Date submitted (UTC): 4/5/2016 12:00:00 AM
First name: Doug
Last name: Heiken
Organization: Oregon Wild
Title:
Official Representative/Member Indicator:
Address1: PO Box 11648
Address2:
City: Eugene
State: OR
Province/Region:
Zip/Postal Code: 97440
Country: United States
Email: dh@oregonwild.org
Phone:
Comments:

April 5, 2016
Blue Mountains Restoration Strategy Team
via email to: r6restorationprojects@fs.fed.us

Re: Blue Mountains Forest Resiliency Project -
Scoping Comments from Oregon Wild
Dear Forest Service,
Please accept the following scoping comments from Oregon Wild concerning the Blue Mountains Forest Resiliency Project. Oregon Wild represents about 10,000 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).
These scoping comments from Oregon Wild have extensive input from Pam Hardy, Doug Heiken, and Rob Klavins. Our comments are far-ranging, reflecting the broad scope of this project. Be sure to review the Supplemental Input from Doug and Rob, which follows the main comments. Please excuse some amount of repetition inherent in this group effort. We expect our comments and concerns to become more focused as the details of this project to become more clear.
The truly remarkable thing about this project is that it is so much larger than any project central or eastern Oregon forests have seen in recent memory. The project anticipates 610,000 acres of thinning and prescribed fire across a project area that includes:
* 200,000 acres on the Ochoco National Forest
* 520,000 acres on the Umatilla National Forest
* 550,000 acres on the Wallowa-Whitman National Forest
Comment: We are concerned about the size of this project. While it is the case that more land can now be surveyed using models, it is impossible for any of the principles on this project to actually field check anything this large.
Additionally, a project of this size is going to take years to implement. As new science becomes available there should be opportunities to update the plan. This project should include a robust monitoring and adaptive management system.

The Purpose & Need
According to the Notice in the Federal Register the overall purpose of this project is
to enhance landscape and species resilience to future wildfire by restoring forests to their natural (historical) range of variation, reduce the risk of wildfire to high value resources both on and adjacent to National Forest System lands, and provide a diversity of economic opportunities and commodities.
According to the notice in the Federal Register, the project area is not within the Historical Range of Variation (HRV) as a result of "decades of fire suppression, past timber management practices, and climate change."
Comment: We agree that the dry forests of central and eastern Oregon are in many cases significantly departed from their historical range of variability. This is a result of fire suppression, and past management practices - grazing and timber removal, usually clear cutting of old growth trees.
We also agree that moving the forest back to historic conditions is most likely to be a reliable way of

reintroducing resilience to the forests in light of coming climate change. Use the historic range of variability as a guide, but don't just focus on seral stage. Consider also the historic abundance of ecological attributes like large trees, large snags, the scale and distribution of patches of dense forest, road density, roadless areas, etc. all of which have been severely altered from historic norms.

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. Acknowledge 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. 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."

James Johnston's work, as presented at the Ochoco and Blue Mountains Forest Partners meetings, has shown that in the past 1,000 years we have had droughts as severe as any we are likely to encounter in the next 100 years. Climate change may well push these conditions to the most extreme that these forests have ever seen, but there is reason to believe that they will be able to continue to thrive, if they are within their historic range of variability. The FS should also recognize that CO2 enrichment of the atmosphere makes trees use water more efficiently, so stand density may not be as much of a concern as it would be under normal CO2 concentrations.

Please clearly disclose the science you are using to determine the historical range of variability. This is a highly controversial topic within the environmental community. We understand that there are internal models which you are likely to be relying on for these results. Please disclose which models they are, and what assumptions they make. Given that this is the foundation of your analysis and conclusions please make the source of these assumptions clear.

We recommend that you create a website for this project that clearly discloses the science and models you will be using prior to releasing the DEIS. Given your very tight timeline, the public may get only 30 days to respond to your proposed plan. That would be way too short to adequately examine the science that you're basing your recommendations on.

The Notice goes on to specify that there is a need to

* Reduce overabundant closed-canopied forest stands in dry forest; maintain existing old forests and increase their abundance over the long term; increase the abundance of fire-tolerant tree species and large tree dominated stands; and restore forest patterns and disturbance regimes that are more reflective of the RV, including reestablishing historic openings and grasslands;

Comment: We are concerned that restoring stand density will be a primary driver of proposed logging. Why is this so important? Why doesn't the FS put just as much emphasis on restoring road density (or other ecological parameters) to historic norms? This is a one-sided goal statement. We urge the FS to harmonize density reduction goals with other important goals such as carbon storage to mitigate climate change.

* Enhance landscape resilience to future wildfire, and insect and disease outbreaks, and increase public and firefighter safety in the event of a wildfire;

Comment: We urge the FS to think of "wildfire, and insect and disease outbreaks" as solutions rather than problems. These are natural processes that are helping to diversify forest conditions. Firefighter safety should be emphasized in the structure ignition zone and within 150 feet of main roads, but firefighter safety should not trump ecological restoration goals across the landscape.

* Enhance the diversity and quality of habitat conditions across the planning area to improve overall abundance and distribution of wildlife habitat that is more reflective of the RV;

Comment: This is vague. The FS cannot fix everything, so they will choose a subset of habitat conditions to restore. We are concerned that the choice will favor logging and disfavor snags, roadless values, dense forest, etc.

* Restore tribal treaty resources, and high social values associated with traditional uses and culture that are related to the forest restoration need;

* Maintain and enhance resources of high social value, and support local economies by providing a diversity of resource management activities, commodity outputs, ecosystem services, and employment opportunities from public lands;

Comment: We urge the FS to make it a goal to provide for sustainable outputs and community stability. This will help the FS avoid creating an unsustainable "boom" of commodity production that will be followed by a future economic "bust."

* Improve existing road networks to provide access for forest treatments while meeting forest plan

standards and guidelines as well as Endangered Species Act consultation guidance;
Comment: We urge the FS to adopt a goal of restoring the RV for road density. Road density is an important determinant of wildlife values and watershed function. "Providing access to treatments" is a one-sided goal. Road construction has serious long-term impacts that often outweigh the ecological benefits of treatments. We urge the FS to adopt a more balanced goal such as provide access when and where the net ecological benefits are clear and compelling.
Comment: All three National Forests included in this project area have more roads than they can reasonably maintain. If evaluating the overall road network is a part of this project, many roads will have to be closed.
* Build and strengthen relationships among National Forest stakeholders through collaborative processes; and,
* Reduce fuel loading in strategic locations to promote safe and effective use of planned and unplanned fire.
Comment: We urge the FS to develop a fire management plan for the project area so that fire can most effectively be used as a tool.
According to the FR Notice
The 50 year average of annual acres burned was about 18,000, 26,000 and 34,000 acres for the Ochoco, Umatilla, and Wallowa-Whitman National Forests, respectively, before the current fire suppression era. The majority of these fires were of low severity, and relatively high frequency. The available current fire suppression era fire history for these forests indicates that on average about 4,000, 5,000, and 13,000 acres burn annually. The size and frequency of high severity fires are generally greater, and the size and frequency of low severity fires are generally lower across Blue Mountains forests than desired.
Comment: It is important to note that historically, large numbers of acres would burn annually in these three dry forests, and that today fewer acres are burning. So we cannot actually say that there is more fire. You argue that the fire we see is more severe, but see the MTBS: Monitoring Trends in Burn Severity: Report attached. For the PNW as a whole the evidence does not show a trend toward more severe fires. Please address this work specifically. Explain whether this trend holds in the dry forests you are planning to treat. If fire is not actually more severe, then maybe we can let fires do most of the work. The dry forests of eastern Oregon are adapted to regular fire. A significant part of our goal should be to return these forests to a state where natural fire ignitions can be allowed to burn in their characteristic low-intensity way.
That will only be accomplished if all the described underburning is actually accomplished. Given the existing backlog of underburning we are skeptical that this second part of the project (prescribed burning) will actually be accomplished. Please either
* create a mechanism for assuring that prescribed fire will take place within a reasonable time after the thinning; OR
* analyze the effects of harvest without prescribed fire.
Obviously, we would like to see you actually do the first. Eastern Oregon forests need fire to be healthy. We are willing to work with you in whatever way we can to assure that fire is reintroduced to the landscape in its historic role.
Additionally, new science has recently been emerging calling into question the assumption that thinning will always reduce fire hazard. The NEPA analysis should take this new science into consideration, and where it yields uncertain results, acknowledge the differing opinions.
In 2013 Firescience.Gov reported some surprising findings in a study by EJ Martinson & PN Omi:
"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."
The authors further make the point that treatments are only effective for a short-time (5-15 years) and will require periodic retreatment, essentially in perpetuity. William Baker and Jonathan Rhodes make a similar point. They ask:
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 in 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?
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.
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.
The Proposed Action
Narrow Scope, Large Scale
According to the Federal Register Notice "This project was intentionally designed to encompass a large scale and narrow scope."
Although this statement is not expanded upon in the Notice, conversations with members of the team working on this project suggest that it means that this project addresses only one specific ecosystem type, but does so across millions of acres of eastern Oregon.
Comment: This does not strike us as an ecologically responsible way to go about this project. In real life forests are a messy mosaic of different forest types. Different soil types, slope, aspect and proximity to riparian areas make forests highly variable. It makes no sense to enter an area, and only treat the narrow piece that is actually dry forest, and leave all the other parts. Entire watersheds should be treated together in one action. But that's only possible if you have enough staff to go out and see each watershed, and its particular needs. Further, on the Wallowa Whitman and Umatilla forests you are actually treating a large amount of moist and mixed conifer forests. There is substantially less social agreement on how to treat those stands. That also means this EIS is not actually the narrow scope you claim it is. It's actually a very large project that covers virtually all forest types on the forest except those that don't have commercial value, such as aspen or mahogany (which also happen to be the most important areas for wildlife.) The 100 acres or so or aspen treatment you propose is likely less than 1% of the historic range of aspen on the acreage you're planning to treat.
We recommend that you make this a programmatic EIS. Do a well-documented analysis of the impacts of different kinds of logging on dry forests. Make the science clear and transparent. Then give that science to the different forests to incorporate into their site-specific NEPA analyses where the mosaic can be treated effectively. This project is too big to have enough site specificity to comply with NEPA.
The Specific Actions
According to the notice "The proposed action was constructed by comparing current conditions to the RV across all ownerships at the scale of watersheds (5th field hydrologic units of 45,000-200,000 acres each)."
Comment: This is incomplete information. It explains something of how the proposed action was determined, but it does not actually explain either the full extent of the reasoning, or what the proposed action is. It is not clear to us that you actually know what the historical stand characteristics were at any one given site. Additionally, not all the forest was in the same stage of growth at any one given time. Some was old, some was young, some was somewhere in between. How will you determine which stands are returned to old growth, which to young, and which to the middle?
In attempting to decipher the above sentence, it appears to us that the proposed action generally aims to return the forest as a whole to within its historical range of variability. It appears from the above sentence that the plan might include looking at the percentages of forest in various structure types across all lands (public and private), and then use National Forest lands to bring the entire landscape back to HRV. So for example if

* OFSS should be at 55% of a particular 200,000 acre unit, and
* That unit is half public and half private, and
* OFSS is at 10% on private lands and
* 5% on public lands,
* Then, this project will aim to return approximately 90% of Forest Service lands to OFSS so that across the entire 200,000 acres approximately 55% of the land is in OFSS at the end of the project.

Is that accurate? Please more thoroughly explain your process and reasoning in the DEIS. If this is accurate, we would like to note here that you will have to identify the reasonably foreseeable actions that private forest land owners are likely to take on their properties in the next ten years, or over the time that this project will be implemented.
Instead of striving for park-like single strata forests, work 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, and generally tolerate more diversity in the stand. Norm Johnson and Jerry Franklin worked on a restoration plan called the Interforest Report for the Klamath Tribes former reservation. That report defined "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.
The Notice goes on to explain that treatments may include:
* Thinning/low severity fire-removes small (5-10? dbh) and medium sized (10-20? dbh) trees to reduce stand density and canopy cover, and with time and growth, lead to an increase in average stand diameter.
Comment: While this is appropriate in many stands, we encourage you to leave a cohort of all age classes in every stand.
* Opening-through mixed severity fire or mechanical treatments, removes a major proportion of medium and large trees (>20? dbh) to create openings, or canopy gaps of early seral structure and composition.
Comment: We understand that there have always naturally been places throughout the forest where soils do not support tree cover for some reason or where high intensity fire has created natural regeneration.
We encourage and support heavy thinning in areas that would have historically seen natural openings such as wet meadows and aspen stands that have been encroached on by conifers. Similarly, rocky ridges and some scab lands have never been able to support a healthy population of conifers and should be naturally free of conifers, and largely populated by mountain mahogany. These openings are critical to create high quality browse for ungulates such as deer and elk.
However, we don't entirely understand why there should be openings in other places - especially not in the middle of areas that could have historically supported a healthy population of trees. Admittedly there were high severity fires in some places, but as you've already made clear, even those were rare.
Natural disturbances processes such as insects, fire, mistletoe, root rot, wind, snow are still operating in our forests to create openings. Some of these disturbances are expected to become more active under the influence of climate change. We do not see a need to create artificial openings on top of the ones creates via natural processes.
We urge the FS to think of openings as small patches of "very heavy thinning," not mini-clearcuts. This is in recognition of the fact that natural processes killed trees but rarely removed them. We should strive to mimic natural processes and natural structures by creating "structure rich" openings.
We strenuously object to the removal of large trees to create openings. If a large tree is growing it means the site can support it. The LRMPs as amended by the Eastside Screens require all large trees to be retained. There is no reason not to retain them here. The FS should recognize that isolated large trees within openings create valuable habitat features use d by woodpeckers, bats, and owls, among other species.
Please don't allow openings larger than an acre in areas that there is not a site-specific justification. Please keep openings under 10% of the total treatment area unless there is a site specific justification to make it larger.
* Other disturbance/growth-thinning to manage for young stands, while increasing tree growth and vigor.
Comment: Could you be more specific. It's not clear to us what "other disturbance" might entail.
* Growth with low severity fire-allows forest succession and growth to occur while maintaining an open forest canopy.
* Grassland restoration-thinning and fire treatments to reduce conifer expansion within grasslands, and reestablish historic grassland/forest edges.
* Aspen enhancement-thinning and fire treatments to reduce conifer expansion within aspen inclusions, and stimulate aspen regeneration to the historical extent of the aspen clone.
Comment: We strongly encourage aspen enhancement wherever treatments include or are adjacent to aspen stands. Evidence in the Malheur National Forest suggests that aspen may currently only inhabit 10 - 20% of its former territory. Because aspen stands are critical to numerous wildlife species recovery of aspen stands is essential to the effort to return the forest to its historical range of variability.
When planning restoration activities please consider the driver of the aspen degradation in the first place. For example in some places aspen might be declining because of decreased water in the soil. This could be due to channelization of a wet meadow, or to reduction in snow pack. If the cause is channelization of a wet meadow, the solution would have to include restoration of the original hydrologic function on the meadow, and

not just removal of encroaching conifer trees.
Similarly, the cause may be excessive ungulate browse. If elk or deer are the culprits, different kinds of fencing will be necessary than if cattle are the culprits.
Attached are the Zones of Agreement reached by the Ochoco Collaborative on aspen management. We encourage you to follow those in all national forests.
* Strategic fuel treatments-includes any of the treatment types above, and other actions that change fuel abundance and arrangement, and decrease resistance to wildfire control at strategic locations to facilitate safe and effective fire management at appropriate spatial scales.
Comment: Could you be more specific here? This sounds like a blank check to treat in any way that might make it easier to fight fire. A clear cut might briefly make it easier to fight fire. We hope that's not what you're planning.
I have been asking the forest service and local scientists for data on the real extent to which treatments impact fire behavior for a long time. So far it has been to no avail - I have never seen a single observational study showing the difference in fire behavior before and after treatments. If part of your justification for doing this project is to change fire behavior, please identify the data on which you will be relying to determine what needs to be done. We understand that there are models out there that predict fire behavior. But simply telling us the results of your models is not helpful for a public that is skeptical of the science that went into the models in the first place. There is considerable disagreement in the public about whether dry forests should be treated at all, and about whether high severity fire is natural. See, for example, the recent book The Ecological Importance of Mixed Severity Fires by Dominick DellaSala. If the claims in this book are not accurate on the dry forests of eastern Oregon, please specifically address this work, and explain why.
Summary Comment: Different treatments are appropriate in different circumstances. Please provide clear and detailed descriptions of silvicultural prescriptions and marking guides in the NEPA document, and explain the criteria you will use to determine which environmental settings will receive which treatments.
Acknowledge and analyze the real "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-dryer-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.

Forest Treatments
According to the scoping notice in the Federal Register, the following treatments would occur:
* Thinning and "opening" smaller diameter (<20? dbh), closed-canopied (> about 40% canopy cover) stands to move them toward more open conditions, and encourage growth in average diameter.
Comment: There are an enormous number of acres proposed for this treatment, and is as large as any project the collaborative has worked on in recent memory. Please explain how you will choose which areas to treat, and which areas to leave.
* "Opening" treatments would also be used to create canopy gaps, where needed; smaller diameter, open canopied (< about 40% canopy cover) stands to move them toward more open conditions encourage growth in average diameter, and/or restore desirable fire regimes. Opening treatments would also be used to create canopy gaps, where needed;
Comment: We are concerned about the vagueness of this term "opening." Does it mean general density reduction or specifically creating large or small canopy gaps? Please explain how you will determine the sizes and locations of gap/openings. This region did historically see openings in the forest canopy, however it is usually around wet meadows, scabby uplands or places with poor soils. As a result, these openings are generally sized to the appropriate local conditions. Some are small (less than an acre) others, like the top of Lookout Mountain or Big Summit Prairie can be dozens of acres. However, it would be entirely ecologically inappropriate to put an opening the size of Big Summit Prairie anywhere else on the Ochoco - that would be nothing but an ecologically devastating clear cut. Each opening larger than one acre, or each 100-acre area with more than 2% opening should be individually described and analyzed. A specific justification should be given for each opening.
* Thinning larger diameter (> about 20? dbh), closed-canopied stands to move them toward more open conditions, and encourage growth in average diameter;

Comment: We encourage you not to remove trees larger than 21" DBH at all.
If you do plan to remove trees larger than 21" please only remove grand fir that don't show old-growth characteristics(according to the Van Pelt guidelines) where they are actually touching the canopy of old growth ponderosa pine.

* Thinning open stands with larger diameter trees to restore desirable fire regimes, and encourage growth in average diameter without reducing the abundance of large tree, open canopied stands overall;
* Grassland restoration;

Comment: Please provide maps for your proposed grassland restoration. We can imagine that there are 4,000 acres that are appropriate for grassland restoration, but there are many more acres where such a treatment would be entirely inappropriate. Without more detailed information, we cannot adequately comment on this proposal.

* Treating aspen inclusions to reduce conifer expansion and stimulate aspen regeneration.

Comment: There are many more acres of aspen stands in and near the proposed treatment areas. Please treat all the aspen stands that are either in or adjacent to the proposed treatment areas. Recognize that aspen and conifer can co-exist. Retain desired conifers >21" dbh.

* Strategic fuel treatments could be applied on more than 150,000 acres of smaller diameter moist and cold forest to achieve desired planned and unplanned fire behavior, facilitate safe and effective fire management, conserve high value resources, and restore fire at landscape scales more reflective of the RV. These treatments would be integrated with upland dry forest treatments to achieve landscape-level objectives.

Comment: It worries us that the scope of this project has grown to include treatments in moist mixed conifer areas. There is a lack of consensus on the need for restoration treatment in moist and cool forest types. Many of these forests have not missed fire cycles and even if they have, they have fuel conditions that are part of the historic pattern. When fires do occur in these forests, they often behave in characteristic ways. We are open to culturing of legacy trees in moist forest types via the removal of small-young trees that are in direct competition with large-old legacy trees. We might also be open to development of a network of shaded fuel breaks that will facilitate reintroduction of natural and prescribed fire. It worries us even more that the proposed treatment is one of the most vague unspecific treatments in the entire project. Please explain exactly what you plan to do here, and what science you're using to determine that you're actually returning these stands to their historic range of variability.

Riparian Areas

Forest treatments in any Category of riparian habitat conservation area would be limited to prescribed fire and small diameter thinning (<9? dbh), and adhere to the Blue Mountains Project Design Criteria, which were developed under programmatic informal consultation between the Wallowa-Whitman, Umatilla (and Malheur) National Forests and the National Marine Fisheries Service (November 2013).

Comment: We support a cautious approach to logging in RHCAs. We might be able to support culturing of large-old legacy trees that are located in RHCAs via the felling of small-young trees (<20 inches) that are in direct competition with large-old legacy trees. Felled trees 15-20" dbh should be retained on-site to provide dead wood values.

Old Growth Treatments

No specific description is provided about how to treat old growth stands.

Comment: We encourage you to cut no trees greater than 21" in diameter, and no trees that exhibit old growth characteristics, even if they are under 21" in diameter.

Oregon Wild will do it's 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 or to bring back a more natural old growth ecosystem.

The system of small patches of "designated old-growth" established during the last round of forest plans is inadequate to conserve old-growth ecosystems and return eastside forests to their natural range of variability. "The idea of short corridors between fragmented pieces of habitat is now considered by many experts to be outdated and the time is ripe to study larger landscape linkages." We encourage the Forest Service to restore old-growth, and all other under-represented ecosystems, across the landscape, not just in little preserves. 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. Recognize that large trees have a large cross section of non-conductive woody tissue, so stands with more large trees can sustain more basal area.

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.
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 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.
Roads
Comment: This project should attempt to move the road system back to its historic range of variability as well as the ecosystems. In other words it should address how to minimize the road systems to something that is actually necessary and affordable in the long run.
The range of alternatives analyzed in the DEIS will include one or more proposed road systems that, post implementation, would meet Forest Plan standards and guidelines and consultation guidance provided during the development of those plans.
Comment: In order to support the assertion that logging is really restoration and not just timber production under a new name, the adverse impacts of roads must be acknowledged and mitigated with clear conservation benefits. If this project plans to create any temporary roads or use/open any existing closed roads the tradeoffs should be carefully acknowledged. Areas that are currently unroaded (even if not designated) or where old closed roads have been overgrown should probably be left alone unless a clear benefit from thinning can be shown.
According to Reed Noss, in his in-depth analysis of the effects of roads
Nothing is worse for sensitive wildlife than a road. Over the last few decades, studies in a variety of terrestrial and aquatic ecosystems have demonstrated that many of the most pervasive threats to biological diversity - habitat destruction and fragmentation, edge effects, exotic species invasions, pollution, and overhunting - are aggravated by roads. Roads have been implicated as mortality sinks for animals ranging from snakes to wolves; as displacement factors affecting animal distribution and movement patterns; as population fragmenting factors; as sources of sediments that clog streams and destroy fisheries; as sources of deleterious edge effects; and as access corridors that encourage development, logging and poaching of rare plants and animals. Road-building in National Forests and other public lands threatens the existence of de facto wilderness and the species that depend on wilderness.
A 2010 publication from the National Academy of Sciences indicated that the erosion from roads is far worse than that from severe fire. The Forest Service itself has acknowledged that human-caused wildland fire is nearly five times more likely to occur on essentially roaded lands than on essentially unroaded lands
Additionally roads are a common vector for weeds and other non-native organisms.
Temporary Roads
According to the FR Notice
Temporary road construction would be based on site suitability, kept to a minimum to minimize detrimental effects such as soil disturbance and potential erosion, designed whenever possible and suitable over existing disturbance footprints (i.e., legacy roads), located to avoid stream crossings, and obliterated upon completion of project implementation.
Comment: Temporary roads are not an adequate solution. Please acknowledge that temporary roads have significant environmental impacts, and need to be considered on a site by site basis. Making broad statements such as "temporary road construction will be minimized" and placing the work on the project design standards, is not a sufficient analysis of the real environmental impacts of any particular road.
We are concerned that proposed construction of temporary roads is one of the primary reasons that this large scale NEPA analysis likely won't meet the requirements of NEPA. Road construction has long-term effects on soil, watershed function, vegetation, and habitat. The FS cannot do an adequate job of documenting the site specific need for roads, let along the direct site-specific, effects of building those roads. Site specific analysis is needed to document: the site-specific need for commercial versus non-commercial vegetation treatments; the adequacy of existing roads and landing sites; the existing condition of old roadbeds and their suitability for re-use; the slope and soil type; alternative access opportunities; the presence/absence of weeds, cultural resources, and special habitats such as talus, rock outcrops, wetlands, rare plants, etc.
The ecological costs of road construction almost always outweigh any benefits of the associated commercial logging activity. Since an optimal landscape restoration plan includes a mix of treated and untreated areas, the agency can easily avoid road construction by co-locating untreated areas and inaccessible areas.
The November 2000 National Forest Roadless Area Conservation FEIS p 3-30 says that temporary roads are not designed and constructed to the same standard as classified roads and therefore result in a "higher risk of

environmental impacts." The NEPA analysis must account for this increased risk of temporary roads compared to permanent roads.
The Roadless FEIS also says:
Temporary roads present most of the same risks posed by permanent roads, although some may be of shorter duration. Many of these roads are designed to lower standards than permanent roads, are typically not maintained to the same standards, and are associated with additional ground disturbance during their removal. Also, use of temporary roads in a watershed to support timber harvest or other activities often involves construction of multiple roads over time, providing a more continuous disturbance to the watershed than a single, well-designed, maintained, and use-regulated road. While temporary roads may be used temporarily, for periods ranging up to 10 years before decommissioning, their short- and long-term effects on aquatic species and habitats can be extensive. [The FEIS has similar disclosures citing extensive impacts to terrestrial species and habitats, and rare plant populations.]
There tends to be an assumption that temporary and semi-permanent new roads will have no effect because they are temporary. In fact, scientific research has shown exactly the opposite.
As a result we strongly recommend not building any new roads and not re-opening any old roads that may have already naturally grown in.
Additional Comments
Comment: We would like to initially point out that this might be the most confusing scoping document we have EVER seen. Clearly the FS has an internal database somewhere and has simply printed out many of the key tables. This makes actual review of the information exceeding tedious.
Please make the database itself available, including geo-references for the watershed codes.
Comment: Please describe the exact prescriptions you plan to use. We recommend that you stay within the LRMPS as amended by the Eastside Screens and limit yourself to removing only trees less than 21" in diameter. Attached is a handbook drafted by our late colleague, Tim Lillebo, that explains, in detail, how to work with dry forests, especially dry forests with old growth.
Snag & Down Wood Requirements
The Federal Register Notice does not address snags or downwood, but we have a few comments.
Comment: 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.
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.
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.
Retain abundant snags and course wood and green trees for future recruitment of snags and wood. Retention should be 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.
Think not only about existing snags but more importantly about the processes that recruit snags, including: a large pool of green trees from which to recruit snags and the existence of competition and other mortality 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.
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.

Insects & Disease

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.

Manage for Mixed Severity Fire

Treatments in forests with naturally mixed-severity fire regimes should be carefully scrutinized to ensure those areas

* are in fact outside of the HRV, and
* treatment will not remove scarce habitat for focal species that depend on dense forests, and
* treatments are in fact needed and
* 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.

New evidence indicates that far more of the "dry" forests, rather than being typified by 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.

Wildlands Urban Interface

A large part of the purpose of the project appears to be to reduce the impact of wildfire on structures and other more urban developments.

Comment: Consider bifurcating the landscape along the area defining the "structure ignition zone" within 200 feet of homes and built structures. Inside the structure ignition zone, vegetation treatments can focus on modifying fuels to protect infrastructure. Outside the structure ignition zone, treatments should focus on ecological restoration, where fuel hazard is but one consideration. 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. Fuel treatments in the WUI should be coupled with efforts to make communities fire resilient, not just to facilitate fire suppression.

Recognize that fuel reduction efforts can 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.

Biomass

Comment: 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?

Elk and Deer Forage & Winter Habitat

The Federal Register says nothing about elk and deer forage, connectivity corridors, or winter range.

Comment: Widespread density reduction as proposed in this project is likely to reduce elk and deer cover below Forest Plan standards. Although this might produce more forage, the true results - as far as we know - are not yet clear, especially where there are cattle grazing allotments. Please carefully examine the impacts to deer and elk and the habitat connectivity issues that will be created by such a large project area.

As far as we know there is not specific eastside science on this issue. However, there are existing thinning projects. An examination of the impacts to deer and elk in those projects could be used to estimate the effects

of this project.
Cumulative Effects
Comment: 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?
Recommendation
Comment: Long before the Draft EIS is published, please post all the science you will be using on a single organized website where the public can access it, and come to a solid understanding of the basis of your reasoning. While we generally agree with the principle that dry forests in eastern Oregon have grown in more densely than natural, we are less persuaded that there is a clear consensus about the density that is actually appropriate for wildlife and long term sustainability. Please explain the science you are using to come up with your prescriptions.
For Ayn
Can we get a copy of these tables in Excel so we can explore the data in more ways?
Conclusion
Thank you for all the work that you do to care for our forests. We look forward to working with you long into the future to secure both a healthy ecosystem and a healthy local economy.
Please send a timely copy of all subsequent NEPA documents and decisions regarding this project to Oregon Wild at the Bend, Enterprise and Eugene addresses above. Make sure that the resource management plan, watershed analyses, specialists reports, and other similar assessments and supporting materials that are relevant to this project are readily accessible on the agency's website.
Thank you for your consideration of our comments.
Sincerely,

Pam Hardy
Central Oregon Field Coordinator
Oregon Wild

Attachments
Tim's Eastside handbook.
OFRC's Aspen Zones of Agreement
Oregon Wild's Citizen Roadless Inventory GIS shapefiles (zipped)
Heiken, Doug. 2009. The Case for Protecting Both Old Growth and Mature Forests, Version 1.8. Oregon Wild. http://dl.dropbox.com/u/47741/Mature%20Forests%2C%20Heiken%2C%20v%201.8.pdf
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. http://dl.dropbox.com/u/47741/Heiken_Log_it_to_Save_it_v.1.0.pdf
Heiken, D. 2012. Thinking About Dead Wood in Managed Landscapes (powerpoint)
https://dl.dropbox.com/u/47741/dead%20wood%20slides%202012.ppt
Heiken, D. "The Straight Facts on Forests, Carbon, and Global Warming" provides a more detailed foot-noted report:
https://dl.dropboxusercontent.com/u/47741/Oregon%20Wild%20Report%20on%20forests%2C%20carbon%2C%20and%20global%20warming%2C%20ver.%201.4.pdf
Supplemental input from Doug Heiken and Rob Klavins pasted below
Supplemental Input from Doug Heiken on the Scope of the Blue Mountains Forest Resiliency Project
1. The Blue Mountain Forest Resiliency Project was not collaboratively developed. It was not initiated by collaboratives. It was developed by the Forest Service and is being forced upon collaboratives. The collaboratives may have different priorities about location, prescriptions, and appropriate scale of analysis. This violates the principles of the collaborative groups. The BMFP Declaration of Commitment says that "identification of priority areas" is among the important topics for collaboration. In this case, the FS is identifying a huge priority and then forcing it upon the collaboratives. This project is of such grand scale that it will eat up all of the collaboratives' time and prevent them from addressing other priorities. The March 20, 2015 powerpoint said the Team Charter is to "Test ways to increase the pace and scale of collaborative project planning." Is this goal shared by the collaboratives? Many of the collaboratives call for "appropriately scaled" projects that recognize the complexity of ecosystems.
2. Maintaining a narrow scope for this project focused on density reduction and timber industry log supply, does not respect the diverse restoration interests of the collaboratives. The BMFP says Guiding Principles include "Projects will be selected that are of mutual concern and are agreed upon by the group." Collaborative priorities should be set by group, not the FS. Tim Lillebo's Statement of Commitment to the

Harney County Restoration Collaborative says: "The reintroduction of natural fire regimes and modification of commercial logging and grazing practices are necessary to conserve and restore these forests. ... In some cases, the reintroduction of fire without prior silvicultural treatment is appropriate. ... Restoration must include coniferous vegetation and understory, steppes (grassland), riparian, aspen, fire, roads, hydrology, soil, water, wildlife, fisheries, and grazing issues." A narrowly focused project of this scale, leaves many of our priorities unaddressed. After the Blue Mtns Forest Resiliency Project is fully implemented, we are concerned that the FS may lack motivation to return to these areas in the future to address of (especially non-commercial) restoration priorities.

3. The FS does not seem to recognize that maintaining a narrow purpose for this project does not really make planning that much simpler, because the effects of such widespread logging and ground disturbance presents a wide variety of significant trade-offs and will have effects on virtually every other resource of concern, including wildlife, carbon, recreation, water quality, unroaded areas, weeds, etc.

4. A narrow definition of resilience does not capture the full range of values people want from their forests. This project focuses on forest resilience, however "resilience" as conceived by this project seems to mean density reduction to reduce fuel hazard. The public also wants resilience for wildlife that live in dense forests, snags, dead wood. We want resilience for the climate, which means maintaining for carbon storage. We want resilience for watersheds which requires reducing road density and reducing livestock grazing.

5. A project of this scale, implemented over a relatively short timeframe, represents a scale of disturbance that does not match the historic pattern and process. This may result in unacceptable cumulative effects. If the FS proposes to take more risk in terms of "pace and scale" then they should address uncertainty and cumulative effects by adopting prescriptions that reduce ecological risks associated with density reduction, such as avoid all road construction, retain greater basal area, leave larger unthinned "skips," retain more medium sized trees for future recruitment of large trees and snags by using a 15" dbh limit, use only non-commercial treatments in unroaded areas >1,000 acres, and apply variable density prescriptions, such as ICO. It is well-recognized that restoration requires investment, not just profitable timber sales. The Eastside Screens are based on an understanding that too much economic and ecological capital was taken out of these forests in decades past. The FS should not compound the problems of the past by exporting more ecologically important trees. The FS should avoid removing medium-large trees to pay for removal of small trees. The FS powerpoint showed that the large-tree/closed-canopy forest are above HRV in terms of acreage, but these forests are still fragmented and not well distributed. The FS analysis needs to recognize that the ecological function of these fragmented forests may be lower than a smaller acreage that is less fragmented. Large-tree/closed-canopy forests should not be degraded to pay for restoration of areas with mostly small trees.

6. The Forest Service's "working assumptions" require discussion and validation. The working assumptions outlined in the March 2015 powerpoint include -

Assumption: * Sound decisions can be made using available information and collaboration

Oregon Wild comments: We still have a lot to learn about dry forest restoration and how to harmonize competing interests including carbon storage, water quality, conservation of unroaded areas, and maintaining habitat and populations of wildlife that depend on relatively dense complex forests. Logging has complex effects and can make both habitat and fire hazard worse instead of better. Scientific uncertainty remains, and NEPA requires site specific analysis and data collection, not quick decisions based on incomplete information. Moriarty et al (2014) identified a significant trade-off associated with thinning. They found that fuel reduction simplifies forest structure and has an adverse effect on marten behavior. Moriarty, K. M., Epps, C. W. and Zielinski, W. J. (2016), Forest thinning changes movement patterns and habitat use by Pacific marten. The Journal of Wildlife Management. doi: 10.1002/jwmg.1060. http://onlinelibrary.wiley.com/doi/10.1002/jwmg.1060/abstract (Abstract: "martens avoided stands with simplified structure, and the altered patterns of movement we observed in those stands suggested that such treatments may negatively affect the ability of martens to forage without increased risk of predation. Fuel treatments that simplify stand structure negatively affected marten movements and habitat connectivity. Given these risks, and because treating fuels is less justified in high elevation forests, the risks can be minimized by applying treatments below the elevations where martens typically occur.") And see, Katie M. Moriarty 2014. Ph.D. Dissertation. Habitat Use and Movement Behavior of Pacific Marten (Martes caurina) in Response to Forest Management Practices in Lassen National Forest, California. November 21, 2014. https://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/54574/141203_Moriarty_OSU_Dissertation_FINAL.pdf

Assumption: * Project planning is a bottleneck to achieving restoration at ecologically relevant scales

Oregon Wild comments: To say that project planning is a bottleneck can be restated as public participation and environmental considerations get in the way of FS discretion. The FS says they are interested in collaboration and transparency, but the real effect of planning at this scale is to shift power from an informed and engaged

public to the Forest Service (and those who may purchase timber sales based on vague NEPA documentation that can be reinterpreted during implementation). The FS powerpoint included a map showing that existing project areas cover a large part of the planning area.Gridlock is a myth. Projects are moving forward. The existing pace and scale is achieving and will continue to achieve ecologically relevant results. Past degradation of this ecosystem took decades, and we should recognize that restoration takes time. Don't rush it. The Ochoco Collaborative Operations Manual does not demand immediate results everywhere. It says
"At all times the focus of projects is to support steady progress towards the long term goal of the Forest as a healthy, diverse ecosystem that is resilient to natural and human disturbance, while at the same time ensuring our communities are safe from wildfires. Project selection and scale of execution is such that major restoration at the overall Forest level will be evident in a 30-year timeframe, with an eye toward appropriate structure for the long-term (150 years)."
Similar language in in the vision statement for the BMFP. The BMFP Guiding Principles include "Project scope, complexity and objectives should be appropriately scaled." This sounds more like a caution against projects that are too large and complex. We still have a lot to learn. Adaptive management requires taking small bites and learning along the way.

Assumption: * Some ways we have been implementing project planning processes go above and beyond adequate satisfaction of policy requirements
Oregon Wild comments: The powerpoint also recognized that eastside forest management is plagued by lack of social agreement, lack of trust, lack of scientific certainty. Appropriate planning processes can help address these issues. A radical reduction in public involvement and planning processes will make these problems worse. The FS would do much better to build trust by improving the quality of its decisions and designing restoration projects that avoid the significant trade-offs associated with projects that focus on producing commercial logs. There is a great need for landscape fire reintroduction, weed removal, instream flow restoration, road removal, livestock grazing reform, rebuilding carbon stocks, etc.

Assumption: * NEPA adequacy should be measured against policy and regulation, not tradition
Oregon Wild comments: The FS NEPA process probably wastes effort in some areas and underachieves in others. The NEPA process can be refined, but not radically revised. Court decisions also set NEPA requirements. The large scale contemplated here is more of a programmatic NEPA process, not site-specific as required by law. We actually support programmatic NEPA to help set regional priorities/guidelines, etc., but it must be followed by site-specific analysis so that important local issues don't get ignored and so that trade-offs are revealed and mitigated.

Assumption: * Effective project planning doesn't require addressing every need in a particular place "just because we're there"
Oregon Wild comments: This project's narrow focus on density reduction and timber industry economics leaves out many of the interests of the collaboratives. Good restoration practices requires a comprehensive and integrated approach. This is especially true at large scales. Good restoration practice is comprehensive and integrated, not focused on just reducing tree density and economic aid for the timber industry. BMFP Guiding Principles include "Decision making processes for the group should focus on producing outcomes that strive to meet the needs of all participants" (not just the timber industry, and those who seek density reduction).

Alternatives
The Forest Service should consider a full range of alternatives to highlight the trade-offs. We recommend alternatives that range from low amounts of logging (~15% of the landscape) along with significant road density reduction and lots of managed fire, ranging up to proportionally higher amounts of logging (~50% of the landscape) along with needed roads and fire.

We hereby request that the Forest Service develop and consider an alternative that focus on meeting the purpose and need by emphasizing low-impact, less-controversial restoration activities:
* Develop a fire management plan for the Blue Mountains that allows reintroduction of fire, both wild and prescribed.
* Treat dry forests, not moist and cool forests
* Remove only small-young trees. Consider using a 16" diameter limit for desired species such as Ponderosa pine, sugar pine, white pine, and larch.
* Retain all large trees and all old trees regardless of size,
* Treat south and west slopes; Leave other topographic positions unlogged;
* Focus commercial treatments on areas accessible from existing roads. Build no new roads, including

temporary roads;
* Emphasize light and moderate thinning. Retain adequate basal area to ensure recruitment of future large trees and snags; Small patches might be heavily thinned to create "gaps" but they should retain structure; not mini-clearcuts;
* Treat a small subset of the landscape, leaving unthinned areas to meet important ecological values associated with natural processes, such as biomass accumulation, mortality, snag habitat, carbon storage, etc;
* Emphasize variable thinning (clumpy, patchy, gappy) with large skips and small gaps,
* Exclude RHCA and unroaded areas >1,000 acres,
* Increase watershed resilience by reducing road density and reducing livestock numbers and season of use in key watersheds;
* Follow LRMPs (no amendments);

Consider another alternative that relies on fire to do most of the work. Strategically treat fuels on approximately 15% of the landscape (e.g. shaded fuel breaks to create "fire containers") and let low and mixed-severity fires burn.

Plan amendments. The scoping notice says "If necessary to meet the purpose and need of the FRP, the Forest Service may need to amend one or more Forest Plans for activities such as cutting large trees (>21? in diameter), restoring or conserving old forest characteristics, restoring forest structure in elk habitat, or maintaining current road densities." We object to revising the conservation requirements of the LRMPs, such as to allow removal of large trees, or allow removal of vegetation cover for big game. Any plan amendments at the scale of this project would trigger full NFMA review as a significant plan amendment/revision.

Early seral forest. The FS should not be conducting regeneration harvest or creating early seral forest conditions because fire will do this work for us. We are very concerned about unacceptable cumulative effects from artificial regeneration conducted as part of this project, plus early seral created by wildfire, plus the intensive forest practice and degraded habitat conditions on non-federal lands.

Carbon and Climate Change. It is important for the Forest Service to consider the carbon emissions associate with such a large-scale logging project. Especially, the very extensive treatment proposed in moist and cold forests that can store a lot of carbon and are less frequently subject to disturbance. We urge the FS to quantify the carbon emissions from this project and disclose the social cost of carbon dioxide emissions.

Concerns about the NEPA process.

The large scale of this analysis and the large amount of ground-disturbing activity it will cause, cannot be adequately analyzed at the site-specific level in a single NEPA document with current mandated timeframes. The public won't have access to the detailed information (or time) necessary to meaningfully participate in critical decisions affecting their public lands. This will conflict with the FS stated interest in "procedural transparency."

This is really a programmatic NEPA analysis that the agency intends to use to support project level decisions without further NEPA review. This raises serious concerns about whether conducting NEPA at this scale is site-specific enough to meet NEPA's hard look mandate. One of the most important parts of an EIS is the disclosure of environmental consequences. "This section forms the scientific and analytic basis for the comparisons [of alternatives] under ?1502.14. [This section] shall include discussions of: (a) Direct effects and their significance" ?1502.16 CEQ defines "effects" to "include: (a) Direct effects, which are caused by the action and occur at the same time and place." 40 CFR ? 1508.8. We are very concerned that the FS will never put boots on the ground in most of the areas proposed for logging. How will they know if there are direct effects and site-specific issues that need to be addressed, such as the presence or absence of: large-old trees and snags, seeps and springs, wetlands, cultural artifacts, rare plants, unique plant associations, unique habitats (talus, rock outcrops, scabs), adequate road access that may pose unacceptable risks of erosion/weeds/OHV trespass, etc. Knowing these site-specific details is essential to making an reasoned choice whether to conduct logging, especially when the FS proposes to log trees up to 150 years old, and modify habitat that may take 100 years to recover.

40 CFR ? 1502.22(a) says "If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement." We are very concerned that in a project of this scale the FS will not have site-specific information to support its decision to log particular sites. This information is clearly available it the FS would just take its time and do the required fieldwork. The cost of obtaining this site-specific information is not exorbitant, because the agency does it (the right way) all the time (until now). The only thing that makes site specific NEPA seem daunting is because the FS has chosen to conduct its project-level NEPA analysis at an unprecedented scale that make site specific analysis nearly impossible. This approach is not mandated in any way. It's a choice made by the FS.

The CEQ regulations encourage tiering. ("[40 CFR] ?1502.20 Tiering. Agencies are encouraged to tier their environmental impact statements to eliminate repetitive discussions of the same issues and to focus on the

actual issues ripe for decision at each level of environmental review (?1508.28)." [which says] "Tiering is appropriate when the sequence of statements or analyses is: (a) From a program, plan, or policy environmental impact statement to a program, plan, or policy statement or analysis of lesser scope or to a site-specific statement or analysis.") The FS is proposing a huge program of density reduction and fuel reduction. At this stage, the site-specific impacts of logging particular stands are not available to the agency, have not been disclosed to the public, and are not ripe for review and decision.
40 CFR ?1500.1(b) says "NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality." ?1500.2 says "Environmental impact statements shall ? be supported by evidence that agencies have made the necessary environmental analyses. " NEPA analysis conducted at the scale contemplated here is unprecedented and will not result in the "high quality information" and informed decision-making expected under NEPA.
The issues at this stage include:

* What is the appropriate mix of treated and untreated stands?
* What are the trade-offs involved in large-scale removal of woody structure from the forest?
* What are the cumulative impacts of this program of logging on wildlife that prefer to avoid human disturbance, and that prefer relatively dense and complex forests, watershed values that will be degraded by extensive road activity, and carbon storage, etc.
* Will communities be destabilized by the temporary pulse of economic activity associated with this unsustainable level of forest management in a short time? Would it be better for community stability to adopt a steady and sustainable pace of restoration activity?

Blue Mountain Forests May not Need Such a Massive Logging Intervention.

Recent studies show that the area affected by fire may be increasing but fire severity is not increasing. Low and moderate fire severity still dominate and those fires are essentially thinning from below but without building roads or removing ecologically valuable biomass.

An analysis of trends in burn severity in the Northwest over the last 20 years found that "there is a [statistically] significant increase in average fire size between 1984-1999 and 2000-2005 [yet] there is still no trend toward higher burn severity? MTBS data does not support the assumption that wildfires are burning more severely in recent years." The majority of fire effects remain low severity and the proportion of high severity fire is not showing an increasing trend, therefore one could conclude that the increased incidence of fire on the landscape is just a re-establishment of a natural process. Natural fire is not a problem, but a solution to decades of fire suppression.

We evaluated the effects of reintroduced frequent wildfire in unlogged, fire-excluded, ponderosa pine forest in the Bob Marshall Wilderness, Montana, USA. Initial reintroduction of fire in 2003 reduced tree density and consumed surface fuels, but also stimulated establishment of a dense cohort of lodgepole pine, maintaining a trajectory toward an alternative state. Resumption of a frequent fire regime by a second fire in 2011 restored a low-density forest dominated by large-diameter ponderosa pine by eliminating many regenerating lodgepole pines and by continuing to remove surface fuels and small-diameter lodgepole pine and Douglas-fir that established during the fire suppression era. Our data demonstrate that some unlogged, fire-excluded, ponderosa pine forests possess latent resilience to reintroduced fire. A passive model of simply allowing lightning-ignited fires to burn appears to be a viable approach to restoration of such forests.
Andrew J. Larson, R. Travis Belote, C. Alina Cansler, Sean A. Parks, and Matthew S. Dietz 2013. Latent resilience in ponderosa pine forest: effects of resumed frequent fire. Ecological Applications, 23(6), 2013, pp. 1243-1249.
http://www.cfc.umt.edu/forestecology/files/Larson_Belote_Cansler_Parks_Dietz_EcoApps_2013.pdf

The majority of area burned falls within the unburned to low severity range, with relatively low annual variation in these severity classes. The high and moderate severity classes show higher relative variation between years, suggesting that these classes may be most influenced by variation in climate, weather, and seasonal fuel conditions. ?
Percentage of Area by Burn Severity-PNW & PSW

* 28 percent-unburned to low severity
* 36 percent-low severity
* 21 percent-moderate severity
* 15 percent-high severity

?

?
The Unburned-to-Low and Low severity classes are also interesting because their proportions are relatively stable from year to year. The Unburned-to-Low class averages approximately 28 percent of the burned area with only ?6 percent variation from year-to-year (one exception in 1995) for the entire data record. This compares with the high severity class, which averages 15 percent of the area with ?11 percent variation. Also, in 82 percent of the years the combination of the Unburned-to-Low and Low severity classes was 60 percent of the burned area. The lower end of the burn severity spectrum appears to be fairly consistent across the data record and regularly comprises a majority of the burned area.
MTBS: Monitoring Trends in Burn Severity: Report on the Pacific Northwest and Pacific Southwest Fires (1984 to 2005). http://mtbs.gov/reports/MTBS_pnw-psw_final.pdf.

Trees Evolved with Climate Variability

This project is intended to make forests more resilient. This is a vague term that can lead to unintended consequences. Some wildlife prefer to live in forests that are a product or disturbance or are vulnerable to disturbance. Increasing tree vigor and reducing the effects of wildfire do not benefit these species. Implementing the proposed action across hundreds of thousands of acres would make populations of these species less resilient, not more.

While global temperatures have increased during the last 100 years, but they are not outside the range experienced by current forest tree species during the last 10,000 years. In fact, during the last 11,300 years, 28% of decades were warmer than the first decade of the 21st century (which was considered very warm by modern standards). Shaun Marcott 2015. Pleistocene-to-modern Records of Climate Change, https://vimeo.com/138772308 citing SA Marcott, JD Shakun, PU Clark, AC Mix 2013. A reconstruction of regional and global temperature for the past 11,300 years. Science 339 (6124), 1198-1201 https://www2.bc.edu/jeremy-shakun/Marcott%20et%20al.,%202013,%20Science.pdf

This indicates a need for humility when designing projects to increase forest resilience. What trees are experiencing now is not necessarily far different form what they have experienced before. Trees carry the genes to adapt to a changing climate. We may not need to intervene, especially when it involves significant trade-offs such as degrading habitat and reducing carbon storage.

Basal Area Retention
Basal Area retention is an important ecological consideration that must be disclosed quantitatively in the NEPA analysis. The NEPA analysis should disclose basal area retention levels that provide assurance that enough trees are being retained to meet ecological needs for live and dead trees now and in the future.
Where there are lots of small trees we recommend variable density thinning to 60-80 sq ft/acre basal area, retaining the largest trees that will become the next generation of old growth. Since larger trees have a higher ratio of basal area to leaf area, sites with abundant large trees can sustain higher basal areas, and we recommend retaining 100-140+ sq ft/acre.
Basal area retention should be variable but not be too low in any one unit. Enough trees need to be retained to retain and recruit large and old trees and snags now and in the future. Basal area targets should be adjusted higher to account for the following actors:
* Prescribed basal area retention should be weighted to accommodate relatively greater retention in stands with large trees and desirable clumps of trees that contribute to LOS structural conditions.
* All things being equal, large and old trees are more sustainable and resilient than small trees, so where large and old trees are abundant, the site can sustain higher basal area and the mature and old trees do not need to be thinned.
* Retention patches should be excluded from the basal area calculation. Basal area should not be averaged across the stand, but rather across the treated portion of the stand. We recommended 3-4 clumps per acre of 2-10 individual trees as well as the skips to emulate natural historic stand structures.
* Basal area can be higher in riparian areas, area with higher water table, north slopes, etc...
The agency should avoid reducing stand density lower than is appropriate to meet the full suite of ecological

objectives, including wildlife cover, perpetuating mortality processes that create and sustain valuable habitat features, etc.

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, https://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. 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

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. Cutting basal area down to 30-40 ft2/acre is too low. We urge the agency to retain at least 60-120 ft2/acre of basal area. 30-40 ft2/acre might be OK in small patches within units as part of a variable prescription, but the average over a unit must be much higher than that in order to ensure adequate cover for wildlife, and adequate dead wood recruitment through time.

Disclose and Mitigate Trade-offs

Land management inevitably involves trade-offs among competing uses of the public lands. The agency must avoid portraying the effects of the proposed action in uniformly positive terms, while describing the effects of no action in uniformly negative terms. NEPA requires disclosure of the trade-offs among competing uses.

Project-level planning and implementation pursues management activities in accordance with forest plans to enhance flows of particular ecosystem services-to improve a specific fish or wildlife population, for example, or reduce the likelihood that natural disturbance (e.g., wildfire) might adversely affect flows of ecosystem services. However, many ecosystem services and the associated landscape conditions from which they derive are interrelated in either conflicting or synergistic ways such that changes in one service necessarily involve changes in another service. In some cases, increased flows of one service may only be possible by accepting decreased flows of another service. Evaluating and communicating expected management outcomes necessarily must account for these interrelationships and the tradeoffs-the exchange of one level of service for another-made necessary when implementing a project that will affect multiple ecosystem service flows. Conceptually, tradeoffs among ecosystem services are best illustrated by using the economic concept of "production possibility frontiers" (e.g., Bowes and Krutilla 1989: 49, Stevens and Montgomery 2002). Production possibility frontiers show the combinations and levels of ecosystem services that can be produced on a landscape given that landscape's capacity to produce those services (e.g., its size and biophysical features) and management inputs (e.g., labor) and capital improvements (e.g., roads, trails, culverts).
?
Understanding the production possibilities for a given landscape enables managers to identify and weigh the possible output combinations that might be expected on a given landscape, and may make it more feasible to avoid unnecessary tradeoffs.
?
Another important step in evaluating forest management tradeoffs is characterizing how valued ecosystem services are likely to change in response to management activities under consideration. ? Ideally, analysis of the likely outcomes of landscape management would be based on credible scientific information linking expected changes in ecosystem services to specific changes in landscape conditions and processes resulting from proposed plans and projects. The quantity and quality of scientific information available for evaluating management effects in this way can differ depending on how well particular ecosystem processes are understood and how well they can be described by ecologists and biophysical scientists as changes in ecosystem services.
? [M]any economists refer to a need for ecological production functions (e.g., Polasky 2008) that link the

production of a given ecosystem service in space and time to landscape conditions and processes necessary to its production. ?
Whether dealing with empirical data and models or qualitative data and narratives, evaluating and communicating expected management outcomes calls for managers to (1) identify key landscape conditions that affect the quantity and quality of valued ecosystem services; (2) characterize key relations between those landscape conditions and the levels of ecosystem services produced; and (3) describe the degree of uncertainty in the data and models used to predict management outcomes. This process includes describing the spatial and temporal aspects of expected outcomes.
Kline, Jeffrey D.; Mazzotta, Marisa J. 2012. Evaluating trade-offs among ecosystem services in the management of public lands. Gen. Tech. Rep. PNW-GTR-865. Portland, R: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 48 p. http://www.fs.fed.us/pnw/pubs/pnw_gtr865.pdf.

[W]hile specific structural attributes of forest ecosystems have been correlated with certain species, it is uncertain how such species will respond to treatments designed to recreate these features. There is always the possibility that in our attempt to create a structural attribute we think is important, we eliminate another attribute that is equally important, but unrecognized. One example is that attempts to restore spotted owl habitat by heavily thinning to accelerate the development of large diameter nesting trees could actually delay spotted owl recovery by reducing production of the large down wood utilized by the species it preys upon (Forsman et al., 1984; Carey, 1995; North et al., 1999). Similarly, heavily thinning stands to accelerate the development of marbled murrelet nesting trees also create open stands with a dense understory that is ideal habitat for a number of corvid species that prey on marbled murrelet nest eggs (USFWS, 2010). Riparian thinning efforts to create long-term supplies of very large diameter instream wood that can initiate complex wood jam formation (e.g., key pieces) are also likely to reduce the supply of large diameter wood that will create pools (Beechie and Sibley, 1997; Beechie et al., 2000; Fox and Bolton, 2007). Thus, we suggest that any efforts to actively restore riparian forests for the benefit of certain species should be treated as scientific experiments and proceed cautiously, skeptically, and with robust pre- and post-treatment data collection efforts. Hypothesized effects of thinning on riparian forest structure and the use of that structure by targeted species should be tested against empirical data.
Pollock, Michael M. and Timothy J. Beechie, 2014. Does Riparian Forest Restoration Thinning Enhance Biodiversity? The Ecological Importance of Large Wood.Journal of the American Water Resources Association (JAWRA) 50(3): 543-559. DOI: 10.1111/jawr.12206. http://oregon-stream-protection-coalition.com/wp-content/uploads/2014/07/Pollock-and-Beechie.-2014.-Riparian-thinning-and-biodiversity.pdf

The agency should look for tools to help illuminate and transparently resolve trade-offs. "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 http://www.firescience.gov/projects/09-2-01-16/project/09-2-01-16_09-2-01-16_rmrs_gtr292web.pdf Chatper 7 of this document highlights the importance of clearly articulated project objectives, quantitative metrics defining success across multiple objectives, "a format to display the benefits and trade-offs among the metrics...," and a clearly articulated rationale linking treatment prescriptions to desried objectives.

Another potentially useful framework for weighing trade-offs among ecosystem services (such as timber production and biodiversity) is presented here: Cavender-Bares, J., S. Polasky, E. King, and P. Balvanera. 2015. A sustainability framework for assessing trade-offs in ecosystem services. Ecology and Society 20(1): 17. http://dx.doi.org/10.5751/ES-06917-200117; http://www.ecologyandsociety.org/vol20/iss1/art17/ ("Similar to Bator's 1957 article, 'The simple analytics of welfare maximization,' which sought to provide a coherent unified treatment of welfare economics that was widely accessible, we sought to provide a coherent unified and clear treatment of ecosystem service trade-offs in the context of sustainability. We did so in a series of steps that (1) defined the biophysical constraints of the system in the form of an efficiency frontier, (2) combined the values of stakeholders and the efficiency frontier, (3) examined temporal lags and intergenerational inequalities, and (4) incorporated thresholds and nonlinear system dynamics. ? Our sustainability framework emphasizes the ecological processes underlying the production of ecosystem services that contribute to human well-being. This emphasis complements the work of economists on "inclusive wealth " (Hamilton and Clemens 1999, Dasgupta and M?ler 2000, Heal 2000, Arrow et al. 2004, 2012). Inclusive wealth is a measure of the value of all capital assets, i.e., manufactured, human, social, and natural capital, with value reflecting the contribution of the asset

to providing benefits both now and in the future. To be sustainable, inclusive wealth should be nondeclining, so that future generations have bundles of assets that are of equal or greater value than the value of current assets. The advantage of the inclusive wealth approach is that it offers a clear and simple criterion for sustainability with a comprehensive and global scope (Cavender-Bares et al. 2013). ? The process of developing a study in the context of the sustainability framework as we have outlined it is a valuable exercise (cf. Ewing and Runck 2015, Grossman 2015, Mastrangelo and Laterra 2015; P. Balvanera, F. Mora, A. Castillo, and J. Trilleras, unpublished manuscript, M.). It untangles the known from the perceived, makes transparent disparate viewpoints and underlying assumptions of stakeholders, and clarifies the information base that stakeholders rely on for informing themselves about the system. Moreover, it identifies the data gaps so that stakeholders can make more informed decisions about the most appropriate intervention for an area, given social and biophysical constraints (Grossman 2015; P. Balvanera, F. Mora, A. Castillo, and J. Trilleras, unpublished manuscript). The process itself, however, may be more valuable than any immediate outcome of the analysis. As such, the framework has the potential to contribute to a participatory approach (E. G. King, J. Cavender-Bares, T. Mwampamba, P. Balvanera, and S. Polasky, unpublished manuscript) that builds trust, common ground, and the working environment needed to address ecological problems in a way that can secure long-term commitment to resolving them, which is a necessary building block for sustainability. Ultimately, an integrated social-ecological analysis of the trade-offs among ecosystem services and their dynamics through time is necessary to assess how close or far we are from attaining sustainability.")

Yang et al (2015) created a framework linking ecosystem services to human welling being. They "used net benefits rather than gross benefits to allow the indices to capture both [ecosystem services] and disservices, account for costs associated with provision of [ecosystem services], consider trade-offs and synergies between different [ecosystem services], and facilitate cross-context com-parisons (Yang et al. 2013b)." Yang, W., T. Dietz, D. B. Kramer, Z. Ouyang, and J. Liu. 2015. An integrated approach to understanding the linkages between ecosystemservices and human well-being. Ecosystem Health and Sustainability 1(5):19. http://dx.doi.org/10.1890/EHS15-0001.1; http://onlinelibrary.wiley.com/doi/10.1890/EHS15-0001.1/epdf. In this framework, the benefits of ecosystem services provided by wood products would be adjusted to reflect the costs of water pollution, loss of biodiversity, and carbon emissions , and other values associated with logging.

Protect the Values of Roadless Areas and Low-Road-Density Areas
We urge the Forest Service to put more trust in the natural processes that have self-regulated forests for millennia. This requires leaving substantial areas unlogged both within and between treatment areas. In particular, we urge the Forest Service to avoid commercial logging in large unroaded areas (>1,000 acres). We have attached the GIS shapefiles representing the best available information on the roadless and unroaded areas in the Blue Mountains.
Low impact restoration activities including but not limited to prescribed burning, mowing, precommercial thinning, fire rehab, and soil rehab, may be appropriate in roadless/unroaded areas as long as they will be substantially unnoticeable to the casual observer. The NEPA document should describe each roadless/unroaded area, the roadless/unroaded values represented, and the site-specific need for, and impacts of, proposed restoration activities.

Large intact expanses of habitat were once quite common but are now rare. Species evolved in the context of the large habitat patches that result from the natural disturbance regime. New science confirms that roads and logging tend to be contagious on the landscape (managed areas beget more management until little remains unmanaged), so to conserve the habitat values associated with wild places we have to prevent the first intrusions.
The Forest Service defines unroaded areas as any area without the presence of classified roads, and of a size and configuration sufficient to protect the inherent characteristics associated with its roadless condition. http://web.archive.org/web/20010729111100/http://roadless.fs.fed.us/documents/feis/glossary.shtml. Unroaded areas greater than about 1,000 acres, whether they have been inventoried or not provide valuable natural resource attributes that must be protected. These include: water quality; healthy soils; fish and wildlife refugia; centers for dispersal, recolonization, and restoration of adjacent disturbed sites; reference sites for research; non-motorized, low-impact recreation; carbon sequestration; refugia that are relatively less at-risk from noxious weeds and other invasive non-native species, and many other significant values. See Forest Service Roadless Area Conservation FEIS, November 2000.

Former Secretary of Agriculture Tom Vilsack recognizes the value of National Forest roadless areas: "Roadless areas preserve essential watersheds and help ensure an abundant supply of clean drinking water. These large areas of undisturbed forests provide diverse habitats for sensitive and endangered wildlife. In addition, road

less areas provide other critical ecological services, such as carbon storage, and operate as effective barriers to invasive species, while also providing social values such as scenic landscapes and a host of recreational opportunities. Let me assure you that USDA and the Forest Service will move forward to conserve and protect these lands and meet all legal obligations." March 11, 2009 letter to Oregon Governor Ted Kulongoski.

World Wildlife Fund and the Conservation Biology Institute summarized the important attributes of small roadless areas.
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
WWF CBI 200x. Importance of Roadless Areas in Biodiversity Conservation: A Scientific Perspective - Executive Summary.
http://magicalliance.org/download/ecological-importance-of-roadless-areas.pdf

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://docs.google.com/open?id=0B4L_-RD-MJwrRzhFcm5QcFR0MHM

To the list of special values found within unroaded areas must be added carbon storage. European policy leaders consider roadless areas effective for carbon storage and climate mitigation:
[T]he European Parliament has agreed to raise the issue of roadbuilding in intact forests at the UN Climate Change Conference to be held next month in Warsaw (Poland); it calls on parties to use the existence of roads in forest areas as an early negative performance indicator of REDD+ projects, and to prioritise the allocation of REDD+ funds towards road free forests.
Oct 24, 2013 Press release: EUROPEAN PARLIAMENT BACKS THE PROTECTION OF ROADFREE AREAS.
http://kritonarsenis.gr/eng/actions/view/european-parliament-backs-the-protection. Federal land managers should recognize the tremendous carbon values in unroaded/unmanaged forests and avoid actions that would threaten these values.

In 1994, several scientific societies submitted a report to Congress and the President recommending conservation of roadless areas larger than 1,000 acres. This report is describe by the Interior Columbia Ecosystem Management Project as a "Major Stud[y] of Eastside Ecosystems and Management."
Because roads crisscross so many forested areas on the Eastside, existing roadless regions have enormous ecological value. ? Although roads were intended as innocuous corridors to ease the movement of humans and commodities across the landscape, they harm the water, soils, plants, and animals in those landscapes. [p 6]
?
4. Do not construct new roads or log within existing (1) roadless regions larger than 1000 acres or (2) roadless regions smaller than 1000 acres that are biologically significant.
Roadless regions constitute the least-human-disturbed forest and stream systems, the last reservoirs of ecological diversity, and the primary benchmarks for restoring ecological health and integrity. Roads fragment

habitat; alter the hydrological properties of watersheds; discharge excessive sediment to streams; increase human access and thus disturbance to forest animals; and influence the dispersal of plants and animals, especially exotic species, across the landscape. Because many forested areas in eastern Oregon and Washington are heavily dissected by roads, the ecological value of existing roadless regions is especially high. [pp 8, 202]
?
Our analysis defined a roadless region as any region where all points within an LS/OG stand were at least 100 meters from a road or trail.
?
What remains of ponderosa pine and Douglas fir LS/OG is the least protected today. In the four national forests within the Blue Mountains, 48% of the land base above 6000 feet lies in wilderness areas, whereas only 10% of the land below 6000 feet, where ponderosa pine occurs, receives such protection ? [p 110]

? Fifth, roads, whose impact on aquatic and terrestrial resources is well documented, are widely distributed in eastside forests. Road densities in western Colville, Winema, and Ochoco National Forests average 2.5, 3.5, and 3.7 miles per square mile, respectively. Densities reach 8.8 and 11.9 miles per square mile in some watersheds. In the national forests of Oregon's Blue Mountains (Table 5.2), less than 10% of roadless regions on slopes steeper than 60% are now protected, less than 15% on slopes of 30-60%. Moreover, roadless regions, like LS/OG patches, are extensively fragmented. In northern Ochoco National Forest, nearly one-third (38,882 acres) of 128,140 acres of roadless region consists of patches smaller than 1000 acres. (RARE II surveys underestimated total roadless area in this region [45,700 acres] because they considered only areas larger than 5000 acres.) [p 110]
?
CONCLUSIONS
Watersheds outside wilderness and roadless regions in eastern Oregon and Washington are highly degraded. Without an intensive restoration effort on federal and private lands, many native aquatic stocks and species risk extinction. [p 160]
?
Because the distribution of many native fishes in Oregon's national forests has receded into steep headwater areas, USPS has a vital role in protecting the few remaining watershed refugia and preventing further damage to already degraded habitats downstream. Critical to securing eastside [aquatic diversity areas] ADAs as aquatic refugia are the remaining roadless regions, sources of large wood from LS/OG forests, and the integrity of riparian corridors on national forestlands. [p 168]
?
7. High road densities harm many forms of wildlife.
The ecological integrity of existing LS/OG patches and other roadless regions can only be maintained if these sites are not disturbed by the construction of roads. Roadless regions serve as critical refuges for terrestrial wildlife sensitive to human disturbance. Road densities in LS/OG patches that already have roads should be reduced to less than 1 mi/mi2. Achieving this goal is vital to rehabilitation of eastside fisheries and terrestrial resources. [p 197]
Henjum, M.G., J.R. Karr, D.L. Bottom, D.A. Perry, J.C. Bednarz, S.G. Wright, S.A. Beckwitt and E. Beckwitt. 1994. Interim Protection for Late-Successional Forests, Fisheries, and Watersheds: National Forests East of the Cascade Crest, Oregon and Washington. A Report to the Congress and President of the United States. Eastside Forests Scientific Society Panel.

Before logging roadless areas the agency should consider the impacts to all the values of roadless areas, including:
(1) High quality or undisturbed soil, water, and air;
(2) Sources of public drinking water;
(3) Diversity of plant and animal communities;
(4) Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land;
(5) Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation;
(6) Reference landscapes;
(7) Natural appearing landscapes with high scenic quality;
(8) Traditional cultural properties and sacred sites; and
(9) Other locally identified unique characteristics.
36 CFR ?294.11
We are aware that the PNW Regional office issued a directive relative to uninventoried roadless areas, aka

"undeveloped areas". This 11-24-04 memo from Lisa Freedman wisely instructs the Forest Service to give consideration to "special" features of undeveloped areas regardless of size.
The Forest Service adopted new guidance concerning ecological restoration and resilience which urges managers to "Identify opportunities to sustain ecological refugia that may serve as vital sources of ecological diversity." FSM 2020.3 - Policy.
http://web.archive.org/web/20090511091720/http://www.fs.fed.us/im/directives/fsm/2000/id_2020-2008-1.doc.
This is an opportunity to look at uninventoried roadless areas in a fresh new light.

"It is well established in this [9th] Circuit that logging in an unroaded area is an 'irreversible and irretrievable' commitment of resources and 'could have serious environmental consequences.'" and therefore requires an EIS. Sierra Club v. Austin No 03-35419; DC No. CV-03- 00022 DWM (9th Circ 2003), citing Smith v. Forest Service 33 F.3d 1072, 1078 (9th Circ 1994). This project involves activities in such unroaded areas. The NEPA analysis for this project must discuss the impacts of proposed activities on all the many significant values of roadless/unroaded areas.
The NEPA analysis should discuss whether the project will push the landscape toward or away from the natural range of variability for large-scale habitat patches. Landscape analysis based on historic disturbance patterns suggests that historically the majority of old forest occurred in large patches. See Wimberly, M. 2002. Spatial simulation of historical landscape patterns in coastal forests of the Pacific Northwest. Can. J. For. Res. 32:13-16-1328 (2002) http://andrewsforest.oregonstate.edu/pubs/pdf/pub2859.pdf (72% of the total mature forest in the Oregon Coast Range was concentrated in patches >1,000 ha). These large patches of older forests that native fish and wildlife species evolved with are now severely underrepresented on the forest landscape and must be protected and restored.

The planning team should consider the conclusions and recommendations of the interagency Road Density Analysis Task Team:
Unroaded and low road density areas potentially represent areas in which the aquatic ecosystems are still operating with minimal human disturbances. Areas like these that provide for high quality habitat and stable fish populations are important refugia and a cornerstone of most species conservation strategies.
?
Even well engineered roads act as conduits for sediment (Filipek 1993). Lee et al. (1997), also note that although improvements in road construction and logging methods can reduce sediment delivery to streams, sedimentation increases are unavoidable even when using the most cautious logging and construction methods.

As stated in the Biological Opinion for bull trout (USFWS 1998), there is no positive contribution from roads to physical or biological characteristics of watersheds. Under present conditions, roads represent one of the most pervasive impacts of management activity to native aquatic communities and listed fish species.
?
RDAT Recommendation (4): The Regional Executives provide direction to the field units that allow for road construction in undesignated low road density areas only after completion of the mid/fine scale analysis of these areas.

Regional Executive Decision: While we agree that avoiding road construction in low road density areas with high to very high fish values may be desirable, we also recognize that providing direction precluding such development could conflict in some instances with our legal obligations under laws such as the Alaska National Interest Lands Conservation Act (ANILCA) and the 1872 Mining Laws. Rather than totally precluding such development, the BLM State Directors and Regional Foresters, through this transmittal letter, direct field units as follows:
A. Avoid new road construction in low road density areas to the extent practical, consistent with existing authorities and LRMPs, but keep in mind that in some cases the need to remove hazardous fuels may be paramount for long term watershed restoration,
B. Decisions to allow new road construction in low road density areas should not be made without an assessment of environmental effects, including any changes to the value of the low road density area as a current or potential stronghold for listed aquatic species. This assessment and/or analysis should also consider the amount of acreage within the watershed already in Wilderness and inventoried roadless areas, and
C. Where new road development in low road density areas cannot be avoided, road location and design should minimize effects to aquatic resources and incorporate practical mitigation measures, including closure or decommissioning of the road if the need for the road is temporary.
Land Management Recommendations Related to The Value of Low Road Density Areas In the Conservation of

Listed Salmon, Steelhead, and Bull Trout: A Commitment made as part of the Biological Opinions For Chinook Salmon and Steelhead (Snake River and upper Columbia River) and Bull Trout (Columbia and Klamath Rivers-areas not covered by the Northwest Forest Plan); Final Report; January 30, 2002; Prepared by the: Road Density Analysis Task Team.
http://web.archive.org/web/20021123151942/http://www.blm.gov/nhp/efoia/or/FY2002/IB/ib-or-2002-134.htm.

An action does not have to occur inside a RARE II boundary to affect a roadless area, because RARE II is not the final word on roadless lands. As the Forest Service is abundantly aware, the court ruled in California v. Block that actions affecting wilderness status could not rely on RARE II. The court ruled that RARE II did not comply with NEPA and "was inadequate to support the non-wilderness designations of the disputed areas and therefore violated NEPA." In the present case, the Forest Service is relying on an illegitimate RARE II boundary of this roadless area to support its contention that logging may occur in de facto roadless land without affecting future wilderness designation.

Further, the Forest Service Washington Office ruled in its appeal decision of the Idaho Panhandle Forest Plan Appeal that roadless areas must be evaluated individually when logging is to occur in them.

Consider the following Dec. 1999 comments from WWF and CBI on the proposed National Forest Roadless Rule:
In eastern Washington and Oregon, from 70 to 95% of the late-successional and old-growth forest that remain cover less than 100 acres. Three national forests (Colville, Wallowa-Whitman, and Winema) in this region have no late seral patches larger than 5,000 acres, and only one of the seven late-successional forests larger than 5,000 acres in three national forests (Malheur, Ochoco, and Umatilla) is protected (Henjum et al. 1994). For these reasons, the Eastside Scientific Society Panel (Henjum et al. 1994) recommended protecting all roadless areas of 1,000 acres or those smaller than 1,000 acres of ecological significance as key to restoring ecological integrity (aquatic and terrestrial) and maintaining the remaining patches of late-seral/old-growth forests across the region. Thus, it is imperative that the EIS recognize the importance of these smaller roadless areas for their contribution in maintaining late-seral forests throughout the nation and particularly in the regions identified above.

Setting Conservation Thresholds (coarse vs. fine filter approaches) - the basic premise of a coarse-filter approach is to protect representative habitats (particularly in redundant sequence) within an ecoregion as a means for minimizing the need and costs of protecting or managing every species. Based on the above review, the supposition that roadless areas act a coarse filter approach to biodiversity is not only plausible but scientifically defensable. In general, large roadless areas are more likely to capture a representative array of habitat types and elevation bands, particularly in highly complex regions, than small roadless areas. However, in many ecoregions (both eastern and western examples provided here) what remains of landscapes with ecological integrity is smaller than the RARE II threshold of 5,000 acres. Consequently, the 5,000 acres threshold is not as ecologically meaningful as 1,000 acres for maximizing the conservation benefits and opportunities to achieve the twin goals of representation and ecosystem restoration. A more defensible threshold would be to use 1,000 acres as the initial starting point, back-filling with fine filter conservation approaches aimed at targeting smaller areas of ecological significance and ecological hot spots such as endemic species foci that operate over smaller spatial scales. This process would more effectively ensure an "adaptive" conservation approach that makes use of coarse and fine filters, achieves representation objectives, and is consistent with recommendations as proposed by the scientific community above and the Eastside Scientific Society (Henjum et al. 1994). To set the threshold at 5,000 acres would increase ecological risks significantly.
http://replay.waybackmachine.org/20060615084657/http://www.worldwildlife.org/wildplaces/kla/pubs/roadscope.pdf.

The Wilderness Society has released a report on the relationship between healthy watersheds and protected lands in the National Forest System. They used GIS technology to study the overlap between three categories of watershed conditions (properly functioning, at risk, and impaired) and three types of national forest land designations (Wilderness, Roadless, and all other national forest lands). The results at a national scale (as summarized below) show a striking association between watershed health and land protection (i.e. "water loves wilderness").

///

///

///

Mike Anderson, J.D., Collene Gaolach, M.S., Janice Thomson, Ph.D., and Greg Aplet, Ph.D. 2012. Watershed Health in Wilderness, Roadless, and Roaded Areas of the National Forest System. The Wildernes Society. http://wilderness.org/sites/default/files/wilderness_newsroom_toolsfactsheets_forestsandpubliclands_AI_060512_factsheet1.pdf.

Optimal Mix of Treated and Untreated
Oregon Wild supports thinning of young planted stands when such projects are well planned and designed to accomplish comprehensive restoration objectives and carefully implemented to avoid unintended consequences. One of the key considerations is to find the optimal mix of treated and untreated patches within and between stands. This is because thinning benefits some aspects of late successional forest conditions such as large trees and vegetation diversity, but thinning also has adverse effects on other aspects of late successional forests such as dead wood recruitment, biomass accumulation, wildlife cover, soil quality, and microclimate conditions. In order to achieve all the objectives for optimal late successional forest conditions, restoration projects must contain both thinned and unthinned patches. Finding the right mix should not be an accident based mostly on operational feasibility and site constraints, but should be a conscious decision based on quantitative analysis showing how best to achieve optimal late successional conditions. Since thinning has a long-term negative effect on reducing recruitment of dead wood, it should be treated as a limiting factor and used to drive the search for an alternative with the most appropriate mix of treated and untreated stands.
It is useful to apply the concept of "habitat complementation" based on proximity of different stand types and different needs of wildlife. Some stand types provide shelter from predators and weather, while other stand types provide foraging opportunities. Recognize that the thoughtful juxtaposition of thinned and unthinned areas can provide habitat benefits greater than large homogeneous areas of either thinned or unthinned. There is a synergy to creation of a mosaic of thinned and unthinned stands that is greater than the sum of its parts. With this recognition, an important purpose of the NEPA document and the ultimate decision is to seek and find the most optimal mix of treated and untreated areas. Instead of an 80/20 mix of treated/untreated areas, consider a variety of combinations such as 60/40, 50/50, 40/60, and 20/80. Note that both the absolute proportion and the spatial pattern of treated and untreated must be considered.
Consider the ecological costs and benefits of both thinned areas and unthinned areas. Thinned areas grow big trees (but fewer of them), while unthinned areas recruit more dead wood habitat structure in the short and long-term. In order to accomplish real ecological restoration in young stands we need to plan for and implement both thinned areas and unthinned areas.
Determining the appropriate scale of thinned and unthinned areas is a critical decision which requires clear objectives and quantitative analysis. One necessary component of such an analysis is to determine how many green trees are needed at what density in order to recruit sufficient snags over time (both short and long-term) to achieve 50-80% DecAID tolerance levels across the project area.
It is important to integrate the analysis of road access and the optimal mix of treated and untreated areas. Since road construction has serious adverse impacts on soil, water, weeds, and wildlife, and because some areas will contribute to ecological goals while not being thinned, the agency should just allocate inaccessible areas to the untreated portion of the mix. This will lead to complementary benefits - avoided road impacts, and ecological benefits associated with dense forest and long-term dead wood recruitment.

Big game cover and forage requirements, and dead wood habitat recruitment represent good tools to help optimize the mix of treated and untreated stands and the scale and extent of untreated skips and heavily-thinned "gaps" within treated stands. Thinned areas may provide better forage opportunities for big game, while untreated skips offer essential hiding cover for big game and other wildlife. Thinned and regenerated areas are not expected to recruit adequate numbers of snags and dead wood habitat over time, while untreated areas will recruit near-natural levels of dead wood habitat. The need for well-distributed patches of relatively dense forest where snags are continuously recruited is a good 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 agency should consider alternatives with different mixes of treated and untreated areas for this purpose.

General recommendations for dry forest thinning/restoration
We urge the FS to consider integrating the following principles into the design of this project.

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 http://www.firescience.gov/projects/09-2-01-16/project/09-2-01-16_09-2-01-16_rmrs_gtr292web.pdf

4. 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.

5. 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.")
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.

6. 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.

7. There are a lot of people calling for an increase in the "pace and scale" of restorationon eastside forests. The large size of recent projects raises concerns because the agency may run out of things to do. If the agency moves too fast, they 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.

8. 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.

9. 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.fed.us/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.

10. Protect soil and water quality by avoiding ground-based logging and log hauling during the wet season.

11. 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.

12. 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/mi2.

13. 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.

14. 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.

15. 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 Graham, 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.")

16. 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.

17. 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

18. 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.")

19. "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 also 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, vegetation treatments can focus on modifying fuels to protect infrastructure. Outside the structure ignition zone, treatments should focus on ecological restoration, where fuel hazard is but one consideration. 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. 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.")

20. 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.

21. 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

22. 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 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 Z?st, 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.

23. 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.

24. 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 goashawk, 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 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.

25. 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-dryer-windier; and makes site resources available to stimulate the growth of future surface and ladder fuels. Amy E.M. Waltz, Peter Z. Ful?, W. Wallace Covington, and Margaret M. Moore. 2003. Diversity in Ponderosa Pine Forest Structure Following Ecological Restoration Treatments. Forest Science 49(6) 2003.
http://www.globalrestorationnetwork.org/uploads/files/LiteratureAttachments/91_diversity-in-ponderosa-pine-forest-structure-following-ecological-restoration-treatments.pdf (Kaufmann M.R., G.H. Aplet, M. Babler, W.L. Baker, B. Bentz, M. Harrington, B.C. Hawkes, L. Stroh Huckaby, M.J. Jenkins, D.M. Kashian, R.E. Keane, D. Kulakowski, C. McHugh, J. Negron, J. Popp, W.H. Romme, T. Schoennagel, W. Shepperd, F.W. Smith, E. Kennedy Sutherland, D. Tinker, and T.T. Veblen. 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. 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.

26. 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. http://ecoshare.info/projects/central-cascade-adaptive-management-partnership/workshops/restoring-westside-dry-forests/

27. 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.

28. 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.

29. 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.

30. 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. 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.

31. 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 and fuel laddering into the dominant fire tolerant overstory?" Umqua NF, Diamond Lake RD, Lemolo Pine Health Maintenance Burn Project, June 1, 2010 scoping notice.

32. 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.

33. 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.

34. 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.

35. 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. 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.

36. 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, https://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.

37. 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 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.

38. 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.")

39. 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.

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

41. 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.

42. 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). 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 you have determined the relative acres accessed per mile of road construction, you can take the analysis one step further, to 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 standards for big game, 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/mi2. 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.

43. 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.

44. 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?

45. Provide clear and detailed descriptions of silvicultural prescriptions and marking guides in the NEPA document.

46. 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

47. 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, dryer, 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 benefit s 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, dryer, 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.")

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-dryer-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 indicate a need for caution.

Conducting "restoration" at such a large scale assumes that we know exactly how to do it and that there are no meaningful trade-offs. This assumption is not supported by the evidence. Forest restoration is still a work-in-progress and the agencies need to approach every project with caution and 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.

The NEPA analysis should address the following unresolved questions that seem to come up again and again:

1. 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 innitial 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.

2. 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.

3. 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

4. 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. See 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. 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.

5. 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, dryer, windier, and stimulates growth of future ladder fuels? 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, dryer, 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.fed.us/rm/pubs_other/rmrs_2010_reinhardt_e001.pdf.

6. 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.

7. 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.

8. How much dead wood habitat should we be leaving, and how do we ensure that enough is provided through time? In a natural forest, 100 percent of the trees that grow in the forest stay in the forest (and provide a wide variety of ecosystem functions) until trees combust or decompose. Exporting trees from the forest truncates important ecological cycles and habitat values associated with tree growth, mortality, and decay. 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.
* 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. http://www.fs.fed.us/psw/publications/documents/gtr-181/.
* 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. 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.

9. Project designed to limit mortality must recognize that logging mortality is likely greater than expected natural mortality. Logging will cause greater mortality than the alleged natural disturbances that the logging is intended to address. The FS needs to explain why mortality from natural events like drought, beetles fire are unacceptable, while mortality from logging is acceptable. This is analogous to the 9th Circuit's decision in Humane Society vs Locke (9th Circ. November 23, 2010) which halted the killing of sea lions below Bonneville Dam because "NMFS has not adequately explained its finding that sea lion predation is having a significant negative impact on salmonid decline or recovery in light of its positive environmental assessments of harvest plans having greater mortality impacts. The absence of an explanation is particularly concerning with respect to the 2005 fishery environmental assessment. In that assessment, NMFS found that a plan providing for fisheries to take between 5.5 and 17 percent of listed salmonids annually, depending on run size, would be expected to result in "minimal adverse effects on Listed Salmonid [populations] in the Columbia River Basin," and that the "[c]umulative impacts from NMFS's Proposed Action would be minor if at all measurable." Those findings are in apparent conflict with NMFS's finding in this case that sea lions responsible for less or comparable salmonid mortality have a "significant negative impact" on the decline or recovery of these same populations, yet the agency has not offered a rationale to explain the disparate findings.... NMFS cannot avoid its duty to confront these inconsistencies by blinding itself to them." http://www.ca9.uscourts.gov/datastore/opinions/2010/11/23/08-36038.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. This is probably important in all forests where we are trying to maintain viable populations of wildlife that evolved with natural cycles of tree growth and mortality. See

* K. Norm Johnson, Jerry Franklin, Debora Johnson. The Klamath Tribes' Forest Management Plan. May 2008. http://www.klamathtribes.org/background/documents/Klamath_Plan_Final_May_2008.pdf.
* 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.
* S?NDOR 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.
* Carey, Andrew B., Janet Kershner, Brian Biswell, and Laura Dominguez de Toledo. 1999. Ecological Scale and Forest Development: Squirrels, Dietary Fungi, and Vascular Plants in Managed and Unmanaged Forests. Wildlife Monographs, No 142, Supplement to the Journal of Wildlife Management, Vol. 63 No. 1, January 1999. http://www.fs.fed.us/pnw/pubs/journals/pnw_1999_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
* 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. ftp://ftp2.fs.fed.us/incoming/r5/Science/Rhodes%20&%20Baker%20(2008).pdf.
* 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]hadetolerant 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.
* 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.

* 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.fed.us/pnw/sciencef/scifi85.pdf.
* 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?
* How to appropriately integrate management before, during, and after disturbance. Right now our 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.
* 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 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. 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.
http://dl.dropbox.com/u/47741/Heiken_Log_it_to_Save_it_v.1.0.pdf
These questions are not intended to doubt the need for restoration but rather to refine the focus of restoration and improve methods. The NEPA analysis should consider a full range of NEPA alternatives to illuminate and explore these unresolved issues.
Supplemental Input from Rob Klavins' on the Scope of the Blue Mountains Forest Resiliency Project

Collaborative Involvement:
* When the Forest Service has consulted with collaborative groups on this project, there has been a tremendous amount of mixed messaging and there has been a distinct disconnect between those mixed messages and action by the Forest Service on this project. This is especially true in the realm of public involvement, education, and interface with collaboratives. Some of it may come from good intentions, but this project was not collaboratively developed and has already arguably served to deepen divisions within collaboratives and between stakeholders.
* At a meta-collaborative meeting in Baker City in 2015, in a presentation about this project, the Forest Service stated that a lesson learned from the Lower Joseph project was that "the team did not have much time to discuss and hear what the collaboratives themselves wanted?We're not going to just do work [on BM Resiliency] and then just ask for buy-in." How has the Forest Service honored those words? Can that be harmonized that with increasing pace and scale? If so, how?
* Many collaborative members have raised concerns with the Forest Service about this project. Individually and as part of collaboratives groups, Oregon Wild staff have spent many hours being talked to by the Forest Service, but we have had disproportionally little opportunity to offer practical, implementable feedback. We assume our experience is not unique.
* The Forest Service - along with some stakeholders have - mischaracterized this project, the positions of stakeholders (and collaboratives), assumptions about the state of our forests, and the process that has taken place so far.
* By their very nature, even the most effective and celebrated collaboratives are exclusionary. They may be helpful in augmenting public involvement, understanding interests, and overcoming conflict. However they do not and should not substitute for full public involvement.
* A number of collaboratives in the forests being covered by this project have not yet reached a level of maturity where they regularly act as entities unto themselves. Rather - even when there appears to be agreement - they are made up of stakeholders and diverse interests that are frequently unreconciled.
* The Forest Service must be careful not to inappropriately scale-up Collaborative agreements made in

specific sets of circumstances by specific interests or make assumptions about broader agreement that may not exist.

* Different Collaborative groups have come to different zones of agreement that the Forest Service has indicated it wants to adopt in this project. Which ones will the Forest Service choose? By what criteria will differences be reconciled or chosen?
* Dry forest treatments in this project are often characterized as "the easy stuff" on which there is a great deal of agreement. These are the very things novice Collaboratives should focus upon. This project runs the risk of taking all the "easy stuff" off the table and may force nascent Collaboratives to prematurely tackle controversial issues and undermine their own goals.

RHCA's

* PACFISH and INFISH allow some treatment in RHCA's but require site-specific or watershed analysis. RHCA's in other projects have been treated based on site-specific information and/or after a great deal of public involvement and stakeholder buy-in. Without that information how does the Forest Service plan to get through consultation?
* RHCA treatments and plan amendments based on conditional treatments on a landscape of this size and diversity represent a much broader change that could violate the Forest Plans, the ESA, and other important provisions.
* The Forest Service has said it wants to learn whether there is "social license to do RHCA treatments within a narrow scope and timeframe" that seems largely based on the team's experience with the Lower Joseph project. It is dangerous to assume that leaps of faith from some stakeholders on RHCA treatments in Lower Joseph and other recent projects should be precedent-setting or scalable - even if they are achieved.
* At a meeting, the Forest Service acknowledged that when it comes to RHCA's, "we know there's a lack of information. We need to know how much we need and how we get it". How has the Forest Service addressed that question? We urge caution in meeting absolute minimal requirements. The Forest Service can and should do better. We also urge caution about assuming too much social acceptance of third party analysis as was done in Lower Joseph or lack of controversy in treatments on projects like Little Dean or Thomas Creek.

Pace and Scale and Scope

* The Forest Service seems to have embraced the goal of "increasing pace and scale". While some interests share that vision, the Forest Service must recognize that many stakeholders are more concerned about increasing the quality of work as much as doing things faster and bigger. If this project is to be successful, the agency must focus as much or more on quality as on quantity.
* The Forest Service has indicated that increasing the pace and scale of a project such as this requires narrowing the focus. However that runs directly counter to the combining of two projects (strategic fuel breaks in moist forests and density reduction in dry forests) initially considered as separate. The fuel breaks project will include moist forests, dry forests, high and low elevation, WUI and backcountry. Rather than narrowing scope, the Forest Service has dramatically broadened it.
* Since the Forest Service broadened the scope of the project, why not address grazing damage, roads, carbon storage, water retention, wildlife corridors, fish passage, or connectivity in an age of climate change? Why did the Forest Service focus to choose on this narrow aspect of resilience over all others?
* By planning on such a massive scale, the Forest Service risks locking an entire ecosystem into a 2015 understanding of the state of the world and our effect on it. Given that the project is premised on decades of earlier - and ongoing - mismanagement, we would suggest a more humble approach. At the very least the project must contain a robust adaptive management mechanism. As new science comes to light - which it almost certainly will during the length of this project - there should be a pre-planned way to include that over time.
* Natural fire provided a mosaic of effects over time. Humans doing it at this scale in a compressed timeframe may cause more - or simply different - problems. Treating every dry acre in the next 10 years is very different than the next 25 or 50.
* By taking all the "easy stuff" off the table (as described above) on such a scale, the Forest Service risks creating a future shortage of wood volume and work for commercial interests. A project of this size may maintain - or create demand - that the project may make harder to sustain into the future.
* At a 2015 meta-collaborative meeting, the Forest Service indicated the project would likely treat moist forests adjacent to dry forests as part of the dry forest treatment. How will the Forest Service decide where to draw the line?
* Large-scale together with site-specific is an oxymoron. Simply identifying a stand does not suffice as "site-specific." Forest Service staff have admitted they are "stretching the limit" but are convinced "we can do it." What is the limit for an implementable NEPA decision? When does this become simply an experiment to

see what the law allows or what limits the public can be pushed to?

* We urge you to honor the spirt and letter of the on the Roadless Rule and other important safeguards. We also urge the Forest Service to avoid controversy by avoiding commercial activities and road building in potential wilderness areas, other unroaded lands, backcountry, and other areas that are otherwise valuable and sources of controversy.

Fire Breaks

* Creating fire breaks before a fire has some potential appeal. To the extent it is appealing, the appeal is largely based on the likelihood that they will actually be used and effective, that they will reduce the need for overly aggressive fire suppression, that they will allow fire to take a step towards playing out its historic role on the landscape, and the extent to which trade-offs can be minimized. What assurances can or will be given that that will be the case? Is this the final plan or, if implemented, can we expect this to be just the start of more such breaks? What maintenance will they require (especially in light of the fact that openings may quickly become bigger fire hazards than they were before)? Have resources or plans been identified to maintain them? We urge the FS to analyze the likelihood of fire control benefits and ecological costs (tradeoffs), accounting for the less-than-100% probability of fire.
* Since roads are an ignition source, decommissioning roads should be considered within the scope of the fire breaks project. Given the reticence to seriously address road concerns, that's especially true if "creating containers" along roads will make those roads more permanent and increase & expand the many impacts (invasive species, windfall potential, fire ignition, hydrology, illegal activity, decreased wildlife security, etc.) of those roads.
* Fire breaks could break up areas that were left intact based on past intentional decisions. That should be considered.

Analysis

* Oregon Wild has long supported landscape level analysis. That analysis must look beyond Forest Service Lands, other public lands, and inholdings. Not doing so ignores values that may look over-represented on the Forest that are critically deficient across the broader landscape and vice-versa. A real landscape look should take into account lands permanently converted by agriculture, industrial timber practices, and other development.
* Oregon Wild supported landscape-scale NEPA in the Wyden East Side bill but it's notable that bill looked at areas of 50-250k acres, not several million. It was also informed by important agreements to avoid controversy and an independent science team that looked at an area first and created sideboards.
* HRV assumptions should be broadened. Roads, wheat, and cows are above HRV. Many wildlife species are far below HRV. We don't know the HRV of insects and other natural disturbance

Implementation

* A great deal of discretion on complex actions and interpretation will be left to unknown actors in implementation. That leads to a great deal of uncertainty that needs to be minimized and accounted for in the effects analysis. Specific prescriptions should be included in the DEIS so collaboratives and the public can see exactly what is being proposed beyond the general principles.
* Who will be interpreting conditional prescriptions? Who will oversee and monitor them?
* Given the complexity of the landscape, and it would be impossible to consider all possible permutations, what are the conditions for conditional prescriptions? There are infinite variables.
o Consider a hypothetical example: it's 2023. In-migration to eastern Oregon has resulted in a local citizenry that opposes commercial activity on public lands. Forests are more resilient to climate change than expected. A particular stand has escaped a beetle outbreak that has affected most of the Blues. The stand includes a seep on a south slope near a cultural site within a recently burned dry forest. A litter of lynx were photographed nearby and while Goshawk are no longer of concern, Douglas squirrel are now critically endangered and a new species of paintbrush has been discovered. Which of those factors would matter? How would they be considered? How would the public know? What substantive input could they have?
* What will constitute a change in condition? Staff turnover? Climate change? Development? Social change? Listing or de-listing of a species? New science? Change in condition elsewhere in the landscape? A decrease in fire suppression? An increase in prescribed fire implementation? Available resources? Economic conditions? A new Forest Plan?
* Treatments may be premised on aspirations the Forest Service can't guarantee (decreased fire suppression, prescribed fire implementation, etc.). What assurances can the public have on full or partial implementation? Especially those parts that may be less economically profitable? Without them, it's hard to see the BM Resiliency project as anything other than a straight timber sale(s). If those assurances are insufficient, the Forest Service should analyze the effects of the project with an acknowledgement of likelihood of

implementation of particular components.
* If a large fraction of marketable trees are taken off the landscape with this project, it will make funding of future work more difficult.
* From our perspective dry forest restoration is more than fire resiliency through cutting trees and prescribed fire. It requires addressing aspen decline, roads, over-grazing, etc.

Economics/Social
* The Forest Service should consider the effect of the project in creating (or propping up existing) extractive infrastructure that may create future demand and the effect of that future demand.
* The Forest Service has expressed that "Social and economic vitality and resilience are significant concerns." We don't disagree, but at what scale? This plan should reflect the fact that our forests are becoming increasingly important for water supply, carbon storage, biodiversity conservation, and quality of life.

Process/Public involvement
* What opportunities will the public have for meaningful involvement in the future? What tools will they have to effect outcomes?
* The intent of fundamental laws and rules like NEPA, the Roadless Rule, 21" screens, etc. are as important as the letter of those laws.
* We may agree with a great deal of the premise of dry-forest restoration needs, landscape-level planning, and likely some site-specific treatments. But we also have a lot of concern over process. Not just because we like process, but because of what it leads to on the ground.
* We have heard this is meant to be a "different way of doing and thinking about things". Does that extend beyond process? If active management, logging, and fire suppression created the problem, how is more active management, logging, and fire suppression different? Is the Forest Service really changing the way things are done, or just the way it's talked about and the process to get there?

Footnotes
1- http://www.fs.usda.gov/detail/r6/landmanagement/resourcemanagement/?cid=fseprd490874
2- As far as we can tell there was no formal scoping document released besides the notice in the Federal Register and the tables of watersheds and their existing and desired conditions. The project website, ___, contains only the Federal Register notice, the tables document, and maps of the areas in which the projects are proposed to take place.
3- 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).'
4- 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.
5- 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.
6- 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
7- 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.
8- 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. ftp://ftp2.fs.fed.us/incoming/r5/Science/Rhodes%20&%20Baker%20(2008).pdf.
9- Interforest Report (2000). http://web.archive.org/web/20040202102340/http://klamathtribes.org/forestplan.htm
10- "thinning captures mortality" is kind of a term of art.
The point of forestry (under the agricultural model) is to prevent all mortality except at the time of harvest, at which point mortality is "captured" before beetles or competition can cause any tree death, and before the wood might rot and become less economically valuable.
Thinning tends to reduce most agents of mortality and increase tree vigor. After thinning there is a log period

when snags are in short supply. And just about the time agents of mortality might kick in, the agency will likely want to re-enter the stand and thin again, increasing vigor and reducing snag recruitment. This repeated cycle leaves the forest short of dead wood and this is one of the primary reasons we need to leave of mix of thinned and unthinned stands across the landscape.
In a natural forest, natural agents of mortality do the thinning instead of chainsaws, and the dead trees stay in the forest.
11- http://web.archive.org/web/20070808101639/http://www.reo.gov/monitoring/10yr-report/documents/synthesis-reports/index.html
12- 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://www.sustainablenorthwest.org/bmfp/hessburg__salter__james_paper_11.pdf
13- 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.
14- 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.
15- 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
16- "[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.

zip file on O drive