of the Eastside Screens. ("I am rescinding all past letters that include direction and guidance … related to the Eastside Screens implementation and expect Forest Supervisors responsible for adhering to the standards to implement the Eastside Screens as written … When implementing this [Screens] direction as written, there is no need to propose a site-specific, project-level plan amendment to remove trees 21-inches and larger because you are implementing the plan direction that is currently in effect."). The practical effect of this new regional direction is to green-light logging of large trees *inside* LOS (mature and old-growth forests), which is contrary to best available science and well-reasoned past policies adopted over the last 30 years.

This new 2025 regional direction represents a *de facto* significant plan amendment was done without public review and without following NEPA and NFMA procedures. *See ONRC and HCPC v. Forsgren*, 252 F. Supp. 2d 1088 (D. Or. 2003). In that case, a timber sale EA relied on the Lynx Conservation Assessment and Strategy (LCAS) which the court said was a *de facto* plan amendment that had not been subject to NEPA or NFMA review and comment. The court held the agency cannot rely on these strategies until they have subjected to proper procedures.

The NEPA analysis needs to address significant new information that natural mortality processes are self-correcting the species composition, and getting the job done better than logging because natural processes kills the trees that are least fit to survive, and natural processes create and retain snags, and dead wood habitat. In 2022, forest scientists reported a "Firmageddon" event, where true firs such as white fir and grand fir and noble fir were dying across large areas of

eastern Oregon, apparently from drought stress. See Nathan Gilles 2022. Massive die-off hits fir trees across Pacific Northwest | Columbia Insight (AP) Updated: Nov 27, 2022. https://www.mailtribune.com/top-stories/2022/11/27/massive-die-off-hits-fir-trees-across-pacific-northwest/.

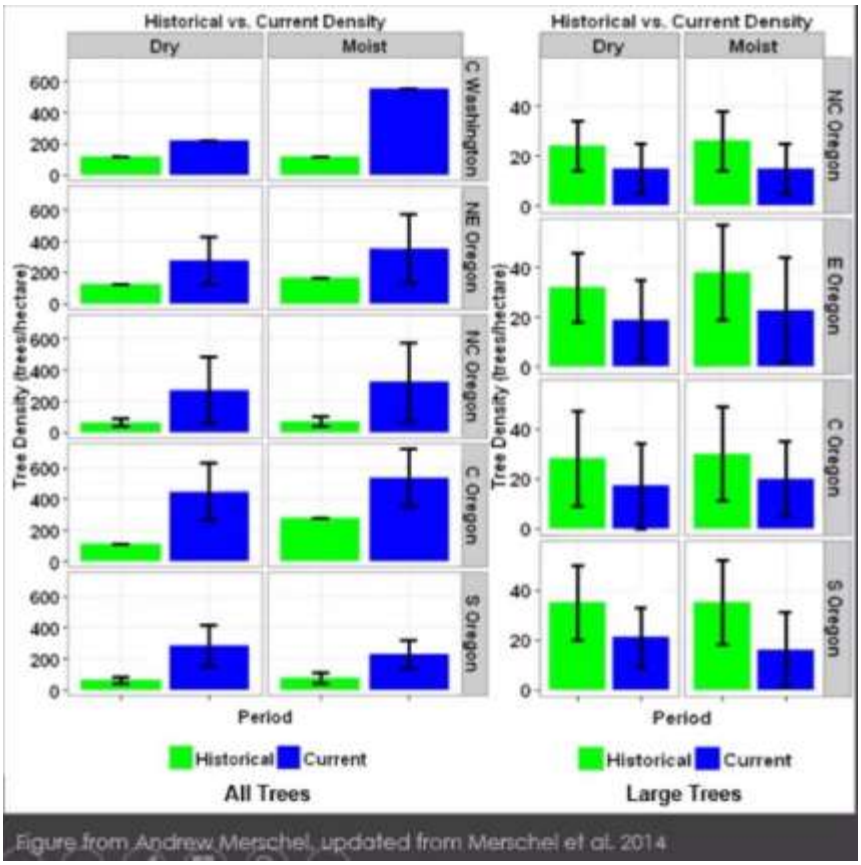
The NEPA analysis needs to address new information indicating that Grand fir may be more fire resistant than typically assumed. "The grand fir forest type had severity values at the same level of forest types dominated by fire-resister species despite grand fir was classified as a fire-avoider species. … In many ponderosa pine forests maintained historically by a high frequency, low-severity fire regime, the transition towards denser forests dominated by Douglas-fir and grand fir would explain why ponderosa pine and Douglas-fir still compose a significant proportion of basal area in the grand fir forest type, and many maintain large, old, fire-resistant ponderosa pine trees (Johnston et al. 2021; Merschel et al. 2021). Therefore, the particular structure and composition of these "recent" grand fir forests (e.g., Merschel et al. 2014), with an important presence of large-diameter trees of fire-resistant species, may provide latent fire resistance (Larson et al. 2013)." Jose V. Moris, Matthew J. Reilly, Zhiqiang Yang, Warren B. Cohen, Renzo Motta, Davide Ascoli 2022. Using a trait-based approach to asses fire resistance in forest landscapes of the Inland Northwest, USA. Landsc Ecol (2022) 37:2149–2164. energyhttps://doi.org/10.1007/s10980-022-01478-w, https://www.fs.usda.gov/rm/pubs_journals/2022/rmrs_2022_moris_j001.pdf.

The NEPA analysis needs to address new information in DellaSala & Baker 2020. Large Trees: Oregon's Bio-Cultural Legacy Essential to Wildlife, Clean Water, and Carbon Storage. https://wild-heritage.org/wp-content/uploads/2020/12/Large-Trees-Report-12.2020.pdf.

The NEPA analysis should clearly disclose the effects of removal of large trees 20-30" dbh under the Trump Screens Amendment, as well as large trees removed for safety and operational purposes. The NEPA analysis should be clear about any proposed removal of large trees, including location, extent, and tree species.

Recognizing the fact that past logging practices have greatly reduced the abundance of large trees and snags, the Eastside Screens also require that projects use the best available science to meet the intent of 100% potential populations of primary cavity excavators. While the potential population methodology has been discredited the Forest Service must still meet the intent by not taking any action that could reduce populations of primary cavity excavators.

If any exceptions to the Eastside Screens will be considered, such as removing white fir larger than 21" dbh, please recognize that compelling ecologic justification for removal of large trees are lacking. As shown in the table below from the 2020 Amendment to the Eastside Screens, there is still a shortage of large trees across the eastside landscape.



Significantly, large white fir contribute positively to biodiversity associated with large trees and large snags, climate mitigation and adaptation, and fire resistance/resilience. The problem of large white fir co-mingling and adversely competing with large pine is overstated, and does not justify sweeping exemptions to the well-supported standards requiring protection of all large trees in eastside National Forests.

Where large trees appear to be abundant, they are helping to compensate for large areas lacking large trees. The agency is not helping when they propose to remove large trees when they exceed the historic average, because large trees populations exhibited a range of conditions often exceeding the average.

Furthermore, where large trees appear to be in competition and at risk of mortality, they are just furthering the natural processes that help tree populations develop adaptive traits such as when less fit individuals die and allow more fit individuals to survive and reproduce, thus increasing population resilience to drought. Mortality also helps recruit valuable large snags and dead wood. It is unavoidable that logging large trees has net negative ecological effects and cannot be justified on ecological grounds. The agency must consider all the trade-offs carefully.

Hessburg et al 2015 recommend: "To improve the longevity of larger early seral trees, restorative activities would include thinning and removing neighboring shade-tolerant trees to reduce competition for water and nutrients, and removing nearby surface and ladder fuels to reduce fire intensities that would threaten their long-term survival." Paul F. Hessburg . Derek J. Churchill . Andrew J. Larson . Ryan D. Haugo . Carol Miller. Thomas A. Spies . Malcolm P. North . Nicholas A. Povak . R. Travis Belote . Peter H. Singleton. William L. Gaines . Robert E. Keane . Gregory H. Aplet . Scott L. Stephens . Penelope Morgan, Peter A. Bisson . Bruce E. Rieman . R. Brion Salter . Gordon H. Reeves. 2015. Restoring fire-prone Inland Pacific landscapes: seven core principles. Landscape Ecology, May 2015. DOI 10.1007/s10980-015-0218-0 http://link.springer.com/content/pdf/10.1007%2Fs10980-015-0218-0.pdf.

However, the co-mingling of large Ponderosa pine and large white fir is not a significant problem. Mildrexler et al (2023) looked at the FIA data and found –

> Large ponderosa pine co-mingle with large grand fir about 14% of the time (259 plots), leaving 86% of plots with large ponderosa pine without large grand fir (1616 plots). Similarly, large western larch co-mingle with large grand fir about 56% of the time. Large ponderosa pine and grand fir are found together on only 8% of all plots in the region, while large larch and grand fir are found together on only 4% of all plots in the region. In other words, large ponderosa pine are by far the most common tree species found in these six National Forests and infrequently co-mingle with large grand fir at the FIA plot scale, whereas large western larch are far less common and co-mingle with large grand fir about half the time, which is expected since these species occupy similar environmental settings …

David J. Mildrexler, Logan T. Berner, Beverly E. Law, Richard A. Birdsey, William R. Moomaw 2023. Protect large trees for climate mitigation, biodiversity, and forest resilience. Conservation Science and Practice. 2023;e12944. https://doi.org/10.1111/csp2.12944. This paper also notes that large trees are more resilient to drought stress than small trees, and "a trait-based approach to assess fire resistance found that the grand fir forest type had the second highest fire resistance score, and one of the lowest fire severity values among forest types of the Inland Northwest USA (Moris et al., 2022)." Citing Moris, J. V., Reilly, M. J., Yang, Z., Cohen, W. B., Motta, R., & Ascoli, D. (2022). Using a trait-based approach to asses fire resistance in forest landscapes of the inland northwest, USA. Landscape Ecology, 37, 2149–2164. https://doi.org/10.1007/s10980-022-01478-w.

Shifting species composition has become a popular rationale for removing large trees. The agency needs to recognize that the shift toward shade-tolerant tree species is a natural process. The PNW Region's Eastside Screens Plan Amendment draft EA (p 23) says:

> ***3.1.4.2 Forest Succession Assumptions: All Alternatives***
>
> Species composition will continue to shift toward fire intolerant species like grand fir and white fir. Less fire tolerant trees like white fir and grand fir will be the most abundant young trees as they can flourish in shady understories in the absence of periodic fire. Large fires

with uncharacteristically large patch sizes will favor species with light windborne seeds that are capable of reseeding areas much farther away from reproducing survivors instead of the fire adapted species with heavy seeds (e.g. ponderosa pine) which do not travel far from the reproducing individual (Kemp et al. 2016, Westerling 2016, Owen et al. 2017, Coop et al. 2019, Downing et al. 2019, Hessburg et al. 2019). The increasing representation of these fire intolerant trees in dry and moist forest landscapes creates a feedback loop that perpetuates conditions more conducive to severe large-scale disturbances with increased risk of a future altered or unique vegetation conditions (Walker et al. 2018, Davis et al. 2019).

USDA 2020. Eastside Screens Plan Amendment draft EA. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd779174.pdf. Retaining large grand fir and white fir that did not grow up under intense competition is better than removing them, especially when the expectation is for lots more small trees and greater challenges growing large trees of any species.

Instead of striving for park-like single strata forests, the agency should consider working toward complex forests. Such an approach would retain all existing large and old trees, retain untreated patches at many scales, manipulate basal area as guided by PAGs, manage for more snags, not fewer, and generally tolerate more diversity in the stand. Norm Johnson and Jerry Franklin worked on a restoration plan for the Klamath Tribes former reservation which defined "complex forests" —

> The Interforest Report defines structurally complex forests as follows: "These are forests which retain much of the pre-management forest structure, including: 1) a large-diameter tree component (including ponderosa pine when appropriate to the site); 2) a spatially-complex pattern of stand structural units (e.g., large tree groves and open areas of dense regeneration); 3) coarse wood habitats (snags and logs); 4) a well-developed understory communities of herbs and shrubs; and 5) moderate tree stocking levels (Interforest Report 2000, p. 21)." The goal of restoration of healthy, diverse, structurally complex forest ecosystems" calls for the return of ponderosa pine and mixed-conifer forests of the Reservation to this structurally complex condition across the landscape.
>
> A complex ponderosa pine forest is illustrated in Figure 1 (from the Interforest Report). Individual patches can be relatively simple, i.e., all trees of similar size, but the mosaic of different sizes and ages creates the complexity. Thus, the structural complexity is achieved through a fine-scale mosaic of relatively simple patches along with scattered large trees, snags, and down logs.

Figure 1. Canopy profile (150m x 20m) that shows the structural cross-section of a ponderosa pine forest at Bluejay Springs, Klamath Reservation Forest. Source: Interforest Report (2000). http://web.archive.org/web/20040202102340/http://klamathtribes.org/forestplan.htm [See

page 49 of the report for pictures of a "superlative" ponderosa pine stand that needs only maintenance, not restoration.]

Shifting species composition has become a popular rationale for removing large trees. The PEA failed to recognize that the shift toward shade-tolerant tree species is a natural process. The PNW Region's Eastside Screens Plan Amendment draft EA (p 23) says:

> ***3.1.4.2 Forest Succession Assumptions: All Alternatives***
> Species composition will continue to shift toward fire intolerant species like grand fir and white fir. Less fire tolerant trees like white fir and grand fir will be the most abundant young trees as they can flourish in shady understories in the absence of periodic fire. Large fires with uncharacteristically large patch sizes will favor species with light windborne seeds that are capable of reseeding areas much farther away from reproducing survivors instead of the fire adapted species with heavy seeds (e.g. ponderosa pine) which do not travel far from the reproducing individual (Kemp et al. 2016, Westerling 2016, Owen et al. 2017, Coop et al. 2019, Downing et al. 2019, Hessburg et al. 2019). The increasing representation of these fire intolerant trees in dry and moist forest landscapes creates a feedback loop that perpetuates conditions more conducive to severe large-scale disturbances with increased risk of a future altered or unique vegetation conditions (Walker et al. 2018, Davis et al. 2019).

USDA 2020. Eastside Screens Plan Amendment draft EA. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd779174.pdf. Retaining large grand fir and white fir that did not grow up under intense competition is better than removing them, especially when the expectation is for lots more small trees and greater challenges growing large trees of any species.

Removing large grand fir/white fir comes with an ecological cost. The NEPA analysis needs to recognize that pileated woodpeckers are large birds that need large snags and dead wood which tends to become scarce in managed landscapes. The NEPA analysis needs to consider that the majority (62%) of roost trees for pileated woodpecker are in grand fir, both live and dead, especially trees infected by Indian paint fungus (*Echinodontium tinctorium*). Roost stands tended to be ≥60% canopy cover with little or no logging history. Evelyn L. Bull, Richard S. Holthausen and Mark G. Henjum. 1992. Roost Trees Used by Pileated Woodpeckers in Northeastern Oregon. The Journal of Wildlife Management. Vol. 56, No. 4 (Oct., 1992), pp. 786-793. Published by: Wiley on behalf of the Wildlife Society. DOI: 10.2307/3809474. https://www.jstor.org/stable/3809474.

Retention of large shade-tolerant (especially grand fir) trees is also important for maintaining resting and denning sites for American marten. Evelyn L. Bull and Thad W. Heater 2000. Resting and Denning Sites of American Martens in Northeastern Oregon. Northwest Science. Vol. 74, No. 3, 2000. https://research.libraries.wsu.edu/xmlui/bitstream/handle/2376/1018/v74%20p179%20Bull%20and%20Heater.PDF?sequence=1. ("Most of the [resting] trees (92%) were living, and the average dbh was 52 cm (Table 2). Trees typically had branches along the entire length of the bole. … Trees with cavities were used as rest sites all year although April and December had the greatest use (Figure 2). The majority of cavities were in grand fir and western larch (Table 2). Sixty-seven percent of the trees were dead, and the rest living. Most of the trees with cavities used by martens were hollow, based on the presence of fruiting bodies of Indian paint fungus (*Echinodontium tinctorium*) on grand fir … . Martens entered these hollow trees through broken tops, holes excavated by pileated woodpeckers (*Dryocopus pileatus*), or through natural cavities usually created when a branch broke off. Cavities occurred in large diameter trees … [T]rees with cavities used as dens were grand fir (84%), western larch (8%), and subalpine fir

(8%) ... The dens in grand fir and western larch were entered through pileated woodpecker holes or broken off tops. ... Hollow logs used for dens were grand fir (55 %), western larch (27%), Engelmann spruce (9%), and subalpine fir (9%). The logs averaged 73 cm in diameter at the large end and 24 m long. ... Typically, only large-diameter trees contain a hollow chamber large enough for a marten to use because the chamber forms only when the former heartwood has decayed and slumped downward (Bull et al. 1997). The high use of living trees occurred because hollow chambers caused by heartrot fungi are created while the tee is still alive (Bull et al. 1997). This decay process can take decades to develop, and trees may be several hundred years old. Typically, these hollow trees occur in forest stands of grand fir in late-successional stages, which now occupy only about 3% of the landscape in northeastern Oregon (Bull et al. 1997). The use of cavities in large-diameter trees that we observed has been reported by Steventon and Major (1982), Spencer (1987). Marlin and Barrett (1991), Buskirk and Ruggiero (1991), and Raphael and Jones (1997); ... The findings in our study can be used by managers to retain the appropriate structures to provide martens with rest sites and dens. Large-diameter hollow trees and logs, accumulations of coarse woody debris, and trees with brooms provided important habitat for resting sites. The silvicultural practices of removing trees with brooms, removing hollow trees, and reducing fuels (coarse woody debris) to lower the risk of or damage by wildfire may negatively alter marten habitat").

TABLE 2. Tree species (%) and tree characteristic means (SD) of three types of resting sites used by American martens in northeastern Oregon, 1993-97.

Characteristic	Platforms	Cavities	Hollow Logs
Tree species			
Grand fir	11	58	58
Western larch	10	32	17
Engelmann spruce	43	5	7
Subalpine fir	25	3	8
Douglas-fir	9	1	3
Lodgepole pine	1		
Ponderosa pine	1	1	7
Tree dbh (cm)	51.7 (20.94)	78.9 (21.22)	66.1 (18.38)
Tree height (m)	26.4 (7.85)	21.2 (9.85)	19.7 (10.68)
Marten height (m)	12.6 (5.99)	11.2 (6.74)	
Canopy depth (%)	89.1 (18.62)	52.4 (39.63)	
Sample size	517	271	67

The NEPA analysis must take a hard look at the habitat needs of primary cavity excavators over the long term. It is not enough to meet the needs of woodpeckers for a few years after harvest. Maintaining viable populations of primary cavity excavators will require retention of virtually all the overstory trees so that there is a long-term supply of snags and dead wood.

Johnson & Franklin (2013) review several considerations that the agency should make in the NEPA analysis, including recognition that large grand fir provide valuable habitat:

Shift Tree Composition towards More Fire- and Drought-Tolerant Species

Restoring the dominance of fire- and drought-tolerant species in Dry Forests is fundamental to increasing resilience. ….

The desired proportion of fire-tolerant to fire-intolerant species will vary by PAG. On sites historically dominated by ponderosa pine, meeting wildlife, fire and fuels, and resilience objectives may involve leaving almost 100% of a stand's post-treatment basal area in pines. In the more productive Dry Mixed-Conifer stands, some Douglas-fir or grand/white fir may need to be left to achieve residual basal area objectives.

Restoring species composition towards historical levels can often mean removing large but younger (<150 year) grand/white fir and Douglas-fir to favor pines and western larch. Hard diameter limits, such as a 21-inch dbh limit, can make it difficult or impossible to achieve desired composition in many Mixed-Conifer Forests, which would compromise their future resilience. At the same time, large, young fir trees provide important wildlife habitat in their live, standing dead and down states, so some often should be retained (Box 5).

…

Box 5: Deciding Which Larger Grand/White Fir to Retain or Remove During Restoration

Deciding how many and which larger grand or white fir to retain and which to remove can be a challenging question for managers, stakeholders, and marking crews, particularly when there are no diameter limits (e.g., trees >21" dbh) or where diameter limits have been suspended. Large grand/white firs are often abundant on sites where they are poorly adapted or unwanted as potential fuel or a continuing source of grand/white fir seed. On the other hand, **larger grand/white firs often make up a large percentage of the basal area and provide important wildlife habitat.** So, what to do? Let's begin by looking at some attributes of grand/white firs and then examine factors favoring retention or removal. Do remember that all older (e.g., greater than approximately 150 year old) grand/white firs should generally be retained along with older trees of other species.

Grand/white firs have the potential to grow fast and to larger sizes relatively quickly on sites that are environmentally favorable, such as Moist Mixed-Conifer sites. They are aggressive regenerators, producing large seed crops at frequent intervals. Grand/white firs are highly shade tolerant and typically retain lower branches as they grow into saplings and poles, creating potential fuel ladders. While growth during the first century is often rapid, grand/white firs are relatively short-lived species with low resistance to trunk, butt, and root rots, insect defoliators (especially spruce budworm), and bark beetles, among other afflictions (Table 1). Hence, mature (e.g., approximately 100 year old) stands dominated by white or grand fir can be expected to fall apart during their second century because of high levels of tree mortality, although individual trees may survive for 200 years or more. Grand/white firs are decay prone in the dead as well as the live state, so persistence as a snag or down log is short. Grand/white firs are also highly vulnerable to damage or death by wildfire or drought.

Why would we retain larger young grand/white firs in restoration treatments, given their vulnerability to disease, insects, fire, and drought? One major reason might be the desire to retain some larger diameter trees as part of the residual stand, and a second may be that retaining grand/white fir could help achieve the target residual stand structure (e.g., basal area or tpa) where this species is a major component. Grand/ white firs may be a good choice for retention where rapid growth in wood volume is a major objective in the restored stand, however wildlife habitat is more likely to be a reason for retaining larger grand/white firs. **Larger grand/white firs often have decadent**

features, like cavities, decay pockets, and brooms, which are useful to wildlife. Furthermore, many of these trees are important sources of snags and logs, since most will die in the near future (e.g., 50 years). For example, grand/white firs hollowed by Indian paint fungus may be opened up by pileated woodpeckers and later used by Vaux swifts. Finally, grand/white firs produce seed crops that are valuable to some wildlife, including Douglas squirrels.

Why should many or most of the larger grand/white firs be removed during restoration treatments? First, they compete aggressively with ponderosa pine and other fire- and drought-resistant species and may provide significant fuel ladders. Hence, the location of larger grand/white firs relative to pines and larches or even Douglas-fir may be an important factor in deciding which ones to retain. Grand/white firs are also relatively short-lived and highly susceptible to fires and defoliators; they are not likely to make a long-term contribution to the live basal area of the stand or to contribute to its resilience. There are many examples where larger grand/white firs were retained to maintain the basal area of restored stands but died within the next decade. Of course, this is fine if an objective is to generate short-lived snags and down logs for wildlife. Finally, removal of larger grand/white fir will substantially reduce the amount of grand/white fir seed source present on the site and, potentially, its abundance in regeneration.

So, what are the most appropriate larger grand/white firs to retain in restoration treatments? First, retain any grand/white fir older than approximately 150 years of age. Guides for visual identification of these older trees are under development and initial results are reported above. With larger grand/white firs that are less than 150 years of age, **consider retaining individuals that are not threatening older pines or western larches either as fuel ladders or competitors, especially in Moist mixed-Conifer Stands.** Further, where a choice is between trees with significant defects, such as cavities and stem rots, and sound trees of comparable size, retaining defective trees is generally the better choice ecologically and economically. Trees with defects generally will have the greatest wildlife value both in the short- and long-term.

Franklin, J.F., Johnson, K.N., et al 2013. Restoration of Dry Forests in Eastern Oregon – A Field Guide. The Nature Conservancy, Portland, OR. 202 pp. http://nature.ly/dryforests.

Removal of large trees is ill-advised because large trees store a disproportionate amount of the carbon in eastside forests and logging will transfer a significant portion of that carbon to the atmosphere, making global climate change (and ocean acidification) worse. Mildrexler David J., Berner Logan T., Law Beverly E., Birdsey Richard A., Moomaw William R. 2020. Large Trees Dominate Carbon Storage in Forests East of the Cascade Crest in the United States Pacific Northwest. Frontiers in Forests and Global Change. Vol 3, Pp 127. https://www.frontiersin.org/articles/10.3389/ffgc.2020.594274/pdf ("ABSTRACT: Large-diameter trees store disproportionally massive amounts of carbon and are a major driver of carbon cycle dynamics in forests worldwide. In the temperate forests of the western United States, proposed changes to Forest Plans would significantly weaken protections for a large portion of trees greater than 53 cm (21 inches) in diameter (herein referred to as "large-diameter trees") across 11.5 million acres (~4.7 million ha) of National Forest lands. This study is among the first to report how carbon storage in large trees and forest ecosystems would be affected by a proposed policy. We examined the proportion of large-diameter trees on National Forest lands east of the Cascade Mountains crest in Oregon and Washington, their contribution to overall aboveground carbon (AGC) storage, and the potential reduction in carbon stocks resulting from widespread harvest. We analyzed forest inventory data collected on 3,335 plots and found that large trees play a major role in the accumulated carbon stock of these forests. Tree AGC (kg)

increases sharply with tree diameter at breast height (DBH; cm) among five dominant tree species. Large trees accounted for 2.0 to 3.7% of all stems (DBH ≥ 1" or 2.54 cm) among five tree species; but held 33 to 46% of the total AGC stored by each species. Pooled across the five dominant species, large trees accounted for 3% of the 636,520 trees occurring on the inventory plots but stored 42% of the total AGC. A recently proposed large-scale vegetation management project that involved widespread harvest of large trees, mostly grand fir, would have removed ~44% of the AGC stored in these large-diameter trees, and released a large amount of carbon dioxide to the atmosphere. Given the urgency of keeping additional carbon out of the atmosphere and continuing carbon accumulation from the atmosphere to protect the climate system, it would be prudent to continue protecting ecosystems with large trees for their carbon stores, and also for their co-benefits of habitat for biodiversity, resilience to drought and fire, and microclimate buffering under future climate extremes.").

We incorporate by reference our scoping comments and comments on the Large Tree Amendment EA and preserve all legal claims related to the issues raised in our NEPA comments. https://cara.fs2c.usda.gov/Public//ReadingRoom?Project=58050.

Emergency Situation Determination

The FS has been considering this project since January 2021. It seems strange that it's suddenly an emergency, when it was apparently not an emergency for 5 years.

The agency intends to use the Emergency Action Determination (EAD) authority to avoid some public processes. Just because the agency thinks it has the authority does not mean it's a good idea. Bypassing public process undermines public trust in the agency.

When diagnosing and treating forest health problems, it is more essential to consider alternative treatments. There is a maxim in medical field which says "If it's not in the differential it won't be in the diagnosis" which highlights that making a correct diagnosis is impossible unless all of the possible alternative diagnoses are considered. This is known as a "comprehensive differential diagnosis" and is essential to prevent improper or potentially harmful treatments. This is precisely why NEPA requires consideration of all reasonable alternatives, so that the the environmental conditions are accurately assessed, and the most appropriate "treatment" plan can be identified. This analogy is particularly apt when the agency cliams to be addressing forest "health" concerns such as fire, insects, disease, drought stress, etc.

Given the complex effects of logging on fire and fuels, we think it is wise to use the NEPA process to consider alternatives that resolve complex trade-offs in different ways. It is absurd to think there is only one way to get this project done, and to pretend there are no trade-offs from using commercial logging as the tool for the job here.

- Logging will make fire hazard worse, not better, by making the stands hotter/drier/windier, moving hazardous fuels from the canopy to the ground where they are more hazardous, stimulating growth of hazardous fuels, and making future maintenance treatments more expensive. The agency often lacks funds and personell to treat activity fuels so they often sit on the ground for a long time, raising fire hazard compared to no action.
- Logging will make the forest less resilient because species that depend on dead wood will be put at further risk, carbon emissions will exacerbate global climate change and worsen weather extremes that the forests must endure. Road construction also makes the watershed less resilience hydrologically and may increase the risk of fire ignitions.

Population Viability Concerns for Management Indicator Species

The Biological Evaluation attached to the PEA says:

> The effects determination for MIS (in this case, Pacific Marten, Pileated Woodpecker, and American Goshawk) is dependent on whether the Project is consistent with Forest Plan objectives. Assuming implementation of Project design criteria (Table 2), the Project May Impact Individuals or Habitat (MIIH) during implementation, but actions are consistent with Forest Plan objectives and it will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
>
> … [and for primary cavity excavators]
>
> The effects determination for MIS (in this case, PCEs) is dependent on whether the Project is consistent with Forest Plan objectives. The Project May Impact Individuals or Habitat (MIIH) of PCEs during implementation, but actions are consistent with Forest Plan objectives and it will not likely contribute to a trend towards Federal listing or cause a loss of viability to populations or species.

These conclusory statements are not backed up with credible analysis of cumulative effects and forest-wide compliance given the pace and scale of aggressive logging on the Wallowa-Whitman National Forest. These conclusions are suspect because logging will reduce and degrade habitat requirements of marten, pileated woodpecker, goshawks and primary cavity excavators via reduction in long-term dead wood habitat, reduced prey base, and reduced forest density and large trees. The PEA quantitatively compares "reference" and "current" levels of dead wood and snags, but fails to quantitative disclose the levels of dead wood and snags after logging, which is a primary purpose of NEPA.

NFMA also requires that all forest plans "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives."[1] The 1982 NFMA regulations required the Forest Service to manage fish and wildlife habitat to maintain viable populations of existing native and desired non-native vertebrate species.[2] To ensure viable populations are maintained, "habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area."[3] To carry out this requirement, the 1982 regulations directed the Forest Service to designate certain species as "management indicator species" whose population changes would indicated the effects of management activities.[4]

Here, the WWNF plan was developed under the 1982 regulations and designates Pacific marten, northern goshawk, and pileated woodpecker as MIS that represent snag habitat and old-growth and late old structural (LOS) forests.[5] The WWNF plan establishes a goal "[t]o provide habitat for viable populations of all existing native and desired nonnative vertebrate wildlife species and to maintain or enhance the overall quality of wildlife habitat across the Forest."[6] This is then

[1] *Id.* § 1604(g)(3)(B).
[2] 36 C.F.R. § 219.19 (1982).
[3] 36 C.F.R. § 219.19.
[4] 36 C.F.R. § 219.19(a)(1).
[5] WWNF Plan, p. 2-9.
[6] WWNF Plan, p. 4-2.

translated into goals (also characterized as "desired future conditions" and "outputs") to "maintain viable (or higher) populations" of MIS.[7]

The WWNF plan defines a viable population as "a population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area," citing FSM 1905.[8] For northern goshawk and pileated woodpecker, the WWNF plan's Monitoring Action Summary identifies a "variability threshold" of "greater than 10% variation below expected [or projected] population levels."[9] For marten, the variability threshold is "greater than 10% of habitat unused."[10] The Wildlife Specialist Report for the project identifies a "threshold for significance" related to MIS as "[h]abitat reduction leading to reduced forest-wide species viability," and specifically cites the 1982 viability regulations at 36 C.F.R. § 219.19.[11]

The EA failed to take a hard look at the adverse effects of this project on wildlife viability and the cumulative adverse effects of this and other large habitat-altering projects on the Wallowa-Whitman National Forest, including but not limited to Morgan Nesbit, Lower Joseph, Baker City Watershed, and others all further reducing source habitat for MIS.

The Lower Joseph Project reduced goshawk source habitat by 4,000 acres. The Baker City Watershed Project will reduce goshawk source habitat by another 1,720 acres. The Morgan Nesbit Project will reduce goshawk source habitat by a staggering 9,220 acres. And now, the Sufferin' Springs Project will reduce that species' source habitat by another 3,727 acres. That is a staggering total of 18,667 acres of habitat for this rare species removed in a short number of years. By the Forest Service's admission, the Sufferin' Springs Project area will support only half the number of goshawk pairs after logging.

What percentage of goshawk source habitat reduction do these projects individually and cumulatively result in forest-wide? How much additional goshawk source habitat does the Forest Service anticipate removing through projects in the foreseeable future? How does the Forest Service contend this species can remain viable in light of such drastic reductions in source habitat over a short period of time?

Meanwhile, the Lower Joseph Project reduced pileated woodpecker source habitat between 400 and 800 acres, while the Baker City Watershed Project will reduced that species' source habitat by another 805 acres. The Morgan Nesbit Project will reduce pileated woodpecker source habitat by 4,376 acres, and the Sufferin' Springs Project will reduce that another 466 acres. That is at least 6,000 acres of source habitat removed for this species in a short period of time. Shockingly, post-implementation the Sufferin' Springs Project area will support just one-fifth of the number of pileated woodpeckers pairs it supported pre-implementation, from 30 pairs down to just 6 pairs, according to the wildlife specialist report.

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[7] WWNF Plan, pp. 5-44, 5-45, & 5-47.
[8] WWNF Plan, Glossary p. 49. This is also the definition in the 1982 regulation.
[9] WWNF Plan, p. 5-10.
[10] *Id.*
[11] Wildlife Specialist Report v3.0, pp. 9-10.

Again, what percentage of pileated woodpecker source habitat reduction do these projects individually and cumulatively result in forest-wide? How much additional pileated woodpecker source habitat does the Forest Service anticipate removing through projects in the foreseeable future? How does the Forest Service contend this species can remain viable in light of such drastic reductions in source habitat over a short period of time?

Similarly, it is concerning to see that Pacific marten source habitat will be reduced by 315 acres, allowing the project area to support just 1 breeding pair post-implementation. The Baker City Watershed Project reduce marten source habitat by 148 acres, and other projects like Lower Joseph and Morgan Nesbit removed or at least degraded marten source habitat even further. How much additional marten source habitat does the Forest Service anticipate removing through projects in the foreseeable future? How does the Forest Service contend this already-rare species can remain viable in light of reductions and degradation of source habitat over a short period of time?

The EA needs to analyze and disclose this project's incremental contribution to the cumulative forest-wide reduction in source habitats for management indicator species.

The EA makes repeated findings that this project will not cause adverse effects on population viability or cause trends toward listing, but these conclusions are not based on credible analysis based on population monitoring or credible habitat modelling that considers cumulative effects, and the many ways that logging and roads degrade habitat for MIS.

This project will have adverse impacts on several terrestrial and aquatic Management Indicator Species, but the Forest Service lacks monitoring data which would tell them whether the cumulative effects of this project and all other past, present, and future projects might be pushing these indicator species toward some threshold of concern for population viability.

USDA policy does not allow the Forest Service to take actions that would cause trends toward listing species under the Endangered Species Act. The Forest Service manages Management Indicator Species as surrogates for "habitats that were likely to be limiting in the future (in short supply either in total acreage or in distribution)" (this is a general statement of the purpose of the MIS program from the Fremont LRMP, Appendix G-11). There is an inherent assumption that MIS are "vulnerable" or represent a class of species that are vulnerable due to current or future habitat limitations. Id. The impacts of management activities on these vulnerable species is likely to be significant in a NEPA context, especially in the absence of clear monitoring information indicating that these populations are health and/or have an increasing trend.

Species associated with mature and old-growth forest, species associated with snag habitat, and species associated with high quality aquatic habitat are most in need of monitoring and conservation, because these species are specialists and are adapted to habitats that are degraded and under-presented. For instance, Appendix G of the Wallowa-Whitman National Forest LRMP says that "many species associated with the mature and old-growth successional stages are habitat specialists and less adaptable than species associated with early successional stages." (LRMP p G-4).

The Forest Service has a choice to either monitor actual populations of Management Indicator Species, OR it must develop and rigorously validate habitat models that allow the Forest Service to use habitat as a proxy for populations of these species. We object to the use of proxy-on-proxy approach to wildlife management where the agency uses crude and unverified habitat modeling rather than actual population surveys as a means to ensure the viability of Management Indicator Species ("MIS"). We are not aware of any forest in the Pacific northwest that is using a credible and validated habitat model for MIS. If the Forest Service is not monitoring MIS populations directly, please explain in detail the model the Forest Service is using to correlate populations and habitat.

MIS are chosen to represent a suite of other species, but unfortunately MIS populations are not monitored as required by NFMA and the LRMP. NFMA and its implementing regulations require the forest service to manage forests for viable populations of native vertebrate and desired non-native species. Diversity is assessed by identifying MIS, monitoring MIS, gathering inventory data on MIS, and analyzing the impacts of logging (and other management activities) on MIS, because MIS are an indicator of the overall diversity of the forest.

NFMA, its implementing regulations, and subsequent case law require the Forest Service to know what the viable populations of MIS located in the project area are before management prescriptions are applied. However, the NEPA document and the underlying specialist reports never explain what the population levels are for the MIS. This is despite the fact MIS habitat will be negatively affected by this project.

The 9th Circuit also does not approve of the "proxy on proxy" approach favored by the Forest Service where indicator species are chosen to represent a suite of other species but then the indicator species populations are not even monitored— instead the agency monitors habitat levels that may or may not reflect populations levels. The Forest Service must refrain from destroying habitat until they have completed population monitoring and documented viable populations of native species. See
Idaho Sporting Congress and Alliance for the Wild Rockies v. Rittenhouse
http://web.archive.org/web/20061007221615/http://www.ca9.uscourts.gov/ca9/newopinions.nsf/D6B0EF3C12752B5588256C360081AA9E/$file/0135403.pdf?openelement

The 9th Circuit reiterated that "species viability may be met by estimating and preserving habitat '*only* where *both* the Forest Service's knowledge of what quality and quantity of habitat is necessary to support the species *and* the Forest Service's *method for measuring the existing amount of that habitat are reasonably reliable and accurate*.' *Earth Island Inst. v. U.S. Forest Serv.*, 442 F.3d 1147, 1175-76 (9th Cir. 2006) (quoting *Native Ecosystems Council v. U.S. Forest Serv.*, 428 F.3d 1233, 1250 (9th Cir. 2005))" ONRC v. Goodman (Mt Ashland case, 9th Circuit Sept 24, 2007) (emphasis added).
http://caselaw.findlaw.com/us-9th-circuit/1151013.html
and http://caselaw.findlaw.com/us-9th-circuit/1094367.html.

Determining effects on species viability requires consideration of cumulative effects on species populations, including identification of risk factors, species limiting factors, current threats, the relative contribution of private lands and federal lands to species conservation, monitoring results that elucidate the effectiveness of proposed management actions, and disclosure and response to diverse views, adverse opinions, and inconsistent data.

The NEPA analysis must explain the short-comings of the habitat monitoring approach and the risks of relying on habitat monitoring to fulfill its wildlife conservation mandates.

[H]abitat monitoring alone has limited usefulness in predicting wildlife populations for several reasons:
• Our understanding of wildlife-habitat relationships is poor for most species.
• Wildlife species may be affected by properties of the larger landscape, outside the area being measured.
• The habitat variables measured may be chosen for logistical reasons rather than because they are the best indicators of ecological conditions for targeted species. For instance, red-cockaded woodpecker populations are known to be strongly influenced by the availability of nest cavities, yet nest cavities are not likely to be assessed in a general habitat monitoring scheme.
• The disturbance history (e.g. fire, timber harvest) of an area may influence population size, especially where wildlife species are not mobile and/or where populations are fragmented.
• Current disturbances, such as recreational use, may not affect the physical features of an area but can limit or exclude occupancy by species sensitive to human presence.
• The wildlife species of concern may be influenced by population size of other prey, predator, mutualistic, or competitor wildlife species.
• Population-limiting processes may occur elsewhere for migratory or seasonally mobile species.
• Intrinsic factors, such as disease or parasites, may cause declines in wildlife species that are not predicted by habitat. The general amphibian decline of the past several decades is a good example in which population changes would have been poorly predicted by habitat monitoring alone.
...
[F]or the many reasons listed in the bullets above, a more informed understanding requires us to effectively relate population data to habitat data.
Where habitat and population data are being collected to refine our understanding of their relationship, several factors must be considered:
• Effects of external influences on populations, such as those mentioned above, are likely to introduce variability into the habitat/population relationship.
• Collection of habitat data must be consistent with the spatial scale at which species respond to habitat.
• Different levels of habitat data specificity may be needed for collection with different population measures:
    o Predictions of presence/absence for wildlife can be based on broad and correlative habitat variables;
    o Predictions of population change should be based on variables closely tied to factors inducing population change; and
    o Predictions for survival and reproduction should be based on habitat attributes thought to directly influence survival and reproduction, e.g., food availability.

Holthausen, Richard; Czaplewski, Raymond L.; DeLorenzo, Don; Hayward, Greg; Kessler, Winifred B.; Manley, Pat; McKelvey, Kevin S.; Powell, Douglas S.; Ruggiero, Leonard F.; Schwartz, Michael K.; Van Horne, Bea; Vojta, Christina D. 2005. Strategies for monitoring terrestrial animals and habitats. Gen. Tech. Rep. RMRS-GTR-161. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 34 p. http://www.fs.usda.gov/rm/pubs/rmrs_gtr161.pdf.

The cumulative impacts analysis must describe the cumulative impacts at relevant scales. For cumulative impacts on species, one of the relevant scales is the range of the species. Impacts on species must be done at the range-wide level (like the 1994 NW Forest Plan EIS that described

the cumulative impacts of all federal management throughout the range of the spotted owl and the marbled murrelet, as well as several salmon ESUs), not at the project level.

Each special status species was designated because of some level of concern for persistence or special relevance to land management. Even though some habitat type may be relatively abundant at the project- or watershed-scale, the agency cannot ignore the facts that (1) many habitat types (especially old forest, young complex forest with abundant legacies, park-like stands on the eastside, functional aquatic habitats) are far below the historic range of variability across the range of many special status species, and run(2) the long-term viability of various species that live in the project area is dependent upon the management of habitat across the range of the species. The agency must clearly describe (in a NEPA document) the condition of habitat for sensitive species (especially those dependent upon under-represented habitats such as old forest, unsalvaged disturbances, and aquatic habitats) and describe the impacts of federal land management on the species as a whole. The ICBEMP EIS was a partial attempt to do this but it was never completed, so the agency cannot tier to it.

Cumulative Impacts Must Be Properly Assessed

The Forest Service contends it does not need to analyze or disclose cumulative impacts because USDA regulations currently in place do not require their consideration. Instead, the Forest Service has identified a much more constrained list of "connected actions" within the same geographic footprint of the project area. This utterly fails to satisfy NEPA. The Supreme Court has made clear that "when several proposals ... that will have cumulative or synergistic environmental impact upon a region are pending concurrently before an agency, their environmental consequences must be considered together." *Kleppe v. Sierra Club*, 427 U.S. 390 (1976).

This is especially true for forest-wide concerns such as the viability of Management Indicator Species and whether LOS and connectivity requirements are satisfied throughout the WWNF. Species do not adhere to project area boundaries, and limiting consideration only to those activities within an arbitrary "geographic scope" fails to accurately account for the overall impact of a project when examined in combination with other projects affecting the same species or environmental values elsewhere on the WWNF. As noted above, several large-scale logging projects (including but not limited to Lower Joseph, Baker City Watershed, Morgan Nesbit) will dramatically decrease available source habitat for several MIS, and the Sufferin' Springs Project will exacerbate that loss of source habitat further.

The Forest Service has completely ignored the forest-wide implications of this cumulative loss of MIS source habitat and the resulting downward shift in the baseline. With every acre lost, the overall percentage of further reduction in habitat increases with each subsequent logging project. The Forest Service cannot turn a blind eye to the rapidly declining amount in total source habitat for these species. Failure to disclose and analyze the cumulative impacts on MIS populations and habitat from the Sufferin' Springs Project combined with past and ongoing logging projects on the WWNF renders both the NEPA analysis and NFMA viability conclusions deficient and unsupported.

The decision in The Lands Council v. Powell (2004 WL 1801880 (-- F.3d -- 9th Circuit, August 2004, amended Jan 2005. Pdf makes clear that NEPA are not met with a mere listing of other projects, but requires careful disclosure of impacts of other projects and adding up of impacts so they can be compared to management thresholds. This case says:

> Cumulative effects analysis requires the Final Environmental Impact Statement to analyze the impact of a proposed project in light of that project's interaction with the effects of past, current, and reasonably foreseeable future projects. See 40 C.F.R. § 1508.7. … there is no discussion of the connection between individual harvests and the prior environmental harms from those harvests that the Forest Service now acknowledges. Instead, the Final Environmental Impact Statement contains only vague discussion of the general impact of prior timber harvesting, and no discussion of the environmental impact from past projects on an individual basis, which might have informed analysis about alternatives presented for the current project. … Muckleshoot Indian Tribe v. United States Forest Serv., 177 F.3d 800, 809-10 (9th Cir. 1999) ("[A]n EIS must catalogue adequately the relevant past projects in the area.... Detail is therefore required in describing the cumulative effects of a proposed action with other proposed actions." (internal citation and quotation marks omitted)). Stated differently, the general rule under NEPA is that, in assessing cumulative effects, the Environmental Impact Statement must give a sufficiently detailed catalogue of past, present, and future projects, and provide adequate analysis about how these projects, and differences between the projects, are thought to have impacted the environment. See Neighbors of Cuddy Mountain v. United States Forest Serv., 137 F.3d 1372, 1379-80 (9th Cir. 1998); City of Caramel-By-The-Sea v. United States Dept. of Transp., 123 F.3d 1142, 1160-61 (9th Cir. 1997). … For the public and agency personnel to adequately evaluate the cumulative effects of past timber
> harvests, the Final Environmental Impact Statement should have provided adequate data of the time, type, place, and scale of past timber harvests and should have explained in sufficient detail how different project plans and harvest methods affected the environment. The Forest Service did not do this, and NEPA requires otherwise.7 Muckleshoot, 177 F.3d at 809-10.

The 9th Circuit's legal requirement for adequate discussion of the cumulative effects of timber harvest and other projects requires the agency to disclose, analyze, and consider:

1. a "detailed catalog of past present and future projects"
2. "the time, type, place, and scale of past timber harvests"
3. "how these projects, and differences between the projects, are thought to have impacted the environment" and "explain[] in sufficient detail how different project plans and harvest methods affected the environment"
4. "analyze the impact of a proposed project in light of that project's interaction with the effects of past, current, and reasonably foreseeable future projects"

Logging in Unroaded/Undeveloped Areas

Buried in an appendix on page 359 of the pdf that is the EA is a disclosure that logging will occur in 3,048 acres of "other undeveloped areas" but the EA fails to disclose the impacts of this logging. The Forest Service cannot say that those impacts are disclosed as part of the overall impacts analysis because it fails to recognize that roadless/undeveloped areas provide disproportionate ecosystem services and logging them will cause disproportionate harm to those values. That is why there is growing scientific recognition that unroaded/undeveloped areas deserve protection.

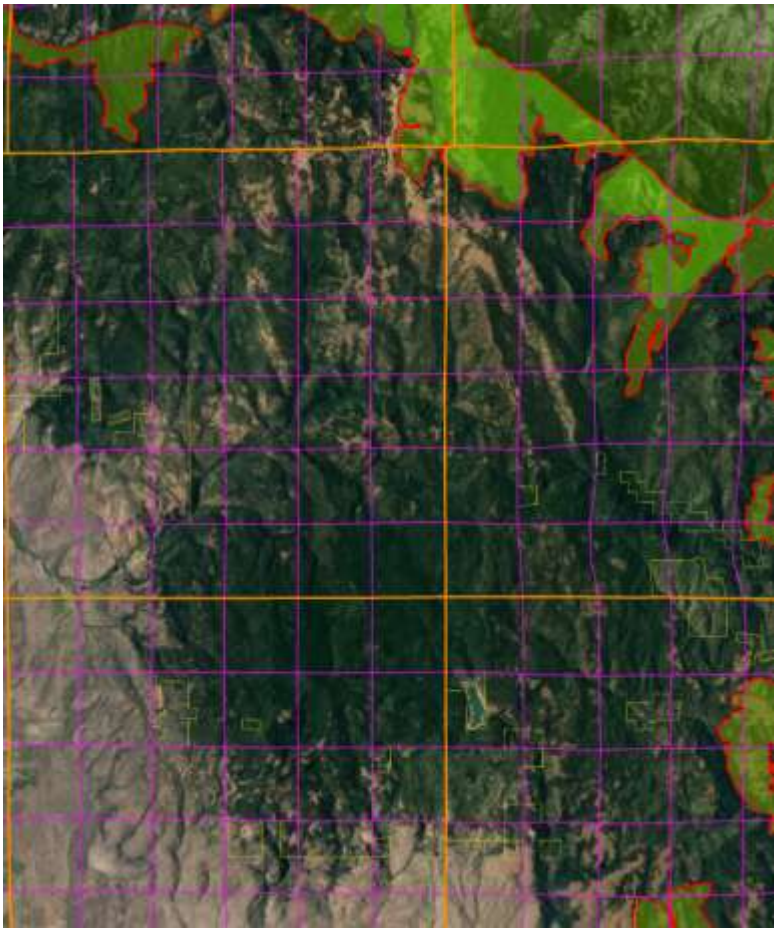


Figure 1. Potential roadless/unroaded areas in the Suffering Springs Project Area

In a 1997 letter to President Clinton, 136 scientists said:

> There is a growing consensus among academic and agency scientists that existing roadless areas–irrespective of size–contribute substantially to maintaining biodiversity and ecological integrity on the national forests. The Eastside Forests Scientific Societies Panel, including representatives from the American Fisheries Society, American Ornithologists' Union, Ecological Society of America, Society for Conservation Biology, and The Wildlife Society, recommended a prohibition on the construction of new roads and logging within existing (1) roadless regions larger than 1,000 acres, and (2) roadless regions smaller than 1,000 acres that are biologically significant.... Other scientists have also recommended protection of all roadless areas greater than 1,000 acres, at least until landscapes degraded by past management have recovered.... As you have acknowledged, a national policy prohibiting road building and other forms of development in roadless areas represents a major step towards balancing sustainable forest management with conserving environmental values on federal lands. In our view, a scientifically based policy for roadless areas on public lands should, at a minimum, protect from development all roadless areas larger than 1,000 acres and those smaller areas that have special ecological significance because of their contributions to regional landscapes.

Letter to President Clinton from 136 scientists (Dec. 10, 1997).
https://drive.google.com/file/d/0B4L_-RD-MJwrRzhFcm5QcFR0MHM/view?usp=sharing&resourcekey=0-2-sbGMN3bOUBQGGMDBQM1Q

Large unroaded areas are important simply due to the fact that they better represent the historic condition that species evolved with but they are now rare on the landscape due to human activities that have degraded and fragmented the majority of the landscape. For instance, the mature and old-growth forests located within unroaded areas is likely much less fragmented than the mature and old-growth forests located outside these unroaded areas. The Northwest Forest Plan LSOG Effectiveness Monitoring Plan says that "perhaps 80 percent or more [of the historic late-successional old-growth forest] would probably have occurred as relatively large (greater than 1,000 acres) areas of connected forest." Miles Hemstrom, Thomas Spies, Craig Palmer, Ross Kiester, John Teply, Phil McDonald, and Ralph Warbington; Late-Successional and Old-Growth Forest Effectiveness Monitoring Plan for the Northwest Forest Plan, USFS General Technical Report PNW-GTR-438; December 1998; http://www.fs.usda.gov/pnw/pubs/gtr_438.pdf. Currently, these 1,000 acre and larger patches are rare on the landscape.

World Wildlife Fund and the Conservation Biology Institute summarized the important attributes of small roadless areas (1,000-5,000 acres).

> Small roadless areas share many of attributes in common with larger ones, including:
> • Essential habitat for species key to the recovery of forests following disturbance such as herbaceous plants, lichens, and mycorrhizal fungi
> • Habitat refugia for threatened species and those with restricted distributions (endemics)
> • Aquatic strongholds for salmonids
> • Undisturbed habitats for mollusks and amphibians
> • Remaining pockets of old-growth forests
> • Overwintering habitat for resident birds and ungulates
> • Dispersal "stepping stones" for wildlife movement across fragmented landscapes

DellaSala, Dominick and James Strittholt. 2002. Scientific Basis For Roadless Area Conservation. World Wildlife Fund. Ashland, OR; Conservation Biology Institute. (June 2002 - Updated October 2003) https://consbio.org/wp-content/uploads/2022/05/Scientific_Basis_For_Roadless_Area_Conservation.pdf.

There are tremendous co-benefits from conserving large blocks of unmanaged forests, such as climate mitigation and biodiversity conservation.

> Based on the species–area relationship, regarded as one of ecology's few universal laws, protection of [too] little habitat will condemn thousands of species to extinction if habitat outside them is converted, degraded or lost. It is this logic that underpins calls for 'Nature Needs Half' [26], together with an understanding that ecosystem processes and services of the scale needed to sustain the well-being of life on Earth require large wildlife populations and huge expanses of intact and restored habitat. … Climate change adds a new dimension to the question of how much protected area coverage is needed to assure conservation of wild nature. Climate change is already reducing wildlife population sizes and forcing range shifts as conditions alter [28,29]. Protected areas counter such stresses by building up populations, and connectivity of populations and habitats is emerging as a key property in securing species persistence and resilience to rapid change [5]. Hence networked protected areas, especially where embedded within well-managed land or seascapes, provide crucial stepping stones to accommodate range shifts and, where no further movements are possible, refuges of last resort [5]. Analyses suggest that adequate levels of population viability and connectivity can be achieved only with marine protected area coverages of 30% or more [27]. … [G]iven that many ecosystems are already degraded, ensuring continued provision of ecosystem services

requires not only the precautionary protection of currently intact habitats, but also large-scale habitat restoration.

Providing greater space for recovery of intact, vibrant nature is not altruistic conservation, but is, we argue, an indispensable act of self- preservation, producing a cascade of benefits that will help maintain the habitability of the biosphere as the climate changes, thereby securing the well-being of generations to come.

Roberts CM, O'Leary BC, Hawkins JP. 2020 Climate change mitigation and nature conservation both require higher protected area targets. Phil. Trans. R. Soc. B 375: 20190121. https://royalsocietypublishing.org/doi/pdf/10.1098/rstb.2019.0121. See also, Soto-Navarro C et al. 2020 Mapping co-benefits for carbon storage and biodiversity to inform conservation policy and action. Phil. Trans. R. Soc. B 375: 20190128. http://dx.doi.org/10.1098/rstb.2019.0128 showing the congruence of high carbon value and high biodiversity value in PNW forests.

Law et al (2022) make a strong case that conservation of intact forests advances the twin goals of protecting the climate and biodiversity, and that broad-scale thinning to reduce fire severity conflicts with climate and biodiversity goals.

"While primary forests of all extents have conservation value, areas of greater extent warrant particular attention where they persist, as they support more biodiversity, contain larger carbon stocks, provide more ecosystem services, encompass larger-scaled natural processes, and are more resilient to external stresses. The significance of large areas of primary forests has been highlighted by the global mapping of Intact Forest Landscapes (IFL) greater than 500 km2 in extent. While suitable for many purposes, other thresholds may be more suitable at regional and national levels that reflect local ecological factors." (IUCN Policy Statement on Primary Forests, https://www.iucn.org/sites/dev/files/content/documents/iucn_pf-ifl_policy_2020_approved_version.pdf, accessed on 22 April 2020).

…

Instead of regularly harvesting on all of the 70% of U.S. forest land designated as "timberlands" by the U.S. Forest Service, setting aside sufficient areas as Strategic Reserves would significantly increase the amount of carbon accumulated between now, 2050 and 2100, and reestablish greater ecosystem integrity, helping to slow climate change and restore biodiversity. The 2022 IPCC AR6 report stated that "Recent analyses, drawing on a range of lines of evidence, suggest that maintaining the resilience of biodiversity and ecosystem services at a global scale depends on effective and equitable conservation of approximately 30% to 50% of Earth's land, freshwater and ocean areas, including currently near-natural ecosystems (high confidence)." Continuing commercial timber harvest on a portion of the remaining public lands and tens of millions of hectares of private lands would continue to adequately supply a sustainable forestry sector. Preserving and protecting mature and old forests would not only increase carbon stocks and growing carbon accumulation, they would slow and potentially reverse accelerating species loss and ecosystem deterioration, and provide greater resilience to increasingly severe weather events such as intense precipitation and flooding.

…

Many of the existing forest management practices allegedly protect forests and homes from wildfire and are having severe adverse effects on forest ecosystem integrity and resilience, and are worsening climate change and diminishing biodiversity.

…

To summarize, harvest-related emissions from thinning are much higher than potential reduction in fire emissions. In west coast states, overall harvest-related emissions were about 5 times fire emissions …

Law, Beverly E., William R. Moomaw, Tara W. Hudiburg, William H. Schlesinger, John D. Sterman, and George M. Woodwell. 2022. Creating Strategic Reserves to Protect Forest Carbon and Reduce Biodiversity Losses in the United States. Land Vol. 11, no. 5: 721. https://doi.org/10.3390/land11050721, https://www.mdpi.com/2073-445X/11/5/721/htm.

Law et al (2022) describe a strategic reserve approach to protect water, biodiversity, and carbon in Oregon's forests. Existing unroaded areas could make a significant contribution to such an approach.

> Our study demonstrated that Oregon has high carbon density forests that also have high biodiversity and connectivity for species movement. When these characteristics were prioritized within each ecoregion, it identified sufficient forestland to meet both the 30% protection by 2030 and 50% by 2050 targets that are important nationally and internationally. … the climate resilience rank highlights large areas within the ecoregions with larger landscape features that are important for resilience (Figure 2D), such as the topography of mountain ranges in southwest Oregon, the Coast Range, Cascades, and Blue Mountains in the northeast. … Meeting the forest preservation targets would substantially increase protection of tree carbon stocks, animal and tree species' habitat, and surface drinking water source areas. … Meeting these forest preservation targets would substantially increase forest habitat protection for threatened and endangered (T&E) species and other species of interest … Mitigation strategies need to explicitly protect existing oldgrowth forests, and allow mature secondary forests to regrow to their carbon capacity. For climate mitigation using natural climate solutions, effectiveness is based on the time that a unit of biomass carbon is resident in a forest ecosystem stock and thus kept out of the atmosphere (Körner, 2017; Mackey et al., 2020). … We also found that limiting harvest to half of current levels on public lands and doubling harvest cycles to 80 years on private lands was three times more effective as a land use strategy than replanting and reforestation after cutting within current forest boundaries in Oregon (Law et al., 2018). … There is concern that protecting areas that are vulnerable to increased drought and fire will be ineffective, however, species diversity, and threatened and endangered species still need habitat, refugia and connectivity with other protected areas. Wildfires tend to be patchy, and a majority of trees survive low to mixed-severity fires (Halofsky et al., 2011) that can be critical habitat, and burned forests still retain the vast majority of their carbon (Hudiburg et al., 2009; Law et al., 2018). … Older forests in Oregon's watersheds exhibit greater water retention and improved late summer stream flows compared to managed plantations (Segura et al., 2020). Intact forests also tend to harbor more large and old trees, bolstering carbon stores and biodiversity services that large trees provide (Lutz et al., 2018; Plumtre et al., 2021). … The most important action Oregon can take to mitigate climate change, reduce biodiversity losses, and protect watersheds for drinking water is to set aside existing forests.

Law BE, Berner LT, Mildrexler DJ, Bloemers RO and Ripple WJ (2022) Strategic reserves in Oregon's forests for biodiversity, water, and carbon to mitigate and adapt to climate change. Front. For. Glob. Change 5:1028401. doi: 10.3389/ffgc.2022.1028401. https://www.frontiersin.org/articles/10.3389/ffgc.2022.1028401/pdf.

Eastside Screens Require Protecting Large Trees, Managing Toward LOS, and Maintaining Connectivity

The Eastside Screens require the Forest Service to manage toward LOS conditions, protect large trees, identify LOS and identify connectivity corridors 400' wide that connect LOS in at least 2 directions and conserve high canopy cover in those areas, manage non-LOS forest toward LOS

conditions. Please confirm that this project will follow the Screens including not authorizing cutting of any trees over 21 inches dbh, consistent with the original 1995 Eastside Screens.

The NEPA analysis must disclose how the project will comply with all the requirements of the Eastside Screens.

The Eastside Screens say "2) Outside of LOS, many types of timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components in stands subject to timber harvest … Manipulate vegetative structure that does not meet late and old structural (LOS) conditions, … in a manner that moves it towards these conditions as appropriate to meet HRV. … Manipulate vegetation in a manner to encourage the development and maintenance of large diameter, open canopy structure." 1995 Regional Forester's Forest Plan Amendment #2. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5288660.pdf

Looking at the old-growth definition from ICBEMP https://web.archive.org/web/20161221075704/http://www.icbemp.gov/pdfs/sdeis/Volume2/Appendix17a.pdf:

> "old growth is typically distinguished from younger growth by several of the following attributes: 1. Large trees for species and site. 2. **Wide variation in tree sizes and spacing**. 3. **Accumulations of large-size dead standing and fallen trees** that are high relative to earlier stages. 4. Decadence in the form of broken or deformed tops or bole and root decay. 5. **Multiple canopy layers**. 6. Canopy gaps and understory patchiness."

(emphasis added) It is clear that LOS "components" such as abundant snags must be retained and recruited, and many small and medium sized trees are needed grow into large trees. Thinning dense understory trees might help move stands toward LOS, but any action that would remove snags or reduce recruitment of medium trees into large tree classes would not be consistent with the Eastside Screens.

This project definitely violates the requirement of the Eastside Screens to manage toward LOS conditions, especially,

(i) patch cuts up to 5 acres, (patch cuts resemble mini clearcuts that lack the structure found in LOS or even patches of natural disturbance which tend to be structure rich). Patch cuts are a form of group selection. The Eastside Screens *Scenario A* requires "To reduce fragmentation of LOS stands, or at least not increase it from current levels, stands that do not currently meet LOS that are located within, or surrounded by, blocks of LOS stands should not be considered for even-aged regeneration, or group selection at this time."

(ii) removal of large trees, (large trees are a defining feature of LOS. Removing them is moving away from LOS),

(iii) heavy thinning (depletes the population of green trees available for recruitment of snags, so heavy thinning makes a bad situation worse for snag habitat for decades. The design features seem to have standards for snag retention, but the design features fail to protect enough green trees to ensure future recruitment of adequate numbers of snags through the life of the stands, especially after so many trees are removed via thinning and patch cutting under this project. PEA (p 31) says that stands will be "fully stocked" after logging but the analysis just offers conclusory statements about green tree replacements, and makes no effort to use quantitative analysis or stand simulation models to show that ephemeral snag habitat will be adequately renewed through time in stands that are logged. The EA also uses

outdated, scientifically-discredited "potential population" methodology for meeting snag standards.)

(iv) Road building (roads are not part of the LOS condition. Roads are linear clearcuts that lack LOS structure, and fragment the forest.)

The Eastside Screens also state "To reduce fragmentation of LOS stands, or at least not increase it from current levels, stands that do not currently meet LOS that are located within, or surrounded by, blocks of LOS stands should not be considered for even-aged regeneration, or group selection at this time." Any action that would build roads or establish young even-aged stands would not meet the Eastside Screens. Heavy thinning for fuel reduction should also be evaluated under this connectivity standard.

Maintain Connectivity

The Wildlife BE says "The proposed action will treat 2,559 of the 6,825 acres (37%) of designated wildlife corridors. Within designated wildlife corridors, low intensity thinning will maintain ≥ 50% canopy cover, retain snags, large down wood, and multiple canopy layers (if appropriate for the site)." but the EA fails to provide a map and other information to show that all the connectivity requirements of the Screens are met, including linking all late old structure stands in at least 2 directions, and at least 400 feet wide at their narrowest spot.

Make sure that any treatments in wildlife corridors comply with the expectations of the Eastside Screens, i.e. "medium diameter or larger trees are common, and canopy closures are within the top one-third of site potential. Stand widths should be at least 400 ft. wide at their narrowest point…. some amount of understory (if any occurs) is left in patches or scattered to assist in supporting stand density and cover."

The explicit intent of the Screens which is "to insure that blocks of habitat maintain a high degree of connectivity between them,…" 1995 Eastside Screens, Scenario A, INTENT STATEMENT for connectivity (emphasis added).

The connectivity requirements of the screens are detailed and mandatory. Connectivity corridors:

- Must link all late old structure stands in at least 2 directions;
- Must be at least 400 feet wide at their narrowest spot;
- Must be maintained as dense as possible with medium and large trees, or in the top third of site-potential and at least 50% canopy cover;

The Eastside Screens provide …

… it is important to insure that blocks of habitat maintain a high degree of connectivity between them, and that blocks of habitat do not become fragmented in the short-term.

a) Maintain or enhance the current level of connectivity between LOS stands and between all Forest Plan designated "old growth/MR" habitats by maintaining stands between them that serve the purpose of connection as described below:

(1) Network pattern – LOS stands and MR/Old Growth habitats need to be connected with each other inside the watershed as well as to like stands in adjacent watersheds in a contiguous network pattern by at least 2 different directions.

(2) Connectivity Corridor Stand Description – Stands in which medium diameter or larger trees are common, and canopy closures are within the top one-third of site potential. Stand widths should be at least 400 ft. wide at their narrowest point. The only exception to stand width is when it is impossible to meet 400 ft with current vegetative structure, AND these "narrower stands" are the only connections available (use them as last resorts). In the case of lodgepole pine, consider medium to large trees as appropriate diameters for this stand type.

If stands meeting this description are not available in order to provide at least 2 different connections for a particular LOS stand or MR/Old Growth habitat, leave the next best stands for connections. Again, each LOS and MR/Old Growth habitat must be connected at least 2 different ways.

(3) Length of Connection Corridors – The length of corridors between LOS stands and MR habitats depends on the distance between such stands. Length of corridors should be as short as possible.

(4) Harvesting within connectivity corridors is permitted if all the criteria in (2) above can be met, and if some amount of understory (if any occurs) is left in patches or scattered to assist in supporting stand density and cover. Some understory removal, stocking control, or salvage may be possible activities, depending on the site.

We would like to emphasize that the screens anticipated the possibility of logging in connectivity areas, but there are minimum requirements for that. The screens provide: "Harvesting within connectivity corridors is permitted if all the criteria in (2) above can be met …" and some patches of understory are retained.

The 1995 EA for the Eastside Screens identifies the following process for analyzing connectivity:

c) To insure connectivity as described above is maintained, use the following process:
(l) Do suitable network linkages between old and late structural stands and MR-designated habitats occur, according to the previous description? If so, will the proposed project isolate any area or group of areas by reducing any one of the parameters below acceptable levels? If not, the project can continue. If so, the project must be deferred or re-designed to meet connectivity parameters described above.
(2) Do suitable network linkages between old and late structural stands and MR-designated habitats NOT OCCUR under current conditions, as described above? If areas are already isolated, or partially isolated by not meeting the connectivity description above, will the proposed prescription promote linkage sooner than if left alone? If so, the project should continue. If the project is designed in a manner that would further increase isolation, the project must be deferred or re-designed to enhance connectivity parameters.

The NEPA analysis must disclose how much of the project area will maintain >50% canopy closure (or in the top third of site potential) after this project is implemented. The 1995 EA supporting the Eastside Screens says "The intent is to maintain canopy closure as dense as possible." The >50% canopy closure number comes from the 1995 EA for the Eastside Screens which included some clarifying text about connectivity on page 17 of Appendix C. Violation of the Eastside Screens, is a violation of NFMA which requires compliance with the LRMP as amended by the Screens.

Avoid rather than *mitigate* soil and water quality. Do not rely on BMPs.

The EA says that ripping would be used to reduce detrimental soil conditions and bring soil within LRMP standards & guidelines. The intent of the soil standards is to prevent and avoid impacts, not tolerate unacceptable soil impacts, and then rely on imperfect mitigation as a paper cover to pretend all is well.

The NEPA analysis needs to provide a clear analysis of the ineffectiveness and uncertainty surrounding use of BMPs to protect water quality.

Federal agencies approving activities involving non-point source pollution must comply with state water quality standards under Section 313 of the Clean Water Act. 33 U.S.C. § 1323(a). In 2008, Center for Biological Diversity et al. brought a claim against the Fremont-Winema National Forest, alleging that grazing on the Forest was causing violations of several water quality standards. The court ruled against the plaintiffs in that case based on a provision in Oregon's water quality regulations that deemed federal agency BMPs as compliance with non-point source pollution requirements. Former OAR 340-041-0061(12) and OAR 340-041-0028(12)(g). Eventually the courts were confronted with a situation where the federal agency was implementing best management practices but data showed actual violations of water quality standards. Rather than submit the provision to EPA for approval, as the court required, DEQ simply removed those regulations in 2013. Now, forestry and agricultural activities on federal land are no longer deemed to be in compliance with water quality standards simply by implementing a water quality restoration plan or best management practices.

Scientific assessments have repeatedly concluded that there is no reliable empirical evidence that BMPs reduce impacts of logging and roads to ecologically insignificant levels. Beschta, Rhodes, Kauffman, Gresswell, Minshall, Karr, Perry, Hauer, Frissell. 2004. Post-fire management on forested public lands of the Western USA. Cons. Bio. Vol 18 No. 4. August 2004. pp 957-967. Espinosa, F. Al, Jr., J. J. Rhodes, and D. McCullough. 1997. The Failure of Existing Plans to Protect Salmon Habitat in the Clearwater National Forest in Idaho. Journal of Environmental Management (1997) 49, pp 205-230. NPPC Independent Science Group, 1996. Return to the River: Restoration of Salmonid Fishes in the Columbia River Ecosystem. NPPC, Portland, OR. Rhodes, J. J., D. McCullough, and F. A. Espinosa, Jr., 1994. A Coarse Screening Process for Evaluation of the Effects of Land Management Activities on Salmon Spawning and Rearing Habitat in ESA Consultations. CRITFC Tech Rpt 94-4, Portland, OR. https://web.archive.org/web/20040630120242/http://www.critfc.org/tech/94-4report.pdf. Ziemer, Lisle, 1993. Evaluating sediment production by activities related to forest uses— A Northwest Perspective. Proceedings: Technical Workshop on Sediments, Feb. 1992, Corvallis, OR. Pp 71-74. http://web.archive.org/web/20041102031817/http://www.fs.fed.us/psw/rsl/projects/water/Ziemer93.PDF

In recognition of the vast superiority of prevention over mitigation, the Northwest Forest Plan mandates "Do not use mitigation or planned restoration as a substitute for preventing habitat degradation." WR-3, NWFP ROD page C-37. See also *Northwest Indian Cemetery Protective Ass'n v. Peterson* 795 F.2d 688, 697 (9th Cir. 1986) (holding that compliance with BMPs does not equate to compliance with water quality standards).

Most agency evaluations claiming to support the effectiveness of BMPs are not scientifically credible and lack statistical rigor. Chris Frissel says that BMPs seek immunity from water quality impacts by "claiming essentially perfect prescription and implementation of BMPs, [an] ideological fiction that those of us in the trade refer to as the 'Theory of Immaculate Mitigation' and the 'Theory of Divine Implementation.'"

We have seen too often where the agency promises to mitigate impacts and then waives those very protections during contract administration. Examples of post-NEPA contract modifications include wet season log hauling, allowing landings in riparian reserves, operating off skid trials, new roads and landings, remarking large trees, expanding the boundaries of cutting areas, and on and on This makes a mockery of the NEPA process and abusing the public's trust. One of the reasons we often favor no action, is that mitigation turns out to be a meaningless promise. Please disclose the environmental consequence of what you will really do, not what will make the project look good on paper.

As explained by EPA:

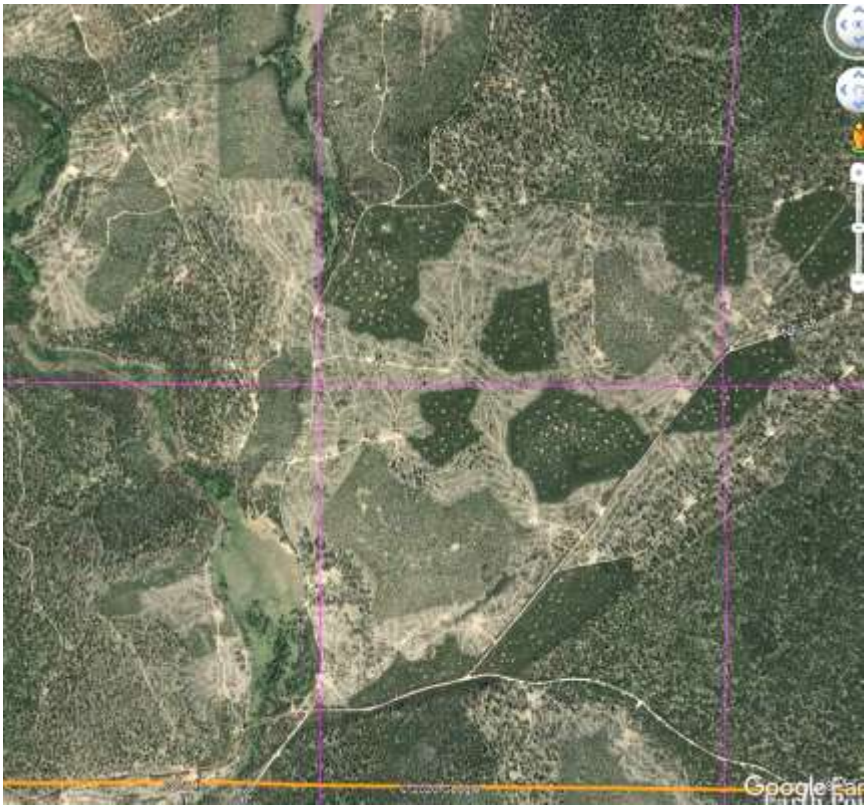
> In 2016, the Forest Service issued a report titled, *Effectiveness of Best Management Practices that Have Application to Forest Roads: A Literature Synthesis*. It summarized research and monitoring on the effectiveness of different BMP treatments for road construction, presence, and use, and stated the following:
>
> > "Many road BMP effectiveness studies do exist; however, the effectiveness of most forest road BMPs has not been investigated rigorously (including replicated and quantitative studies) under a wide variety of geologic, topographic, physiographic, and climatic conditions since their development decades ago. Much more quantification of effectiveness is needed (Anderson and Lockaby 2011a, Moore and Wondzell 2005, Stafford et al. 1996) to understand the site characteristics for which each BMP is most suitable and for proper selection of the most effective BMP techniques (Carroll et al. 1992, Weggel and Rustom 1992)."
>
> The report cites different reasons for why BMPs may not be as effective as commonly thought (p. 133). "Most watershed-scale studies are short-term and do not account for variation over time, sediment measurements taken at the mouth of a watershed do not account for in-channel sediment storage and lag times, and it is impossible to measure the impact of individual BMPs when taken at the watershed-scale." When individual BMPs are evaluated for effectiveness, the "lack of broad-scale testing in different physiographies, climates, soil types, and other factors for most BMPs weakens the argument that their effectiveness is scientifically well proven." Further, the report observes, "The similarity of forest road BMPs used in many different states' forestry BMP manuals and handbooks suggests a degree of confidence validation that may not be justified," because they rely on just a single study (p. 133-32). Therefore, the report indicates that BMP effectiveness is uncertain and dependent upon site-specific conditions, and those site-specific conditions vary across a landscape-scale project.

McCoy, Melissa 2023. EPA Comments on the Dixie National Forest Hungry Creek EA. 8-28-2023 *citing* Edwards et al 2016. Effectiveness of Best Management Practices that Have Application to Forest Roads: A LITERATURE SYNTHESIS. General Technical Report NRS-163 October 2016. USDA Forest Service Northern Research Station. https://www.fs.usda.gov/nrs/pubs/gtr/gtr_nrs163.pdf.

The EA needs to recognize that standard logging practices likely violate soil standards. As described in the Deschutes National Forest, Eyerly Fire Salvage EIS, a typical dendritic system of yarding corridors can cause detrimental soil conditions across 14% of an activity area.

Compaction from off-trail travel adds 5% detrimental conditions. Burning fuel piles adds 2% (just the piles, not including machine use).[12] All these cumulative soil impacts add up to OVER 21% detrimental soil conditions, and this is WITHOUT considering the road system, landings (which typically add 5%), and the machines often used to pile fuels, not to mention the effects of past logging. This is simply illegal and irresponsible.

Here is an example of dense dendritic networks of yarding trails east of Chemult that likely have significant effects on soil and weeds and violate soil standards:



https://www.google.com/maps/@43.1963859,-121.5402617,2651m/data=!3m1!1e3

The EA needs to address the fact that soil quality standards and assessment methods often underestimate soil impacts.

Soil degradation occurs at thresholds that are not detected by the agency's definition of "detrimental soil conditions" and a NEPA analysis based on these criteria will underestimate the effects of management. NEPA requires the agency to disclose all soil impacts not just those that meet these crude, under-inclusive criteria.

The NEPA document did not disclose the methods used for determining detrimental soil conditions, but they are often described in the Soil Quality Standards as follows:

- Detrimental soil compaction in volcanic ash/pumice soils is an increase in soil bulk density of 20 percent or greater over the undisturbed level.

[12] BLM's February 2006 Planning Criteria for the Western Oregon Plan Revision says, "All (100%) of the soil directly beneath burn piles is expected to have detrimental soil damage due to deep burning." p 133.

- Detrimental puddling occurs when the depth of ruts or imprints is six inches or greater.
- Detrimental displacement is the removal of more than 50 percent of the A horizon from an area greater than 100 square feet and at least 5 feet in width.
- Detrimental burn damage requires significant color change of the mineral soil surface to an oxidized reddish color, with the next one-half inch below blackened from organic matter charring as a result of heat conducted from the fire.
- Detrimental erosion requires visual evidence of surface loss over areas greater than 100 square feet, rills or gullies, and/or water quality degradation from sediment or nutrient enrichment.
- Agency analyses of detrimental soil condition often arbitrarily excludes real and significant soil impacts from roads, landings, and hand piles that are burned.

It is obvious from reading this that the soils of the project area could be high impacted yet still not trigger concern under these definitions. For instance, a proposed harvest unit might be compacted over a wide area, but only increase bulk density by 18% instead of the magic 20%; or an area could be 50% displaced or eroded, but in areas less than 5 feet wide and or less than 100 square feet; or an area could be burned but not quite enough to "significantly" change the mineral soil color. And what about combinations of these things? What about some burned soil, some displaced soil, some compacted soil? The cumulative and synergistic effects of sub-threshold soil effects can be significant. Detrimental soil conditions is a measure of cumulative adverse effects, but it fails to accurately measure cumulative effects if some of the adverse effects are not counted.

NEPA requires disclose of all effects. The bottom line is that there can be serious adverse soil effects that are not considered by the agencies arbitrary and capricious soil quality criteria.

General recommendations for dry forest thinning/restoration

Please consider the following recommendations to improve the ecological benefits of restoring dry forests and to mitigate the adverse impacts.

1. Oregon Wild will do its best to maintain the torch that was carried for so long by the late Tim Lillebo who worked to protect and restore eastside forests for almost four decades. In Tim's office, we found the following concise summary of his recommendations for thinning dry forests containing old growth trees.

   Old Growth stand thinning
   My recommendation for thinning in OG stands is the same prescription we used for the Glaze Project where we thinned OG stands.
   Basically,
   -retain all OG trees of all species
   -retain historic mix of species
   -retain all snags and down logs, with safety exceptions
   -retain 15-20% in wildlife leave patches from 1/4 - 5 acres
   -In small trees thin in variable density 60-80 sq ft basal area, retaining the largest trees that will become the next generation of old growth. Larger trees carry higher basal areas of 100-140+.
   -thin leaving clumps of 2-10 trees with 3-4 clumps per acre
   -doughnut thin around old growth trees, but if available retain 1-2 good sized trees in the doughnut to become replacement old growth

A more detailed description of Tim's *restoration concepts*, *vision*, *priorities*, *recommended prescriptions* for eastside forests can be found in Oregon Wild's "Practical Guide for Ecological Restoration of Eastern Oregon's Dry Forests," http://www.oregonwild.org/sites/default/files/pdf-files/Eastside_Restoration_Handbook.pdf. In appropriate dry forest type please consider applying Tim's recommendations, including *lessons for successful restoration,* and *recommendations for minimizing unintended consequences*.

2. Additional dry forest restoration concepts can be found here: Franklin, J.F., Johnson, K.N., et al 2013. Restoration of Dry Forests in Eastern Oregon – A Field Guide. The Nature Conservancy, Portland, OR. 202 pp. http://nature.ly/dryforests (We have not had a chance to carefully review all of the recommendations in this field guide, but it does appear to have some good ideas. We are concerned about the proposed allowance to remove some old trees to make restoration economically viable. There are no clear criteria to ensure that the ecological benefits exceed the ecological costs.)

3. Use an integrated multi-objective planning process. "An integrated planning process focuses on multiple-objective planning rather than single-objective planning from the beginning of the project. It favors a transparent and interactive process that offers opportunities for understanding ecosystem complexity, stakeholder positions, and clear articulation of decision trade-offs and benefits." Jain, Theresa B.; Battaglia, Mike A.; Han, Han-Sup; Graham, Russell T.; Keyes, Christopher R.; Fried, Jeremy S.; Sandquist, Jonathan E. 2012. A comprehensive guide to fuel management practices for dry mixed conifer forests in the northwestern United States. USDA Forest Service Gen. Tech. Rep. RMRS-GTR-292. 2012. https://www.fs.usda.gov/rm/pubs/rmrs_gtr292.pdf.

   For example, the agencies too often assume that ecological restoration and fuel reduction are perfectly aligned. The analysis needs to recognize that fuel reduction and ecological restoration are often in conflict (e.g. thinning reduces habitat for wildlife that prefer dense, snag-rich forests). While it may be acceptable to sacrifice ecological goals INSIDE the structure ignition zone, there is no compelling rationale to sacrifice ecological restoration goals OUTSIDE the structure ignition zone. This conclusion becomes apparent when the analysis fully accounts for (i) the fact that only a small fraction of fuel treatments can be expected to interact with wildfire, (ii) the complex effects of logging as a tool for fuel management (e.g. removing canopy stimulates growth of surface ladder fuel and makes fire hazard worse) and (iii) logging for fuel reduction has many trade-offs (ecological, climate, and economic).

4. Be sure to treat moist forests different than dry forests. Many dry forests are mixed with moist/mixed forests. These stands do not typically need to be commercially logged. Moist stands naturally have dense, multi-layered canopies, and greater abundance of dead wood, and a more mixed fire regime, including patches of stand replacing fire. Natural processes will continue to operate in these stands and create desired conditions. Non-commercial thinning of some small trees may be appropriate if there is significant in-growth of small conifers that threaten legacy trees.

5. When conducting commercial thinning projects take the opportunity to implement other critical aspects of watershed restoration especially reducing the impacts of the road system and livestock grazing and establishing the ecological processes that foster recovery of hydrologic systems and fire regimes. See FEMAT 1993. Appendix V-J: Guidelines for Restoration Projects (unnumbered pages between V-96 and VI-1). Bradbury, Nehlsen et al 1995. Handbook for Prioritizing Salmon & Watershed Restoration. http://pacificrivers.org/science-research/resources-publications/handbook-for-prioritizing-watershed-protection-and-restoration-to-aid-recovery-of-native-salmon.

Most interviewees perceived that noncommercial treatments were not keeping pace with commercial treatments as accelerated restoration strategies have been implemented. Interviewees described how some treatments, especially noncommercial or very low-value treatments, were sometimes not completed as planned during project implementation. As one interviewee observed,

> "[Accelerated restoration] has been pretty effective in getting a constant supply of timber and saw logs off the national forest, which is doing good work for restoration, but the other, maybe more extensive and detailed work of restoration that should be going on alongside that is not always happening."

Some of the noncommercial elements of accelerated restoration cited as being left incomplete included:

- Noncommercial thinning and fuels reduction
- Applying prescribed fire
- Reinstalling large wood in streams
- Culvert replacement to improve fish passage
- Water quality improvements
- Improving recreation resources, such as trails and interpretive signage
- Rangeland grazing improvements, such as ensuring appropriate water sources
- Native species planting
- Invasive species removal
- Habitat restoration for Endangered Species Act-listed species
- Aspen stand restoration
- Decommissioning of roads

Many stakeholders acknowledged that the disparity between what is planned and what is implemented had become a source of conflict and/or frustration, especially for environmental constituents. Some interviewees said that incompletion of non-commercial treatments was causing tension between partners. One interviewee explained,

6. Don't waste too much effort restoring forest *structure* when doing so will require continuous expenditure of money and effort to maintain. Use scarce resources efficiently by striving to restore ecological *processes* that can be self-sustaining. Recognize that insects and disease are natural ecological processes that actually help improve landscape diversity. Recognize that tree mortality recruits valuable habitat structures and makes resources available which increase the vigor of surviving trees, thus accomplishing many of the objectives of mechanical density reduction projects. Don't focus too much on *tree health*, but think instead about *forest ecosystem health*. Use natural processes where it makes sense to do so. Fettig et al 2013 *review draft*. The Ecology and Management of Moist Mixed-Conifer Forests in Eastern Oregon and Washington; a Synthesis of the Relevant Science and Implications for Future Management ("[R]estoration should aim to re-establish the self-organizing, self-maintaining, and adaptive capacities of ecosystems. This is done by restoring ecological patterns and processes. In doing so, we can address the goal of 'healthier, more resistant, more resilient ecosystems, even if they are not exactly the same systems as before (USDA Forest Service).' The application of ad hoc, narrowly focused 'engineering' solutions (e.g., managing forest structure and composition to recover a specific stable state) is expensive, logistically challenging, and often incapable of achieving restoration goals. Engineered solutions can still have limited roles for particular sites, but creating healthy and resilient landscapes requires a more dynamic and process-based perspective.")

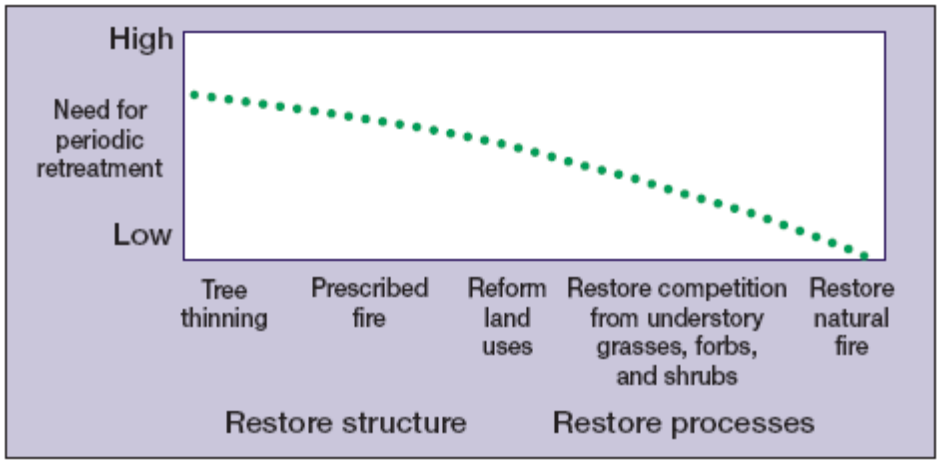


Figure 4. Forest restoration varies along a continuum from restoring structure (which requires periodic retreatment) to restoring potentially self-sustaining processes.

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Reed F Noss, Jerry F Franklin, William L Baker, Tania Schoennagel, and Peter B Moyle. 2006. Managing fire-prone forests in the western United States. Front Ecol Environ 2006; 4(9): 481–487. http://spot.colorado.edu/~schoenna/images/Nossetal2006Frontiers.pdf. Crist, M.R., T.H. DeLuca, B. Wilmer, and G.H. Aplet. 2009 Restoration of Low-Elevation Dry Forests of the Northern Rocky Mountains: A Holistic Approach. Washington, D.C.: The Wilderness Society. http://fedgycc.org/documents/WldrnsSociety_Restoration-Low-Elev-Dry-Forests-Rocky-Mtns.pdf.

7. Use projects as an opportunity to conduct monitoring and research on the effects of thinning. There are many information gaps that need filling. Every project should generate useful information to inform future projects.
8. There are a lot of people calling for an increase in the "pace and scale" of restoration of eastside forests. The large size of recent projects raises concerns about cumulative effects.

Also, if the agency moves too fast, then the "restoration" task may be complete, but the agency will still have a timber target. If the agency proceeds at a more measured and sustainable pace, they can continue to harmonize restoration and timber goals for longer. This should be considered in the NEPA analysis.

9. Treated stands do not exist in isolation, so be sure to consider the effects of thinning on adjacent areas which may provide habitat for species of concern. Prepare a "risk map" based on proximity to different habitat types from high quality to non-habitat. Agencies have a duty to consider habitat connectivity in their NEPA analyses. CEQ issued guidance saying "… agencies should consider and be transparent about the positive or negative impacts of proposed actions and alternatives on connectivity and corridors. Through the NEPA review process, Federal agencies can consider measures to advance corridors and connectivity as components of proposed actions, alternatives to proposed actions, or mitigation for proposed actions' effects." Mallory, B. 2023. CEQ Guidance for Federal Departments and Agencies on Ecological Connectivity and Wildlife Corridors. March 21, 2023. https://www.whitehouse.gov/wp-content/uploads/2023/03/230318-Corridors-connectivity-guidance-memo-final-draft-formatted.pdf.
10. Only a small subset of needed restoration activities are "profitable," so we can't let logging economics determine restoration priorities. If we restore primarily those areas that have commercial-sized logs and fail to treat the thousands of acres of areas that need restoration but lack economic return, we will not be accomplishing real restoration which requires carefully and strategically choosing the subset of the landscape that can be treated to provide the greatest gain (both ecological and fire hazard reduction) for the least ecological "cost" in terms of soil, water, wildlife, carbon, and weeds. "Hoping to boost their economies and also restore these forests, local leaders are interested in the economic value of timber that might be available from thinning treatments on these lands. … [W]e found that on lands where active forestry is allowable, thinning of most densely stocked stands would not be economically viable." Rainville, Robert; White, Rachel; Barbour, Jamie, tech. eds. 2008. Assessment of timber availability from forest restoration within the Blue Mountains of Oregon. Gen. Tech. Rep. PNW-GTR-752. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 65 p. http://www.fs.usda.gov/pnw/pubs/pnw_gtr752.pdf. Allowing economics to drive these choices will result in greater ecological impacts and lower ecological gains. The NEPA analysis must honestly disclose what optimum restoration treatments would look like versus what is actually being proposed, so the public can see what's being sacrificed.
11. Protect soil and water quality by avoiding ground-based logging and log hauling during the wet season.
12. Thinning should focus on areas accessible from existing roads. Building new roads will cause degradation that typically erases any alleged benefit of treatments. Inaccessible areas can be treated non-commercially or become part of the landscape mosaic that is untreated and serve important ecological values such as dense forest cover, carbon storage, and natural rates of snag recruitment.
13. Where road building is necessary, ensure that the realized restoration benefits far outweigh the adverse impacts of the road. Carefully consider the effects of roads on connectivity, especially at road/stream crossings, across ridge tops, and midslope hydrological processes (such as large wood delivery routes). The NEPA analysis should rank new road segments according to their relative costs (e.g. length, slope position, soil type, ease of rehabilitation, weed risk, native vegetation impacts, etc.) and benefits (e.g. acres of restoration facilitated), then use that ranking to consider dropping the roads with the lowest ratio of benefits to costs. Once the relative acres accessed per mile of road is determined, take the analysis one

step further and determine the "effective road density" of each segment. In other words, extrapolate as if that much road were required to reach each acre of the planning area, then compare the resulting road density to RMP objectives for big game, fish conservation, cumulative hydrological impact, etc.? For example, if a new spur road accesses thinning opportunities at a rate of 200 acres of forest per mile of road, then divide 640 acres per section by 200 acres per mile to determine the effective road density of 3.2 mi/mi^2.

14. Use the historic range of variability as a guide, but don't just focus on seral stage. The NEPA description of historic "forest stand structure" is often generalized as stand initiation, stem exclusion, understory reinitiation, etc. These are not very good generalizations because after natural disturbance stand conditions would include abundant legacies that are created by natural disturbance and often persist for long periods after disturbance. However, these same terms are used to describe stand structures created by timber harvest that are NOT like natural stand structures, because logged stands lack the abundant legacy structures. The NEPA analysis should adjust the analytical methods to describe the historic abundance (and current shortage) of live and dead legacy structures. Restoring and maintaining legacies should be a major focus of restoration. Consider also the historic abundance of ecological attributes like large trees, large snags, the scale and distribution of patches of dense forest, low road density, roadless areas, etc., all of which have been severely reduced from historic norms. Also, consider the *natural* range of variability, which is the historic range of variability as modified by future climate change and fire suppression. James A. Harris, Richard J. Hobbs, Eric Higgs, and James Aronson. 2006. Ecological Restoration and Global Climate Change. Restoration Ecology Vol. 14, No. 2, pp. 170–176 JUNE 2006. http://www.globalrestorationnetwork.org/uploads/files/LiteratureAttachments/353_underlying-principles-of-restoration.pdf.

15. Develop restoration treatments appropriate to each forest type or plant association group (PAG). Dry Ponderosa pine forests that have significant ingrowth due to fire exclusion are good candidates for thinning. Mixed-conifer forest types often included some dense forest patches, so they should be retained at appropriate scales. Lodgepole pine and subalpine forests have stand replacing fire regimes and generally do not need to be thinned or regenerated.

16. Prioritize treating stands that are already degraded by past logging, and place less priority on treating previously unlogged forests. See Naficy, Cameron, Anna Sala, Eric G. Keeling, Jon Hagmann, and Thomas H. DeLuca. 2010. Interactive effects of historical logging and fire exclusion on ponderosa pine forest structure in the northern Rockies. Ecological Applications 20:1851-1864. http://rintintin.colorado.edu/~cana4848/papers/Naficy_et_al_2010_Ecol_App.pdf ("We document that fire-excluded ponderosa pine forests of the northern Rocky Mountains logged prior to 1960 have much higher average stand density, greater homogeneity of stand structure, more standing dead trees and increased abundance of fire-intolerant trees than paired fire-excluded, unlogged counterparts. Notably, the magnitude of the interactive effect of fire exclusion and historical logging substantially exceeds the effects of fire exclusion alone. These differences suggest that historically logged sites are more prone to severe wildfires and insect outbreaks than unlogged, fire-excluded forests and should be considered a high priority for fuels reduction treatments.")

17. Recognize the value of untreated areas to provide benefits like dense forest cover, snags recruitment, soil/water quality, etc. Recognize that forests are naturally adaptive and natural processes will accomplish many of the benefits attributed to thinning. "Counter to many regional studies, our results indicated that treated and long-unaltered, untreated areas may be moving in a similar direction. Treated and untreated areas experienced declines in tree density, increases in the size of the average individual, and losses of surface fuels in most

size classes. The number of large trees increased in untreated areas, but decreased in treated areas. Our results suggested that untreated areas may be naturally recovering from the large disturbances associated with resource extraction and development in the late 1800s, and that natural recovery processes, including self thinning, are taking hold. … In a study of forest restoration need across eastern Washington and Oregon, over 25% of required restoration could be achieved through transition to later stages of forest stand development through successional processes as western landscapes recover from widespread historic degradation (Haugo et al., 2015)." Zachmann, L. J., D. W. Shaw, and B. G. Dickson. 2018. Prescribed fire and natural recovery produce similar long-term patterns of change in forest structure in the Lake Tahoe basin, California. Forest Ecology and Management 409:276–287. http://www.csp-inc.org/wp-content/uploads/2017/11/Zachmann_et_al_2017.pdf.

18. Experts makes the following recommendation for wildlife friendly fuel reduction:

    > An evenly spaced stand, with much of the understory shrubs and small diameter trees removed, results in reduced cover and available forage. Habitat complexity elements in the mid to understory are critical for many forest wildlife species. For example, small clumps of trees provide a place for deer and elk to hide from predators, and provide shelter from inclement weather. Shrub clumps provide nesting and hiding cover for ground nesting birds and many small mammals that rely on that shrub layer. Deer and elk forage routinely on these same shrubs and hide their fawns in dense shrub thickets.
    > …
    > Remember, you don't need to eradicate all fuels on your property to reduce your risk of high intensity fire; you do need to break up the continuity of fuels …
    > **Summary of Recommendations:**
    > **Snags and Logs**: Strive for 6 foraging snags/acre and 1 - 2 cavity nesting snags/acre. Strive for snags and logs greater than 15 ft. long/tall and greater than 12" in diameter.
    > **Legacy**: Keep any old growth trees, including defective trees. Strive for 2 - 3 per acre.
    > **Openings**: Openings can vary from 1/10 to 5 acres in size. They can comprise 5 - 15% of the landscape and aim for irregular shapes.
    > **Patches**: Patches can be 30 - 50 ft. across and preferably 100 - 300 ft. in length. Aim for 10 - 20% of the landscape.
    > **Piles**: Build habitat piles of 5 layers with larger material on bottom. Piles should be 20 ft. in diameter, 6 ft. high and 1 - 3 per acre.
    > **Shrubs**: Maintain the best species on the site, keep them in clumps, and beyond any adjacent tree's overhanging limbs (dripline).

    Nicole Strong, Ken Bevis, Gretchen Bracher 2016. Wildlife-Friendly Fuels Reduction in Dry Forests of the Pacific Northwest. Woodland Fish & Wildlife Project of the Western Forestry and Conservation Association. https://woodlandfishandwildlife.com/wp-content/uploads/2019/12/Wildlife-Friendly-Fuels-Reduction-in-Dry-Forests-of-the-Pacific-Northwest_reduced.pdf.

19. Some people describe dry forest thinning as "cutting trees that would likely not be there." But don't forget the biomass in those trees we are removing would likely have accumulated on other trees in the stand, (e.g., the idealized park like stand of low density very large trees) so thinning might get back to the right number of stems per acre but not the right amount of biomass per acre. Removing trees deprives the stand of live and dead biomass over the long term.

20. Prioritize treating dry forest types at low elevation and on south slopes. Treatments in forests with naturally mixed-severity fire regimes should be carefully scrutinized to ensure those areas (i) are in fact outside of the HRV, and (ii) treatment will not remove scarce habitat for focal species that depend on dense forests, and (iii) treatments are in fact needed

and (iv) proposed treatments will be effective. Treatments in mixed severity fire regimes should be more patchy and leave behind more structure, more snags and large dead wood.

21. Removing large numbers of small trees and forest understory across large areas may not be consistent with historic forest conditions. New evidence indicates that small trees were more common in dry forests than previously recognized. Historically, more than 60% of trees in the Blue Mountains and eastern Cascades were "small" (<40 cm or <16" dbh). William L. Baker and Mark A. Williams. 2015. Bet-hedging dry-forest resilience to climate-change threats in the western USA based on historical forest structure. Front. Ecol. Evol., 13 January 2015 | doi: 10.3389/fevo.2014.00088. http://journal.frontiersin.org/Journal/10.3389/fevo.2014.00088/full

22. New evidence indicates that far more of the "dry" forests, rather than being typified low severity fire regimes, were in fact dominated by mixed severity fire regimes (including significant areas of stand replacing fire), so mixed severity fire is an important part of the historic range of variability that should be restored. The goal should not be a uniform low severity fire regime, but rather a wide mix of tree densities in patches of varying sizes. This objective can often be met by allowing natural fire regimes to operate, or by leaving significant areas untreated when planning fuel reduction projects. Hessburg, Paul. Evidence for the Extent of Mixed Severity Fires in Pre-Management Era Dry Forests of the Inland Northwest. Proceedings: Mixed Severity Fire Regimes: Ecology and Management. November 17–19, 2004. Spokane, Washington. http://web.archive.org/web/20100713232718/http://www.sustainablenorthwest.org/bmfp/hessburg_salter_james_paper_11.pdf; Baker, W.L., T.T. Veblen and R.L. Sherriff (2006). Fire, fuels, and restoration of ponderosa pine-Douglas-fir forests in the Rocky Mountains, USA. Journal of Biogeography. 2006. http://www.humboldt.edu/geography/documents/BakerEtAl_FireFuelsPipo_JBiog2007.pdf; Odion, D.C. et al 2014. Examining Historical and Current Mixed-Severity Fire Regimes in Ponderosa Pine and Mixed-Conifer Forests of Western North America. PLOS One. February 2014 | Volume 9 | Issue 2 http://www.californiachaparral.org/images/Odion_et_al_Historical_Current_Fire_Regimes_mixed_conifer_2014.pdf. ("We compiled landscape-scale evidence of historical fire severity patterns in the ponderosa pine and mixed-conifer forests from published literature sources and stand ages available from the Forest Inventory and Analysis program in the USA. The consensus from this evidence is that the traditional reference conditions of low-severity fire regimes are inaccurate for most forests of western North America. Instead, most forests appear to have been characterized by mixed-severity fire that included ecologically significant amounts of weather-driven, high-severity fire."). William L. Baker 2017. Restoring and managing low-severity fire in dry-forest landscapes of the western USA. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0172288 ("Frequent fire (PMFI/FR < 25 years) was found across only about 14% of historical dry-forest area, with 86% having multidecadal rates of low-severity fire. Historical fuels (e.g., understory shrubs and small trees) could fully recover between multidecadal fires, allowing some denser forests and some ecosystem processes and wildlife habitat to be less limited by fire. Lower historical rates mean less restoration treatment is needed before beginning managed fire for resource benefits, where feasible.")

23. "The wildfire crisis generally and structure loss specifically are largely driven by extreme events, highlighted clearly in recent years … The overwhelming majority of wildfires that result in structure loss are started by human-related ignitions, and they are occurring in regions with increasingly high structure density within flammable vegetation. Consequently, the number of structures destroyed by wildfire in the West in any single year was well explained by the total area burned from human-related ignitions; and, total structure loss in

a state over the past two decades was well explained by the number of structures in flammable vegetation" Philip E Higuera, Maxwell C Cook, Jennifer K Balch, E Natasha Stavros, Adam L Mahood, Lise A St. Denis, Shifting social-ecological fire regimes explain increasing structure loss from Western wildfires, *PNAS Nexus*, 2023; https://doi.org/10.1093/pnasnexus/pgad005. "We have learned that forest thinning is rarely effective under extreme burning conditions, and the severity of fire in adjacent forests has little to do with whether a home burns," said Tania Schoennagel, who is affiliated with CU-Boulder's geography department. "Solely relying on public forest management to prevent homes burning by wildfire is simply barking up the wrong tree. We need more integrated solutions that cross the public-private land boundary to help us coexist with inevitable wildfire." CU Boulder Press Release, New global wildfire analysis indicates humans need to coexist and adapt. November 5, 2014. http://www.colorado.edu/news/releases/2014/11/05/new-global-wildfire-analysis-indicates-humans-need-coexist-and-adapt. And Coexist or perish, new wildfire analysis says (2014, November 5) retrieved 6 November 2014 http://phys.org/news/2014-11-coexist-perish-wildfire-analysis.html Fuel treatments in the WUI should be coupled with efforts to make communities fire resilient, not just to facilitate fire suppression. We urge the agency to bifurcate the landscape along the area defining the "structure ignition zone" within 100 feet of homes and built structures. Inside the structure ignition zone, ecological restoration goals can be compromised so that vegetation treatments can focus on modifying fuels to protect infrastructure. Outside the structure ignition zone, treatments should focus on ecological restoration, while expecting some fuel reduction benefits as a byproduct. Do not define the wildland urban interface too broadly, because fire hazard can be reduced by treating the area immediately adjacent to structures and this "structure ignition zone" is usually on non-federal lands. Fire is an important ecological process that needs to be restored on public lands, so the WUI fire problem should be framed as a structure-ignition problem and the solution for that generally lies with the private property owners. Joe H. Scott, Matthew P. Thompson, Julie W. Gilbertson-Day 2016. Examining alternative fuel management strategies and the relative contribution of National Forest System land to wildfire risk to adjacent homes – A pilot assessment on the Sierra National Forest, California, USA. Forest Ecology and Management 362 (2016) 29–37. http://www.fs.usda.gov/rm/pubs_journals/2016/rmrs_2016_scott_j001.pdf ("A treatment scenario that focused on treating defensible space near homes was by far the most efficient at reducing WUI exposure, including exposure transmitted from USFS lands. … [T]he Defensible Space fuelscape was by far the most efficient at reducing home exposure. … In terms of feasible treatment scenarios, treating USFS land near where people live (Five-percent Solution) was not nearly as effective as treating the same amount of area where people live with a focus on land closest to the national forest (Defensible Space). … [T]he analysis suggests that mitigation of wildfire risk to homes through fuel treatment on some landscapes could be best accomplished by treating where the homes are, not on federal land further away. ") Cohen 2008. The Wildland-Urban Interface Fire Problem – A Consequence Of The Fire Exclusion Paradigm. Forest History Today. Fall 2008. http://www.foresthistory.org/Publications/FHT/FHTFall2008/Cohen.pdf. Much more info here: http://www.fusee.org/community-fire-preparedness. See also, Gibbons P, van Bommel L, Gill AM, Cary GJ, Driscoll DA, et al. (2012) Land Management Practices Associated with House Loss in Wildfires. PLoS ONE 7(1): e29212. doi:10.1371/journal.pone.0029212. http://nature.berkeley.edu/moritzlab/docs/Gibbons_etal_2012_PLoS.pdf ("The typical response to destructive wildfires is to increase the total area of land that is fuel-reduced [10,13]. Our results instead indicate that a shift in emphasis from broad-scale fuel-reduction treatments to intensive fuel treatments close to houses will more effectively mitigate impacts

from wildfires on houses. This result is consistent with observations that the density of airborne embers and amount of radiant heat (the principal causes of house loss during wildfires) are greatest closer to the fuel source. This suggests that the actions of private landholders, who manage fuel close to houses, are extremely important when reducing risks to houses posed by fuel."). Alexandra D. Syphard, Teresa J. Brennan, and Jon E. Keeley. 2014. The role of defensible space for residential structure protection during wildfires. International Journal of Wildland Fire - http://dx.doi.org/10.1071/WF13158, https://d2k78bk4kdhbpr.cloudfront.net/media/publications/files/Syphard_defensibleSpace.pdf ("Structures were more likely to survive a fire with defensible space immediately adjacent to them. The most effective treatment distance varied between 5 and 20 m (16–58 ft) from the structure, but distances larger than 30 m (100 ft) did not provide additional protection, even for structures located on steep slopes. The most effective actions were reducing woody cover up to 40% immediately adjacent to structures and ensuring that vegetation does not overhang or touch the structure.") The need for density reduction treatment in the immediate vicinity of homes complements WUI homeowners preferences. See Factsheet: Forest Density Preferences of WUI Homebuyers. https://docs.wixstatic.com/ugd/5fc209_6f3c53750fb84fbfb6d86a40625f3d1f.pdf; and https://docs.wixstatic.com/ugd/5fc209_57cff23959e24668a1863dda2aa3b2b2.pdf ("In the more immediate forest surrounding WUI houses (100-meter (109-yard) radius level), WUI homebuyers have a preference for lower forest density. In the larger surrounding vicinity of WUI houses (500-meter (547-yard) radius level), higher forest density was preferred.")

24. Prioritize treatment of the dense young stands that are most "plastic" and amenable to restoration. Another priority is to carefully plan and narrowly target treatments to protect specific groves of fire-resistant, old-growth trees that are threatened by ingrowth of small fuels, but don't focus on rigid density reduction targets. Leave all medium and large trees that show old-growth characteristics.

25. Thin from below, retaining the largest trees, or use "free thinning" with a diameter cap so that some trees of all size classes are retained. Retain all large trees and most medium sized trees so they can recruit into the larger classes of trees and snags. In the face of uncertainty that is exacerbated by climate change, a bet-hedging strategy should retain trees of all sizes and stands of various densities. "Removal of most small trees to reduce wildfire risk may compromise the bet-hedging resilience, provided by small trees and diverse tree sizes and species, against a broad array of unpredictable future disturbances." William L. Baker and Mark A. Williams. 2015. Bet-hedging dry-forest resilience to climate-change threats in the western USA based on historical forest structure. Front. Ecol. Evol., 13 January 2015 | doi: 10.3389/fevo.2014.00088. http://journal.frontiersin.org/Journal/10.3389/fevo.2014.00088/full

26. Identify and retain all trees with old-growth characteristics even if they are less than 21" dbh. Some refer to these small-old trees as "Tillebo trees" because the late Tim Lillebo was a big advocate for protection of old trees regardless of size. Old growth characteristics include thick bark, colored bark, flat top, asymmetric crown, broken top, forked top, relatively large branches, etc. These trees have important habitat value and human values regardless whether they are 21" dbh. Allow natural processes of succession and mortality to turn some of these medium and large trees into ecologically valuable snags and down wood. The agencies often use this technique to identify and retain old-growth juniper trees and the same can be used to protect old growth pine, larch, Douglas fir and other species. Van Pelt, R. 2008. Identifying Old Trees and Forests In Eastern Washington. Washington DNR. http://www.dnr.wa.gov/Publications/lm_hcp_east_old_growth_hires_part01.pdf. We are generally comfortable with the use of the Van Pelt guidelines to identify tree age, but as science improves, we urge the agency to use the best available information and err on the

side of caution to ensure that trees older than 150 years (regardless of size) are not inadvertently cut. A recent study supports the retention of slow growing old trees because they are relatively more resilient. The study found that slower-growing older trees tend to channel their energy into structural support and defense compounds to "maximize durability while minimizing … damage". Black, Colbert, & Pederson. 2008. Relationship between radial growth rates and lifespan within North American tree species. Ecoscience 15(3), 349-357 (2008). http://fate.nmfs.noaa.gov/documents/Publications/Black_et_al_2008_Ecoscience.pdf. See also. Box 8 of Franklin, J.F., Johnson, K.N., et al 2013. Restoration of Dry Forests in Eastern Oregon – A Field Guide. The Nature Conservancy, Portland, OR. 202 pp. http://nature.ly/dryforests; and Tobias Züst, Bindu Joseph, Kentaro K. Shimizu, Daniel J. Kliebenstein and Lindsay A. Turnbull, Using knockout mutants to reveal the growth costs of defensive traits, in: Proceedings of the Royal Society B, 2011, Jan. 26, doi:10.1098/rspb.2010.2475. See also, University of Montana. June 18, 2019. Cell structure linked to longevity of slow-growing Ponderosa Pines. https://www.sciencedaily.com/releases/2019/06/190618174358.htm ("Slow-growing ponderosa pines may have a better chance of surviving longer than fast-growing ones, especially as climate change increases the frequency and intensity of drought, according to new research from the University of Montana. … [A] key difference between fast and slow growers resides in a microscopic valve-like structure between the cells that transport water in the wood, called the pit membrane. The unique shape of this valve in slow-growing trees provides greater safety against drought, but it slows down water transport, limiting growth rate.") *citing* Beth Roskilly, Eric Keeling, Sharon Hood, Arnaud Giuggiola, Anna Sala. Conflicting functional effects of xylem pit structure relate to the growth-longevity trade-off in a conifer species. Proceedings of the National Academy of Sciences, 2019; 201900734 DOI: 10.1073/pnas.1900734116.

27. Use diameter limits as a management tool because it provides a useful means to prevent economic values from trumping ecological values. The public supports the use of diameter limits because it provides a means to prevent economic values from trumping ecological values. It is often appropriate to use smaller diameter limits for fire tolerant species like Ponderosa pine and Douglas fir, while using somewhat larger limits for fire intolerant species like grand fir/white fir. The exceptional circumstances in which diameter limits allegedly don't work, are more rare than the circumstances in which refusing to use diameter limits will lead to unintended consequences, including removal of ecologically valuable trees and lack of public trust.[13]

28. While the agency embarks on an ambitious effort to reduce fuels and reduce forest density, the agency must also conserve habitat for diverse wildlife that depend on dense forest canopy cover, complex understories, and dead wood. Carbon storage and watershed values are also enhanced when forest cover is maintained. We urge the agency to carefully consider whether there is enough habitat provided for these species, including goshawk, marten, fisher, and pileated woodpecker. The current distribution of recognized and protected habitat areas may be inadequate, especially considering the need for redundancy to account for expected habitat loss from fire, logging, fuel reduction, and natural forest succession. The fact that big game cover requirements need to be amended to accommodate many projects like this raises concerns not just for big game, but for the wide variety of other species that depend on canopy cover, complex understory, and dead wood. Before

[13] The Deschutes National Forest used a sensible approach on the Lava Cast Project using a 21" diameter cap for lodgepole, 18" diameter cap for white fir, a 16" diameter cap for Ponderosa pine where the average diameter is the stand is below 12", and 18" diameter cap for Ponderosa pine where the average diameter of the stand is larger than 12 inches. Lava Cast DN. Feb 2007.

conducting large-scale density reduction efforts or amending big game cover standards, the agency should carefully consider all the other wildlife that were intended to be sheltered by the "umbrella" of big game cover standards in the RMP. The cover and forage requirements of big game is another lens through which to think about optimizing the mix of treated and untreated stands, as well as the scale and extent of skips and heavily-thinned "gaps" within treated stands. The NEPA analysis should consider alternatives with different mixes of treated and untreated areas for this purpose. The agency should use a state-and-transition model to project future dense forest habitat recruitment under a reasonable set of assumptions about disturbance and succession.

29. Recognize that thinning affects fire hazard in complex ways, including some tendencies to make fire hazard worse. The agency must address the fact that thinning creates slash; moves fine fuels from the canopy to the ground (increasing their availability for combustion); thinning increases ignition risk (by increasing human access and human activities, including spark-generating machinery); thinning makes the forest hotter-drier-windier; and makes site resources available to stimulate the growth of future surface and ladder fuels. Amy E.M. Waltz, Peter Z. Fulé, W. Wallace Covington, and Margaret M. Moore. 2003. Diversity in Ponderosa Pine Forest Structure Following Ecological Restoration Treatments. Forest Science 49(6) 2003. https://web.archive.org/web/20170810220240/http://www.globalrestorationnetwork.org/uploads/files/LiteratureAttachments/91_diversity-in-ponderosa-pine-forest-structure-following-ecological-restoration-treatments.pdf (Kaufmann M.R., et al. 2008. The status of our scientific understanding of lodgepole pine and mountain pine beetles – a focus on forest ecology and fire behavior. The Nature Conservancy, Arlington, VA. GFI technical report 2008-2. http://csfs.colostate.edu/pdfs/LPP_scientific-LS-www.pdf. A meta-analysis of the effects of partial cutting showed that understory growth was stimulated in all cases. D. Zhou, S. Q. Zhao, S. Liu, and J. Oeding. 2013. A meta-analysis on the impacts of partial cutting on forest structure and carbon storage. Biogeosciences, 10, 3691–3703, 2013. https://www.biogeosciences.net/10/3691/2013/bg-10-3691-2013.pdf. ("Understory C was stimulated significantly by partial cutting in all of the studies. This stimulation can be mostly attributed to an increase in the availability of light, water, and nutrients to the understory because of tree removal (Aussenac, 2000; Kleintjes et al., 2004; Deal, 2007)"). Fuel reduction must find the "sweet spot," by removing enough of the small surface and ladder fuels while retaining enough of the medium and large trees to maintain canopy cover for purposes of microclimate, habitat, hydrology, suppression of ingrowth, etc. The agency should consider alternative canopy treatments that are small and patchy, instead of extensive and continuous. Selective pruning of lower branches should also be considered as a viable canopy treatment.

30. Not all ladder fuels are hazardous. Studies after the Biscuit fire showed that "Mid-story hardwoods dampened fire and reduced mortality of dominant conifers—consider leaving them when thinning. … Why did controls burn less intensely than thinned stands as predicted by fire models? Evidence to consider: … * Controls retained mid-story hardwoods (madrone, tanoak, chinkapin) and they did not act as fuel ladder as predicted, and rather appeared to dampen the fire (much lower char heights). * Still much to be learned about fire behavior." Bernard Bormann 2009. From B&B to Biscuit: What We Have Learned from Recent Westside Dry Forest Fires, *from* Workshop: Restoring Westside Dry Forests - Planning and Analysis for Restoring Westside Cascade Dry Forest Ecosystems: A focus on Systems Dominated by Douglas-fir, Ponderosa Pine, Incense Cedar, and so on. May 28, 2009. https://www.fs.usda.gov/media/252764.

31. Fire-regime condition-class may not be an accurate predictor of fire hazard, because it assumes incorrectly that time-since-fire is an accurate indicator of fire hazard. There is

compelling evidence that time-since-fire has exactly the opposite of the assumed effect, that is, fires may burn more severely in early seral vegetation, and burn less severely in closed canopy forests. This may be related to the fact that closed canopy forests maintain a cool-moist microclimate that helps retain higher fuel moisture and more favorable fire behavior. Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.A. DellaSala and M.A. Moritz. 2004. Patterns of fire severity and forest conditions in the western Klamath Mountains, California. Conservation Biology 18(4): 927-936. http://nature.berkeley.edu/moritzlab/docs/Odion_etal_2004.pdf. Canopy cover also helps suppress the growth of ladder fuels. The practical significance of this is that thinning projects should retain more canopy variability across the stand, and need not focus on treatment of canopy fuels except to provide some well-distributed "escape hatches" for hot gases generated by surface fires. Credible models of post-thinning fire behavior, must account for both fuel structure and microclimate effects of thinning.

32. There is growing evidence that in order to be effective, mechanical treatments must be followed by prescribed fire. But the effects of such fires must also be carefully considered. Fuel treatments without regular follow-up treatments might be worse than doing nothing at all because thinning can be expected to stimulate the growth of future surface and ladder fuels. Crystal L. Raymond. 2004. The Effects of Fuel Treatments on Fire Severity in a Mixed-Evergreen Forest of Southwestern Oregon. MS Thesis. http://depts.washington.edu/nwfire/publication/Raymond_2004.pdf; Jonathan R. Thompson, Thomas A. Spies 2009. Vegetation and weather explain variation in crown damage within a large mixed-severity wildfire. Forest Ecology and Management 258 (2009) 1684–1694. Therefore retain plenty of canopy cover to suppress the growth of those future fuels and as insurance against the very real possibility that follow-up fuel treatments may not be adequately funded and implemented.

33. Don't thin to uniform spacing. Use variable density thinning techniques to establish a variety of microhabitats, break up fuel continuity, create discontinuities to disrupt the spread of other contagious disturbances such as disease, bugs, weeds, fire, etc. Retain patchy clumps of trees which is the natural pattern for many species.

34. Be creative in establishing diversity and complexity both within and between stands. "Patchy, gappy, and clumpy" is often use to describe the distribution of trees in dry forests. Use skips and gaps within units to help achieve diversity. Gaps should be small, while skips should be a little larger. Landings do not make good gaps because they are clearcut, highly compacted and disturbed, more likely subject to repeated disturbance, and directly associated with roads. Gaps should be located away from roads and should not be clearcut but rather should retain some residual structure in the form of live or dead trees. Methods of implementing spatial variability in restoration treatments are described by Churchill, D.J., M.C. Dalhgreen, A.J. Larson, and J.F. Franklin. 2013. The ICO approach to restoring spatial pattern in dry forests: Implementation guide. Version 1.0. Stewardship Forestry, Vashon, Washington, USA. https://web.archive.org/web/20130330181038/http://www.cfc.umt.edu/ForestEcology/files/ICO_Manager_Guide.pdf and Derek J. Churchill, Andrew J. Larson, Matthew C. Dahlgreen, Jerry F. Franklin, Paul F. Hessburg, and James A. Lutz. 2013. Restoring forest resilience: From reference spatial patterns to silvicultural prescriptions and monitoring. Forest Ecology and Management 291 (2013) 442–457. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5428873.pdf

Figure 1. An example of naturally clumped large pines.

A historical reconstruction of forests in the Blue Mountains of Oregon, showed that more than 2/3 of plots had large clumps of between 10-30 trees and 50-90% of individual trees were within 6 meters of other trees (i.e., few were isolated individuals). Churchill, Derek J.; Carnwath, Gunnar C.; Larson, Andrew J.; Jeronimo, Sean A. 2017. Historical forest structure, composition, and spatial pattern in dry conifer forests of the western Blue Mountains, Oregon. Gen. Tech. Rep. PNWGTR-956. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 93 p. https://www.fs.usda.gov/pnw/pubs/pnw_gtr956.pdf. See also Churchill, D.J., S T. Seager, A.J. Larson, E.E. Schneider, K.B. Kemp and C. Bienz. Ecological Functions of Spatial Patterns in Dry Forests: Implications for Forest Restoration. The Nature Conservancy, Portland, OR. 7 p. https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/oregon/forests/Documents/WOC_9_ICO.pdf.

35. Thin heavy enough to stimulate development of some patches of understory vegetation, but don't thin so heavy that future development of a uniform understory of ladder fuels becomes a more significant problem than the one being addressed by the current project. 15-20 years after thinning and prescribed fire, the Umpqua NF found "considerable development of less fire tolerant understory vegetation …. Continued stand development … will result in increased understory density and fuel laddering into the dominant fire tolerant overstory…" Umpqua NF, Diamond Lake RD, Lemolo Pine Health Maintenance Burn Project, June 1, 2010 scoping notice.
36. The scale of patches in variable density thinning regimes is important. Ideally variability should be implemented at numerous scales ranging from small to large, including: the scale of tree fall events; pockets of variably contagious disturbance from insects, disease, and mixed-severity fire; soil-property heterogeneity; topographic discontinuities; the imprint of natural historical events; etc.
37. Retain and protect under-represented species of conifer and non-conifer trees and shrubs. Retain patches of dense young stands as wildlife cover and pools for recruitment of future forests.

38. View native insects and disease in an ecological context. They are part of the natural processes that diversify and enrich our forests. They are best viewed as solutions, rather than problems. In particular, mistletoe brooms and seeds (and the large trees that mistletoe often live on) provide many ecological benefits, and treatment efforts are typically ineffective. So mistletoe, insect, and disease treatments have many costs and few benefits.

39. Recognize that thinning captures mortality and that most stands (especially plantations) are already lacking critical values from dead wood due to the unnatural stand history of logging, planting, and disrupted natural processes.[14] To inform the decision, please conduct a stand simulation model showing that long term snag recruitment (after logging) will still meet DecAID 50-80% tolerance levels.

40. We are concerned that the agencies' stocking guides were created and intended to be used as a tool to avoid mortality which is clearly inconsistent with ecosystem management. ("To preclude serious tree mortality from mountain pine beetle, western dwarf mistletoe and perhaps western pine beetle, stand densities should be maintained below the upper limit of the management zone" Powell 1999, Suggested Stocking Levels for Forest Stands in Northeastern Oregon and Southeastern Washington: An Implementation Guide for the Umatilla National Forest, F14-SO-TP-03-99, https://web.archive.org/web/20220121011438/https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev7_016034.pdf) Healthy forests require dead trees, sometimes in abundance, in order to meet the needs of diverse wildlife and provide full suite of ecosystem functions. A comprehensive restoration approach requires focusing not just on live trees, but also on the full suite of ecological processes including density dependent mortality processes that create and recruit snags and dead trees as a valuable feature of eastside forests. We urge the agency not to manage for tree vigor and minimum stocking levels because it will not provide enough green trees for recruitment of snags through time. This is a critical issue given that the current standards for snag habitat are outdated and fail to provide adequate levels of snags and dead wood, and adequate levels of green trees needed to recruit those snags through time.

41. Retain abundant snags and course wood and green trees for future recruitment of snags and wood. Retention should be both distributed and in clumps so that thinning mimics natural disturbance. Retention of dead wood should generally be proportional to the intensity of the thinning, e.g., heavy thinning should leave behind more snags not less. Retain wildlife trees such as hollows, forked tops, broken tops, leaning trees, etc. Think not only about existing snags but more importantly about the processes the recruit snags, including: a large pool of green trees from which to recruit snags and the existence of competition and other mortality

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[14] Tom Spies made some useful observations in the Northwest Forest Plan Monitoring Synthesis Report: "Certainly, the growth of trees into larger diameter classes will increase as stand density declines (Tappeiner and others 1997). At some point, however, the effect of thinning on tree diameter growth levels off and, if thinning is too heavy, the density of large trees later in succession may be eventually be lower than what is observed in current old-growth stands. In some cases, opening the stand up too much can also create a dense layer of regeneration that could become a relatively homogenous and dominating stratum in the stand. Furthermore, if residual densities are too low, the production of dead trees may be reduced (Garman and others 2003). Thinning should allow for future mortality in the canopy trees." http://web.archive.org/web/20070808101639/http://www.reo.gov/monitoring/10yr-report/documents/synthesis-reports/index.html

processes. Logging will significantly harm both of these snag recruitment factors. Recognize that thinning captures mortality. To inform the NEPA decision, please conduct a stand simulation model to fully disclose the adverse effects of logging on dead wood, especially long-term recruitment of large snags >20" dbh, and then mitigate for these adverse effects by identifying areas within treated stands and across the landscape that will remain permanently untreated so they can recruit adequate large snags and dead wood to meet DecAID 50-80% tolerance levels as soon as possible and over the long-term.

42. "Biomass contains nutrients stored within the tree and when removed those nutrients are also removed as future nutrient input." Deschutes NF 2025. Fuels Maintenance EA. If using techniques such as whole-tree yarding or yarding with tops attached to control fuels, the agency should top a portion of the trees and leave the greens in the forest in order to retain nutrients on site. Achat, Deleuze, et al 2015. Quantifying consequences of removing harvesting residues on forest soils and tree growth – A meta-analysis. Forest Ecology and Management Volume 348, 15 July 2015, Pages 124–141. http://www.sciencedirect.com/science/article/pii/S0378112715001814 ("Our study showed that, compared with conventional stem-only harvest, removing the stem plus the harvesting residues generally increases nutrient outputs thereby leading to reduced amounts of total and available nutrients in soils and soil acidification, particularly when foliage is harvested along with the branches. … Soil fertility losses were shown to have consequences for the subsequent forest ecosystem: tree growth was reduced by 3-7% in the short or medium term (up to 33 years after harvest) in the most intensive harvests (e.g. when branches are exported with foliage). Combining all the results showed that, overall, whole-tree harvesting has negative impacts on soil properties and trees that may have an impact on the functioning of forest ecosystems.") See also, NSF 2015. Morticulture: Forests of the living dead. Scientists unearth importance of dead wood to forest ecosystems. NSF News October 19, 2015. https://www.nsf.gov/news/morticulture-forests-living-dead ("Scientists now know that some of the nutrients from a rotting log are returned to the forest floor to replenish the soil almost immediately. Before Harmon's study, foresters often spent considerable expense and effort on removing dead trees and log debris. … … [L]eav[ing] downed trees in the forest … creates a more diverse landscape, leaves nutrients on site, and provides habitat for species like bluebirds and woodpeckers that nest in tree cavities. … Dead wood was long considered a wasted resource and a hazard in forest landscapes. But it performs a range of ecological functions: as habitat and food sources for many terrestrial and aquatic species; seedbeds for plants, including new trees; a source of water, energy, carbon and nutrients for the entire forest; and an agent that controls stream structure and function …").

43. Thinning creates activity fuels that can be treated (or not treated) in a variety of ways. Strive to treat fuels in ways that provide public benefits such as wildlife habitat (e.g., complex woody structure) and charcoal production (e.g., enhanced soil carbon storage), and reduce detrimental soil impacts from machine piling and hot burn piles. Deborah S. Page-Dumroese et al. 2017. Methods to Reduce Forest Residue Volume after Timber Harvesting and Produce Black Carbon. Scientifica. Volume 2017 (2017), Article ID 2745764, https://doi.org/10.1155/2017/2745764; https://www.hindawi.com/journals/scientifica/2017/2745764/; Jon Cox, Ken Bevis, Fran Cafferata, and Susan Barnes 2023. Habitat Piles Tools for Family Forestland Owners. Woodland Fish & Wildlife Project of the Western Forestry and Conservation Association. https://woodlandfishandwildlife.com/wp-content/uploads/2023/05/WFW-2023-Habitat-Piles-final_reduced.pdf. Use burn piles as an opportunity to produce biochar that helps improve soil and store carbon. https://www.fs.usda.gov/research/rmrs/understory/making-biochar-hand-built-piles.

44. Avoid impacts to raptor nests and enhance habitat for diverse prey species. Train marking crews and cutting crews to look up and avoid cutting trees with nests of any sort and trees with defects.

45. Take proactive steps to avoid the spread of weeds. Avoid and minimize soil disturbance. Retain canopy cover and native ground cover to suppress weeds.

46. Buffer streams from the effects of heavy equipment and loss of bank trees and trees that shade streams. Mitigate for the loss of LWD input by retaining extra snags and wood in riparian areas. Recognize that thinning captures mortality that is not necessarily compensated by future growth.[15]

47. Protect soils by avoiding road construction, minimizing ground-based logging, and avoiding numerous large burn piles. Mitigate the adverse soil impacts from burn piles by inoculating affected sites after burning (with living soil and native plant seeds, Julie E. Korb, Nancy C. Johnson, and W. W. Covington. 2004. Slash Pile Burning Effects on Soil Biotic and Chemical Properties and Plant Establishment: Recommendations for Amelioration. Restoration Ecology Vol. 12 No. 1, pp. 52-62 March 2004). Where road building is deemed necessary, ensure that the realized restoration benefits far outweigh the adverse impacts of the road, build the roads to the absolute minimum standard necessary to accomplish the job, and remove the road as soon as possible to avoid firewood theft, OHV trespass, and certainly before the next rainy season to avoid stormwater pollution. Do not allow log hauling during the wet season.

48. Adopt a purpose and need (and develop NEPA alternatives) that maintains and increases carbon storage in forest ecosystems. There is a carbon cost associated with thinning that must be disclosed and considered. As stands develop from young to mature to old, they continuously recruit carbon-rich material from the live tree pool to the dead wood pool. Some of that wood gets incorporated into the soil or falls in fire refugia where it can accumulate. Logging, even thinning, can dramatically affect the accumulation of carbon in the dead wood pool by capturing mortality, diverting it from the forest, and accelerating the transfer of carbon to the atmosphere. Carbon stays out of the atmosphere much longer if it remains in the forest as live and/or dead trees, instead of being converted to wood products and industrial and consumer waste.

49. If this project involves biomass utilization, the impacts need to be clearly disclosed. How will the biomass be moved from the remote corners of the treatment areas to the landings? Will there be extra passes made by heavy equipment? Will the landings be enlarged to make room for grinders, chip vans, and other equipment? Can the local forest roads accommodate chip vans? Will the roads be modified to make them passable by chip vans? What are the impacts of that? What are the direct, indirect, and cumulative impacts on soil, water, wildlife, and weeds?

50. Provide clear and detailed rationale that connects proposed actions to desired conditions. Test the rationale for actions and effects analysis against the scientific evidence, including the full range of evidence, reasonable opposing viewpoints, and the evidence presented in these comments. For each treatment unit, provide clear descriptions of silvicultural prescriptions and marking guides in the NEPA document.

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[15] "[T]he data have not supported early expectations of 'bonus' volume from thinned stands compared with unthinned. … [T]hinnings that are late or heavy can actually decrease harvest volume considerably." Talbert and Marshall. 2005. Plantation Productivity in the Douglas-fir Region Under Intensive Silvicultural Practices: Results From Research And Operations. Journal of Forestry. March 2005. pp 65-70. *citing* Curtis and Marshall. 1997. LOGS: A Pioneering Example of Silvicultural Research in Coastal Douglas-fir. Journal of Forestry 95(7):19-25.

51. Recognize that federal fuel reduction efforts likely have adverse unintended effects on human behavior and land use and fire hazard. "This project has explored the hypothesis that public fire suppression in fire-prone areas acts as a subsidy to landowners, incentivizing conversion of land to residential and commercial development. Landowners do not bear the full cost of their choice to build on land in fire-prone areas, since they do not pay for suppression, though they reap all of the benefits, potentially resulting in economically inefficient levels of development. … Results suggest that when federal suppression efforts intensify on public lands, private development accelerates nearby. The main paper produced by the funded research thus shows that public investment in reducing the damages from fire in the short run causes unintended long-run behavioral responses, which may increase future hazard exposure." Sheila Olmstead (PI), Carolyn Kousky (co-PI), Roger Sedjo (co-PI) 2013. Final Report to the Joint Fire Science Program Wildland Fire Suppression and Land Development in the Wildland/Urban Interface. http://www.firescience.gov/projects/10-3-01-33/project/10-3-01-33_final_report.pdf. Rasker, R. 2016. Why do we keep putting people in the way of wildfire? The wrong carrots and sticks. LA Times Op-Ed. http://www.latimes.com/opinion/op-ed/la-oe-rasker-wildfire-preparation-incentives-20160901-snap-story.html. ("Wildfire presents a classic case of a moral hazard, which is what occurs when someone takes a risk knowing someone else will bear a great deal of the cost if things go wrong. Typically, the wildfire version plays out in the West like this: Local governments, eager to reap increased property taxes, willingly approve new home construction, even on or near the most flammable of lands. When fire comes, federal and state agencies send in crews and air tankers to defend private homes. Most of the cost is borne by taxpayers… [T]he hard and unpleasant reality is that we will never solve the wildfire problem unless local governments are forced to bear a higher proportion of the firefighting costs. Keeping more of the costs local would create a strong incentive for continually improving land-use planning and other wildfire preparation policies. It may also provide elected officials the political cover they need to require stricter fire-safe standards for existing as well as new developments because it would make land-use planning a fiscal necessity.")

52. Acknowledge and consider the following potentially significant issues in the NEPA analysis:
    a. Removing commercial sized logs, and associated roads and slash disposal, often conflicts with other resource values such as soil, water, weeds, wildlife habitat, fire hazard, and carbon storage;
    b. Removal of commercial sized logs can make the stand hotter, drier, and windier, making fire hazard worse instead of better;
    c. Commercial logging tends to present significant risks of weed infestations because of soil disturbance and canopy reduction;
    d. Removal of commercial logs necessitates road related impacts on soil and water resources. Machine piling and pile burning tend to cause significant adverse impacts on soil and water, especially when combined with road impacts and other logging disturbances.
    e. "Capturing mortality" reduces future snag habitat that is already deficient. Increasing vigor via thinning delays recruitment of snag habitat that is already deficient;
    f. The unavoidable adverse impacts of logging and roads must be balanced against the rather uncertain benefits of fuel reduction. Fuel reduction has little or no beneficial effect on low severity fires (controlled by favorable weather conditions) or on high severity fires (controlled by unfavorable weather conditions). There is actually a very low probability that moderate intensity fire will affect any given stand during the relatively brief time period that fuel hazard is alleged to be reduced. Please disclose the realistic probability that desired outcomes will occur based on (1) whether fire is

likely to occur when the fuel treatments are likely to be effective, and (2) if fire does occur, whether there will be a good match between (A) the actual forest type and fuel treatment type, and (B) the actual probability of favorable weather conditions and fire conditions for that forest type and treatment type. Depending on these variables, fuel treatments may have little influence on both low intensity fire and extreme high intensity fire, leaving only a small subset of well-matched fuel treatments and fires, and a low probability that the proposed treatments will have ecological benefits that exceed ecological impacts.

g. The effects of forest health thinning are very complex with many feedback loops. There is still a fair amount of scientific uncertainty about several critical factors relevant to a decision about fuel reduction, including: (A) uncertain rates of tree mortality and how many young trees need to be retained to ensure proper recruitment of future stands of old trees and large snags; (B) uncertainty about how much the canopy can be reduced without making the stand hotter, drier, and windier (and exacerbating fire hazard); (C) uncertainty whether logging has any significant beneficial effect on controlling insects and diseases like mistletoe.

h. The agency must test the assumption that fire (and insect) risk reduction is compatible with ecological restoration objectives. This test must be spatial, probabilistic, and use reasonable assumptions about weather, fire frequency, fire suppression, and historic conditions in areas with variable-severity fire regimes. Sensitivity analysis should test the robustness of assumptions and conclusions. Example analyses can be found in the literature, e.g. Rutherford V. Platt, Thomas T. Veblen, and Rosemary L. Sherriff. 2006. Are Wildfire Mitigation and Restoration of Historic Forest Structure Compatible? A Spatial Modeling Assessment. Annals of the Association of American Geographers, 96(3), 2006, pp. 455–470. http://www.colorado.edu/geography/class_homepages/geog_4430_f10/Platt%20et%20al_Wildfire%20Mitigatnion_AnAAG_2006.PDF , *and* R. V. Platt, T. T. Veblen, and R. L. Sherriff. 2008. Spatial Model of Forest Management Strategies and Outcomes in the Wildland–Urban Interface Natural Hazards Review, Vol. 9, No. 4, November 1, 2008. DOI:10.1061/(ASCE)1527-6988(2008)9:4(199) http://public.gettysburg.edu/~rplatt/Platt%20et%20al._NatHazReview08.pdf ("The results point toward several ways to guide current management practices in the study area. First, prioritizing land at the lowest elevations leads to the selection of the most land where both wildfire mitigation and restoration of historical forest conditions are needed. When thinning is restricted to Forest Service land, less land is selected where both goals are needed under all parameter scenarios. This is because Forest Service land tends to be at higher elevations and comprises forest types that are within the HRV. … Prioritizing the stands with the highest canopy cover decreases the percentage of selected land where both outcomes are needed.… Many of the stands where restoration of historical forest conditions is needed are open canopy and located on south facing slopes and at lower elevations. In contrast, many closed canopy stands are often located at higher elevations and on north-facing slopes where restoration of historical forest conditions is not needed.")

i. Focus the analysis on "trade-offs" related to logging. All logging, including thinning, includes some adverse impacts and trade-offs. Some impacts of logging are unavoidable, so there is no such thing as a logging operation that is 100% beneficial. Depending on how thinning is done, it can have adverse impacts such as soil disturbance, habitat disturbance, carbon removal, spreading weeds, reduced recruitment of snags; road-related impacts on soil, water, site productivity, and habitat; moving fuels from the canopy to the ground, hotter-drier-windier microclimate that is favorable to greater flame lengths and rate of fire spread, etc.

Some of these negative effects are fundamentally unavoidable, therefore all thinning has negative effects that must be compensated by beneficial effects such as reducing competition between trees so that some can grow larger faster, increased resistance drought stress and insects, possible increasing species and structural diversity, possible fire hazard reduction, etc. The NEPA analysis should elucidate and weigh these trade-offs and attempt to display net ecological effects.

Unresolved questions about forest restoration may require an EIS.

Forest restoration is still a work-in-progress and the agencies need to approach every project as an opportunity to learn and improve practices and ensure achievement of restoration objectives. It is important to recognize that logging has complex effects some of which might be considered restorative and some detrimental to ecological values, so all the effects (both beneficial and adverse) must be carefully described and weighed. Over-simplification of the complexities of forest restoration treatments can lead to unintended consequences. NEPA's mandates for full-disclosure and informed-decision-making require that these unintended consequences be daylighted and avoided as much as possible.

"[F]uel-reduction activities may have undesirable environmental effects (e.g., the need for periodic treatments, introduction of weeds, soil disturbance, or maintenance of some roads)." Spies, Thomas A.; Hemstrom, Miles A.; Youngblood, Andrew; Hummel, Susan. 2006. Conserving old-growth forest diversity in disturbance-prone landscapes. Conservation Biology. 20(2): 351-362. http://www.fs.usda.gov/pnw/pubs/journals/pnw_2006_spies001.pdf.

The NEPA analysis should address the following unresolved questions that seem to come up again and again, especially when considering so-called "dry" forests:

1. Sharon Friedman questions several assumptions about historic range of variability and restoration of fire regimes:

   (1) The idea that there is one past "historic fire regime" for millennia conceivably there were glaciers and warm periods, cool periods, and so on. Then there were humans* actively engaged, strangely absent from this narrative. Unless we know for sure that they were not burning forests.

   (2) Then there is an idea that "ecosystems are adapted." Adaptation is something that we usually consider to be a property of species. Exactly what is an "ecosystem" in this context, and how does it "adapt" since "an ecosystem" is an idea about real physical things, and not a thing in itself?

   (3) That you need to reenact the past for things to be OK …

   Sharon Friedman 4-30-2019 commenting on The Missing (PNW) Fires at The Smokey Wire blog. http://forestpolicypub.com/2019/04/30/the-missing-pnw-fires/#comment-453153. See also, The scientific controversy described in Baker, William L., Chad T. Hanson, Mark A. Williams, and Dominick A. DellaSala. 2023. "Countering Omitted Evidence of Variable Historical Forests and Fire Regime in Western USA Dry Forests: The Low-Severity-Fire Model Rejected" Fire 6, no. 4: 146. https://doi.org/10.3390/fire6040146; https://www.mdpi.com/2571-6255/6/4/146 *citing* Hagmann, R.K.; Hessburg, P.F.; Prichard, S.J.; Povak, N.A.; Brown, P.M.; Ful, P.Z.; Keane, R.E.; Knapp, E.E.; Lydersen, J.M.; Metlen, K.L. Evidence for widespread changes in the structure, composition, and fire regimes of western North American forests. Ecol. Appl. 2021, 31, e02431. And see Odion DC, Hanson CT, Arsenault A,

Baker WL, DellaSala DA, et al. (2014) Examining Historical and Current Mixed-Severity Fire Regimes in Ponderosa Pine and Mixed-Conifer Forests of Western North America. PLoS ONE 9(2): e87852. doi:10.1371/journal.pone.0087852.

2. Firescience.Gov reported the management implications of Martinson & Omi (2013): "Until residual activity fuels are disposed, they largely offset much of the hazard reduction benefit achieved from opening the canopy. While follow-up slash treatment may be generally intended, untreated slash seems to be encountered by large wildfires with surprising frequency." Firescience.Gov News. Fuel Treatments and Fire Severity: A Meta-Analysis. Issue 58 | June 7, 2013. http://us2.campaign-archive1.com/?u=5f6de7b069a57255f980944b4&id=97915ceb5e&e=47edde4b58 *citing* Martinson, E.J.; Omi, P.N. 2013. Fuel treatments and fire severity: A meta-analysis. Res. Pap. RMRS-RP-103WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 35 pp https://www.firescience.gov/projects/08-2-1-09/project/08-2-1-09_RMRS-RP-103WWW.pdf. Martison & Omi (2013) make the point that treatments are only effective for a short-time (5-15 years) and will require periodic retreatment, essentially in perpetuity. This raises a serious conundrum. If the initial fuel treatment in a stand is funded by removal of "excess" small trees, follow-up treatments are either (a) unlikely to occur because there are no more excess trees to pay for them, or (b) if follow-up treatments are funded with more tree-removals, such treatments will be removing ever more ecologically valuable trees and undermining any ecological benefit of the initial treatment. From an ecological perspective, the "excess" trees were removed in the first treatment. After that, all the trees *belong* and need to be retained so they can grow large and old in order to rebuild the severely depleted population of old growth.
3. There is a critical need to consider the trade-offs and cumulative effects of a fuel treatment *program*. Another important point that ties together several of the findings of Martinson & Omi (2013) (above):
    - Treating fuels in individual stands is unlikely to be effective in altering landscape fire behavior because stand-scale treatments are unlikely to encounter fire during the relatively brief period that treatments is "effective;"
    - In order to increase the probability that treatments will encounter fire and actually modify fire behavior, treatments must be implemented across the landscape;
    - The cumulative effects of landscape-scale treatments (plus the REQUIRED follow-up treatments) comes with significant trade-offs in terms of water quality, wildlife habitat, carbon, roads, soil, weeds, cost, etc.

    Any attempt to reduce fuels should address these cumulative effects and unresolved trade-offs.
4. Removing the understory across large areas may not be consistent with historic forest conditions. New evidence indicates that small trees were more common in dry forests than previously recognized. Historically, more than 60% of trees in the Blue Mountains and eastern Cascades were "small" (<40 cm or <16" dbh). William L. Baker and Mark A. Williams. 2015. Bet-hedging dry-forest resilience to climate-change threats in the western USA based on historical forest structure. Front. Ecol. Evol., 13 January 2015 | doi: 10.3389/fevo.2014.00088. http://journal.frontiersin.org/Journal/10.3389/fevo.2014.00088/full
5. How can we balance the need to thin overly dense forests in order to grow more big trees and the need to provide habitat for species that depend on dead wood and dense canopy cover? This is a particular concern in terms of species associated with dead wood and those associated with complex riparian areas. There is evidence that

capturing mortality has adverse consequences for these species that have not been fully integrated into our management approaches. Some might argue that our forests are suffering more from a lack of management, but we would strenuously argue that our forests are still more threatened by too much of the wrong forms of management, past, present and future (roading, logging, grazing, mining, fire suppression) and there is still too little recognition of this.

6. How can we balance the competing effects of canopy removal that both reduces fire hazard by reducing canopy bulk density and increases fire hazard by making the stand hotter, drier, and windier? Canopy reduction has competing effects on fuels and microclimate that need to be more carefully examined. Recognizing that "The fire environment is thus an integration of the effects of all of its components" (Countryman 1972) the agencies lack a comprehensive model that integrates the effects of logging on both fuel structure (rearranging fuels, moving the canopy to the ground) and microclimate (making the stand hotter, drier, windier). "The evaluation of biomass removal alternatives on fire potential is complex and many-faceted. … Treatments can alter many aspects of a stand and thus of fire potential. … In fact, fuels and fire potential change dynamically and continuously— and not always consistently. The relative success of treatments in reducing fire potential may change as stands and fuels develop. … In the long run, opening a stand and removing biomass alters stand dynamics and fuel dynamics. Effects on potential fire behavior may vary with time since treatment …" Reinhardt, Elizabeth D.; Holsinger, Lisa; Keane, Robert 2010. Effects of biomass removal treatments on stand-level fire characteristics in major forest types of the northern Rocky Mountains. Western Journal of Applied Forestry. 25(1): 34-41. http://www.fs.usda.gov/rm/pubs_other/rmrs_2010_reinhardt_e001.pdf.
7. How do we integrate and balance terrestrial and aquatic restoration objectives which can sometime be in conflict. Terrestrial restoration often involve manipulation of vegetation, while aquatic restoration more often benefits from minimal anthropogenic ground disturbance. Terrestrial restoration often requires road systems which are almost universally harmful to aquatic systems.
8. Is fire-regime condition-class (FRCC) a sound basis for describing and prioritizing fuel treatments. FRCC is a widely used tool which assumes that "time since fire" is an accurate indicator of fire hazard, but there is conflicting evidence showing that closed canopy forests that develop in the absence of fire can help suppress the growth of surface and ladder fuels and maintain a cool, moist microclimate that helps reduce fire hazard. Dense canopy cover might actually help suppress fire rather than spread it. See Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.A. DellaSala and M.A. Moritz. 2004. Patterns of fire severity and forest conditions in the western Klamath Mountains, California. Conservation Biology 18(4): 927-936. http://nature.berkeley.edu/moritzlab/docs/Odion_etal_2004.pdf.
9. How much dead wood habitat should we be leaving, and how do we ensure that enough is provided through time? The current forest plan standards for snag-associated wildlife (based on "biological potential") are scientifically outdated and need to be updated. DecAID is a start, but it has its own limitations and DecAID has not been officially adopted as a management standard with appropriate tolerance levels clearly specified for each land allocation. See
    - Franklin, J.F., Lindenmayer, D., MacMahon, J.A., McKee, A., Magnuson, J., Perry, D.A., Waide, R., and Foster, D. 2000. Threads of Continuity. Conservation Biology in Practice. [Malden, MA] Blackwell Science, Inc. 1(1) pp9-16. https://andrewsforest.oregonstate.edu/sites/default/files/lter/pubs/pdf/pub2815.pdf.

- William F. Laudenslayer, Jr., Patrick J. Shea, Bradley E. Valentine, C. Phillip Weatherspoon, and Thomas E. Lisle Technical Coordinators. Proceedings of the Symposium on the Ecology and Management of Dead Wood in Western Forests. PSW-GTR-181. https://www.fs.usda.gov/psw/publications/documents/psw_gtr181/psw_gtr181.pdf.
- Lofroth, Eric. 1998. The dead wood cycle. In: Conservation biology principles for forested landscapes. Edited by J. Voller and S. Harrison. UBC Press, Vancouver, B.C. pp. 185-214. 243 p. https://web.archive.org/web/20110716234012/http://www.for.gov.bc.ca/hre/deadwood/DTrol.htm.
- Rose, C.L., Marcot, B.G., Mellen, T.K., Ohmann, J.L., Waddell, K.L., Lindely, D.L., and B. Schrieber. 2001. Decaying Wood in Pacific Northwest Forests: Concepts and Tools for Habitat Management, Chapter 24 in Wildlife-Habitat Relationships in Oregon and Washington (Johnson, D. H. and T. A. O'Neil. OSU Press. 2001) http://web.archive.org/web/20060708035905/http://www.nwhi.org/inc/data/GISdata/docs/chapter24.pdf.
- Stevens, Victoria. 1997. The ecological role of coarse woody debris: an overview of the ecological importance of CWD in B.C. forests. Res. Br., B.C. Min. For., Victoria, B.C. Work. Pap. 30/1997. http://www.for.gov.bc.ca/hfd/pubs/docs/Wp/Wp30.pdf.
- Hagar, Joan, 2007, Assessment and management of dead-wood habitat: USGS Administrative Report 2007-1054, pp. 1-32. http://pubs.usgs.gov/of/2007/1054/pdf/ofr20071054.pdf.
- Bruce G. Marcot 2017. Ecosystem Processes Related to Wood Decay. PNW Research Note 576. https://www.fs.usda.gov/pnw/pubs/pnw_rn576.pdf

10. Our understanding of mortality processes in eastside forests is still limited, so as we switch from human-dominated disturbance regimes back to more natural disturbance regimes, how many medium-sized trees do we need to retain in order to achieve desired levels of future old growth structure? The final recovery plan for the spotted owl recommends retention of large populations of medium-sized trees for recruitment as future large trees, both live and dead. See
    - USFWS. 2008 Final Recovery Plan for the Northern Spotted Owl. http://www.fws.gov/pacific/ecoservices/endangered/recovery/NSORecoveryplanning.htm.
    - K. Norm Johnson, Jerry Franklin, Debora Johnson. The Klamath Tribes' Forest Management Plan. May 2008. https://web.archive.org/web/20151029184053/http://www.klamathtribes.org/background/documents/Klamath_Plan_Final_May_2008.pdf.
11. What are the full benefits of variability both within and between stands? Variability is not only good for habitat, but is also an under-appreciated way to moderate fire behavior.
    - Kevin W. Zobrist. 2005. A literature review of management practices to support increased biodiversity in intensively managed Douglas-fir plantations. Final Technical Report to the National Commission on Science for Sustainable Forestry (NCSSF). http://www.ruraltech.org/pubs/working/ncssf/tech_a/tech_report_a.pdf.
    - Poage, Nathan, J. 2005, Variability in Older Forest Structure in Western Oregon. U.S. Geological Survey, Open-file Report 2005-1385, 28 p.

- SÁNDOR BARTHA et al. 2004. On the Importance of Fine-Scale Spatial Complexity in Vegetation Restoration Studies. International Journal of Ecology and Environmental Sciences 30: 101-116, 2004 http://www.zpok.hu/img_upload/cb39111eba7a31c9c0e48686fa8e3c87/IJEES2004.pdf.
- Franklin J.F.; Van Pelt R. 2004. Spatial Aspects of Structural Complexity in Old-Growth Forests. Journal of Forestry, Volume 102, Number 3, April/May 2004, pp. 22-28(7).
- Lutz. J.A. 2005. The Contribution of Mortality to Early Coniferous Forest Development. MS Thesis. University of Washington. http://faculty.washington.edu/chalpern/Lutz_2005.pdf and See also Lutz & Halpern 2006. Tree Mortality During Early Forest Development: A Long-Term Study Of Rates, Causes, And Consequences. Ecological Monographs, 76(2), 2006, pp. 257–275. http://cfr501.jamesalutz.com/Lutz_Halpern_Mortality_EM_2006.pdf.
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- Andrew B. Carey, Constance A. Harrington; Small mammals in young forests: implications for management for sustainability; Forest Ecology and Management (2001) 154(1-2): 289-309; http://www.fs.usda.gov/pnw/pubs/journals/pnw_2001_carey003.pdf.
- Kevin Shear Mccann, The diversity–stability debate. Nature 405, 228 - 233 (11 May 2000). http://www.iterations.com/protected/dwnload_files/diversity_stability_debate.pdf.
- USFWS. 2008 Final Recovery Plan for the Northern Spotted Owl. http://www.fws.gov/pacific/ecoservices/endangered/recovery/NSORecoveryplanning.htm

12. How can we balance the unavoidable adverse impacts of logging, roads, activity fuels, weeds, etc. versus the rather uncertain benefits of fuel reduction? Fuel reduction may have little or no beneficial effect on low severity fires (which are largely controlled by favorable weather conditions) or high severity fires (which are largely controlled by unfavorable weather conditions). What is the actual likelihood that favorable fire will occur any given stand during the relatively brief time period that fuel hazard is reduced by treatments? And, if fire does occur, will there be a good match between the actual forest type, the actual fuel treatment, and the actual weather conditions? See William L. Baker, Jonathan J. Rhodes. 2008. Fire Probability, Fuel Treatment Effectiveness and Ecological Tradeoffs in Western U.S. Public Forests. pp.1-7 (7). The Open Forest Science Journal, Volume 1. 2008. https://www.energyjustice.net/files/biomass/library/Rhodes-Baker.pdf.
13. How effective will restoration treatments be in the long run unless we address the underlying causes of forest health problems, such as fire suppression, livestock grazing, roads, as well as top-down influences such as CO2 enrichment and climate change. For instance, "[s]hade-tolerant trees show greater growth responses to CO2 than do shade-intolerant species because of more efficient use of light, water, and nutrients." John Aber, Ronald P. Neilson, Steve Mcnulty, James M. Lenihan, Dominique Bachelet, And Raymond J. Drapek. 2001. Forest Processes and Global

Environmental Change: Predicting the Effects of Individual and Multiple Stressors. BioScience vol 51, no. 9, pp735-751. http://www.usgcrp.gov/usgcrp/Library/nationalassessment/forests/bioone3.pdf This could account in part for the proliferation of shade tolerant ladder fuels in our forests.

14. How do we determine the appropriate mix of park-like stands and denser stands? How do we merge limited snapshot views of historic conditions into an accurate picture of the full range of historic conditions? Could low density forest conditions be at least partially a lingering artifact of native American burning practices? Is the current densification of forests partly related to climate change and CO2 enrichment? What is the "future range of variability" in light of climate change? How do we manage eastside forests to be both resilient to disturbance and to store lots of carbon in order to help mitigate climate change? See William T. Sommers, Stanley G. Coloff, Susan G. Conard 2011. Synthesis of Knowledge: Fire History and Climate Change. JFSP Project 09-02-1-09 Fire History and Climate Change, Chapter 6. http://www.firescience.gov/JFSP_fire_history.cfm ("When researchers and managers talk about "historic" fire regimes, they are generally referring to fire regimes during the period before extensive European settlement. Because Native American populations were widespread in much of the western US for over 10,000 years, on a broad scale it is generally impossible to separate the effect that they had on vegetation and fire regimes from the effects of fire ignited by lightning and other sources.") See also Baker, W.L., T.T. Veblen and R.L. Sherriff (2006). Fire, fuels, and restoration of ponderosa pine-Douglas-fir forests in the Rocky Mountains, USA. Journal of Biogeography. 2006. https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1307&context=barkbeetles.
15. When commercial logging is used as a tool to accomplish restoration, how can we ensure that we don't remove the very building blocks of forest health? There is evidence that commercial logging objectives can conflict with the attainment of objectives for both habitat and fire hazard. Are there other ways to pay for restoration that relies less on removing structure from the forest? See USDA PNW Research. Science Findings, Issue 85. http://www.fs.usda.gov/pnw/sciencef/scifi85.pdf.
16. What scales and pace of restoration is needed to maintain viable populations of native wildlife, or conversely, what do we have to do on federal lands to compensate for what is occurring on non-federal forest lands? What scales and pace of treatment can be tolerated across the landscape while still maintaining viable populations of native fish & wildlife?
17. How to appropriately integrate management before, during, and after disturbance. Right now these efforts are very dis-integrated. We try to restore forests to be more fire adapted, while we continue to aggressively suppress fire and remove valuable structural legacies after fire. This makes no sense.
18. The agency often claims that fuel reduction logging improves habitat for species dependent on old growth forests, such as pileated woodpeckers and goshawks. The claim is that by reducing fire hazard logging improves forest conditions over the long term, but recent research shows that fuel reduction logging has a significant cost in terms of reduced carbon storage. Even if logging reduces fire hazard there is less carbon stored in the logged forest than is stored in a burned forest. See Mitchell, Harmon, O'Connell. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems. Ecological Applications. 19(3), 2009, pp. 643–655

https://web.archive.org/web/20111024074629/http://www.fs.fed.us/pnw/pubs/journals/pnw_2009_mitchell001.pdf. Although thinning can affect fire, the agencies are likely to remove more carbon by logging than will be saved by avoiding fire. Forest carbon biomass is a rough proxy for wildlife habitat, soil quality, and other forest values, maybe even water quality. This brings into question the agency's frequent claims that they are saving the forest by logging it. The agency especially must recognize that carbon biomass is a meaningful proxy for wildlife habitat, especially for species associated with structurally complex mature and old-growth forest, so the NEPA analysis needs to disclose the likely adverse consequences of logging in terms of loss of complex wood structure in these forests.

19. "[T]reatments that create more open stands in areas where user-created trails already exist invite development of more user-created trails, even when the project design leaves buffers along trails." This can have a significant effect on soil, water, wildlife, recreation, and weeds. Unfortunately, this problem is not well understood because "a proliferation of user-created trails that made the GIS layers an unreliable data source for tracking these metrics." Deschutes Collaborative Forest Project 2022. A Decade of Learning 10-Year Monitoring Report. Mamut Consulting, 6-30-2020. http://deschutescollaborativeforest.org/ The NEPA analysis needs to carefully consider these issues.
20. Modern forestry does not account for the complex effects of both competition and cooperation among the trees in a stand. Forest science tends to assume that competition dominates, but in reality the trees in a stand often share resources and provides benefits to their neighbors. Logging interferes with natural forest community dynamics.

    Wohlleben: We all learn in school that evolution advances by pitting each individual against every other in the struggle for survival. As a forester, I learned that trees are competitors that struggle against each other for light, for space. But we are now learning that individuals of a species are actually working together, they are cooperating with one another.

    e360: How exactly do trees cooperate with one another?

    Wohlleben: One thing is that mother trees suckle their children, they feed the young tree just enough sugars produced by its own photosynthesis to keep it from dying. Trees in a forest of the same species are connected by the roots, which grow together like a network. Their root tips have highly sensitive brain-like structures that can distinguish whether the root that it encounters in the soil is its own root, the root of another species, or the roots of its own species. If it encounters its own kind, I don't know if scientists yet know how this happens, but we have measured with radioactive-marked sugar molecules that there is a flow from healthy trees to sick trees so that they will have an equal measure of food and energy available.

    e360: How do the healthy trees that feed their sick companions benefit? Parts of the forest that grew naturally were 3 degrees C cooler than those managed by humans."

    Wohlleben: If sick trees die, they fall, which open gaps in the canopy. The climate becomes hotter and drier and the environment becomes worse for the

> trees that remain. In the forest I manage, students from Aachen University did a study that shows that the parts of the forest that grew naturally were 3 degrees C cooler than those that are managed and disturbed by humans.
>
> The world is trying to limit warming from climate change to 2 degrees, but undisturbed forests can do even better than that. Forests create their own microclimate. When we thin forests, the temperature rises, the humidity goes down, evaporation increases, and all the trees begin to suffer. So trees have a stake in supporting one another to keep all members of the community healthy.

Richard Schiffman, e360 INTERVIEW: Are Trees Sentient Beings? Certainly, Says German Forester. In his bestselling book, The Hidden Life of Trees, Peter Wohlleben argues that to save the world's forests we must first recognize that trees are "wonderful beings" with innate adaptability, intelligence, and the capacity to communicate with — and heal — other trees. 16 NOV 2016. http://e360.yale.edu/feature/are_trees_sentient_peter_wohlleben/3055/. (*Another view*, Henriksson, N., Marshall, J., Högberg, M.N., Högberg, P., Polle, A., Franklin, O. and Näsholm, T. (2023), Re-examining the evidence for the mother tree hypothesis – resource sharing among trees via ectomycorrhizal networks. New Phytol. https://doi.org/10.1111/nph.18935 ("We conclude that evidence of a significant net [tre-to-tree] C transfer via common mycorrhizal networks that benefits the recipients is still lacking. Furthermore, a role for fungi as a C pipeline between trees is difficult to reconcile with any adaptive advantages for the fungi.")). Similarly, Forests with more mature trees and more fungal connections may be more resilient than forests with fewer trees and fewer connections. Betkowski, B. 2020. Soil fungi act like a support network for trees, study shows – [University of Alberta] research is first to show that growth rate of adult trees is linked to fungal networks colonizing their roots. Folio Oct 22, 2020. https://www.folio.ca/soil-fungi-act-like-a-support-network-for-trees-study-shows/ *citing* Birch, JD, Simard, SW, Beiler, KJ, Karst, J. Beyond seedlings: Ectomycorrhizal fungal networks and growth of mature Pseudotsuga menziesii. J Ecol. 2020; 00: 1– 13. https://doi.org/10.1111/1365-2745.13507. See also, Marissa J Goodwin, Matthew D Hurteau. 2024. The effect of shrub cover on conifer water-use patterns, growth, and response to precipitation variability in the southern Sierra Nevada, Tree Physiology, tpae004, https://doi.org/10.1093/treephys/tpae004 ("our results suggest that growing in the presence of shrubs does not alter the water uptake patterns of white fir and Jeffrey pine and instead may have a positive effect on the growth rates of these species during both wet and dry years.")

These questions are not intended to doubt the need for restoration but rather to refine the focus of restoration and improve methods. Hand thinning of small trees might still makes sense but building roads and commercial removal of established trees may not. The NEPA analysis should consider a full range of NEPA alternatives to illuminate and explore these unresolved issues.

This project presents a number of trade-offs that must be considered in an EIS, such as:

- Commercial logging and road construction versus unroaded/undeveloped values. Large unroaded/unmanaged areas provide disproportionate ecosystem services such as clean

abundant water, high quality habitat, carbon storage / climate change mitigation, soil conservation, scenic values, quality of life, intact plant communities with fewer weeds, etc. Unroaded areas are rare and under-represented across the landscape and need to be restored, not further degraded. Building more roads and treating such a large fraction of the landscape move this landscape in the wrong direction;

- Commercial logging and road construction versus carbon storage. Climate change is a significant issue facing humanity. Our forests are an important part of the global carbon cycle. Logging will make climate change worse, while forest conservation will help store more carbon across the landscape and over time. This project is part of the cumulative global problem of carbon emissions. The global carbon cycle is globally distributed. There is no single place, or single activity that can fix the climate problem. All agencies must take steps to reduce GHG emissions. We can't point the blame and solution elsewhere;

- Commercial logging and road construction versus long-term recruitment of snags and dead wood habitat. Snags and dead wood habitat are critically important to forest ecosystems. Dead wood serves a wide variety of ecosystem services, not just habitat. Snags and dead wood habitat has been significantly reduced and degraded by decades of forest management on public and private lands. Logging kills trees and exports the wood unavoidably reducing dead wood values. This is a particular concern when such a large fraction of the landscape will be treated. The RMP and Eastside Screens are based on outdated "potential population" methodology. New science indicates that wildlife need more snags and dead wood for a wider variety of life functions and more green trees are needed to serve as a recruitment pool for continuous snag recruitment through the life of the stand. The agency has not (but needs to prepare an EIS and plan amendment to) adopt new standards to replace the outdated standards. The agency should use DecAID as the best available science but should use this tool appropriately: prepare a stand simulation that project snag recruitment under the action and no action alternatives, not just rely on the reference stand conditions, but instead compares future snag conditions to the DecAID tolerance levels for individual species who's viability depends on high snag abundance;

- Commercial logging and road construction versus habitat for wildlife that prefer complex forest and dense forest cover. Many wildlife, including goshawk, marten, pileated woodpecker, marten, three-toed woodpecker, black-backed woodpecker, and fish that need well-shaded streams and abundant dead wood, etc. Logging across such a large fraction of this landscape will remove and degrade habitat for these fish & wildlife. The NEPA analysis needs to carefully disclose and weigh these impacts and provide mitigation to ensure species viability;

- Commercial logging and road construction versus fire hazard. Logging has complex effects on fire and fuels with some effects tending to reduce hazard, and other effects tending to increase hazard. When forest "restoration" treatments involve significant reduction of canopy cover it can have complex effects on fire hazard with potential to increase fire hazard by making the stand hotter/drier/windier, generating more hazardous slash, stimulating the growth of future surface and ladder fuels, and additional roads increase human ignition risks. These trade-offs require an EIS.

Scoping Comments

There are numerous important issues addressed in our scoping comments that were not adequately addressed in the EA. We incorporate by reference Oregon Wild's scoping comments dated March 8, 2024.

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Each substantive issue discussed in these comments should be (i) incorporated into the purpose and need for the project, (ii) used to develop NEPA alternatives, including mitigation alternatives, that balance tradeoffs in different ways, (iii) carefully analyzed and documented as part of the effects analysis, and (iv) used to inform the finding of significance.

Please post to the project website, links to all relevant ESA and EFH consultation documents, RMPs, watershed analyses, and other supporting documents relied on in the NEPA analysis.

Please post to the project website before the public comment period, georeferenced maps of the proposed activity units that can be used to navigate in the field using apps such as Avenza.

Please provide Oregon Wild with timely notice of any forthcoming comment opportunities, and any draft and final decisions on this project. If the agency discovers new information or changed circumstance or modifies the project or the analysis after the decision, Oregon Wild requests to be notified and provided an opportunity to comment.

Note: If any of these web links in these comments are dead, they may be resurrected using the Wayback Machine at Archive.org. http://wayback.archive.org/web/

Sincerely,

Doug Heiken (he/him)
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