April 30, 2018

Regional Forester, Objection Reviewing Officer
Pacific Northwest Region, USDA Forest Service
ATTN: 1570 Objections and Appeals
PO Box 3623
Portland, OR 97208-3623

Subject: OBJECTION to Mission Restoration Project

Objection transmitted as attachment to the following email addresses: objections-pnw-regional-office@fs.fed.us and: https://cara.ecosystem-management.org/Public//CommentInput?Project=49201

Pursuant to 36 CFR 218 regulations, this is an objection to the draft Decision Notice (DN) proposing to implement Alternative 2 from the Mission Restoration Project Final Environmental Assessment (Mission EA, or EA) on the Methow Valley Ranger District, Okanogan-Wenatchee National Forest (OWNF). The Responsible Official is Forest Supervisor Michael R. Williams. This objection is filed on behalf of Alliance for the Wild Rockies, Conservation Congress, and WildLands Defense (Objectors).

The draft DN's selected Alternative 2 would authorize logging of approximately 8 million board feet from approximately 1,853 acres. Figures describing Alternative 2 from the Mission EA:

Figure 6. Alternatives 2 and 3 Proposed Treatments

Treatment Type	Description	Amount	Alternative
Non-Commercial Thinning	Plantation Thin	1,738 acres	2, 3
	Wetland Thin	22 acres	2, 3
	Ladder Fuel Reduction Thin (outside of commercial thinning units)	6,500 acres	2, 3
	Post and Pole Thin	36 acres	2, 3
	Conifer Girdling & Thin for Aspen Restoration	71 acres	2, 3
	Subtotal Non-Commercial Thinning	*8,367 acres*	
Commercial Thinning	Aspen Release Thin	160 acres	2, 3
	Moist Forest Thin	70 acres	2, 3
	Dry Forest Restoration Thin	1,280 acres	2, 3
	Dry Forest Restoration – Dwarf Mistletoe Thin	284 acres	2, 3
	Variable Retention Regeneration (VRR) Thin and post-harvest tree planting	59 acres	2, 3
	Subtotal Commercial Thinning	*1,853 acres*	

Prescribed Fire	Hand-piling and pile burning	2,900 acres	2, 3
	Machine-piling and pile burning	702 acres	2, 3
	Underburning	6,617 acres	2, 3
	Landing pile burning	179 landings	2, 3
	Subtotal Prescribed Fire	*10,219 acres + 179 landings*	
Soil Restoration	Sub-soil areas of previously-compacted soil	468 acres	2, 3
Culvert Replacement	Replace culverts where fish barriers exist on fish-bearing streams	8 culverts	2, 3
	Replace culverts where existing culverts are undersized on non-fish-bearing streams	15 culverts	2, 3
Beaver Habitat Enhancement	Enhance and protect areas viable for future beaver utilization.	8 sites	2, 3
West Fork Buttermilk Bridge Replacement	Replace bridge across West Fork Buttermilk Creek to restore motorized access	1 bridge	2
Coarse Woody Debris (CWD) Enhancement	Restore deficient levels of CWD in fish-bearing stream channels.	8.2 miles	2, 3
Rock Armoring	Apply rock to road surface at stream crossings.	Alt 2: 6 stream crossings Alt 3: 33 stream crossings (6 crossings will be funded through the timber sale, and 27 with outside funds)	2, 3
Hardened Fords	Construct rocked open fords on stream crossings	4 stream crossings	3

Figure 7. Alternative 2 Proposed Transportation Changes

Road Type	Existing (miles)	During Project	Post-Project Status			
			Open NFS Roads	*Closed NFS Roads*	*Closed NFS Roads with Administrative Access*	*Decommissioned*
Open NFS Roads	56.1	80.6	45.7	2.6	5.5	2.2
Closed NFS Roads	62.8	36.7	4.4	29.5	9.7	19.2
Unauthorized Roads	15.8	15.8	0.61	2.7	0.2	12.1
Total	**134.7**	**133.1**	**50.7**	**34.8**	**15.4**	**33.6**

Objectors submitted comment letters on the Proposed Action dated June 1, 2016 and June 3, 2016; and submitted three comment letters on the Mission EA dated March 1, 2017, April 3,

2017 and July 25, 2017. We incorporate all those comment letters into this Objection, by reference.

This objection also incorporates by reference the Objections to the Mission project submitted by Don Johnson and Chris Frue.

Regulations require Objectors to demonstrate how the issues we raise are related to those we raised in our previous comments. To simplify this demonstration we include the original text of our 4/3/2017 and 7/25/2017 comments below in blue text[1] (exceptions are where our EA comments included some text blocks or figures snipped from other documents, which are highlighted with blue background shading.) Additional discussion will be in normal black text, written into the appropriate section.

Response to Comments
To provide context for an untitled and undated Forest Service document, the agency posted its response to comments on the EA where it posted specialists reports in July 2017 thus:

From inspecting this "Responses to Comments on Draft EA" document publicly posted on March 28, 2018 (almost two weeks into the Objection period), we have no idea how the Forest Service (FS) responded to or even considered most of the comments we submitted during the comment periods on the EA. It appears the vast majority of comments were simply ignored.

The lack of responses to our comments is a public process issue. In responses to public comments on the Objection process, the USDA stated in the Federal Register, "The objection process is intended to be an open and transparent process for considering and seeking resolution of lingering issues." Those regulations also indicate the FS doesn't feel obligated to respond to all the issues raised in objections, and our experience with the process bears this out. So by ignoring and failing to respond to earlier comments, the FS ensures the list of "lingering issues" is long, left for federal courts to resolve. That's terrible public policy.

[1] This also gives the FS another crack at actually responding to our comments, which have so far been largely ignored.

Also, following the public comment period on the June 2017 "Revised Preliminary" EA, twenty-five (25) more pages were added to chapters 1 – 3 for the "Final" EA dated March 2018.[2] The Introduction to the Final EA states, **"**Edits were made to address some of the comments on the Preliminary and Revised Preliminary EAs." Other than that statement, the FS didn't explain the reason for the additional 25 pages. The amount of new analysis constitutes significant new information the public has never previously had the opportunity to comment on. The Objection period is not the proper timing for public review of new information and analysis. Proceeding without a public comment period on this substantially altered EA violates 36 CFR § 218.22.

Remedy: Withdraw the draft DN and prepare an Environmental Impact Statement (including providing the required comment periods and written responses) for the reasons stated above and later in this objection.

April 3, 2017

Michael Williams, Forest Supervisor,
Okanogan-Wenatchee National Forest
c/o Meg Trebon
Methow Valley Ranger District
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Comments transmitted as an attachment to the following email addresses:
https://cara.ecosystem-management.org/Public/CommentInput?Project=49201 and comments-pacificnorthwest-okanogan-methowvalley@fs.fed.us

Mr. Williams, Ms. Trebon;

I appreciate the opportunity to provide comments on the draft Mission Restoration Project Environmental Assessment (EA), on behalf of WildLands Defense, Alliance for the Wild Rockies (AWR), Conservation Congress and the Upper Columbia Group of the Sierra Club.

Restoration priorities
We commend the Forest Service (FS) for proposing to decommission 33.6 miles of miles of road (56.2 miles with Alternative 3). However, even Alternative 3 (emphasis to "Increase scale of aquatic/hydrologic restoration") is still too skewed toward "restoring" vegetation conditions rather than healing an overly roaded landscape. But we begin by identifying scientific support for minimizing the road system. Wisdom, et al., 2000, conducted analyses of the Interior Columbia River Basin and made the following statements (emphases added):

> Our analysis …indicated **that >70 percent of the 91 species are affected negatively by one or more factors associated with roads.** …**Comprehensive mitigation of road-associated factors would require a substantial reduction in the density of existing roads as well as effective control of road access in relation to management of**

[2] This was in addition to the 20 pages added to the June 2017 "Revised Preliminary" EA from the January 2017 "Preliminary" EA.

> **livestock, timber, recreation, hunting, trapping, mineral development, and other human activities.**
>
> **...Efforts to restore habitats without simultaneous efforts to reduce road density and control human disturbances will curtail the effectiveness of habitat restoration, or even contribute to its failure; this is because of the large number of species that are simultaneously affected by decline in habitat as well as by road-associated factors.**

Portraying the proposal as "restoration" is dishonest—this project is all about tree farming for timber production. One of the touted "restoration" benefits, repeated dozens of times in the EA, is to increase the growth rate of the remaining trees, as if having large trees on the landscape for their ecological benefits for a long time is the FS's priority. Yet we find no plan that designates retention of any specified number of large trees across a wide landscape for an extended period of time into the future—not in this EA, not in the Forest Plan for the Okanogan National Forest (forest plan), and not in the 2012 Okanogan-Wenatchee National Forest Restoration Strategy. Even the non-commercial treatments are tailored to maximize wood production.

As far as the "restoration" being alleged to address the impacts of long-term fire suppression, likewise there is no cogent plan for integrating wildland fire back into this ecosystem. The Forest Plan and this EA are all about continuing this repressive and suppressive regime, however the FS has never conducted an adequate cumulative effects analysis of its forestwide fire suppression despite the vast body of science that has arisen since the Forest Plan ROD was signed in 1989. The "plan" is clearly to log now, suppress fires continuously, and log again in the future based on the very same "need" to address the results of fire suppression.

True restoration of these already heavily logged and roaded watersheds would prioritize removing the impediments to natural recovery. The Montana Forest Restoration Committee, 2007 adopted 13 Principles, written collaboratively by a diverse set of stakeholders which included two national forest supervisors along with representatives from timber and forest products industries, conservation groups, recreation interests, and others. Principle #3 states:

> Use the appropriate scale of integrated analysis to prioritize and design restoration activities: Use landscape, watershed and project level ecosystem analysis in both prioritization and design of projects unless a compelling reason to omit a level of analysis is present. While economic feasibility is essential to project implementation, **priorities should be based on ecological considerations and not be influenced by funding projections.** (Emphases added.)

Consistent with this principle, the FS would publish a landscape assessment so a genuine scoping process would guide project restoration priorities. Instead, the FS prioritized project activities based upon appropriated funds and collaborator input. The FS took Congress's ill-informed priorities for this project area (logging) and promoted them via "collaboration" to subsidize narrow financial interests. The collaborators' concerns don't include such important issues as maintaining wildlife populations, habitat security, soil productivity, and there is not a single

restoration goal or metric. That the collaborators don't represent wildlife, fish, biological diversity, sustainability, or good science reveals their illegitimacy for any pre-NEPA process.

Given the highly adverse impact of forest roads, as discussed in below section, the FS should instead pursue an alternative that results in a road system reduced to the level which is fully affordable to maintain on an annual basis, within all of the watersheds affected by the proposal. Expected annual appropriations would be the yardstick to measure "affordable", based on recent years' funding levels. The actions needed to reduce the road system to this affordable level need not themselves be within expected budgets. Indeed, few restoration projects proposed or implemented by the FS are fully funded by appropriated dollars. Figuring out a way to fund road decommissioning would follow from a decision to implement it. That would be a way to collaborate productively.

In analyzing such an alternative, it may turn out that some roads the EA proposes for maintenance or upgrading may not be affordable to maintain, or may be located where chronic sedimentation into streams persists. In such cases consideration of highest restoration priorities would require full road obliteration.

Such an alternative would be in compliance with the Travel Management Rule Subpart A, which requires the FS to identify the forestwide minimum road system—itself necessarily being maintainable using expected annual appropriations. This alternative would be consistent with Montana Forest Restoration Committee Principle #13, which is to "Establish and maintain a safe road and trail system that is ecologically sustainable."

By reducing the footprint of roads, such an alternative would reduce the spread of noxious weeds and their associated costs and environmental damage.

Such an alternative would also fully decommission/obliterate any unauthorized roads and unauthorized ATV/OHV routes on national forest land in the project area to restore hydrologic functioning and soil productivity, improve visitor safety, reduce spread of noxious weeds, and promote ecosystem integrity.

Such an alternative would not construct any new roads, including temporary roads, or excavated skid trails. The Roadless Rule EIS agrees that in many cases "temporary" roads create the same adverse impacts as permanent system roads—and that is verified in cases such as this when previously decommissioned "temporary" roads are proposed for construction once again.

Such an alternative would not log, mechanically treat or build roads within unroaded/roadless areas. The Scientific Assessment which was a basis for the ICBEMP EIS, along with much other scientific research, point out that Wilderness and roadless areas already have the highest ecological integrity of all lands.

Such an alternative would maximize the short-term sequestration of carbon in the forest, because already dangerously elevated greenhouse gases are an immediate issue that must be addressed.

Remedy: Choose the no action alternative. Alternatively, withdraw the EA and draft DN and prepare an Environmental Impact Statement, including a truly ecologically-based restoration alternative for full public review and NEPA analysis.

Environmental Impact Statement is required

Comments our groups submitted during the scoping period identified reasons why an Environmental Impact Statement (EIS) is necessary in order to comply with the National Environmental Policy Act (NEPA) for development of the Mission project. From our reading of the EA, several additional reasons arise that support the need for an EIS for this project.

For one, the EA indicates the FS is implementing its 2012 Okanogan-Wenatchee National Forest Restoration Strategy with the Mission project. This Restoration Strategy states in part, under "Need for Change and a Sense of Urgency":

> (A) new strategy is needed because of new science, local monitoring results, and a need to be more efficient in our planning efforts. The OWNF Restoration Strategy emphasizes a restoration paradigm where ecological outcomes for multiple resources drive the development and implementation of projects. This is different from the existing paradigm in which timber production targets often drive forest projects, while the needs of other resources are often overlooked. …The Restoration Strategy enables more efficient project area identification and planning to increase the size of the OWNF's restoration footprint.

But the development of the Restoration Strategy, which would eliminate Late Successional Reserves and other Northwest Forest Plan direction, was not done in the context of any sort of NEPA process.

Alarmingly, the EA cites the results of absolutely none of the monitoring required in the 1989 Okanogan National Forest plan or the 1994 Northwest Forest Plan. The 1989 Forest Plan states:

> Effectiveness monitoring will accomplish the following NFMA monitoring requirements:

- Quantitatively compare planned versus actual outputs and services [219.12(k)(1)].
- Measure effectiveness of prescriptions, including significant changes in land productivity [219.12(k)(2)].
- Determine planned cost versus actual cost associated with carrying out prescriptions [219.12(k)(3)].

- Determine the populations trends of the management indicator species and relationship to habitat changes [219.19(a)(6)].
- Evaluate the effects of National Forest management on adjacent land, resources, and communities [219.7(f)].
- Identify research needs to support of improve National Forest management (219 28).
- Determine if land is adequately restocked [219.12(k)(i)].
- Determine, at least every ten years, if land unsuitable for timber production has become suitable [219.12(k)(5)(ii)].
- Determine whether maximum size limits for harvest areas should be continued [219.12(k)(5)(iii)].
- Ensure that destructive insects and disease organisms do not increase to potentially damaging levels following management activities [219.12(k)(5)(iv)].

None of that was addressed in the Mission EA. The Forest Plan also states:

Validation monitoring determines whether the initial data, assumptions, and coefficients used in development of the Forest Plan are correct, or if there is a better way to meet forest planning regulations, policies, goals, and objectives. Conduct validation monitoring when effectiveness monitoring results indicate basic assumptions or coefficients are questionable. Generally, conduct validation monitoring by establishing permanent plots or studies in close coordination with research personnel. Limit the scope of validation monitoring to those coefficients and standards that are not reasonably substantiated by existing research.

Monitoring will determine:

- if Management Area direction is being applied as directed.
- if standards are being followed.
- if the Forest is achieving the objectives of the Forest Plan.
- if application of Management Area direction is achieving desired conditions.
- if the effects of implementing the Forest Plan are occurring as predicted.
- if the costs of implementing the Forest Plan are as predicted.
- if management practices on adjacent or intermingled non-National Forest System land are affecting the Forest Plan goals and objectives.
- if implementation of the Forest Plan is keeping other agencies from reaching their stated objectives.

Again, none of the above requirements were addressed in the Mission EA. The Forest Plan includes no less than 14 pages of monitoring items to be used in the evaluation of the Forest Plan and its implementation, for the reasons and purposes cited above, yet there is apparently no connection between the Mission project and what the FS was supposed to have learned in 28 years of Forest Plan-directed monitoring. The EA also fails to address and demonstrate consistency with the related Forest Plan Standard 1-5, which requires:

1-5 In addition to specific monitoring items discussed in the FOREST PLAN, CHAPTER 5, the responsible official and the subordinate line officers shall periodically conduct appropriate management reviews to assure compliance with the standards and guidelines contained in this chapter. During these management reviews, the responsible official and the subordinate line officers shall also evaluate and assess monitoring criteria, monitoring efforts, and resulting conclusions where appropriate. Management reviews shall include follow-up to assure completion of action items from previous reviews.

The purpose of monitoring implementation of the Forest Plan is to understand cumulative impacts of management activities and inform later management in an adaptive management paradigm. The lack of Forest Plan monitoring means the FS must compensate in project analyses, but reading the Mission EA, it's certain this hasn't happened.

A proper cumulative effects analysis would include:

- A list of all past projects (completed or ongoing) implemented in the proposed project area watersheds.
- A list of the monitoring commitments made in all previous NEPA documents covering the project area.
- The results of all that monitoring.
- A description of any monitoring, specified in those past project NEPA documents or the Forest Plan for proposed project area, which has yet to be gathered and/or reported.
- A summary of all monitoring done in the project area as a part of the Forest Plan monitoring and evaluation effort.
- A cumulative effects analysis which includes the results from the monitoring required by the Forest Plan.

The EA fails to include an analysis of how well those past projects met the goals, objectives, desired conditions, etc. stated in their respective NEPA documents, and how well the projects conformed to forest plan standards and guidelines. The EA fails to include an analysis of how well the statements of Purpose and Need in those NEPA documents were served.

Those items are a critical part of the NEPA analysis. Without this critical link the validity of many EA assumptions are baseless. Without analyzing the accuracy and validity of the assumptions used in previous NEPA processes one has no way to judge the accuracy and validity of the current proposal. The predictions made in previous NEPA processes also need to be disclosed and analyzed because if these were inaccurate, and the agency is making similar decisions, then the process will lead to failure. For instance, if for previous projects the FS said they were going to do a certain monitoring plan or implement a certain type of management and these were never effectively implemented or monitored, it is important for the public and the decision maker to know. If there have been problems with FS implementation or monitoring in the past, it is not logical to assume that implementation will now all of a sudden be appropriate. If prior logging, prescribed fire and other "forest health" or "fuel" treatments have not been monitored appropriately, then there is no valid justification for this project.

The EA also doesn't consider Forest Plan "Information Needs"—including the FS's apparent failure to acquire much of this information.

In addition, regarding invasive plants the EA states:

> The combination of herbicide, biological, and manual treatments would be conducted by the District Weed program with herbicide treatments authorized under the 2000 Okanogan National Forest Integrated Weed Management EA Decision Notices. The Forest is finalizing an environmental analysis (the Forest-wide Site- Specific Invasive Plants Environmental Impact Statement) with a decision expected in 2017. This EIS will provide for invasive plant treatments in the project area and will supersede previous decisions.

The Mission EA cites none of the monitoring results conducted under the direction of the 2000 Okanogan National Forest Integrated Weed Management EA or Decision Notice, and fails to explain how the Mission project is responding to the new Forest-wide Site-Specific Invasive Plants EIS purpose and need.

The Mission EA does not explain how it addresses the "Considerations for Forest Plan Revision", "New Information" and "Challenges to Managing Our National Forest" in the Proposed Action for forest plan revision.

"The Forest is conducting an environmental analysis for travel management planning that will designate motorized public access routes in the project area; a decision on this analysis is expected in 2017." (EA 46.) The EA fails to explain how the Mission project is responding to or conflicts with the purpose and need for this motorized route designation process. The EA also fails to provide sufficient analysis and disclosure of the ongoing impacts of motorized travel in the project area.

The EA does not explain how the process used for Mission project forest plan amendments conforms to the 2012 Planning Rule.

The EA also fails to address many matters of scientific debate and research, which were raised in comments. The FS failed to acknowledge such scientific information, most significantly when the science conflicts or is contrary to FS opinion or science cited in the EA. NEPA requires that outstanding controversies be resolved within the context of an EIS, not simply dismissed with an EA and Finding of No Significant Impact (FONSI). We discuss many scientific "lingering issues" in this Objection.

NEPA regulations discuss potential significance, for which preparation of an Environmental Impact Statement (EIS) might be required.

At 40 CFR § 1508.27 it states:

> (b) …The following should be considered in evaluating intensity:

(1) Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.
(2) The degree to which the proposed action affects public health or safety.
(4) The degree to which the effects on the quality of the human environment are likely to be highly controversial.
(5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
(6) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
(7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

The intensity of impacts listed above is intrinsic to Selected Alternative 2. The FS failed to reconcile the scientific controversy surrounding different—and often competing or conflicting—management approaches in the EA.

The amount of cumulative ecological damage already incurred in the project area is also significant.

As is discussed in several places in this Objection, the impacts of Alternative 2 management approaches are in fact highly uncertain and involve unique and/or unknown risks.

For the above and many other reasons expressed in previous comments, a FONSI would be illegal. The FS is obligated to prepare an EIS for the Mission Project proposal, and failing to do so violates NEPA.

Remedy: Choose the no action alternative. Alternatively, withdraw the EA and draft DN and prepare an Environmental Impact Statement (EIS). In any case, before preparing that EIS, finish the ongoing process of revising the Forest Plan to address the issues identified as needs for change in the forest plan revision process.

Restoration Strategy and Ecosystem Management Decision Support model

In adopting the Restoration Strategy (RS) as its management direction, the FS installs an analysis process into the Mission EA which has no demonstrated scientific support or validity for such a purpose. The EA at p. 12 states:

> One analysis tool used by interdisciplinary team members in this project was the Ecosystem Management Decision Support (EMDS) modeling tool (EMDS; Hessburg 2013). This tool used photo-interpreted data supported by field verification and professional expertise to compare existing vegetation conditions to both historic reference conditions and to likely future conditions (given conservatively-estimated changes in climate). The EMDS tool evaluated the Libby and Buttermilk Creek sub-watersheds separately, showing where vegetation characteristics and processes such as stand structure

and crown fire risk were outside of the desired range of values, and helped set priorities for where vegetation-related restoration actions should occur.

However it's clear from the EA the EMDS is not "one analysis tool"—it is THE analysis tool the FS relies upon to develop the project's purpose and need, and propose vegetation treatments (typically logging and burning). The EA discloses little regarding the limitations of that model for directing this active management and conducting such analyses.

The EA describes the FS's vegetation model:

> EMDS modeling of photo interpreted data was used to characterize the presence of large and medium size trees in vegetation polygons (patches) in the entire Buttermilk Creek and Libby Creek sub-watersheds in the following manner:
>
> - Medium = overstory trees 16 inches to 25 inches diameter at breast height (DBH).
> - Large = overstory trees larger than 25 inches DBH with understory trees smaller than 16 inches DBH.
> - Large and medium = large size overstory trees (> 25 inches DBH) with medium size understory trees 16 inches to 25 inches DBH.

The EA doesn't really support its assumption that the vegetation model is accurate enough to reflect on-the-ground reality in the project area, such that its use in the analysis is validated.

And where the EA does reveal signs the FS ought to be cautious about its heavy reliance on the EMDS model, the agency simply ignores them. E.g., "Wildlife habitat for selected focal wildlife species was analyzed based on field data because EMDS results predicted habitat characteristics that were inconsistent with what was observed in the project area." (Id.) In other word, the only wildlife data the FS possesses for this project area that was gathered on the ground—which just happens to be inconsistent with the "photo-interpreted data"—was disregarded in favor of the latter in regards to choosing areas for logging and/or burning.

In conceptually implementing the RS, the FS alleges it is choosing its logging and burning (manipulation) areas "where vegetation characteristics …were outside of the desired range of values." (Id.) Yet a simple inspection of the EA's vegetation analysis section reveals this isn't what the FS is doing at all. Several vegetation characteristics of chosen manipulation areas are within the FS's own desired conditions yet they are proposed for logging and/or burning anyway. Furthermore, the proposed manipulations wouldn't result in some of the vegetation conditions being brought to the FS's desired conditions. The FS's vegetation purpose and need statements, modeling results, vegetation characteristics, and desired conditions are an incoherent mess.

Then there are the "likely future conditions given conservatively-estimated changes in climate" (Id.) which are presented as a range in vegetation conditions based vaguely upon the FS's questionable interpretation of climate models for the region. In other words, the vegetation condition arrows are not merely being shot at targets with ranges defined by historic reference conditions (themselves based upon insufficient data and/or of single snapshots in time)—the ranges of these targets are further blurred by estimates of ecosystem changes due to climate

change. And without a proper NEPA analysis, we're to believe this methodology will pan out—not resulting in any unforeseen significant impacts on the environment. The RS is unprecedented management hubris, on a grand scale heretofore not seen. Frissell and Bayles (1996) note:

> Most philosophies and approaches for ecosystem management put forward to date are limited (perhaps doomed) by **a failure to acknowledge and rationally address the overriding problems of uncertainty and ignorance about the mechanisms by which complex ecosystems respond to human actions.** They lack humility and historical perspective about science and about our past failures in management. They still implicitly subscribe **to the scientifically discredited illusion that humans are fully in control of an ecosystemic machine and can foresee and manipulate all the possible consequences of particular actions while deliberately altering the ecosystem to produce only predictable, optimized and socially desirable outputs.** Moreover, despite our well-demonstrated inability to prescribe and forge institutional arrangements capable of successfully implementing the principles and practice of integrated ecosystem management over a sustained time frame an at sufficiently large spatial scales, would-be ecosystem managers have neglected to acknowledge and critically analyze past institutional and policy failures. They say we need ecosystem management because public opinion has changed, neglecting the obvious point that **public opinion has been shaped by the glowing promises of past managers and by their clear and spectacular failure to deliver on such promises**. (Emphases added.)

The EA claims that the FS is "emphasizing the restoration of natural processes, functions, and patterns across the landscape to build more resilient ecosystems that would be responsive to projected changes in climate." (Id.) But building ecosystems is not a human endeavor. Any claim to be doing so is delusional. Ecosystems are largely defined by the functioning of natural processes. It would be good if the FS were in fact "emphasizing the restoration of natural processes" with this project, however that statement is false on the face of it. The FS apparently doesn't understand what a natural process is, in one place defining it (Id.) as "crown fire risk." The FS perhaps confuses crown fire risk (a model output) with wildland fire, a process which has shaped the project area for millennia. And as this EA demonstrates, the FS has no plan to allow wildland fire as a process to operate in the project area—in fact the RS is all about forever replacing wildland fire with management manipulations.

The FS's strategy to move towards desired future vegetation conditions focuses on achieving static conditions, instead of fostering the natural dynamic characteristics of ecosystems. An abundance of scientific evidence indicates the RS's static desired conditions must be rejected in favor of desired future dynamics to align with best available science. FS researcher Everett (1994) states, "To prevent loss of future options we need to simultaneously **reestablish ecosystem processes and disturbance effects that create and maintain desired sustainable ecosystems**, while conserving genetic, species, community, and landscape diversity and long-term site productivity." (Emphasis added.) Hessburg and Agee 2003 also emphasize the primacy of natural processes for management purposes:

> Ecosystem management planning must acknowledge **the central importance of natural processes and pattern–process interactions, the dynamic nature of ecological systems**

(Attiwill, 1994), the inevitability of uncertainty and variability (Lertzman and Fall, 1998) and cumulative effects (Committee of Scientists, 1999; Dunne et al., 2001).

(Emphasis added.) Collins and Stephens (2007) suggest direction to implement restoring the process of wildland fire by educating the public, which means explaining the inevitability of wildland fire, teaching about fire ecology, and identifying landowners' primary responsibility for protecting their properties. Not surprisingly, since proper education conflicts with the RS's manipulate-and control management paradigm, we don't see it in the Mission project.

The RS provides no explicit plan disclosing the details on how a restored landscape would be sustained. In other words, how often treatments will occur, how extensive they need to be, which kinds of treatments will be necessary, how many miles of roads will be needed (both permanent and temporary), etc. This means we cannot know how many acres at any given time will be suffering reduced productivity because of soil damage or infested by noxious weeds, or how many acres of wildlife will be subject to diversity impacts due to snag losses due to logger safety or firewood cutting. Also missing is an economic analysis of the RS, which would disclose how much managing for this regime will cost on a continuing basis—and therefore how likely such a plan could actually be implemented in order to achieve or maintain the "restored" (under the FS definition) vegetation conditions.

The FS must conduct a Science Consistency Review for the RS and its application for a project such as Mission. Guldin et al. 2003:

> ...outlines a process called the science consistency review, which can be used to evaluate the use of scientific information in land management decisions. Developed with specific reference to land management decisions in the U.S. Department of Agriculture Forest Service, the process involves assembling a team of reviewers under a review administrator to constructively criticize draft analysis and decision documents. Reviews are then forwarded to the responsible official, whose team of technical experts may revise the draft documents in response to reviewer concerns. The process is designed to proceed iteratively until reviewers are satisfied that key elements are **consistent with available scientific information.**

The FS can cite all the science it wants in the RS or while preparing a NEPA document, but it's another matter entirely whether or not the proposed management actions are **consistent** with the best available science. The FS must enlist objective, independent peer review to evaluate its proposed management. Such an undertaking would also assist the public, per NEPA direction, in understanding best available science.

Schultz (2010) recommends peer review of large-scale assessments and management guidelines, and more robust, scientifically sound monitoring, and measurable objectives and thresholds for maintaining viable populations of all native and desirable non-native wildlife species.

Consistency with Forest Plan

We find that our ability to participate in this NEPA process is severely hampered by the failure of the EA to state all applicable and relevant forest plan direction, and explain how Mission project and other management would be consistent with that direction. This includes direction from the original forest plan, and also as amended by the Northwest Forest Plan. Such omissions are likely because the FS believes it is permissible to simplify the NEPA process utilizing an EA to the point that compliance with the forest plan and other laws is merely a given, instead of taking a hard look at that direction. This leaves the public uninformed as to the FS's intent, and gives the impression that the FS is incapable of adhering to environmental laws and tailoring management to be consistent with best available science.

Although these comments do cite some examples, it is not our intent to quote each and every relevant forest plan or Northwest Forest Plan standard, guideline, objective, goal, etc. that FS should have evaluated but the EA ignores. It is the duty of the FS to make explicit in NEPA documents how it is following programmatic direction at a level of detail that allows an evaluation of conformance. Only then can the public be adequately informed and involved in the NEPA process.

As a result of the FS making the RS its de facto forest plan, the EA fails to demonstrate consistency with management direction in the real Forest Plan, which was prepared and developed in conformance with NEPA guidelines and full public involvement. Desired Conditions of the RS supplant Forest Plan desired future conditions. Several Forest Plan standards and guidelines relevant to the Mission project are completely ignored in the EA. This violates both NEPA and NFMA.

Scientific integrity

As discussed above, a substantial portion of the EA's analysis relies upon the EMDS, but it also utilizes other models. The FS has not determined the reliability of all the data used as input for the various models used. Since "an instrument's data must be reliable if they are valid" (Huck, 2000) this means the data that is input to a model must accurately measure that aspect of the world it is claimed to measure, or else the data is invalid for use by that model. Also, Beck and Suring, 2011 "remind practitioners that if available data are poor quality or fail to adequately describe variables critical to the habitat requirements of a species, then only poor quality outputs will result. Thus, obtaining quality input data is paramount in modeling activities." And Larson et al. 2011 state: "Although the presence of sampling error in habitat attribute data gathered in the field is well known, the measurement error associated with remotely sensed data and other GIS databases may not be as widely appreciated."

Huck, 2000 states:

> The basic idea of reliability is summed up by the word consistency. Researchers can and do evaluate the reliability of their instruments from different perspectives, but the basic question that cuts across these various perspectives (and techniques) is always the same: "To what extent can we say the data are consistent?" …(T)he notion of consistency is at the heart of the matter in each case.

> …(R)eliability is conceptually and computationally connected to the data produced by the use of a measuring instrument, not to the measuring instrument as it sits on the shelf.

During litigation of a timber sale on the Kootenai NF, the FS criticized a report provided by plaintiffs, stating "(Its) purported 'statistical analysis' reports no confidence intervals, standard deviations or standard errors in association with its conclusions."

As Huck (2000) states, the issue of "standard deviations or standard errors" that the FS raised in the context of that litigation relates to the reliability of the data, which in turn depends upon how well-trained the data-gatherers are with their measuring tools and measuring methodology. In other words, different measurements of the same phenomenon must result in numbers that are very similar to result in small "standard deviations or standard errors" and thus high reliability coefficients, which in turn provide the public and decisionmakers with an idea of how confident they can be in the conclusions drawn from the data.

Also, the document, "USDA-Objectivity of Statistical and Financial Information" is instructional on this topic.

The next level of scientific integrity is the notion of "validity." So even if FS data input to its models are reliable, a question remains of the models' validity. In other words, are the models scientifically appropriate for the uses for which the FS is utilizing them? As Huck, (2000) explains, the degree of "content validity," or accuracy of the model or methodology is established by utilizing other experts. This, in turn, demonstrates the necessity for utilizing the peer review process. The validity of the various models utilized in the EA's analyses have not been established for how agency utilizes them. No studies or reviews are cited which establish their content validity, and no independent peer review process has occurred.

Model results can be no better than as the data fed into them, which is why data reliability is discussed above. The Ninth Circuit Court of Appeals has declared that the FS must disclose the limitations of its models in order to comply with NEPA. However, the Mission EA has failed to disclose these limitations. Unfortunately, the FS uses models without any real indication as to how much they truly reflect reality.

In a recent timber sale FEIS, the FS defines "model" as "a theoretical projection in detail of a possible system of natural resource relationships. A simulation based on an empirical calculation to set potential or outputs of a proposed action or actions." (Clear Creek Integrated Restoration Project FEIS at G-14.) From www.thefreedictionary.com:

> Empirical – 1. a. Relying on or **derived from observation or experiment**: empirical results that supported the hypothesis. b. Verifiable or provable by means of observation or experiment: empirical laws. 2. Guided by practical experience and not theory, especially in medicine.

(Emphasis added.) So models are "theoretical" in nature and the agency implies that they are somehow based in observation or experiment that support the hypotheses of the models. That would be required, because as Verbyla and Litaitis (1989) assert, "Any approach to ecological modelling has little merit if the predictions cannot be, or are not, assessed for their accuracy using independent data." This corresponds directly to the concept of "**validity**" as discussed by Huck, 2000: "(A) measuring instrument is valid to the extent that it measures what it purports to measure."

However, there is no evidence that the FS has performed validation of any the models for the way they were used to support the EA's analyses. There is no documentation of someone using observation or experiment to support the model hypotheses.

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Larson et al. 2011 state:

> Habitat models are developed to satisfy a variety of objectives. ...A basic objective of most habitat models is to predict some aspect of a wildlife population (e.g., presence, density, survival), so assessing predictive ability is a critical component of model validation. **This requires wildlife-use data that are independent of those from which the model was developed.** ...It is informative not only to evaluate model predictions with new observations from the original study site but also to evaluate predictions in new geographic areas.

(Internal citations omitted, emphasis added). A FS forest plan monitoring and evaluation report provides an example of the agency itself acknowledging the problems of data that is old and incomplete, leading to the limitation of models the FS typically uses for wildlife analyses for old-growth wildlife habitats:

> Habitat modeling based on the timber stand database has its limitations: the data are, on average, 15 years old; canopy closure estimates are inaccurate; and data do not exist for the abundance or distribution of snags or down woody material… .

(USDA Forest Service, 2000c.) In that case, the FS expert believed the data were unreliable, so the usefulness or applicability of the model—its validity—is limited.

USDA Forest Service 1994b states "It is important to realize that all models greatly simplify complex processes and that the numbers generated by these models should be interpreted in light of field observations and professional judgement." (III-77.)

Beck and Suring, 2011 state:

> Developers of frameworks have consistently attained scientific credibility through published manuscripts describing the development or applications of models developed within their frameworks, but a major weakness for many frameworks continues to be a lack of validation. Model validation is critical so that models developed within any framework can be used with confidence. Therefore, we recommend that models be validated through independent field study or by reserving some data used in model development.

Larson et al. 2011 state:

> (T)he scale at which land management objectives are most relevant, often the landscape, is also the most relevant scale at which to evaluate model performance. Model validity, however, is currently limited by a lack of information about the spatial components of wildlife habitat (e.g., minimum patch size) and relationships between habitat quality and landscape indices (Li et al. 2000).

Beck and Suring, 2011 developed several criteria for rating modeling frameworks—that is, evaluating their validity. Three of their criteria are especially relevant to this discussion:

Habitat–population linkage	Does the modeling framework incorporate vital rates (e.g., production, survival), other demographic parameters (e.g., density, population size); surrogates (e.g., quality of home ranges, habitat conditions in critical reproductive habitats, presence/absence) of population demographic parameters; or does the modeling framework model habitat conditions without specific consideration of wildlife population parameters?	0 = does not rely on population demographics or surrogates of modeled species 1 = relies on surrogates for population demographic parameters or framework; can utilize population demographics if desired, but is not dependent on them 2 = specifically relies on population demographics of modeled species
Output definition	Is the output well defined and will it translate to something that can be measured? acceptance by an array of professionals?	1 = difficult 2 = moderate 3 = easy application of the modeling framework

The documents, "USDA-Objectivity of Regulatory Information" and "USDA-Objectivity of Scientific Research Information" are instructional on this topic.

The EA violates NEPA because the FS has not insured the reliability of data relied upon by the EA's models, and the FS has not validated the models for the way the EA utilizes them.

Ruggiero, 2007 (a scientist from the research branch of the FS) recognizes a fundamental need to demonstrate the proper use of scientific information, in order to overcome issues of decisionmaking integrity that arise from bureaucratic inertia and political influence. Also, Sullivan et al. 2006 addressing the issue of what is "best available science." And the Committee of Scientists (1999) state:

> To ensure the development of scientifically credible conservation strategies, the Committee recommends a process that includes (1) scientific involvement in the selection

> of focal species, in the development of measures of species viability and ecological integrity, and in the definition of key elements of conservation strategies; (2) independent scientific review of proposed conservation strategies before plans are published; (3) scientific involvement in designing monitoring protocols and adaptive management; and (4) a national scientific committee to advise the Chief of the Forest Service on scientific issues in assessment and planning.

Ruggiero, 2007 discusses the risk to scientific integrity if that separation is not maintained, that is, if politics overly influences the use of scientific research:

> This separation also serves to keep conducting science separate from formulating policy and the political ramifications of that process. The wisdom here is that science cannot be credible if it is politicized. Science should not be influenced by managers, and scientists should not establish policy. This logic keeps scientific research "independent" while ensuring that policy makers are free to consider factors other than scientific understandings. Thus, science simply informs decision making by land managers. As the new forest planning regulations clearly state, those responsible for land management decisions must consider the best available science and document how this science was applied (Federal Register 70(3), January 5, 2005; Section 219.11(4); p. 1059).

Sullivan et al. 2006 state that "Peer-reviewed literature ...is considered the most reliable mainly because it has undergone peer review." They explain:

> *Peer review*.—A basic precept of science is that it must be verifiable, and this is what separates science from other methods of understanding and interpreting nature. The most direct method of verification is to redo the study or experiment and get the same results and interpretations, thus validating the findings. Direct verification is not always possible for nonexperimental studies and is often quite expensive and time-consuming. Instead, scientists review the study as a community to assess its validity. This latter approach is the process of peer review, and it is necessary for evaluating and endorsing the products of science. **The rigor of the peer review is one way to assess the degree to which a scientific study is adequate for informing management decisions.** (Emphasis added.)

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Sullivan et al. 2006 contrast peer-reviewed literature with gray literature (such as Samson, 2006

and Samson, 2006a cited in the EA,) which:

> ...does not typically receive an independent peer review but which may be reviewed in-house, that is, within the author's own institution. ...Gray literature, such as some agency or academic technical reports, ...commonly contains reports of survey, experimental or long-term historical data along with changes in protocols, meta-data, and the progress and findings of standard monitoring procedures.

As does Ruggiero, 2007, Sullivan et al., 2006 discusses the dangers of the "Politicization of Science":

> Many nonscientists and scientists believe that science is being increasingly politicized. Articles in newspapers (e.g., Broad and Glanz 2003) and professional newsletters document frequent instances in which the process and products of science are interfered with for political or ideological reasons. In these cases, the soundness of science, as judged by those interfering, turns on the extent to which the evidence supports a particular policy stance or goal. ...Politicization is especially problematic for scientists supervised by administrators who may not feel the need to follow the same rules of scientific rigor and transparency that are required of their scientists.

Agency expert opinion and gray literature relied upon in the Mission EA is not necessarily the same as "the best scientific information" available. Sullivan et al., 2006 discuss the concept of best available science in the context of politically influenced management:

> Often, scientific and political communities differ in their definition of best available science and opposing factions misrepresent the concept to support particular ideological positions. Ideally, each policy decision would include all the relevant facts and all parties would be fully aware of the consequences of a decision. But economic, social, and scientific limitations often force decisions to be based on limited scientific information, leaving policymaking open to uncertainty.
>
> The American Fisheries Society and the Estuarine Research Federation established this committee to consider what determines the best available science and how it might be used to formulate natural resource policies and shape management actions. The report examines how scientists and nonscientists perceive science, what factors affect the quality and use of science, and how changing technology influences the availability of science. Because the issues surrounding the definition of best available science surface when managers and policymakers interpret and use science, this report also will consider the interface between science and policy and explore what scientists, policymakers, and managers should consider when implementing science through decision making.
>
> As part of their implicit contract with society, environmental scientists are obliged to communicate their knowledge widely to facilitate informed decision making (Lubchenco 1998). For nonscientists to use that knowledge effectively and fairly, they must also understand the multifaceted scientific process that produces it.
>
> Science is a dynamic process that adapts to the evolving philosophies of its practitioners

and to the shifting demands of the society it serves. Unfortunately, these dynamics are often controversial for both the scientific community and the public. To see how such controversies affect science, note that over the last decade nonscientists have exerted increasing influence on how science is conducted and how it is applied to environmental policy. Many observers find this trend alarming, as evidenced by several expositions titled "science under siege" (e.g., Wilkinson 1998; Trachtman and Perrucci 2000).

To achieve high-quality science, scientists conduct their studies using what is known as the scientific process, which typically includes the following elements:

- A clear statement of objectives;
- A conceptual model, which is a framework for characterizing systems, stating assumptions, making predictions, and testing hypotheses;
- A good experimental design and a standardized method for collecting data;
- Statistical rigor and sound logic for analysis and interpretation;
- Clear documentation of methods, results, and conclusions; and
- Peer review.

NEPA states that "Accurate scientific analysis... (is) essential to implementing NEPA." And the NEPA regulations at 40 CFR § 1502.24 ("Methodology and scientific accuracy") state:

> Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements. They shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement. An agency may place discussion of methodology in an appendix.

Carbon Sequestration and Climate change

Some politicians and status quo profiteers pretend there's nothing to do about climate change because it isn't real. The FS acknowledges it's real, focuses only its symptoms and—like those politicians and profiteers—ignores and distracts from the causes it enables.

The FS's position on project impacts on climate change is that the project would have a miniscule impact on global carbon emissions: The obvious problem with that viewpoint is, once can say the same thing about every source of carbon dioxide and other greenhouse gas emission on earth, and likewise justify inaction as does this EA. In their comments on the KNF's Draft EIS for the Lower Yaak, O'Brien, Sheep project, the EPA rejected that sort of analysis, basically because that cumulative effects scale dilutes project effects. We would add that, if the FS wants to refer to a wider scope to analyze its carbon footprint, we suggest that it actually conduct such a cumulative effect analysis and disclose it in a NEPA document.

The FS (in USDA Forest Service, 2017b) discusses some effects of climate change on forests, including "In many areas, it will no longer be possible to maintain vegetation within the historical range of variability. Land management approaches based on current or historical conditions will need to be adjusted." The EA has no scientific basis for its claims that proposed vegetation "treatments" will result in sustainable vegetation conditions under likely climate

change scenarios. It also fails to provide a definition of "increasing resilience" that includes metrics for valid and reliable measurement of resilience. The scientific literature even debates if the same tree species mix that has historically inhabited sites can persist after disturbances, including the types of disturbances proposed under project action alternatives.

Global climate change is a significant threat to humanity and forests. Climate change is caused by excess CO_2 and other greenhouse gases transferred to the atmosphere from other pools. All temperate and tropical forests, including those in this project area, are an important part of the global carbon cycle. Since the time the forest plan was written, there is significant new information reinforcing the need to conserve all existing stores of carbon in forests to keep carbon in forests and out of the atmosphere, in order to mitigate climate change. Since all forests are an important part of the global carbon cycle, the agency must do its part by managing forests to maintain and increase carbon storage. Global warming is caused by the *cumulative* buildup of greenhouse gases, including CO_2, in the atmosphere. Logging will add to the cumulative total carbon emissions so it is clearly part of the problem and must be minimized. Logging will not only transfer carbon from storage to the atmosphere but future regrowth is unlikely to ever make up for the effects of logging, because carbon storage in logged forests will lag behind carbon storage in unlogged forests for decades or centuries.

Global warming and its consequences may be effectively *irreversible*, which implicates certain legal consequences under NEPA and NFMA and ESA (e.g., 40 CFR § 1502.16; 16 USC §1604(g); 36 CFR §219.12; ESA Section 7; 50 CFR §§402.9, 402.14). The USFS should recognize that all net carbon emissions from logging represent "irretrievable and irreversible commitments of resources."

Clearly, the management of the planet's forests is a nexus for addressing the largest crisis ever facing humanity. Yet the EA fails to even provide a minimal quantitative analysis of project- or agency-caused CO_2 emissions or consider the best available science on the topic. This is immensely unethical and immoral. The lack of detailed scientific discussion in the EA concerning climate change is far more troubling than the document's failures on other topics, because the consequences of unchecked climate change will be disastrous for food production, sea level rise, and water supplies, resulting in complete turmoil for all human societies. This is an issue as serious as nuclear annihilation (although at least with the latter we're not already pressing the button).

The EA fails to provide an accurate, objective analysis and disclosure of how project and Forest Service activities affect the dynamic balance of carbon sequestration and emit greenhouse gasses. There is no cumulative effects analysis of OWNF carbon sequestration and greenhouse gas emission over time. The same is true for the entire national forest system.

Respected experts say that the atmosphere might be able to safely hold 350 ppm of CO2.[3] So when we were at pre-industrial levels of about 280 ppm, we had a cushion of about 70 ppm which represents millions of tons of GHG emissions. Well, now that cushion is completely gone.

[3] http://www.350.org/about/science.

We are already at about 390 ppm CO_2 and rising, so what's the safe level of additional emissions (from logging or any other activity)? It's negative. There is no safe level of additional emissions that our earth systems can tolerate. In fact, we need to be removing carbon, not adding carbon to the atmosphere.[4] How could we do that? By growing forests. Logging moves us away from our objective while conservation moves us toward our objective.

Researchers Mackey, et al 2013 "clarify some well-established fundamentals of the global carbon cycle that are frequently either misunderstood, or seemingly overlooked." The authors state: "At present some forests have carbon sequestration potential due to depletion of carbon stocks from past land use." The authors call this potential, "Reforestation of previously cleared or logged land…" They do not attribute this potential to "increasing forest resilience to disturbance" or the kind of forest "restoration" implied by the Forest Plan or this EA.

Mackey, et al 2013 also make the following points:

- Avoiding and reducing land carbon emissions is therefore an integral part of any comprehensive approach to solving the climate change problem.

- In addition to deforestation, forests have been degraded by land-use activities such as logging and soil disturbance that deplete their organic carbon stocks and emit CO_2. Emissions from forest degradation are poorly quantified globally, but estimates indicate that they increase regional carbon emissions by nearly 50% over deforestation alone.

- The capacity of the land to remove atmospheric carbon and store it in vegetation and soil is limited to the amount previously depleted by land use.

- If the forest is allowed to develop into an ecologically mature state, the carbon stock approaches a dynamic equilibrium with prevailing environmental conditions, where respiration approximately balances photosynthesis. At this point, the depleted land carbon stock has been refilled and the sink function has gone. The mitigation value of the ecosystem resides in maintenance of the stored carbon stock.

- Ecologically mature (>200 years) and old-growth forests aged up to 800 years can continue to function as sinks. … In terms of carbon mitigation policy, the primary reason to conserve forests is the carbon stocks they contain. The idea that replacing primary forests by plantations will 'create sinks' and thereby be positive for climate mitigation is incorrect, as it fails to account for the loss of carbon stock from the primary forest. Furthermore, plantation forests store less carbon than the pre-existing natural primary forest, secondary (regenerating) natural forests or a primary forest under the same environmental conditions.

[4] "To get back to 350 ppm, we'll have to run the whole carbon-spewing machine backwards, sucking carbon out of the atmosphere and storing it somewhere safely. … By growing more forests, growing more trees, and better managing all our forests, …" http://blog.cleanenergy.org/2013/11/26/exploring-biocarbon-tools/comment-page-1/#comment-375371

- Consistent with our understanding of the lifetime of the airborne fraction of a pulse of CO_2, the most effective form of climate change mitigation is to avoid carbon emissions from all sources.

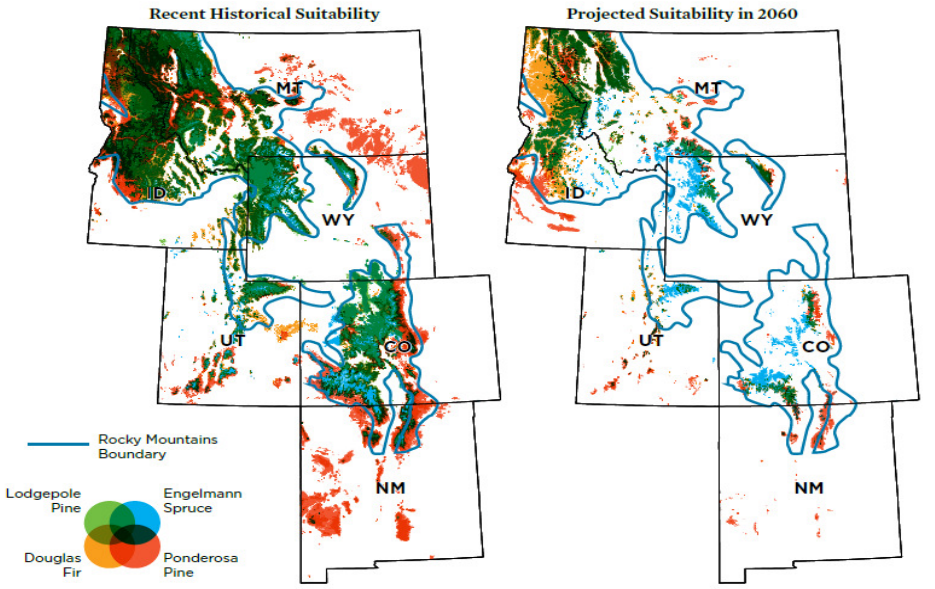
Pecl, et al. 2017 "review the consequences of climate-driven species redistribution for economic development and the provision of ecosystem services, including livelihoods, food security, and culture, as well as for feedbacks on the climate itself." They state, "Despite mounting evidence for the pervasive and substantial impacts of a climate-driven redistribution of Earth's species, current global goals, policies, and international agreements fail to account for these effects. … To date, all key international discussions and agreements regarding climate change have focused on the direct socioeconomic implications of emissions reduction and on funding mechanisms; **shifting natural ecosystems have not yet been considered in detail**." (Emphasis added.)

Pecl, et al. 2017 conclude:

> The breadth and complexity of the issues associated with the global redistribution of species driven by changing climate are creating profound challenges, with species movements already affecting societies and regional economies from the tropics to polar regions. Despite mounting evidence for these impacts, current global goals, policies, and international agreements do not sufficiently consider species range shifts in their formulation or targets. Enhanced awareness, supported by appropriate governance, will provide the best chance of minimizing negative consequences while maximizing opportunities arising from species movements—movements that, with or without effective emission reduction, will continue for the foreseeable future, owing to the inertia in the climate system.

For only one example of what Pecl et al. are talking about, the Mission EA doesn't consider climate change effects on reforestation success. From a report by the Union of Concerned Scientists & Rocky Mountain Climate Organization (Funk et al., 2014):

FIGURE 5 AND TABLE 1. **Projected Changes in Suitable Ranges for Key Rocky Mountain Tree Species**



Species	Current	2060		
	Recent Historical Suitability (acres)	Projected Suitability (acres)	Net Change in Suitability (acres)	Percent Net Change
Lodgepole Pine	60,474,000	6,065,000	-54,409,000	-90%
Ponderosa Pine	39,842,000	7,771,000	-32,071,000	-80%
Engelmann Spruce	64,651,000	21,999,000	-42,652,000	-66%
Douglas Fir	53,620,000	22,606,000	-31,014,000	-58%

The caption under Funk et al.'s Figure 5 and Table 1 states:

> Much of the current range of these four widespread Rocky Mountain conifer species is projected to become climatically unsuitable for them by 2060 if emissions of heat-trapping gases continue to rise. The map on the left shows areas projected to be climatically suitable for these tree species under the recent historical (1961–1990) climate; the map on the right depicts conditions projected for 2060 given medium-high levels of heat-trapping emissions. Areas in color have at least a 50 percent likelihood of being climatically suitable according to the models, which did not address other factors that affect where species occur (e.g., soil types). Emissions levels reflect the A2 scenario of the Intergovernmental Panel on Climate Change. For more about this methodology, see www.ucsusa.org/forestannex.

Moomaw and Smith, 2017 identify the need for forest protection to be an urgent, national priority in the fight against climate change and as a safety net for communities against extreme weather events caused by a changing climate. As those authors explain,

> Global climate change is caused by excess CO_2 and other greenhouse gases transferred to the atmosphere from other pools. Human activities, including combustion of fossil fuels and bioenergy, forest loss and degradation, other land use changes, and industrial processes, have contributed to increasing atmospheric CO_2, the largest contributor to global warming, which will cause temperatures to rise and stay high into the next millennium or longer.

> The most recent measurements show the level of atmospheric carbon dioxide has reached 400 parts per million and will likely to remain at that level for millennia to come. Even if all fossil fuel emissions were to cease and all other heat-trapping gases were no longer emitted to the atmosphere, temperatures close to those achieved at the emissions peak would persist for the next millennium or longer.
>
> Meeting the goals of the Paris Agreement now requires the implementation of strategies that result in negative emissions, i.e., extraction of carbon dioxide from the atmosphere. In other words, we need to annually remove more carbon dioxide from the atmosphere than we are emitting and store it long-term. Forests and soils are the only proven techniques that can pull vast amounts of carbon dioxide out of the atmosphere and store it at the scale necessary to meet the Paris goal. Failure to reduce biospheric emissions and to restore Earth's natural climate stabilization systems will doom any attempt to meet the Paris (COP21) global temperature stabilization goals.
>
> The most recent U.S. report of greenhouse gas emissions states that our forests currently "offset" 11 to 13 percent of total U.S. annual emissions. That figure is half that of the global average of 25% and only a fraction of what is needed to avoid climate catastrophe. And while the U.S. government and industry continue to argue that we need to increase markets for wood, paper, and biofuel as climate solutions, the rate, scale, and methods of logging in the United States are having significant, negative climate impacts, which are largely being ignored in climate policies at the international, national, state, and local levels.
>
> The actual carbon stored long-term in harvested wood products represents less than 10 percent of that originally stored in the standing trees and other forest biomass. If the trees had been left to grow, the amount of carbon stored would have been even greater than it was 100 years prior. Therefore, from a climate perspective, the atmosphere would be better off if the forest had not been harvested at all. In addition, when wood losses and fossil fuels for processing and transportation are accounted for, carbon emissions can actually exceed carbon stored in wood products.

(Also see: "US Needs to Massively Scale Up Forest Protection to Tackle Climate Change" and "Scripps says climate change may represent 'existential' threat to humanity".)

Like all forests, the OWNF is an important part of the global carbon cycle. Clear scientific information reinforces the critical need to conserve all existing stores of carbon in forests to keep it out of the atmosphere. Given that forest policies in other countries and on private lands are politically more difficult to influence, the FS must take a leadership role to maintain and increase carbon storage on publicly owned forests, in order to help mitigate climate change effects.

The effects of climate change have already been significant, particularly in the region. Westerling, et al. 2006 state:

> Robust statistical associations between wildfire and hydro-climate in western forests indicate that increased wildfire activity over recent decades reflects sub-regional responses to changes in climate. Historical wildfire observations exhibit an abrupt transition in the mid-1980s from a regime of infrequent large wildfires of short (average of one week) duration to one with much more frequent and longer-burning (five weeks) fires. This transition was marked by a shift toward unusually warm springs, longer summer dry seasons, drier vegetation (which provoked more and longer-burning large wildfires), and longer fire seasons. Reduced winter precipitation and an early spring snowmelt played a role in this shift. Increases in wildfire were particularly strong in mid-elevation forests. …The greatest increases occurred in mid-elevation, Northern Rockies forests, where land-use histories have relatively little effect on fire risks, and are strongly associated with increased spring and summer temperatures and an earlier spring snowmelt.

Running, 2006 cites model runs of future climate scenarios from the 4th Assessment of the Intergovernmental Panel on Climate Change, stating:

> (S)even general circulation models have run future climate simulations for several different carbon emissions scenarios. These simulations unanimously project June to August temperature increases of 2° to 5°C by 2040 to 2069 for western North America. The simulations also project precipitation decreases of up to 15% for that time period (*11*). Even assuming the most optimistic result of no change in precipitation, a June to August temperature increase of 3°C would be roughly three times the spring-summer temperature increase that Westerling *et al.* have linked to the current trends. Wildfire burn areas in Canada are expected to increase by 74 to 118% in the next century (*12*), and similar increases seem likely for the western United States.

Pederson et al. (2009) note that western Montana has already passed through 3 important, temperature-driven ecosystem thresholds.

The Pacific Northwest Research Station, 2004 recognizes "(a) way that climate change may show up in forests is through changes in disturbance regimes—the long-term patterns of fire, drought, insects, and diseases that are basic to forest development."

Depro, et al., 2008 found that ending commercial logging on U.S. national forests and allowing forests to mature instead would remove an additional amount of carbon from the atmosphere equivalent to 6 percent of the U.S. 2025 climate target of 28 percent emission reductions.

Forest recovery following logging and natural disturbances are usually considered a given. But forests have recovered under climatic conditions that no longer exist. Higher global temperatures and increased levels of disturbance are contributing to greater tree mortality in many forest ecosystems, and these same drivers can also limit forest regeneration, leading to vegetation type conversion. (Bart et al. 2016.)

The importance of trees for carbon capture will rise especially if, as recent evidence suggests, hopes for soils as a carbon sink may be overly optimistic. (He et al., 2016.) Such a potentially

reduced role of soils doesn't mean that forest soils won't have a role in capture and storage of carbon, rather it puts more of the onus on aboveground sequestration by trees, even if there is a conversion to unfamiliar mixes of trees.

The EA ignores the large body of science on forest management's adverse effects on carbon sequestration. Also, the FS likes to claim that carbon emissions from projects such as Mission are minimal in the overall context of such things, however the FS avoids the logical step of analyzing and disclosing the cumulative effects of overall agency management contributions to climate change.

The Committee of Scientists, 1999 recognize the importance of forests for their contribution to global climate regulation. Also, the 2012 Planning Rule recognizes, in its definition of *Ecosystem services*, the "Benefits people obtain from ecosystems, including: (2) *Regulating services,* such as long term storage of carbon; climate regulation…"

The EA does not analyze or disclose the body of science that implicates logging activities as a contributor to reduced carbon stocks in forests and increases in greenhouse gas emissions.

The Idaho Panhandle National Forests plan revision draft EIS defines **carbon sequestration**: "…the process by which atmospheric carbon dioxide is taken up by vegetation through photosynthesis and stored as carbon in biomass (trunks, branches, foliage, and roots) and soils."

The EA fails to provide estimates of the total amount of CO_2 or other greenhouse gas emissions caused by FS management actions and policies—forestwide, regionally, or nationally. Instead, agency policymakers seem comfortable maintaining a position that they need not take any leadership on this issue, and obfuscate via this EA to justify their failures.

The best scientific information strongly suggests that management that involves removal of trees and other biomass increases atmospheric CO_2. The EA doesn't state that simple fact. The EA fails to present any modeling of forest stands under different management scenarios. The FS should model the carbon flux over time for its proposed stand management scenarios and for the various types of vegetation cover found on the Okanogan-Wenatchee NF.

The EA also ignores CO_2 and other greenhouse gas emissions from other common human activities related to forest management and recreational uses. These include emissions associated with machines used for logging and associated activities, vehicle use for administrative actions, recreational motor vehicles, and emissions associated with livestock grazing. The FS is simply ignoring the climate impacts of these management and other authorized or allowed activities.

Kassar and Spitler, 2008 provide an analysis of the carbon footprint of off-road vehicles in California. They determined that:

> Off-road vehicles in California currently emit more than 230,000 metric tons — or 5000 million pounds — of carbon dioxide into the atmosphere each year. This is equivalent to the emissions created by burning 500,000 barrels of oil. The 26 million gallons of

> gasoline consumed by off-road vehicles each year in California is equivalent to the amount of gasoline used by 1.5 million car trips from San Francisco to Los Angeles.
>
> . . . Off-road vehicles emit considerably more pollution than automobiles. According to the California Air Resources Board, off-road motorcycles and all-terrain vehicles produce 118 times as much smog-forming pollutants as do modern automobiles on a per-mile basis.
>
> . . . Emissions from current off-road vehicle use statewide are equivalent to the carbon dioxide emissions from 42,000 passenger vehicles driven for an entire year or the electricity used to power 30,500 homes for one year.

Also, Sylvester, 2014 provides data on the amount of fossil fuel being consumed by snowmobiles in Montana, from which one can calculate the carbon footprint. The study finds that resident snowmobilers burn 3.3 million gallons of gas in their snowmobiles each year and a similar amount of fuel to transport themselves and their snowmobiles to and from their destination. Non-residents annually burn one million gallons of gas in snowmobiles and about twice that in related transportation. So that adds up to 9.6 million gallons of fuel consumed in the pursuit of snowmobiling each year in Montana alone. Multiply that by 20 pounds of carbon dioxide per gallon of gas (diesel pickups spew 22 pounds per gallon) and snowmobiling releases 192 million pounds (96 thousand tons) of climate-warming CO_2 per year into the atmosphere. Can we really afford this?

Fossil fuel emissions created by motor vehicles can be estimated. The Mission EA fails to disclose the fossil fuel emissions caused by recreational activities and resource management activities.

Nitrous oxide, a by-product generated by the microbial breakdown of nitrogen in livestock manure, is a potent greenhouse gas completely ignored by the Mission EA. Also, the digestion of organic materials by livestock is a large source of methane emission. Methane is a far more potent substance than CO_2 causing climate change. Beschta et al 2012 review some of the science on livestock exacerbation of climate change:

> Livestock production impacts energy and carbon cycles and globally contributes an estimated 18% to the total anthropogenic greenhouse gas (GHG) emissions (Steinfeld and others 2006). How public-land livestock contribute to these effects has received little study. Nevertheless, livestock grazing and trampling can reduce the capacity of rangeland vegetation and soils to sequester carbon and contribute to the loss of above- and below-ground carbon pools (e.g., Lal 2001b; Bowker and others 2012). Lal (2001a) indicated that heavy grazing over the long-term may have adverse impacts on soil organic carbon content, especially for soils of low inherent fertility. Although Gill (2007) found that grazing over 100 years or longer in subalpine areas on the Wasatch Plateau in central Utah had no significant impacts on total soil carbon, results of the study suggest that ‘‘if temperatures warm and summer precipitation increases as is anticipated, [soils in grazed areas] may become net sources of CO2 to the atmosphere’’ (Gill 2007, p. 88). Furthermore, limited soil aeration in soils compacted by livestock can stimulate production of methane, and

emissions of nitrous oxide under shrub canopies may be twice the levels in nearby grasslands (Asner and others 2004). Both of these are potent GHGs.

Gerber, et al., 2013 state, "Livestock producers, which include meat and dairy farming, account for about 15 percent of greenhouse gas emissions around the world. That's more than all the world's exhaust-belching cars, buses, boats, and trains combined."

Saunois et al., 2016a note "the recent rapid rise in global methane concentrations is predominantly biogenic—most likely from agriculture—with smaller contributions from fossil fuel use and possibly wetlands. …Methane mitigation offers rapid climate benefits and economic, health and agricultural co-benefits that are highly complementary to CO_2 mitigation." (Also see Saunois et al., 2016b; Gerber et al., 2013; and the Grist articles "Why isn't the U.S. counting meat producers' climate emissions?" and "Cattle grazing is a climate disaster, and you're paying for it" and Stanford News article "Methane from food production could be wildcard in combating climate change, Stanford scientist says".)

Ripple et al. 2014 provide some data and point out the opportunities available for greenhouse gas reductions via change in livestock policy:

- At present non-CO_2 greenhouse gases contribute about a third of total anthropogenic CO_2 equivalent (CO_2e) emissions and 35–45% of climate forcing (the change in radiant energy retained by Earth owing to emissions of long-lived greenhouse gases) resulting from those emissions.
- Methane (CH4) is the most abundant non- CO_2 greenhouse gas and because it has a much shorter atmospheric lifetime (~9 years) than CO_2 it holds the potential for more rapid reductions in radiative forcing than would be possible by controlling emissions of CO_2 alone.
- We focus on ruminants for four reasons. First, ruminant production is the largest source of anthropogenic CH_4 emissions (Fig. 1c) and globally occupies more area than any other land use. Second, the relative neglect of this greenhouse gas source suggests that awareness of its importance is inappropriately low. Third, reductions in ruminant numbers and ruminant meat production would simultaneously benefit global food security, human health and environmental conservation. Finally, with political will, decreases in worldwide ruminant populations could potentially be accomplished quickly and relatively inexpensively.
- Worldwide, the livestock sector is responsible for approximately 14.5% of all anthropogenic greenhouse gas emissions3 (7.1 of 49 Gt $CO_2$2e yr–1). Approximately 44% (3.1 Gt CO_2e yr–1) of the livestock sector's emissions are in the form of CH4 from enteric fermentation, manure and rice feed, with the remaining portions almost equally shared between CO_2 (27%, 2 Gt CO_2e yr–1) from land-use change and fossil fuel use, and nitrous oxide (N_2O) (29%, 2 Gt CO_2e yr–1) from fertilizer applied to feed-crop fields and manure.
- Globally, ruminants contribute 11.6% and cattle 9.4% of all greenhouse gas emissions from anthropogenic sources.

- Lower global ruminant numbers would have simultaneous benefits for other systems and processes. For example, in some grassland and savannah ecosystems, domestic ruminant grazing contributes to land degradation through desertification and reduced soil organic carbon. Ruminant agriculture can also have negative impacts on water quality and availability, hydrology and riparian ecosystems. Ruminant production can erode biodiversity through a wide range of processes such as forest loss and degradation, land-use intensification, exotic plant invasions, soil erosion, persecution of large predators and competition with wildlife for resources.
- Roughly one in eight people in the world are severely malnourished or lack access to food owing to poverty and high food prices. With over 800 million people chronically hungry, we argue that the use of highly productive croplands to produce animal feed is questionable on moral grounds because this contributes to exhausting the world's food supply.
- In developed countries, high levels of meat consumption rates are strongly correlated with rates of diseases such as obesity, diabetes, some common cancers and heart disease. Moreover, reducing meat consumption and increasing the proportion of dietary protein obtained from high-protein plant foods — such as soy, pulses, cereals and tubers — is associated with significant human health benefits.
- The greenhouse gas footprint of consuming ruminant meat is, on average, 19–48 times higher than that of high-protein foods obtained from plants (Fig. 2), when full life cycle analysis including both direct and indirect environmental effects from 'farm to fork' for enteric fermentation, manure, feed, fertilizer, processing, transportation and land-use change are considered.
- In terms of short-term climate change mitigation during the next few decades, if all the land used for ruminant livestock production were instead converted to grow natural vegetation, increased CO_2 sequestration on the order of 30–470% of the greenhouse gas emissions associated with food production could be expected.
- (D)ecreasing ruminants should be considered alongside our grand challenge of significantly reducing the world's reliance on fossil fuel combustion. Only with the recognition of the urgency of this issue and the political will to commit resources to comprehensively mitigate both CO_2 and non- CO_2 greenhouse gas emissions will meaningful progress be made on climate change. For an effective and rapid response, we need to increase awareness among the public and policymakers that what we choose to eat has important consequences for climate change.

Educate yourselves further:
https://www.facebook.com/DavidAvocadoWolfe/videos/10153860126441512/

Returning to logging, the FS distracts from the emerging scientific consensus that removing wood or ***any*** biomass from the forest only worsens the climate change problem. Law and Harmon, 2011 conducted a literature review and concluded …

> Thinning forests to reduce potential carbon losses due to wildfire is in direct conflict with carbon sequestration goals, and, if implemented, would result in a net emission of CO2 to the atmosphere because the amount of carbon removed to change fire behavior is often far

> larger than that saved by changing fire behavior, and more area has to be harvested than will ultimately burn over the period of effectiveness of the thinning treatment.

Best available science supports the proposition that forest policies must shift away from logging if carbon sequestration is prioritized. Forests must be preserved indefinitely for their carbon storage value. Forests that have been logged should allowed to convert to eventual old-growth condition. This type of management has the potential to double the current level of carbon storage in some regions. (*See* Harmon and Marks, 2002; Harmon, 2001; Harmon et al., 1990; Homann et al., 2005; Law, 2014; Solomon et al., 2007; Turner et al., 1995; Turner et al., 1997; Woodbury et al., 2007.)

Kutsch et al., 2010 provide an integrated view of the current and emerging methods and concepts applied in soil carbon research. They use a standardized protocol for measuring soil CO_2 efflux, designed to improve future assessments of regional and global patterns of soil carbon dynamics:

> Excluding carbonate rocks, soils represent the largest terrestrial stock of carbon, holding approximately 1,500 Pg (1015 g) C in the top metre. This is approximately twice the amount held in the atmosphere and thrice the amount held in terrestrial vegetation. Soils, and soil organic carbon in particular, currently receive much attention in terms of the role they can play in mitigating the effects of elevated atmospheric carbon dioxide (CO_2) and associated global warming. Protecting soil carbon stocks and the process of soil carbon sequestration, or flux of carbon into the soil, have become integral parts of managing the global carbon balance. This has been mainly because many of the factors affecting the flow of carbon into and out of the soil are affected directly by **land-management practices**.

(Emphasis added.) Van der Werf, et al. 2009 discuss the effects of land-management practices and state:

> (T)he maximum reduction in CO_2 emissions from avoiding deforestation and forest degradation is probably about 12% of current total anthropogenic emissions (or 15% if peat degradation is included) - and that is assuming, unrealistically, that emissions from deforestation, forest degradation and peat degradation can be completely eliminated.
>
> ...reducing fossil fuel emissions remains the key element for stabilizing atmospheric CO_2 concentrations.
>
> (E)fforts to mitigate emissions from tropical forests and peatlands, and maintain existing terrestrial carbon stocks, remain critical for the negotiation of a post-Kyoto agreement. Even our revised estimates represent substantial emissions ...

Keith et al., 2009 state:

> Both net primary production and net ecosystem production in many old forest stands have been found to be positive; they were lower than the carbon fluxes in young and mature stands, but not significantly different from them. Northern Hemisphere forests up to 800 years old have been found to still function as a carbon sink. Carbon stocks can continue to accumulate in multi-aged and mixed species stands because stem respiration rates decrease

> with increasing tree size, and continual turnover of leaves, roots, and woody material contribute to stable components of soil organic matter. There is a growing body of evidence that forest ecosystems do not necessarily reach an equilibrium between assimilation and respiration, but can continue to accumulate carbon in living biomass, coarse woody debris, and soils, and therefore may act as net carbon sinks for long periods. Hence, process-based models of forest growth and carbon cycling based on an assumption that stands are even-aged and carbon exchange reaches an equilibrium may underestimate productivity and carbon accumulation in some forest types. Conserving forests with large stocks of biomass from deforestation and degradation avoids significant carbon emissions to the atmosphere. Our insights into forest types and forest conditions that result in high biomass carbon density can be used to help identify priority areas for conservation and restoration.

Harmon, 2009 reviews how the forest ecosystem stores carbon, the issues that must be addressed when assessing any proposed course of action, and some common misconceptions. He also reviews and assesses some of the more common proposals as well as general scientific concerns about the forest system as a place to store carbon.

Hanson, 2010 addresses some of the false notions often misrepresented as “best science” by agencies, extractive industries and the politicians they’ve bought:

> Our forests are functioning as carbon sinks (net sequestration) where logging has been reduced or halted, and wildland fire helps maintain high productivity and carbon storage.
>
> Even large, intense fires consume less than 3% of the biomass in live trees, and carbon emissions from forest fires is only tiny fraction of the amount resulting from fossil fuel consumption (even these emissions are balanced by carbon uptake from forest growth and regeneration).
>
> "Thinning" operations for lumber or biofuels do not increase carbon storage but, rather, reduce it, and thinning designed to curb fires further threatens imperiled wildlife species that depend upon post-fire habitat.

Campbell et al., 2011 also refutes the notion that fuel-reduction treatments increase forest carbon storage in the western US:

> It has been suggested that thinning trees and other fuel-reduction practices aimed at reducing the probability of high-severity forest fire are consistent with efforts to keep carbon (C) sequestered in terrestrial pools, and that such practices should therefore be rewarded rather than penalized in C-accounting schemes. By evaluating how fuel treatments, wildfire, and their interactions affect forest C stocks across a wide range of spatial and temporal scales, we conclude that this is extremely unlikely. Our review reveals high C losses associated with fuel treatment, only modest differences in the combustive losses associated with high-severity fire and the low-severity fire that fuel treatment is meant to encourage, and a low likelihood that treated forests will be exposed to fire. Although fuel-reduction treatments may be necessary to restore historical functionality to

> fire-suppressed ecosystems, we found little credible evidence that such efforts have the added benefit of increasing terrestrial C stocks.

Mitchell et al. (2009) also refutes the assertion that logging to reduce fire hazard helps store carbon, and conclude that although thinning can affect fire, management activities are likely to remove more carbon by logging than will be stored by trying to prevent fire.

Forests affect the climate, climate affects the forests, and there's been increasing evidence of climate triggering forest cover loss at significant scales (Breshears et al. 2005), forcing tree species into new distributions "unfamiliar to modern civilization" (Williams et al. 2012), and raising a question of forest decline across the 48 United States (Cohen et al. 2016).

In 2012 Forest Service scientists reported, "Climate change will alter ecosystem services, perceptions of value, and decisions regarding land uses." (Vose et al. 2012.)

The 2014 National Climate Assessment chapter for the Northwest is prefaced by four "key messages" including this one: "The combined impacts of increasing wildfire, insect outbreaks, and tree diseases are already causing widespread tree die-off and are virtually certain to cause additional forest mortality by the 2040s and long-term transformation of forest landscapes. Under higher emissions scenarios, extensive conversion of subalpine forests to other forest types is projected by the 2080s." (Mote et al. 2014.)

None of this means that longstanding values such as conservation of old-growth forests are no longer important. Under increasing heat and its consequences, we're likely to get unfamiliar understory and canopy comprised of a different mix of species. This new assortment of plant species will plausibly entail a new mix of trees, because some familiar tree species on the CNF may not be viable—or as viable—under emerging climate conditions.

That said, the plausible new mix will include trees for whom the best policy will be in allowing them to achieve their longest possible lifespan, for varied reasons including that big trees will still serve as important carbon capture and storage (Stephenson et al. 2014).

Managing forest lands with concerns for water will be increasingly difficult under new conditions expected for the 21st century. (Sun and Vose, 2016.) Already, concerns have focused on new extremes of low flow in streams. (Kormos et al. 2016.) The 2014 National Climate Assessment Chapter for the Northwest also recognizes hydrologic challenges ahead: "Changes in the timing of streamflow related to changing snowmelt are already observed and will continue, reducing the supply of water for many competing demands and causing far-reaching ecological and socioeconomic consequences." (Mote et al. 2014.)

Heat, a long-established topic of physics, plays an equally important role at the level of plant and animal physiology—every organism only survives and thrives within thermal limits. For example, Pörtner et al. (2008) point out, "All organisms live within a limited range of body temperatures… Direct effects of climatic warming can be understood through fatal decrements in

an organism's performance in growth, reproduction, foraging, immune competence, behaviors and competitiveness." The authors further explain, "Performance in animals is supported by aerobic scope, the increase in oxygen consumption rate from resting to maximal." In other words, rising heat has the same effect on animals as reducing the oxygen supply, and creates the same difficulties in breathing. But breathing difficulties brought on by heat can have important consequences even at sub-lethal levels. In the case of grizzly bears, increased demand for oxygen under increasing heat has implications for vigorous (aerobically demanding) activity including digging, running in pursuit of prey, mating, and the play of cubs.

Malmsheimer et al. 2008 state, "Forests are shaped by climate. Along with soils, aspect, inclination, and elevation, climate determines what will grow where and how well. Changes in temperature and precipitation regimes therefore have the potential to dramatically affect forests nationwide."

Kirilenko and Sedjo, 2007 state "The response of forestry to global warming is likely to be multifaceted. On some sites, species more appropriate to the climate will replace the earlier species that is no longer suited to the climate."

Some FS scientists recognize this changing situation, for instance Johnson, 2016:

> Forests are changing in ways they've never experienced before because today's growing conditions are different from anything in the past. The climate is changing at an unprecedented rate, exotic diseases and pests are present, and landscapes are fragmented by human activity often occurring at the same time and place.
>
> The current drought in California serves as a reminder and example that forests of the 21st century may not resemble those from the 20th century. "When replanting a forest after disturbances, does it make sense to try to reestablish what was there before? Or, should we find re-plant material that might be more appropriate to current and future conditions of a changing environment?
>
> "Restoration efforts on U.S. Forest Service managed lands call for the use of locally adapted and appropriate native seed sources. The science-based process for selecting these seeds varies, but in the past, managers based decisions on the assumption that present site conditions are similar to those of the past.
>
> "This may no longer be the case."

There is scientific certainty that climate change has reset the deck for future ecological conditions. For example, Sallabanks, et al., 2001:

> (L)ong-term evolutionary potentials can be met only by accounting for potential future changes in conditions. …Impending changes in regional climates …have the capacity for causing great shifts in composition of ecological communities.

The issue of forest response to climate change is also of course an issue of broad importance to community vitality and economic sustainability. Raising a question about persistence of forest stands also raises questions about hopes—and community economic planning—for the sustainability of forest-dependent jobs. Allen et al., 2015 state:

> Patterns, mechanisms, projections, and consequences of tree mortality and associated broad-scale forest die-off due to drought accompanied by warmer temperatures—hotter drought", an emerging characteristic of the Anthropocene—are the focus of rapidly expanding literature.
>
> …(R)ecent studies document more rapid mortality under hotter drought due to negative tree physiological responses and accelerated biotic attacks. Additional evidence suggesting greater vulnerability includes rising background mortality rates; projected increases in drought frequency, intensity, and duration; limitations of vegetation models such as inadequately represented mortality processes; warming feedbacks from die-off; and wildfire synergies.
>
> …We also present a set of global vulnerability drivers that are known with high confidence: (1) droughts eventually occur everywhere; (2) warming produces hotter droughts; (3) atmospheric moisture demand increases nonlinearly with temperature during drought; (4) mortality can occur faster in hotter drought, consistent with fundamental physiology; (5) shorter droughts occur more frequently than longer droughts and can become lethal under warming, increasing the frequency of lethal drought nonlinearly; and (6) mortality happens rapidly relative to growth intervals needed for forest recovery.
>
> These high-confidence drivers, in concert with research supporting greater vulnerability perspectives, support an overall viewpoint of greater forest vulnerability globally. We surmise that mortality vulnerability is being discounted in part due to difficulties in predicting threshold responses to extreme climate events. Given the profound ecological and societal implications of underestimating global vulnerability to hotter drought, we highlight urgent challenges for research, management, and policy-making communities.

Also see: "Scientists Letter to the Senate on carbon neutrality of forest biomass."

The EA fails to consider best available scientific information on climate change as it relates directly, indirectly, and cumulatively to the Three Creeks Project, in violation of NEPA.

Roadless expanse

The FS's Northern Region explains the concept of "Roadless Expanse" in a document entitled "Our Approach to Roadless Area Analysis of Unroaded Lands Contiguous to Roadless Areas" (12/2/10). In summary, this paper is based on some judicial history regarding the Roadless Area Conservation Rule. This 2010 document states that "projects on lands contiguous to roadless areas must analyze the environmental consequences, including irreversible and irretrievable commitment of resources on roadless area attributes, and the effects for potential designation as wilderness under the Wilderness Act of 1964. **This analysis must consider the effects to the**

entire roadless expanse; that is both the roadless area and the unroaded lands contiguous to the roadless area." (Emphasis added.)

The Mission EA does not "consider the effects to the entire roadless expanse." The EA does not take a hard look at the Mission project impacts on the Roadless Characteristics and Wilderness Attributes of the Sawtooth Inventoried Roadless Area and uninventoried roadless making up the Roadless Expanse. The public must be able to understand if the project would cause irreversible and irretrievable impacts on the suitability of any portion of the Roadless Expanse for future consideration for Recommended Wilderness or for Wilderness designation under forest planning.

Most roadless areas, particularly in the interior western U.S., are at middle to high elevations (Henjum et al. 1994). Higher elevations are cooler, receive more moisture, and have a shorter summer dry season than lower elevations. They are typically characterized by a regime of low-frequency, high-intensity fires. Roadless areas are therefore less likely to have current fire regimes that are significantly different from historical conditions (Beschta et al. 2004) and are therefore of low priority for fuel treatment. Roadless areas have a lower potential for high-intensity fires than roaded areas partly because they are less prone to human caused ignitions (DellaSala et al. 1995, USDA Forest Service, 2000). The EA fails to acknowledge the best scientific information that recognizes the high ecological integrity and functioning of unmanaged areas.

The EA fails to consider best available science on the high level of ecological integrity found in roadless areas. Human activities have damaged the streams and other natural features found in the project area watersheds. The FS has yet to demonstrate it can extract resources in a sustainable manner in roaded areas, so further expanding an unsustainable management footprint would be extremely shortsighted.

We incorporate the document "**Scientific Literature Review**" which has a section entitled "Scientific Findings on Roads and Roadless Lands."

Remedy: Select the no-action alternative. Otherwise, prepare an EIS for the project, which evaluates the location of roadless area boundaries and analyze and disclose impacts on the Roadless Expanse.

Livestock Grazing & Cumulative Effects

The EA does not properly analyze and disclose the impacts of livestock grazing in the project area and fails to disclose scientifically valid quantitative monitoring data to validate analyses for affected resources within project area and cumulative effects analysis area. The EA violates the NEPA and the National Forest Management Act (NFMA).

We recognize the risk and likelihood of environmental damage from past and ongoing livestock grazing in the Mission project area, and also note the EA's failure to adequately analyze and disclose the cumulative effects of this grazing. With this failure, the FS reveals its bias for accommodating livestock interests above the needs of the general public, who need to understand

how the Mission project activities and impacts interact synergistically and integrate with livestock grazing activities and impacts.

For example, Baker et al., 2006 state:

> Livestock grazing may have complex effects, but generally increases tree density in formerly open stands and thereby increases the fine fuels that contribute most to fire intensity and severity. Removal of grass reduces competition, allowing more trees to successfully regenerate, shown experimentally in the Southwest (Pearson, 1942), and also by paired comparisons in other parts of the West, in which mesas subject to livestock grazing have much higher tree density than do comparable nearby ungrazed mesas (Rummell, 1951; Madany & West, 1983). Grazing can also initially reduce the quantity of fine grass fuels needed for surface fires, and the onset of heavy grazing in south-western ponderosa pine landscapes is temporally associated with a marked reduction in surface fires (e.g. Savage & Swetnam, 1990). However, fine fuels are likely not to have remained low for long. Higher tree density increases fine fuels that lead to faster fire spread and increases ladder fuels that lead fire into the canopy (Zimmerman & Neuenschwander, 1984), together increasing the potential for more fires and more severe fires. However, this potential effect is most important in mature and old-growth forests, which are rare today, and in younger forests evidence of tree density increase is difficult to detect or is minor, as explained later.

Much of the project area is encompassed within the Lookout Mountain grazing allotment. Although not every acre of the allotment may currently be accessible to livestock, the act of removing trees and other vegetation from treatment areas and road corridors would alter that situation significantly. This includes riparian areas, for which the NWFP Aquatic Conservation Strategy establishes Objectives and other direction related to livestock grazing. Yet the EA completely omits discussion of such direction. It is expected that this omission will be corrected in the final NEPA document.

No site specific descriptions of the impairment of the affected streams and riparian areas are disclosed in the EA.

Mazza, 2015 addresses the importance of riparian areas, especially headwater riparian zones: “Riparian area, where the terrestrial mingle with the aquatic, are special places. Riparian area around headwaters are particularly important because they have strong ecological connections to uplands and provide resources to the downstream system.”

Belsky and Gelbard, 2000 is a literature review of livestock as contributing to noxious weed spread. Belsky et al., 1999 is a literature review of peer-reviewed studies concerning effects of livestock grazing on water resources. Belsky and Blumenthal, 1997 investigate the effects of livestock grazing on stand dynamics and soils of upland forests of the Interior West.

Belsky and Gelbard conclude: “Recent research showing that livestock significantly increase invasions by nonindigenous plants in the western U.S. is persuasive. Similar results were found in all western states and for nearly every introduced species that has been studied.” (Id.)

Belsky et al., 1999 is a literature review of peer-reviewed studies concerning the effects of livestock grazing on water resources. They state:

> Livestock grazing was found to negatively affect water quality and seasonal quantity, stream channel morphology, hydrology, riparian zone soils, instream and streambank vegetation, and aquatic and riparian wildlife. No positive environmental impacts were found. Livestock were also found to cause negative impacts at the landscape and regional levels.

USDA Forest Service 2001e at 41 also acknowledges that this modification of cattle activity has the potential to adversely affect riparian areas, including the following project mitigation:

> During harvest activities if cattle activity is modified because of barrier removal, limit livestock trailing, bedding, watering, salting, loading, and other handling efforts to those areas and times that would not retard or prevent attainment of Riparian Management Objectives or adversely affect inland native fish.

The Status of the Interior Columbia Basin, Summary of Scientific Findings (USDA Forest Service & USDI Bureau of Land Management, 1996) includes the following figure at page 126, explaining some effects of livestock grazing on streams and riparian areas:

Unhealthy riparian area with relatively low cover of herb vegetation along the stream banks and on the adjacent terraces. Effects of summer season historic livestock grazing caused the loss of shrubs and compacted the surface soil. The stream cut down in the channel and the water table dropped resulting in a dryer system. This system is less productive, less diverse, will not store as much water, and has low buffering capacity during flood events.

At page 95 that document also states:

> The key ecological roles of lichens include contributing mass and nutrients to litter and duff, increasing canopy and soil moisture-holding capacity, fixing atmospheric nitrogen, serving as food for animals, and acting as bioindicators for air quality. ...Lichens are major components of native rangelands and provide critical soil functions, but have been threatened by exotic grasses, increased fire frequency, conversion of rangelands, and **livestock trampling**. Lichens are part of microbiotic crusts and are susceptible to **damage from livestock grazing and trampling**. One lichen, *Texosporium sancti-jacobi*, is listed as a Category 2 (C2) candidate species.

(Emphasis added.) Also, the Colville NF's Power Lake Vegetation Management Projects Environmental Assessment points out that "Cattle grazing has the potential to impact newly established regeneration from cattle trampling the seedlings or pulling them out of the ground with their teeth." (USDA Forest Service 2012c.) That EA also states:

> Fire regime condition class ... is used to describe the degree of departure from the historic fire regimes that results from alterations of key ecosystem components such as composition, structural stage, stand age, and canopy closure. One or more of the following activities may have caused this departure: fire exclusion, timber harvesting, **grazing**,

introduction and establishment of nonnative plant species, insects or disease (introduced or native), or other past management activities. (Id., emphasis added.)

Baker et al., 2006 discuss significant cumulative effects of livestock grazing on forest conditions that are ignored in the EA. These are conditions the EA uses as justification for the project (Purpose and Need), and attributes to fire suppression. Baker et al., 2006 state:

> Livestock grazing may have complex effects, but generally increases tree density in formerly open stands and thereby increases the fine fuels that contribute most to fire intensity and severity. Removal of grass reduces competition, allowing more trees to successfully regenerate, shown experimentally in the Southwest (Pearson, 1942), and also by paired comparisons in other parts of the West, in which mesas subject to livestock grazing have much higher tree density than do comparable nearby ungrazed mesas (Rummell, 1951; Madany & West, 1983). Grazing can also initially reduce the quantity of fine grass fuels needed for surface fires, and the onset of heavy grazing in south-western ponderosa pine landscapes is temporally associated with a marked reduction in surface fires (e.g. Savage & Swetnam, 1990). However, fine fuels are likely not to have remained low for long. Higher tree density increases fine fuels that lead to faster fire spread and increases ladder fuels that lead fire into the canopy (Zimmerman & Neuenschwander, 1984), together increasing the potential for more fires and more severe fires.

Thirteen scientists discussed the impacts of livestock on national forest lands in their letter commenting on the NFMA regulations Draft EIS (Scientists Letter, 2011). The scientists discuss some of the well-documented, widely known direct, indirect, and cumulative environmental impacts of livestock grazing on national forest lands, focusing on national forests west of the Rockies.

Beschta et al., 2012 conclude that climate change is causing additional stress to already damaged western rangelands, and make management recommendations to address these implications. Among their observations:

- In the western U.S., climate change is expected to intensify even if greenhouse gas emissions are dramatically reduced.
- Among the threats facing ecosystems as a result of climate change are invasive species, elevated wildfire occurrence, and declining snowpack.
- Federal land managers have begun to adapt to climate-related impacts, but not the combined effects of climate and hooved mammals, or ungulates.
- Climate impacts are compounded from heavy use by livestock and other grazing ungulates, which cause soil erosion, compaction, and dust generation; stream degradation; higher water temperatures and pollution; loss of habitat for fish, birds and amphibians; and desertification.
- Encroachment of woody shrubs at the expense of native grasses and other plants can occur in grazed areas, affecting pollinators, birds, small mammals and other native wildlife.
- Livestock grazing and trampling degrades soil fertility, stability and hydrology, and makes it vulnerable to wind erosion. This in turn adds sediments, nutrients and pathogens to western streams.

• Water developments and diversion for livestock can reduce streamflows and increase water temperatures, degrading habitat for fish and aquatic invertebrates.
• Grazing and trampling reduces the capacity of soils to sequester carbon, and through various processes contributes to greenhouse warming.
• Domestic livestock now use more than 70 percent of the lands managed by the BLM and Forest Service, and their grazing may be the major factor negatively affecting wildlife in 11 western states. In the West, about 175 taxa of freshwater fish are considered imperiled due to habitat-related causes.
• Removing or significantly reducing grazing is likely to be far more effective, in cost and success, than piecemeal approaches to address some of these concerns in isolation.

From a News Release accompanying the Beschta et al., 2012 report:

> A growing degradation of grazing lands could be mitigated if large areas of Bureau of Land Management and USDA Forest Service lands became free of use by livestock and "feral ungulates" such as wild horses and burros, and high populations of deer and elk were reduced, the group of scientists said.
>
> This would help arrest the decline and speed the recovery of affected ecosystems, they said, and provide a basis for comparative study of grazing impacts under a changing climate. The direct economic and social impacts might also be offset by a higher return on other ecosystem services and land uses, they said, although the report focused on ecology, not economics.
>
> Livestock use affects a far greater proportion of BLM and Forest Service lands than do roads, timber harvest and wildfires combined, the researchers said in their study. But effort to mitigate the pervasive effects of livestock has been comparatively minor, they said, even as climatic impacts intensify.
>
> The advent of climate change has significantly added to historic and contemporary problems that result from cattle and sheep ranching, the report said, which first prompted federal regulations in the 1890s.
>
> Wild horses and burros are also a significant problem, this report suggested, and high numbers of deer and elk occur in portions of the West, partially due to the loss or decline of large predators such as cougars and wolves. Restoring those predators might also be part of a comprehensive recovery plan, the researchers said.
>
> The problems are sufficiently severe, this group of researchers concluded, that **they believe the burden of proof should be shifted. Those using public lands for livestock production should have to justify the continuation of ungulate grazing, they said.**

(Emphasis added.) From the Abstract of Beschta et al 2012:

> Abstract Climate change affects public land ecosystems and services throughout the American West and these effects are projected to intensify. Even if greenhouse gas

emissions are reduced, adaptation strategies for public lands are needed to reduce anthropogenic stressors of terrestrial and aquatic ecosystems and to help native species and ecosystems survive in an altered environment. Historical and contemporary livestock production—the most widespread and long-running commercial use of public lands—can alter vegetation, soils, hydrology, and wildlife species composition and abundances in ways that exacerbate the effects of climate change on these resources. Excess abundance of native ungulates (e.g., deer or elk) and feral horses and burros add to these impacts. Although many of these consequences have been studied for decades, the ongoing and impending effects of ungulates in a changing climate require new management strategies for limiting their threats to the long-term supply of ecosystem services on public lands. Removing or reducing livestock across large areas of public land would alleviate a widely recognized and long-term stressor and make these lands less susceptible to the effects of climate change. Where livestock use continues, or where significant densities of wild or feral ungulates occur, management should carefully document the ecological, social, and economic consequences (both costs and benefits) to better ensure management that minimizes ungulate impacts to plant and animal communities, soils, and water resources. Reestablishing apex predators in large, contiguous areas of public land may help mitigate any adverse ecological effects of wild ungulates.

Some other key points Beschta et al. 2012, make include:

- If livestock use on public lands continues at current levels, its interaction with anticipated changes in climate will likely worsen soil erosion, dust generation, and stream pollution. Soils whose moisture retention capacity has been reduced will undergo further drying by warming temperatures and/or drought and become even more susceptible to wind erosion (Sankey and others 2009).
- (I)n 1994 the BLM and FS reported that western riparian areas were in their worst condition in history, and livestock use—typically concentrated in these areas—was the chief cause (BLM and FS 1994).
- Ohmart and Anderson (1986) suggested that livestock grazing may be the major factor negatively affecting wildlife in eleven western states. Such effects will compound the problems of adaptation of these ecosystems to the dynamics of climate change (Joyce and others 2008, 2009). Currently, the widespread and ongoing declines of many North American bird populations that use grassland and grass–shrub habitats affected by grazing are ‘‘on track to become a prominent wildlife conservation crisis of the 21st century’’ (Brennan and Kuvlesky 2005, p. 1)
- Climate change and ungulates, singly and in concert, influence ecosystems at the most fundamental levels by affecting soils and hydrologic processes. These effects, in turn, influence many other ecosystem components and processes—nutrient and energy cycles; reproduction, survival, and abundance of terrestrial and aquatic species; and community structure and composition. Moreover, by altering so many factors crucial to ecosystem functioning, the combined effects of a changing climate and ungulate use can affect biodiversity at scales ranging from species to ecosystems (FS 2007) and limit the capability of large areas to supply ecosystem services (Christensen and others 1996; MEA 2005b).

- The site-specific impacts of livestock use vary as a function of many factors (e.g., livestock species and density, periods of rest or non-use, local plant communities, soil conditions). Nevertheless, extensive reviews of published research generally indicate that livestock have had numerous and widespread negative effects to western ecosystems (Love 1959; Blackburn 1984; Fleischner 1994; Belsky and others 1999; Kauffman and Pyke 2001; Asner and others 2004; Steinfeld and others 2006; Thornton and Herrero 2010). Moreover, public-land range conditions have generally worsened in recent decades (CWWR 1996, Donahue 2007), perhaps due to the reduced productivity of these lands caused by past grazing in conjunction with a changing climate (FWS 2010, p. 13,941, citing Knick and Hanser 2011).
- Livestock use effects, exacerbated by climate change, often have severe impacts on upland plant communities. For example … areas severely affected include the northern Great Basin and interior Columbia River Basin (Middleton and Thomas 1997).
- Livestock grazing has numerous consequences for hydrologic processes and water resources. Livestock can have profound effects on soils, including their productivity, infiltration, and water storage, and these properties drive many other ecosystem changes. Soil compaction from livestock has been identified as an extensive problem on public lands (CWWR 1996; FS and BLM 1997). Such compaction is inevitable because the hoof of a 450-kg cow exerts more than five times the pressure of heavy earthmoving machinery (Cowley 2002). Soil compaction significantly reduces infiltration rates and the ability of soils to store water, both of which affect runoff processes (Branson and others 1981; Blackburn 1984). Compaction of wet meadow soils by livestock can significantly decrease soil water storage (Kauffman and others 2004), thus contributing to reduced summer base flows. Concomitantly, decreases in infiltration and soil water storage of compacted soils during periods of high-intensity rainfall contribute to increased surface runoff and soil erosion (Branson and others 1981). These fundamental alterations in hydrologic processes from livestock use are likely to be exacerbated by climate change.
- The combined effects of elevated soil loss and compaction caused by grazing reduce soil productivity, further compromising the capability of grazed areas to support native plant communities (CWWR 1996; FS and BLM 1997). Erosion triggered by livestock use continues to represent a major source of sediment, nutrients, and pathogens in western streams (WSWC 1989; EPA 2009).
- Historical and contemporary effects of livestock grazing and trampling along stream channels can destabilize streambanks, thus contributing to widened and/or incised channels (NRC 2002). Accelerated streambank erosion and channel incision are pervasive on western public lands used by livestock (Fig. 4). Stream incision contributes to desiccation of floodplains and wet meadows, loss of floodwater detention storage, and reductions in baseflow (Ponce and Lindquist 1990; Trimble and Mendel 1995). Grazing and trampling of riparian plant communities also contribute to elevated water temperatures—directly, by reducing stream shading and, indirectly, by damaging streambanks and increasing channel widths (NRC 2002). Livestock use of riparian plant communities can also decrease the availability of food and construction materials for keystone species such as beaver (Castor canadensis).

- Livestock production impacts energy and carbon cycles and globally contributes an estimated 18% to the total anthropogenic greenhouse gas (GHG) emissions (Steinfeld and others 2006). How public-land livestock contribute to these effects has received little study. Nevertheless, livestock grazing and trampling can reduce the capacity of rangeland vegetation and soils to sequester carbon and contribute to the loss of above- and below-ground carbon pools (e.g., Lal 2001b; Bowker and others 2012). Lal (2001a) indicated that heavy grazing over the long-term may have adverse impacts on soil organic carbon content, especially for soils of low inherent fertility. Although Gill (2007) found that grazing over 100 years or longer in subalpine areas on the Wasatch Plateau in central Utah had no significant impacts on total soil carbon, results of the study suggest that ''if temperatures warm and summer precipitation increases as is anticipated, [soils in grazed areas] may become net sources of CO2 to the atmosphere'' (Gill 2007, p. 88). Furthermore, limited soil aeration in soils compacted by livestock can stimulate production of methane, and emissions of nitrous oxide under shrub canopies may be twice the levels in nearby grasslands (Asner and others 2004). Both of these are potent GHGs.
- Managing livestock on public lands also involves extensive fence systems. Between 1962 and 1997, over 51,000 km of fence were constructed on BLM lands with resident sage-grouse populations (FWS 2010). Such fences can significantly impact this wildlife species. For example, 146 sage-grouse died in less than three years from collisions with fences along a 7.6-km BLM range fence in Wyoming (FWS 2010). Fences can also restrict the movements of wild ungulates and increase the risk of injury and death by entanglement or impalement (Harrington and Conover 2006; FWS 2010). Fences and roads for livestock access can fragment and isolate segments of natural ecological mosaics thus influencing the capability of wildlife to adapt to a changing climate.
- (L)ivestock use (particularly cattle) on these lands exert disturbances without evolutionary parallel (Milchunas and Lauenroth 1993; MEA 2005a). …The combined effects of ungulates (domestic, wild, and feral) and a changing climate present a pervasive set of stressors on public lands, which are significantly different from those encountered during the evolutionary history of the region's native species. The intersection of these stressors is setting the stage for fundamental and unprecedented changes to forest, arid, and semi-arid landscapes in the western US (Table 1) and increasing the likelihood of alternative states. Thus, public-land management needs to focus on restoring and maintaining structure, function, and integrity of ecosystems to improve their resilience to climate change (Rieman and Isaak 2010).
- Natural floods provide another illustration of how ungulates can alter the ecological role of disturbances. High flows are normally important for maintaining riparian plant communities through the deposition of nutrients, organic matter, and sediment on streambanks and floodplains, and for enhancing habitat diversity of aquatic and riparian ecosystems (CWWR 1996). Ungulate effects on the structure and composition of riparian plant communities (e.g., Platts 1991; Chadde and Kay 1996), however, can drastically alter the outcome of these hydrologic disturbances by diminishing streambank stability and severing linkages between high flows and the maintenance of streamside plant communities. As a result, accelerated erosion of streambanks and floodplains, channel

incision, and the occurrence of high instream sediment loads may become increasingly common during periods of high flows (Trimble and Mendel 1995). Similar effects have been found in systems where large predators have been displaced or extirpated (Beschta and Ripple 2012). In general, high levels of ungulate use can essentially uncouple typical ecosystem responses to chronic or acute disturbances, thus greatly limiting the capacity of these systems to provide a full array of ecosystem services during a changing climate.

- (F)ederal grazing fees on BLM and FS lands cover only about one-sixth of the agencies' administration costs (Vincent 2012).

Beschta et al 2012, also discuss restoring ungulate-altered ecosystems at great length. These discussions include the following:

- The ecological effectiveness and low cost of wide-scale reduction in ungulate use for restoring public-land ecosystems, coupled with the scarcity of restoration resources, provide a forceful case for minimizing ungulate impacts. Other conservation measures are unlikely to make as great a contribution to ameliorating landscape-scale effects from climate change or to do so at such a low fiscal cost. As Isaak and others (2012, p. 514) noted with regard to the impacts of climate change on widely-imperiled salmonids: ''…conservation projects are likely to greatly exceed available resources, so strategic prioritization schemes are essential.''
- … (A)ddressing the underlying causes of degradation should be the first priority for effectively restoring altered public-land ecosystems.
- Because livestock use is so widespread on public lands in the American West, management actions directed at ecological restoration (e.g., livestock removal, substantial reductions in numbers or length of season, extended or regular periods of rest) need to be accomplished at landscape scales. Such approaches, often referred to as passive restoration, are generally the most ecologically effective and economically efficient for recovering altered ecosystems because they address the root causes of degradation and allow natural recovery processes to operate (Kauffman and others 1997; Rieman and Isaak 2010). Furthermore, reducing the impact of current stressors is a ''no regrets'' adaptation strategy that could be taken now to help enhance ecosystem resilience to climate change (Joyce and others 2008). This strategy is especially relevant to western ecosystems because removing or significantly reducing the cause of degradation (e.g., excessive ungulate use) is likely to be considerably more effective over the long term, in both costs and approach, than active treatments aimed at specific ecosystem components (e.g., controlling invasive plants) (BLM 2005). Furthermore, the possibility that passive restoration measures may not accomplish all ecological goals is an insufficient reason for not removing or reducing stressors at landscape scales.
- For many areas of the American West, particularly riparian areas and other areas of high biodiversity, significantly reducing or eliminating ungulate stressors should, over time, result in the recovery of self-sustaining and ecologically robust ecosystems (Kauffman and others 1997; Floyd and others 2003; Allington and Valone 2010; Fig. 5). Indeed, various studies and reviews have concluded that the most effective way to restore riparian areas and aquatic systems is to exclude livestock either temporarily (with subsequent changed management) or long-term (e.g., Platts 1991; BLM and FS 1994; Dobkin and

others 1998; NRC 2002; Seavy and others 2009: Fleischner 2010). Recovering channel form and riparian soils and vegetation by reducing ungulate impacts is also a viable management tool for increasing summer baseflows (Ponce and Lindquist 1990; Rhodes and others 1994).

- (R)educing ungulate impacts and restoring degraded plant and soil systems may also assist in mitigating any ongoing or future changes in regional energy and carbon cycles that contribute to global climate change. Simply removing livestock can increase soil carbon sequestration since grasslands with the greatest potential for increasing soil carbon storage are those that have been depleted in the past by poor management (Wu and others 2008, citing Jones and Donnelly 2004). Riparian area restoration can also enhance carbon sequestration (Flynn and others 2009).
- While lowering grazing pressure rather than discontinuing use might be effective in some circumstances, public land managers need to rigorously assess whether such use is compatible with the maintenance or recovery of ecosystem attributes such as soils, watershed hydrology, and native plant and animal communities. In such cases, the contemporary status of at least some of the key attributes and their rates of change should be carefully monitored to ascertain whether continued use is consistent with ecological recovery, particularly as the climate shifts (e.g., Karr and Rossano 2001, Karr 2004; LaPaix and others 2009). To the extent possible, assessments of recovering areas should be compared to similar measurements in reference areas (i.e., areas exhibiting high ecological integrity) or areas where ungulate impacts had earlier been removed or minimized (Angermeier and Karr 1994; Dobkin and others 1998). Such comparisons are crucial if scientists and managers are to confirm whether managed systems are attaining restoration goals and to determine needs for intervention, such as reintroducing previously extirpated species.
- … Current livestock or feral ungulate use should continue only where stocking rates, frequency, and timing can be demonstrated, in comparison with landscape-scale reference areas, exclosures, or other appropriate non-use areas, to be compatible with maintaining or recovering key ecological functions and native species complexes. Furthermore, such use should be allowed only when monitoring is adequate to determine the effects of continued grazing in comparison to areas without grazing.
- Where key large predators are absent or unable to attain ecologically functional densities, federal agencies should coordinate with state wildlife agencies in managing wild ungulate populations to prevent excessive effects of these large herbivores on native plant and animal communities.

The Mission EA does not disclose the monitoring results of the grazing operations as prescribed in national forest allotment decisions and NEPA documents.

The Mission EA does not adequately disclose the amount of direct, indirect or cumulative effects regarding site-specific damage caused by cattle grazing within the cumulative effects area on state, private and national forest ground, as NEPA requires.

The following is one of the Forest Plan monitoring requirements that the Okanogan NF has routinely ignored forestwide:

RANGE										
E	Range Health	Determine condition and trend and compliance with S&Gs°on utilization	Condition and trend transects Field observations, production, and/or utilization studies	Continuing	5 years	M/M	1922 7	Range, Watershed, Timber Staff officer	$50,000	Continued downward or static trend in problem areas and/or exceeding utilization in Standards and Guidelines

NEPA regulations at 40 CFR § 1508.7 define "Cumulative impact as:

> ...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

NEPA regulations at 40 CFR § 1502.24 state, under **Methodology and scientific accuracy**: "Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements." The EA violates NEPA in terms of methodology, scientific accuracy, scientific integrity, and failure to properly analyze and disclose cumulative effects.

The EA should disclose the required level of funding to annually administer the Lookout Mountain grazing allotments in the project area.

Fire Suppression

The Okanogan NF has never adequately analyzed and disclosed the forestwide impacts of its current policy of all-out fire suppression, and nothing in the Mission EA indicates the management of wildland fire in the project area will be any different following project implementation.

Continuing direction for this wildfire suppression on the Forest comes from the Forest Plan, which contains the fire policy. The EA's Alternative 1 is the "no action" alternative required under NEPA, and fire suppression is anticipated to be reasonably foreseeable. Fire suppression doesn't imply "no action", but may be included in Alternative 1 if those actions' environmental impacts have been analyzed and disclosed at the programmatic level, such as in the Forest Plan EIS. The problem with this situation is the scale of ecological damage caused by the wide-scale fire suppression program that began almost 100 years ago wasn't recognized until after the Forest Plan was adopted in 1989. It constitutes significant new information that did not result in any new forest plan decisions or direction, which itself may be adopted properly only as an amendment or revision of the Forest Plan, following proper NEPA procedures.

The Forest Plan EIS itself did not contemplate a range of possible fire planning scenarios, there were no differences under each alternative it analyzed. Nor did the Forest Plan EIS present anything like a best available science discussion weighing the ecological and financial costs and benefits of wildland fire.

What we see nowadays are these project-level NEPA documents like the Mission EA, which implement a hybrid, reactionary management scheme, continuing to replace wildland fire with logging and burning, but not in the context of an analysis of cumulative, forestwide impacts.

Odion and DellaSala, 2011 describe this situation: "…fire suppression continues unabated, creating a self-reinforcing relationship with fuel treatments which are done in the name of fire suppression. Self-reinforcing relationships create runaway processes and federal funding to stop wildfires now amounts to billions of tax dollars each year."

The Mission EA doesn't provide a genuine discussion of the varying amounts and levels of effectiveness of fuel changes attributable to: the varying ages of the past cuts, the varying forest types, the varying slash treatments, etc. This is true for land of other ownerships also. The Mission EA simply does not disclose how the vegetation patterns that have resulted from past logging and other management actions would influence future fire behavior.

The vast majority of acres burn under weather conditions that make control impossible, and that result in fires burning through treated areas as well as untreated. The EA also doesn't recognize the temporal gradients in vegetative recovery following treatments, which are the natural processes acting to regrow the components of natural vegetation the FS calls "fuel."

Wisdom et al., 2000 note that the MIS Lewis' woodpecker is associated closely with recent burns and responds favorably to stand-replacing fires—habitat relations not disclosed or analyzed in the Mission EA.

The EA states that the desired condition is "fire can function as a natural process on the landscape…" (19). However, this is absurd since, as the EA discloses, the overriding management emphasis of the project area, especially outside the Wilderness, is all-out fire suppression.

The EA liberally throws around the term "uncharacteristic wildfire" however it provides no definition for how wildland fire can be—or has been—measured to be "uncharacteristic."

The premise that thinning and other mechanical treatments replicate natural fire is contradicted by science (for example see Rhodes and Baker 2008, McRae et al 2001, and Rhodes 2007). DellaSala, et al. (1995) are skeptical about the efficacy of intensive fuels reductions as fire-proofing methods. Veblen (2003) states:

> The premise behind many projects aimed at wildfire hazard reduction and ecological restoration in forests of the western United States is the idea that unnatural fuel buildup has resulted from suppression of formerly frequent fires. This premise and its implications need to be critically evaluated by conducting area-specific research in the forest ecosystems targeted for fuels or ecological restoration projects. Fire regime researchers need to acknowledge the limitations of fire history methodology and avoid over-reliance on summary fire statistics such as mean fire interval and rotation period.

Kauffman (2004) identifies wildland fires as beneficial and suggests current FS fire suppression policies are the catastrophe:

> Large wild fires occurring in forests, grasslands and chaparral in the last few years have aroused much public concern. Many have described these events as "catastrophes" that must be prevented through aggressive increases in forest thinning. **Yet the real catastrophes are not the fires themselves but those land uses, in concert with fire suppression policies that have resulted in dramatic alterations to ecosystem structure and composition**. The first step in the restoration of biological diversity (forest health) of western landscapes must be to implement changes in those factors that have resulted in the current state of wildland ecosystems. Restoration entails much more than simple structural modifications achieved through mechanical means. **Restoration should be undertaken at landscape scales and must allow for the occurrence of dominant ecosystem processes, such as the natural fire regimes achieved through natural and/or prescribed fires at appropriate temporal and spatial scales.** (Emphases added.)

The EA indicates fire suppression will continue under any alternative, meaning that further timber management and fuels treatments would occur perpetually in intervals. The USFS contends a high density of roads also facilitates fire suppression. These are cumulative effects issues, all across the managed portion of the Okanogan-Wenatchee NF. Project-level NEPA documents such as the Mission EA are implementing a hybrid, reactionary management scheme which continues to attempt replacing wildland fire with logging and burning, but not in the context of conducting the necessary analyses of cumulative, forestwide impacts.

Hutto (2008) states:

> (C)onsider the question of whether forests outside the dry ponderosa pine system are really in need of "restoration." While stem densities and fuel loads may be much greater today than a century ago, those patterns are perhaps as much of a reflection of human activity in the recent past (e.g., timber harvesting) as they are a reflection of historical conditions (Shinneman and Baker 1997). Without embracing and evolutionary perspective, we run the risk of creating restoration targets that do not mimic evolutionarily meaningful historical conditions, and that bear little resemblance to the conditions needed to maintain populations of native species, as mandated by law (e.g., National Forest Management Act of 1976).

There has been extensive research in forests about the ecological benefits of mixed-severity (which includes high-severity) fire over the past two decades, so much so that in 2015 science and academic publishing giant Elsevier published a 400-page book, *The Ecological Importance of Mixed-Severity Fires: Nature's Phoenix* which synthesizes published, peer-reviewed science investigating the value of mixed- and high-severity fires for biodiversity (DellaSala and Hanson, 2015). This book includes research documenting the benefits of high-intensity wildfire patches for wildlife species, as well as a discussion of mechanical "thinning" and its inability to reduce the chances of a fire burning in a given area, or alter the intensity of a fire, should one begin

under high fire weather conditions, because overwhelmingly weather, not vegetation, drives fire behavior (DellaSala and Hanson, 2015, Ch. 13, pp. 382-384).

Ultimately the EA reflects an overriding bias favoring vegetation manipulation and resource extraction via "management" needed to "move toward" some selected desired conditions, along the way neglecting the ecological processes driving these ecosystems. Essentially the RS and EA rig the game, as many desired conditions would only be achievable by resource extractive activities. But since desired conditions must be maintained through repeated management/manipulation the management paradigm conflicts with natural **processes—**the real drivers of the ecosystem. The FS strategy to move towards desired landscape conditions essentially focuses upon achieving static conditions, instead of fostering the natural dynamics of the ecosystem. An abundance of evidence suggests DCs be replaced with **desired future dynamics** to align with best available science.

Hutto, 2006 states:

> The profound failure of many decision makers to appreciate the ecological value of burned forests stems from their taking too narrow a view of what forests provide. …Land managers, politicians, and the public-at-large need to gain a better appreciation of the unique nature of burned forests as ecological communities …and how important the legacy of standing deadwood is to the natural development of forests (Franklin et al. 2000).

The popular media have caught on to the need to appreciate the value of the natural process that is wildland fire. (*Wildfires can be a boon to fisheries*, *Out of fire's destruction comes new growth, Birds in the black, One year after fire Black Mountain is springing back to life, What in the blazes, The Washington Post 2002, Rogue River-Siskiyou National Forest rebuilding after massive 2002 Oregon fire).* The media and others have also viewed opinions on the fiscal and environmental folly of the prevailing fire suppression policies (*As wildfire changes, so should we, Approaching firefighting's limits, Born of Fire, Money to Burn, Burning Money, Yellowstone fire guru ponders '88 and now*).

Even the USDA's own Agriculture Office of Inspector General has opined that the agency "…can further strengthen the cost-effectiveness of its firefighting without sacrificing safety by (1) having non-Federal entities pay an equitable share of wildfire protection costs, (2**) increasing the use of wildland fires to reduce forest vegetation such as underbrush that may fuel future fires and thereby increase costs**, and (3) establishing controls to assess the performance of line officers and incident commanders in controlling costs." (Inspector General Report 2006, emphasis added.)

Also, many direct and indirect effects of fire suppression are also ignored in this EA as well as in the programmatic context. For example, Ingalsbee, 2004 describes the direct, indirect, and cumulative environmental impacts of firefighting:

> Constructing firelines by handcrews or heavy equipment results in a number of direct environmental impacts: it kills and removes vegetation; displaces, compacts, and erodes soil; and degrades water quality. When dozerlines are cut into roadless areas they also

create long-term visual scars that can ruin the wilderness experience of roadless area recreationists. Site-specific impacts of firelines may be highly significant, especially for interior-dwelling wildlife species sensitive to fragmentation and edge effects.

...Another component of fire suppression involves tree cutting and vegetation removal. Both small-diameter understory and large-diameter overstory trees are felled to construct firelines, helispots, and safety zones.

...A host of different toxic chemical fire retardants are used during fire suppression operations. Concentrated doses of retardant in aquatic habitats can immediately kill fish, or lead to algae blooms that kill fish over time. Some retardants degrade into cyanide at levels deadly to amphibians. When dumped on the ground, the fertilizer in retardant can stimulate the growth of invasive weeds that can enter remote sites from seeds transported inadvertently by suppression crews and their equipment.

...One of the many paradoxes of fire suppression is that it involves a considerable amount of human-caused fire reintroduction under the philosophy of "fighting fire with fire." The most routine form of suppression firing, "burnout," occurs along nearly every linear foot of perimeter fireline. Another form of suppression firing, "backfiring," occurs when firefighters ignite a high-intensity fire near a wildfire's flaming edge, with or without a secured containment line. In the "kill zone" between a burnout/backfire and the wildfire edge, radiant heat intensity can reach peak levels, causing extreme severity effects and high mortality of wildlife by entrapping them between two high-intensity flame fronts.

...Firelines, especially dozerlines, can become new "ghost" roads that enable unauthorized or illegal OHV users to drive into roadless areas. These OHVs create further soil and noise disturbance, can spread garbage and invasive weeds, and increase the risk of accidental human-caused fires.

...Roads that have been blockaded, decommissioned, or obliterated in order to protect wildlife or other natural resource values are often reopened for firefighter vehicle access or use as firelines.

...Both vegetation removal and soil disturbance by wildfire and suppression activities can create ideal conditions for the spread of invasive weeds, which can significantly alter the native species composition of ecosystems, and in some cases can change the natural fire regime to a more fire-prone condition. Firefighters and their vehicles can be vectors for transporting invasive weed seeds deep into previously uninfested wildlands.

...Natural meadows are attractive sites for locating firelines, helispots, safety zones, and fire camps, but these suppression activities can cause significant, long-term damage to meadow habitats.

The EA emphasizes actions that attempt to adapt a fire-prone ecosystem to the presence of human development, however we firmly believe the emphasis must be the opposite—assisting human communities to adapt to the fire-prone ecosystems into which they been built.

It make more sense both from a safety and financial perspective to expect homeowners to implement firewise measures on their properties so that management could focus more efficiently on safety of egress routes.

Implicit in the EA is an assumption that fire risk can be mitigated to a significant degree by reacting in opposition to natural processes—namely the growth of various species of native vegetation (misleadingly referred to as "fuels). We believe the EA oversells the ability of land managers to make conditions safe for landowners and firefighters. This could lead to landowner complacency—thereby increasing rather that decreasing risk. Many likely fire scenarios involve weather conditions when firefighters can't react quickly enough, or when it's too unsafe to attempt suppression. With climate change, this is likely to occur more frequently. Other likely scenarios include situations where firefighting might be feasible but resources are stretched thin because of priorities elsewhere.

We strongly support government actions which facilitate cultural change towards private landowners taking the primary responsibility for mitigating the safety and property risks from fire, by implementing firewise activities on their property. Indeed, the best available science supports such a prioritization. (Kulakowski, 2013; Cohen, 1999a) Also, see Firewise Landscaping[5] as recommended by Utah State University, and the Firewise USA website by the National Fire Protection Association[6] for examples of educational materials.

The EA fails to disclose the actions being taken to reduce fuels on private lands adjacent to the Project area, and how those activities (or lack of) will impact the efficacy of the activities proposed for this Project.

With perpetual fire suppression under FS management of the project area virtually assured according to the forest plan and EA, proposed management activities would occur periodically, because they would be needed to maintain vegetation in the FS's version of a "safer" condition. The EA fails to provide a full and detailed accounting of the costs to those who would pay for this never-ending "fuels" cycle—the American public. It is also in the FS's best interest to know what sort of long-term financial commitments it is making. Further, the EA fails to disclose the inherent uncertainties of perpetually funding these activities, and the implications of their being left undone.

The FS must have a detailed long-term program for maintaining the allegedly safer conditions, including how areas will be treated in the future following proposed treatments, or how areas not

[5] https://extension.usu.edu/ueden/ou-files/Firewise-Landscaping-for-Utah.pdf
[6] http://www.nfpa.org/Public-Education/By-topic/Wildfire/Firewise-USA/The-ember-threat-and-the-home-ignition-zone

needing treatment now will be treated as the need arises. The public at large and private landowners must know what the scale of the long-term efforts must be, including the amount of funding necessary, and the likelihood based on realistic funding scenarios for such a program to be adequately and timely funded.

The FS has not conducted a forestwide cumulative effects analysis of FS fire suppression policies. The FS also has not conducted ESA consultation on its forestwide fire management plan.

Regardless of EA claims of unnatural conditions due to fire suppression, it doesn't provide scientific support for its claims that disturbance regimes have somehow been altered to the degree that its proposed actions are justified.

Remedy: Choose the No Action Alternative. Alternatively, before preparing an EIS for the Mission project, finish the ongoing process of revising the Forest Plan that includes an analysis of the forestwide ecological and economic impacts of OWNF fire policies.

Fire/Fuels

If the Vegetation analysis is accurate and relevant, the Fire/Fuels section should be redundant and irrelevant. This is because the Vegetation section grinds one through an HRV/DRV/FRV[7] analysis to make a case that the action alternatives make the forest resilient to the effects of fire.

And at the very best, the historical conditions allegedly being compared to current conditions are represented by only a single snapshot in time, ignoring the range of conditions on those same sites down through the centuries, and ignoring potential human causes to the conditions noted at a single snapshot in time.

Assumptions that "dry" forests did not experience stand-replacing fires, that fire regimes were frequent and nonlethal, and that such stands were open and dominated by large well-spaced trees are not supported by science.

"In this analysis, two fire characteristics that contribute to wildfire intensity were analyzed: crown fire behavior and flame length." (138.) Since the EA claims to be addressing risk of catastrophe due to wildland fire, why wouldn't rate of fire spread matter?

The Fire/Fuels analysis "exclude(s) 10% of the more severe conditions such as wind events or drought that contribute to extreme fire behavior." Thereby the EA excludes from analysis the effects of the fires which typically burn most of the acreage during fire season. Thereby the FS invalidates the EA's analysis of this issue.

Furthermore, it is likely that when the other 90% of fire conditions exist, the fire will be suppressed anyway, so what use is this analysis, anyway?

[7] From the EA, Historical Range of Variability, Desired Range of Variability, and Future Range of Variability.

The EA does not consider the temporal gradient post-project as the fuel and fire risk conditions eventually revert back to unacceptable given that fire suppression is planned to be successful. Breaking things into short-term (up to 15 years) and long-term (15+ years) is hardly meaningful.

The EA fails to map or quantify the amount of the project area that falls within fire regimes of fire return intervals of 35-200 years. For these areas, deviations from HRV could not have happened due to fire suppression.

As Table 58 shows, the project has miniscule-to meaningless beneficial effects on crown fire risk (and would even be detrimental in multiple cases) anyway.

The EA fails to provide any analysis of livestock grazing/fire effects interactions.

As discussed below in the Vegetation section, the EA implies that severe and/or stand-replacing fires are not a natural occurrence in such forests, without providing scientific supports for such an assumption.

The EA doesn't explain why specific areas were chosen for treatment at the same time other areas of similarly claimed hazard levels are to be left untreated. The EA does not disclose the "fuel" and stand component conditions in each project area timber stand not proposed for treatment.

The EA does not disclose how the FS will integrate wildland fire use in the project area.

The EA does not cite reports that evaluated fire effects of recent nearby fires. The EA predictions of wildfire effects have not been validated. The EA does not disclose data and analysis on the actual ecological impacts of recent fires in the vicinity. (Impacts on wildlife habitat, soils, current vegetation conditions, water quality, fisheries habitat, noxious weeds etc.)

The EA states, "The combination of overstory thinning, understory thinning, and prescribed fire treatments would create a beneficial, long-term, minor effect in re-establishing the desired amount and arrangement of low CFR (crown fire risk) because these combined treatments would occur in a mosaic pattern dispersed across the drainage." It also states, "maintenance burning …would help maintain low levels of surface fuels and reduce small diameter understory vegetation."

However, the EA does not provide a robust scientific analysis of the expected duration of the effectiveness of the various "fuel" treatments. The EA simply states, "Maintenance underburning of previously treated areas: 6658 acres of units where underburning would occur **would be evaluated for maintenance underburning** about 10-15 years after the initial burn treatment." (Emphasis added.) The draft DN doesn't make any commitment for actually following up with future fuel treatments. Nor does the EA analyze and disclose the likelihood of the FS having the budget to conduct the fuel treatments it only promises to "evaluate."

The EA's obsessive focus on "fuels" fails to disclose that "fuel moisture, weather, and topography" are by far the factors with the most influence on fire behavior and spread.

The EA fails to disclose the average, normal range, and standard deviation for "fuel" loading in the project area, based on each forest classification breakdown.

Cohen, 1999a recognizes "the imperative to separate the problem of the wildland fire threat to homes from the problem of ecosystem sustainability due to changes in wildland fuels."

Graham, et al., 1999a explain that thinning can result in faster fire spread than in unthinned stands. The EA states, "The potential for increased rate of spread is a tradeoff for reductions in fireline intensity and spotting potential that contributes to more rapid fire growth than can occur by surface fires." Yet the EA fails to provide a scientifically robust analysis of this so-called "tradeoff."

Objection Attachment 1 presents the views and expert opinions in news articles, often from scientists and Forest Service experts, discussing the benefits of wildland fire. Also, the FS science bulletin "Wildland Fire: Nature's Fuel Treatment" explains how wildland fire use results in natural landscape level inhibitions on fire. The EA fails to consider this scientific angle in favor of less scientific justifications for logging.

Scientific information contradicts some of the premises upon which the EA is based. Bradley, et al. 2016 "found forests with higher levels of protection had lower severity values even though they are generally identified as having the highest overall levels of biomass and fuel loading." Among the major findings were that areas undisturbed by logging experienced significantly less intensive fire compared with areas that have been logged. From a news release announcing the results of the study (http://www.biologicaldiversity.org/publications/papers/):

> "We were surprised to see how significant the differences were between protected areas managed for biodiversity and unprotected areas, which our data show burned more severely," said lead author Curtis Bradley, with the Center for Biological Diversity.
>
> The study focused on forests with relatively frequent fire regimes, ponderosa pine and mixed-conifer forest types; used multiple statistical models; and accounted for effects of climate, topography and regional differences to ensure the findings were robust.
>
> "The belief that restrictions on logging have increased fire severity did not bear out in the study," said Dr. Chad Hanson, an ecologist with the John Muir Project. "In fact, the findings suggest the opposite. The most intense fires are occurring on private forest lands, while lands with little to no logging experience fires with relatively lower intensity."
>
> "Our findings demonstrate that increased logging may actually increase fire severity," said Dr. Dominick A. DellaSala, chief scientist of Geos Institute. "Instead, decision-makers concerned about fire should target proven fire-risk reduction measures nearest homes and

keep firefighters out of harm's way by focusing fire suppression actions near towns, not in the back country."

The FS obfuscates the fact that logging itself significantly increases fire severity, the opposite of what the Mission EA is claiming. The Sierra Nevada Ecosystem Project Final Report to Congress, 1996 states, "Timber harvest, through its effects on forest structure, local microclimate, and fuels accumulation, has increased fire severity more than any other recent human activity. If not accompanied by adequate reduction of fuels, logging (including salvage of dead and dying trees) increases fire hazard by increasing surface dead fuels and changing the local microclimate. Fire intensity and expected fire spread rates thus increase locally and in areas adjacent to harvest."

Huff, et al, 1995 state:

> In general, rate of spread and flame length were positively correlated with the proportion of area logged (hereafter, area logged) for the sample watersheds. …The potential rate of spread and intensity of fires associated with recently cut logging residues is high, especially the first year or two as the material decays. High fire-behavior hazards associated with the residues can extend, however, for many years depending on the tree.
>
> Logged areas generally showed a strong association with increased rate of spread and flame length, thereby suggesting that tree harvesting could affect the potential fire behavior within landscapes. In general, rate of spread and flame length were positively correlated with the proportion of area logged in the sample watersheds.
>
> As a by-product of clearcutting, thinning, and other tree-removal activities, activity fuels create both short- and long-term fire hazards to ecosystems. The potential rate of spread and intensity of fires associated with recently cut logging residues is high, especially the first year or two as the material decays. High fire-behavior hazards associated with the residues can extend, however, for many years depending on the tree. Even though these hazards diminish, their influence on fire behavior can linger for up to 30 years in the dry forest ecosystems of eastern Washington and Oregon.

We incorporate DellaSala, et al., 2018 which is a synopsis of current literature summarizing some of the latest science around top-line wildfire issues, including areas of scientific agreement, disagreement, and ways to coexist with wildfire.

We also incorporate DellaSala, 2017, who discusses:

> …how proposals that call for increased logging and decreased environmental review in response to wildfires and insect outbreaks are not science driven, in many cases may make problems worse, and will not stem rising wildfire suppression costs.
> …what we know about forest fires and beetle outbreaks in relation to climate change, limitations of thinning and other forms of logging in relation to wildfire and insect management,
> …recommendations for moving forward based on best available science.

We also incorporate "Wuerthner-War Against Wildfire" and "Getting Burned By Logging" (Hanson, undated-b).

Vegetation conditions

The EA states, "Portions of the project area are susceptible to dwarf mistletoe infection, defoliating insects, and bark beetle attacks due to vegetation composition and structure changes from historical conditions." (13.) The FS has no scientific basis for the EA's implication that this susceptibility is in any way unusual or unnatural.

"No large trees would be harvested. Some of the medium sized trees would be harvested…" (124.) What is a "large tree" and what is a "medium sized tree"? What does "some" mean, quantitatively speaking (using numbers)? The EA should document the standards to allow the public to interpret this vaguely stated intent.

The EA Appendix A indicates logging would log trees "up to 24 inches DBH." It makes such statements as, "For commercial thinning, "Remove all Douglas-fir, subalpine fir and Engelmann spruce less than 21 inches DBH within 50 feet of the last indication of infected trees within root disease pockets." It doesn't provide a description of its "treatments" which would explain how

Appendix A qualifies the issue of tree sized to be logged somewhat, using vague terms such as "estimated age of 150 years … based on tree appearance criteria…"

Appendix A presents "desired" tree retention numbers:

Figure 140. Mission Desired Tree Stocking Levels in Dry Forest Restoration Thin Harvest Units

Plant Association Group(s)	Approximate average number of trees per acre retained
Hot-dry ponderosa pine and Douglas-fir	20 - 30
Warm-dry and warm-mesic Douglas-fir	30 - 50
Cool-dry Douglas-fir and subalpine fir	40 - 50

Twenty trees per acre strongly resembles "regeneration" logging—clearcutting modified by retaining a small percentage of the existing trees. In other words, this would resemble a slightly shaded clearcut. This would occur in the vast majority of the acreage to be logged. 30-40 trees per acre is not a highly stocked forest either.

"EMDS was used to compare the current conditions to a range of historical and future reference conditions for each subwatershed to give insights into how dry and moist forest vegetation composition and structure have changed and how they are likely to change…" (EA 102). Another issue with EMDS is that it considers dry and moist forest vegetation to be a stark dichotomy rather than a gradient across the project area, which results in invalid and misleading analyses.

Odion et al., 2014 state:

> There is widespread concern that fire exclusion has led to an unprecedented threat of uncharacteristically severe fires in ponderosa pine (Pinus ponderosa Dougl. ex. Laws) and mixed-conifer forests of western North America. These extensive montane forests are considered to be adapted to a low/moderate-severity fire regime that maintained stands of relatively old trees. However, there is increasing recognition from landscape-scale assessments that, prior to any significant effects of fire exclusion, fires and forest structure were more variable in these forests. Biota in these forests are also dependent on the resources made available by higher-severity fire. A better understanding of historical fire regimes in the ponderosa pine and mixed-conifer forests of western North America is therefore needed to define reference conditions and help maintain characteristic ecological diversity of these systems. 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. Diverse forests in different stages of succession, with a high proportion in relatively young stages, occurred prior to fire exclusion. Over the past century, successional diversity created by fire decreased. Our findings suggest that ecological management goals that incorporate successional diversity created by fire may support characteristic biodiversity, whereas current attempts to ‘‘restore’’ forests to open, low-severity fire conditions may not align with historical reference conditions in most ponderosa pine and mixed-conifer forests of western North America.

The EA states, “The risk of crown fire initiation and spread and associated fire effects are greater than historical conditions, particularly in the Buttermilk watershed, due to increased tree density and development of forest stands with multiple and closed canopy layers across the landscape.” (13.) Again, the EA fails to support this claim of “greater than historical conditions” with any scientifically robust evidence.

The EA basically says that departures from DRV, HRV, or FRV are unacceptable. It fails to disclose how often during reference conditions that all of the metrics it uses fell within desired ranges. The EA doesn’t, because the FS can’t, and because the EA’s conceptualization is scientifically challenged.

Regardless, Figure 53 shows almost two-thirds of combined Landscape and Patch Size categories are “within DRV” but apparently that’s not good enough. Yet the EA doesn’t bother disclosing how many of these categories would be moved within DRV by the action alternatives, because it combines “move towards” with “within.”

The EA states, “Dry and moist forest vegetation in the project area is susceptible to increased frequency and severity of natural disturbances (including insects, disease, and fire) associated with warmer, drier climate.” (13.) What is the scientific basis for this “increased frequency and severity” claim?

Even if project area conditions could correctly be described as overly continuous dense forest this doesn’t imply inevitable catastrophe. In discussing the adjacent Colville National Forest, Churchill, 2011 explains how natural ecological processes/dynamics accomplishes restoration to a significant degree:

> Over time, stand development processes and biophysical variation, along with low and mixed-severity disturbances, **break up these large patches into a finer quilt of patch types. These new patterns then constrain future fires**. Landscape pattern is thus generated from a blend of finer scale, feedback loops of vegetation and disturbance and broad scale events that are driven by extreme climatic events.

(Emphasis added.) Finally, ecological resilience, which the FS implies it would create with this project, is not the absence of natural disturbances such as wildland fire or beetle kill. Rather, it is the opposite (DellaSala and Hanson, 2015, Chapter 1, pp. 12-13). What the FS is promoting here is the human control of the forest ecosystem through mechanical means in order to maintain unnatural stasis by eliminating, suppressing or altering natural disturbances such as wildland fire and insect or disease effects, to maximize the commercial potential of natural resources.

We incorporate the document “Scientific Literature Review” which has a section entitled “Beetle-Killed Trees.”

In several places the EA uses the word “resilient” or “resilience” in terms of how the action alternatives are responding to desired conditions by increasing the resilience of the ecosystem. The Forest Plan for the Kootenai National Forest defines “resilience” as “The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.” However, the Mission EA provides absolutely no operational definition of resilience that would allow anybody to actually **measure** the resilience of the ecosystem as it stands now, or measure the change in resilience following project activities. An essential component of an operational definition is **measurement**. A simple and accurate definition of measurement is the **assignment of numbers to a variable** in which we are interested. In this case, the variable in which we are interested is resilience, and how the FS measures it in these ecosystems.

Resilience is a term that might be used to characterize forest ecosystems. However, mostly what we “learn” about resilience from the FS and EA is it only happens when the forest is “managed” (i.e., mostly logged or prescribe burned), and the more the forest is logged and burned, the more resilient it becomes. Also we “learn” that nothing that happens naturally, without management, will increase resilience. In other words, from the FS’s perspective, resilience can only be manufactured, engineered, or imposed by management. The term “resilience” as used by the EA is invalid, rendering much of the analyses confusing and misleading.

Hayward, 1994 states:

> Despite increased interest in historical ecology, scientific understanding of the historic abundance and distribution of montane conifer forests in the western United States is not sufficient to indicate how current patterns compare to the past. In particular, knowledge of patterns in distribution and abundance of older age classes of these forests in not available. …Current efforts to put management impacts into a historic context seem to focus almost exclusively on what amounts to a snapshot of vegetation history—a documentation of forest conditions near the time when European settlers first began to impact forest structure. …The value of the historic information lies in the perspective it can provide on the potential variation… I do not believe that historical ecology, emphasizing static conditions in recent times, say 100 years ago, will provide the complete picture needed to place present conditions in a proper historic context. Conditions immediately prior to industrial development may have been extraordinary compared to the past 1,000 years or more. Using forest conditions in the 1800s as a baseline, then, could provide a false impression if the baseline is considered a goal to strove toward.

Frissell and Bayles (1996) state:

> From the point of view of many aquatic species, the range of natural variability at any one site would doubtless include local extirpation. At the scale of a large river basin, management could remain well within such natural extremes and we would still face severe degradation of natural resource and possible extinction of species (Rhodes et al., 1994). The missing element in this concept is the landscape-scale *pattern* of occurrence of extreme conditions, and patterns over space and time of recovery from such stressed states. How long did ecosystems spend in extreme states vs. intermediate or mean states? Were extremes chronologically correlated among adjacent basins, or did asynchrony of landscape disturbances provide for large-scale refugia for persistence and recolonization of native species? These are critical questions that are not well addressed under the concept of range of natural variability as it has been framed to date by managers.
>
> …The concept of range of natural variability also suffers from its failure to provide defensible criteria about **which factors ranges should be measured**. Proponents of the concept assume that a finite set of variables can be used to define the range of ecosystem behaviors, when ecological science strongly indicates many diverse factors can control and limit biota and natural resource productivity, often in complex, interacting, surprising, and species-specific and time-variant ways. **Any simple index for measuring the range of variation will likely exclude some physical and biotic dimensions important for the maintenance of ecological integrity and native species diversity.** (Bold emphasis added.)

Dimensions that create significant adverse impacts on native species diversity include those not historically not found in nature, including road densities, edge effects due to logged openings, noxious weeds and other invasive species, livestock, compacted and otherwise productivity-deficient soil conditions, and many human-caused fires.

The EA fails to consider the extensive science that argues that the strategy of "moving towards" targeted vegetative conditions for restoring forests is scientifically deficient. The Committee of Scientists, 1999 recommended management emphasis contrasts with the FS's management strategy merely emphasizing manipulation of habitat for insuring wildlife viability:

> …An emphasis on focal species, including their functional importance or their role in the conservation of other species, combines aspects of single-species and ecosystem management. **It also leads to considering species directly, in recognition that focusing only on composition, structure, and processes may miss some components of biological diversity.** (Emphasis added.)

The strategy of "moving toward" (resilience) basically focuses upon achieving static conditions, instead of prioritizing the natural dynamics of the ecosystem. An abundance of scientific evidence suggests that **desired future dynamics** would align with best available science.

Hessburg and Agee (2003) state:

> Patterns of structure and composition within existing late-successional and old forest reserve networks will change as a result of wildfires, insect outbreaks, and other processes. What may be needed is an approach that marries a short-term system of reserves with a long-term strategy to convert to a continuous network of landscapes with dynamic properties. In such a system, late-successional and old forest elements would be continuously recruited, but would shift semi-predictably in landscape position across space and time. Such an approach would represent a planning paradigm shift from NEPA-like desired future conditions, to planning for landscape-scale **desired future dynamics**. (Emphasis added.)

Sallabanks et al., 2001 state:

> Given the dynamic nature of ecological communities in Eastside (interior) forests and woodlands, particularly regarding potential effects of fire, **perhaps the very concept of defining "desired future conditions" for planning could be replaced with a concept of describing "desired future dynamics."**

(Emphasis added.) The EA fails to consider such scientific information that challenges the FS's management paradigm.

There is plenty of support in the scientific literature an approach emphasizing desired future dynamics instead. Noss, 2001, for example, believes "If the thoughtfully identified critical components and **processes of an ecosystem are sustained**, there is a high probability that the ecosystem as a whole is sustained." (Emphasis added.) Noss, 2001 describes basic ecosystem components:

> Ecosystems have **three basic components: composition, structure, and function**. Together, they define biodiversity and ecological integrity and provide the foundation on which standards for a sustainable human relationship with the earth might be crafted.

(Emphasis added.) Noss, 2001 goes on to define those basic components:

> **Composition** includes the kinds of species present in an ecosystem and their relative abundances, as well as the composition of plant associations, floras and faunas, and habitats at broader scales. We might describe the composition of a forest, from individual stands to watersheds and regions.
>
> **Structure** is the architecture of the forest, which includes the vertical layering and shape of vegetation and its horizontal patchiness at several scales, from within stands (e.g., treefall gaps) to landscape patterns at coarser scales. Structure also includes the presence and abundance of such distinct structural elements as snags (standing dead trees) and downed logs in various size and decay classes.
>
> **Function** refers to the **ecological processes** that characterize the ecosystem. These processes are both biotic and abiotic, and include decomposition, nutrient cycling, disturbance, succession, seed dispersal, herbivory, predation, parasitism, pollination, and many others. Evolutionary processes, including mutation, gene flow, and natural selection, are also in the functional category.

(Emphasis added.) Hutto, 1995 also addresses natural processes, referring specifically to fire:

> Fire is such an important creator of the ecological variety in Rocky Mountain landscapes that the conservation of biological diversity [required by NFMA] is likely to be accomplished only through **the conservation of fire as a process**…Efforts to meet legal mandates to maintain biodiversity should, therefore, be directed toward **maintaining processes like fire**, which create the variety of vegetative cover types upon which the great variety of wildlife species depend.

(Emphasis added.) Noss and Cooperrider (1994) state:

> **Considering process is fundamental to biodiversity conservation because process determines pattern**. Six interrelated categories of ecological processes that biologists and managers must understand in order to effectively conserve biodiversity are (1) energy flows, (2) nutrient cycles, (3) hydrologic cycles, (4) disturbance regimes, (5) equilibrium processes, and (6) feedback effects.

(Emphasis added.) The Environmental Protection Agency (1999) recognizes the primacy of natural processes: (E)cological processes such as natural disturbance, hydrology, nutrient cycling, biotic interactions, population dynamics, and evolution determine the species composition, habitat structure, and ecological health of every site and landscape. **Only through the conservation of ecological processes will it be possible to (1) represent all native ecosystems within the landscape and (2) maintain complete, unfragmented environmental gradients among ecosystems.**

(Emphasis added.) Forest Service researcher Everett (1994) states:

> To prevent loss of future options we need to simultaneously **reestablish ecosystem processes and disturbance effects that create and maintain desired sustainable**

> **ecosystems**, while conserving genetic, species, community, and landscape diversity and long-term site productivity.
>
> …We must address **restoration of ecosystem processes and disturbance effects** that create sustainable forests before we can speak to the restoration of stressed sites; otherwise, we will forever treat the symptom and not the problem. … **One of the most significant management impacts on the sustainability of forest ecosystems has been the disruption of ecosystem processes** through actions such as fire suppression (Mutch and others 1993), dewatering of streams for irrigation (Wissmar and others 1993), truncation of stand succession by timber harvest (Walstad 1988), and maintaining numbers of desired wildlife species such as elk in excess of historical levels (Irwin and others 1993). Several ecosystem processes are in an altered state because we have interrupted the cycling of biomass through fire suppression or have created different cycling processes through resource extraction (timber harvest, grazing, fish harvest). (Emphasis added.)

Hessburg and Agee, 2003 also emphasize the primacy of natural processes for management purposes:

> Ecosystem management planning must acknowledge **the central importance of natural processes and pattern–process interactions, the dynamic nature of ecological systems** (Attiwill, 1994), the inevitability of uncertainty and variability (Lertzman and Fall, 1998) and cumulative effects (Committee of Scientists, 1999; Dunne et al., 2001). (Emphasis added.)

Further, Collins and Stephens (2007) suggest direction to implement restoring the process of fire by educating the public:

> (W)hat may be more important than restoring structure is restoring the process of fire (Stephenson 1999). By allowing fire to resume its natural role in limiting density and reducing surface fuels, competition for growing space would be reduced, along with potential severity in subsequent fires (Fule and Laughlin 2007). As a result, we contend that the forests in Illilouette and Sugarloaf are becoming more resistant to ecosystem perturbations (e.g. insects, disease, drought). This resistance could be important in allowing these forests to cope with projected changes in climate. … Although it is not ubiquitously applicable, (wildland fire use) could potentially be a cost-effective and ecologically sound tool for "treating" large areas of forested land. Decisions to continue fire suppression are politically safe in the short term, but ecologically detrimental over the long term. Each time the decision to suppress is made, the risk of a fire escaping and causing damage (social and economic) is essentially deferred to the future. Allowing more natural fires to burn under certain conditions will probably mitigate these risks. If the public is encouraged to recognize this and to become more tolerant of the direct, near-term consequences (i.e. smoke production, limited access) managers will be able to more effectively use fire as a tool for restoring forests over the long term.

Typically, attempts to control or resist the natural process of fire have been a contributor to deviations from desired conditions. The EA analyses skew toward considering fire as well as

native insects and other natural pathogens as threats to the ecosystem rather than rejuvenating natural processes. It seems to need such an obsolete viewpoint to justify and prioritize the proposed vegetation manipulations, tacitly for replacing natural processes with "treatments" and "prescriptions." However the scientific support for assuming that ecosystems can be restored or continuously maintained by such manipulative actions is entirely lacking.

Biologist Roger Payne has the following to say about the same kind of hubris represented by the FS's view that it can manipulate and control its way to a restored forest by more intensive management:

> One often hears that because humanity's impact has become so great, the rest of life on this planet now relies on us for its succession and that we are going to have to get used to managing natural systems in the future—the idea being that since we now threaten everything on earth we must take responsibility for holding the fate of everything in our hands. This bespeaks a form of unreality that takes my breath away… The cost of just finding out enough about the environment to become proper stewards of it—to say nothing of the costs of acting in such a way as to ameliorate serious problems we already understand, as well as problems about which we haven't a clue—is utterly prohibitive. And the fact that monitoring must proceed indefinitely means that on economic grounds alone the only possible way to proceed is to face the fact that by far the cheapest means of continuing life on earth as we know it is to **curb ourselves instead of trying to take on the proper management of the ecosystems we have so entirely disrupted.**

(Payne 1995, emphasis added.) Not accompanying all the EA's hypothetical promises of improving nature are any acknowledgments of the potential or degree of unintended side effects that pose risk or present likely damage to some other composition, structure, or function of the ecosystem.

Karr (1991) cites a definition of ecological integrity as "the ability to support and maintain "a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitat of the region." Karr (1991) also cites a definition of ecological health: "a biological system ... can be considered healthy when its inherent potential is realized, its condition is stable, its capacity for self-repair when perturbed is preserved, and **minimal external support for management is needed**." (Emphasis added.) The EA misses that last aspect of ecological health—specifically that it doesn't need management meddling.

Likewise Angermeier and Karr (1994) describe biological integrity as referring to "conditions under little or no influence from human actions; a biota with high integrity reflects natural evolutionary and biogeographic processes."

In their conclusion, Hessburg and Agee, 2003 state "Desired future conditions will only be realized by planning for and creating the desired ecosystem dynamics represented by ranges of conditions, set initially in strategic locations with minimal risks to species and processes."

The Forest's foreseeable budget would not allow enough vegetation management under the agency's paradigm to "fix" the problems the FS says would be perpetuated by fire suppression.

Also in describing what it claims to be landscape departures, the EA does not provide a spatial analysis, either for the true reference conditions or of current project area conditions. The EA has no scientifically defensible analysis of the project area **landscape pattern** departure from HRV.

The EA assumes that natural fire regimes operating here would maintain practically all the low and mid-elevation forests in open conditions with widely spaced mature and old trees—mostly ponderosa pine with some Douglas-fir. The FS fails to acknowledge that mixed-severity and even low-severity fire regimes result in much more variable stand conditions across the landscape through time. Assumptions that drier forests did not experience stand-replacing fires, that fire regimes were frequent and nonlethal, that these stands were open and dominated by large well-spaced trees, and that fuel amounts determine fire severity (the false thinning hypothesis that fails to recognize climate as the overwhelming main driver of fire intensity) are not supported by science (see for example Baker and Williams 2015, Williams and Baker 2014, Baker et al. 2006, Pierce et al. 2004, Baker and Ehle 2001, Sherriff et al. 2014). Even research that has uncritically accepted the questionable ponderosa pine model that may only apply to the Mogollon Rim of Arizona and New Mexico (and perhaps in similar dry-forest types in California), notes the inappropriateness of applying that model to elsewhere (see Schoennagel et al. 2004). The EA's assertion that the proposed treatments will result in likely or predictable later wildland fire effects is of considerable scientific doubt (Rhodes and Baker, 2008).

Cohen, 1999 reviewed current scientific evidence and policy directives on the issue of fire in the wildland/urban interface and recommend the focus be on structure ignitability in the Home Ignition Zone rather than extensive wildland fuel management. Cohen, 1999 also recognizes "the imperative to separate the problem of the wildland fire threat to homes from the problem of ecosystem sustainability due to changes in wildland fuels" (Id.). In regards to the latter—ecosystem sustainability—Cohen and Butler (2005) state:

> Realizing that wildland fires are inevitable should urge us to recognize that excluding wildfire does not eliminate fire, it unintentionally selects for only those occurrences that defy our suppression capability—the extreme wildfires that are continuous over extensive areas. If we wish to avoid these extensive wildfires and restore fire to a more normal ecological condition, **our only choice is to allow fire occurrence under conditions other than extremes. Our choices become ones of compatibility with the inevitable fire occurrences rather than ones of attempted exclusion.** (Emphasis added.)

Large fires are weather-driven events, not fuels-driven. When the conditions exist for a major fire—which includes drought, high temperatures, low humidity and high winds—nothing, including past logging, halts blazes. Such fires typically self-extinguish or are stopped only when less favorable conditions occur for fire spread. As noted in Graham, 2003:

> The prescriptions and techniques appropriate for accomplishing a treatment require understanding the fuel changes that result from different techniques and the fire behavior responses to fuel structure**. Fuel treatments, like all vegetation changes, have temporary**

effects and require repeated measures, such as prescribed burning, to maintain desired fuel structure.

Fire Regime Condition Class is a metric that estimates the departure of the forest from historic fire processes and vegetation conditions. Fire regime condition class is derived by comparing current conditions to an estimate of the historical conditions that existed before significant Euro-American settlement. The EA does not disclose the limitations of this methodology. This method likely has very limited accuracy and tends to overestimate the risk of higher-severity fire posed by fuel loads, as documented by studies of recent fires (Odion and Hanson, 2006). Those researchers state:

> Condition Class, was not effective in identifying locations of high-severity fire. … In short, Condition Class identified nearly all forests as being at high risk of burning with a dramatic increase in fire severity compared to past fires. Instead, we found that the forests under investigation were at low risk for burning at high-severity, especially when both spatial and temporal patterns of fire are considered.
>
> Condition Class …(is) too methodologically limited to provide a comprehensive description of the spatial extent and variation in the effects of past fires (reviewed by Veblen 2003).

Another critique is found in Rhodes (2007) who states:

> Several of the biases …are embodied in the Fire Regime Condition Class (FRCC) approach (Hann and Bunell, 2001), which is widely used to provide an index of the potential for uncharacteristically severe fire and fire regime alteration. The FRCC relies on of estimates of mean fire intervals, but does not require that they be estimated on the basis of site-specific historical data. It emphasizes fire scar data, but does not require its collection and analysis on a site-specific basis. The FRCC's analysis of departure from natural fire regimes also relies on estimates of how many estimated mean fire intervals may have been skipped. The method does not require identification and consideration of fire-free intervals in site-specific historic record. Notably, a recent study that examined the correlation of FRCC estimates of likely fire behavior with actual fire behavior in several large fires recently burning the Sierra Nevada in California concluded: "[Fire Regime] Condition Class was not able to predict patterns of high-severity fire. . . . Condition Class identified nearly all forests as being at high risk of burning with a dramatic increase in fire severity compared to past fires. Instead, we found that the forests under investigation were at low risk for burning at high-severity, especially when both spatial and temporal patterns of fire are considered." (Odion and Hanson, 2006.) These results corroborate that FRCC is biased toward overestimating the alteration of fire regimes and the likelihood of areas burning at uncharacteristically high severity if affected by fire. Therefore, in aggregate there is medium degree of certainty that the FRCC is biased toward overestimating departures from natural fire regimes and the propensity of forests to burn at higher severity when affected by fire.

Rhodes, 2007 states: "The transient effects of treatments on forest, coupled with the relatively low probability of higher-severity fire, makes it unlikely that fire will affect treated areas while fuel levels are reduced." (Internal citations omitted.) See also Rhodes and Baker (2008). And Rhodes, 2007 also points out that management with mechanical fuel treatments (MFT) to restore natural fire regimes must take into consideration the root causes of the alleged problem:

> In order to be ultimately effective at helping to restore natural fire regimes, fuel treatments must be part of wider efforts to address the root causes of the alteration in fire behavior. At best, MFT can only address symptoms of fire regime alteration. Evidence indicates that primary causes of altered fire regimes in some forests include changes in fuel character caused by the ongoing effects and legacy of land management activities. These activities include logging, post-disturbance tree planting, livestock grazing, and fire suppression. Many of these activities remain in operation over large areas. Therefore, unless treatments are accompanied by the elimination of or sharp reduction in these activities and their impacts in forests where the fire regime has been altered, MFT alone will not restore fire regimes. (Internal citations omitted.)

If the predictions of uncharacteristically severe fire attributed to the No-action alternative were accurate, one might think that the results of scientific validation of such assumptions would have been cited in the EA. We find no data or scientific analysis of such fire effects validating the EA's predictions of uncharacteristically severe fire effects if the logging is not conducted.

DellaSala, et al. (1995) state:

> Scientific evidence does not support the hypothesis that intensive salvage, thinning, and other logging activities reduce the risk of catastrophic fires if applied at landscape scales ... At very local scales, the removal of fuels through salvage and thinning may hinder some fires. However, applying such measures at landscape scales removes natural fire breaks such as moist pockets of late-seral and riparian forests that dampen the spread and intensity of fire and has little effect on controlling fire spread, particularly during regional droughts. ... Bessie and Johnson (1995) found that surface fire intensity and crown fire initiation were strongly related to weather conditions and only weakly related to fuel loads in subalpine forest in the southern Canadian Rockies. . . . Observations of large forest fires during regional droughts such as the Yellowstone fires in 1988 (Turner, et al. 1994) and the inland northwest fires of 1994 . . . raise serious doubts about the effectiveness of intensive fuel reductions as "fire-proofing" measures.

Veblen (2003) states:

> The premise behind many projects aimed at wildfire hazard reduction and ecological restoration in forests of the western United States is the idea that unnatural fuel buildup has resulted from suppression of formerly frequent fires. This premise and its implications need to be critically evaluated by conducting area-specific research in the forest ecosystems targeted for fuels or ecological restoration projects. Fire regime researchers need to acknowledge the limitations of fire history methodology and avoid over-reliance on summary fire statistics such as mean fire interval and rotation period. While fire regime research is vitally important for informing decisions in the areas of wildfire hazard

> mitigation and ecological restoration, there is much need for improving the way researchers communicate their results to managers and the way managers use this information.

Riggers, et al. 2001 state:

> (T)he real risk to fisheries is not the direct effects of fire itself, but rather the existing condition of our watersheds, fish communities, and stream networks, and the impacts we impart as a result of fighting fires. Therefore, attempting to reduce fire risk as a way to reduce risks to native fish populations is really subverting the issue. If we are sincere about wanting to reduce risks to fisheries associated with future fires, we ought to be removing barriers, reducing road densities, reducing exotic fish populations, and re-assessing how we fight fires. At the same time, we should recognize the vital role that fires play in stream systems, and attempt to get to a point where we can let fire play a more natural role in these ecosystems.

Those FS biologists emphasize, "the importance of wildfire, including large-scale, intense wildfire, in creating and maintaining stream systems and stream habitat. ...(I)n most cases, proposed projects that involve large-scale thinning, construction of large fuel breaks, or salvage logging as tools to reduce fuel loading with the intent of reducing negative effects to watersheds and the aquatic system are largely unsubstantiated."

Noss et al. (2006) state:

> Forest landscapes that have been affected by a major natural disturbance, such as a severe wildfire or wind storm, are commonly viewed as devastated. Such perspectives are usually far from ecological reality. Overall species diversity, measured as number of species–at least of higher plants and vertebrates – is often highest following a natural stand replacement disturbance and before redevelopment of closed-canopy forest (Lindenmayer and Franklin 2002). Important reasons for this include an abundance of biological legacies, such as living organisms and dead tree structures, the migration and establishment of additional organisms adapted to the disturbed, early-successional environment, availability of nutrients, and temporary release of other plants from dominance by trees. Currently, early-successional forests (naturally disturbed areas with a full array of legacies, i.e. not subject to post-fire logging) and forests experiencing natural regeneration (i.e. not seeded or planted), are among the most scarce habitat conditions in many regions.

Baker et al., 2006 state:

> Because multiple explanations exist for the presence and abundance of young, shade-tolerant trees, these trees need to be dated and linked definitively to a particular land use (e.g. livestock grazing, logging, fire exclusion) before their removal is ecologically appropriate in restoration, and so that the correct land use, as discussed later, can be modified.
>
> …Identification of which land uses affected a stand proposed for restoration is essential.

> Fire exclusion, logging and livestock grazing do not have the same effects on these forests, their effects vary with environment, and they require different restoration actions. Before restoration begins, it makes sense to modify or minimize the particular land uses that led to the need for restoration, to avoid repeating degradation and ongoing, periodic subsidies that merely maintain land uses at non-sustainable levels (Hobbs & Norton, 1996). For example, thinning an overgrazed forest, without restoring native bunchgrasses lost to grazing, may simply lead to a new pulse of tree regeneration that will have to be thinned again.

To us, this means making a firm commitment to allowing wildland fire to play its natural role on the landscape, avoiding the knee-jerk firefighting and fire suppression actions that are all too commonly applied as soon as a fire is detected.

The EA claims the logging will improve tree vigor, reduce susceptibility to insect and disease, and, reduce the threat of severe wildfire. In other words, the logging will suppress the natural processes that create snags, down wood habitat, and other diversity characteristic of a natural forest—habitat characteristics for wildlife. This is just tree farming.

NEPA regulations at 40 CFR § 1502.24 state, under **Methodology and scientific accuracy**: "Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements." The EA violates NEPA in terms of methodology, scientific accuracy, and scientific integrity.

Remedy: Prepare an EIS that addresses the analytical and scientific issues identified above.

Wildlife

The quality of the EA's analysis for terrestrial wildlife raises numerous concerns. Apparently many of the species of concern are not detected within the project area, although the EA doesn't present an adequate analysis of the cumulative effects on habitat conditions. In other words, if these species don't occur in the project area, is it because of the way the Forest has been managed and manipulated down through the years, or is it because the project area has naturally or historically not been their habitat?

The U.S. Court of Appeals for the Ninth Circuit has repeatedly emphasized the importance of enforcing NFMA's consistency requirement with respect to Forest Plan standards for maintaining wildlife habitat, and with respect to procedural Forest Plan requirements. In *Neighbors of Cuddy Mountain v. USFS*, 137 F.3d 1372 (9th Cir. 1998), the Ninth Circuit enjoined the FS from proceeding with a timber sale when the FS could not demonstrate that the timber sale area would meet forest plan old growth habitat standards. The court first addressed NFMA's consistency requirement as follows:

> Pursuant to the NFMA, the Forest Service must demonstrate that a site-specific project would be consistent with the land resource management plan of the entire forest. 16 U.S.C. § 1604(i); 36 C.F.R. § 219.10(e).

137 F.3d at 1377 (quotation omitted). Following *Neighbors of Cuddy Mountain*, the Ninth Circuit again confirmed the importance of NFMA's "consistency" requirement, finding that the Tongass National Forest violated its own Forest Plan in failing to perform procedural steps required in the Tongass Land Management Plan prior to approving the a timber sale. *Friends of Southeast's Future v. Morrison*, 153 F.3d 1059, 1067-71 (9th Cir. 1998). The court there stated: "Under *Neighbors of Cuddy Mountain*, we must affirm the district court's decision to enjoin the Ushk Bay timber sale if that sale is inconsistent with the Tongass Land Management Plan." *Friends of Southeast*, 153 F.3d at 1068. Also, site-specific actions must be consistent with the Forest Plan, 16 U.S.C. §1604(i), such that the "Forest Service's failure to comply with the provisions of a Forest Plan is a violation of NFMA." *Native Ecosystems Council v. USFS*, 418 F.3d 953, 961 (9th Cir. 2005).

The Ninth Circuit Court of Appeals as also ruled that the Forest Service "must both describe the quantity and quality of habitat that is necessary to sustain the viability of the species in question and explain its methodology for measuring this habitat." (*Lands Council v. McNair*).

Forest Plan Standards are not based upon scientific research regarding the forestwide amount and distribution of habitat needed to insure viability of special-status wildlife.

The FS has failed to monitor populations of old-growth associated wildlife, in favor of striving towards DRV of habitat (vegetation) in project planning. The Committee of Scientists (1999) state:

> Habitat alone cannot be used to predict wildlife populations…The presence of suitable habitat does not ensure that any particular species will be present or will reproduce. Therefore, **populations of species must also be assessed and continually monitored.** (Emphasis added.)

The Committee of Scientists (1999) report also stress the importance of monitoring as a necessary step for the Forest Service's overarching mission of sustainability: "Monitoring is the means to continue to update the baseline information and **to determine the degree of success in achieving ecological sustainability.**" (Emphasis added.) The Committee of Scientists (1999) further emphasize:

> The proposal is that the Forest Service monitor those species whose status allows inference to the status of other species, are indicative of the soundness of key ecological processes, or provide insights to the integrity of the overall ecosystem. This procedure is a necessary shortcut because monitoring and managing for all aspects of biodiversity is impossible.
>
> No single species is adequate to assess compliance to biological sustainability at the scale of the national forests. Thus, several species will need to be monitored. The goal is to select a small number of focal species whose individual status and trends will collectively allow an assessment of ecological integrity. That is, the individual species are chosen to provide complementary information and to be responsive to specific conservation issues. Thus, the Committee proposed for consideration a broad list of species categories reflecting the diversity of ecosystems and management issues within the NFS.

The Mission EA and Draft DN do not address such scientific opinion that contradicts FS assumptions about habitat management. This is a violation of NEPA. The FS has left assurance of the viability of MIS and TES species on the Forest in limbo.

The EA doesn't disclose the best available biological science the FS is relying upon for establishing species/habitat relationships for all of the species of concern.

Please disclose the best available science the FS relied upon for designing the programmatic habitat management strategies for each of the Management Indicator, Sensitive, and ESA-listed species, and likewise if the EA uses different science, please disclose your comprehensive list of those scientific cites.

Traill et al., 2010 and Reed et al., 2003 are published, peer-reviewed scientific articles addressing "minimum viable population" and how that number has been drastically underestimated in past. The FS has not identified the best available science for making minimum viable population determinations of wildlife species on the Forest.

The EA utilizes changes in suitable habitat as a "Resource Indicator" but such methodology would never allow anyone to tell when too much cumulative habitat "change" (loss) has occurred. The FS fails to set meaningful thresholds in an apparent assumption that habitat losses are insignificant. Schultz (2010) concludes "the lack of management thresholds allows small portions of habitat to be eliminated incrementally without any signal when the loss of habitat might constitute a significant cumulative impact." (See also Schultz 2012, who notes these problems of analyses for many wildlife species.) The geographic scope of wildlife viability analyses must be forestwide, or at least encompass the area of a truly viable population.

And, like other sections of the EA, consistency with forest plan standards and other binding direction is either not assured or otherwise ignored.

The EA does not provide an analysis of population numbers or trends to insure that population viability is being assured on the Forest for any MIS, sensitive, or ESA-listed species. The FS has failed to monitor population trends as directed by the forest plan and NFMA.

Pine marten

Numerous recent studies have found that pine marten are particularly vulnerable to habitat fragmentation. How does the FS assure pine marten viability on this Forest? The EA does not document this issue.

The EA presents "Rationale for Dismissing (marten) from Further Analysis" but fail to recognize that past management has adversely affected marten habitat. It also doesn't consider that natural processes creating snag and down wood habitat are being suppressed here. The rationale also is based upon a simplistic analysis of modeled habitat without considering the validity of the modeling or reliability of data.

The EA fails to consider best available science for insuring viable populations of the pine marten, a species whose habitat is significantly altered by thinning and other active forest management. (See Moriarity et al., 2016; Bull and Blumton, 1999; Hargis et al., 1999 and Wasserman et al., 2012).

Moriarty et al., 2016 found that the odds of detecting a marten was 1,200 times less likely in openings and almost 100 times less likely in areas treated to reduce fuels, compared to structurally-complex forest stands.

Ruggiero et al. 1994b recognize that for martens, "trapper access is decreased, and de facto partial protection provided, by prohibitions of motorized travel."

Old growth allows martens to avoid predators, provides resting and denning places in coarse woody debris and large diameter trees, and allows for access under the snow surface. USDA Forest Service, 1990 reviewed research suggesting that martens prefer forest stands with greater than 40% tree canopy closure and rarely venture more than 150 feet from forest cover, particularly in winter. USDA Forest Service, 1990 also cites research suggesting that at least 50% of female marten home range should be maintained in mature or old growth forest. Also, consideration of habitat connectivity is essential to ensuring marten viability: "To ensure that a viable population of marten is maintained across its range, suitable habitat for individual martens should be distributed geographically in a manner that allows interchange of individuals between habitat patches (Ibid.).

This raises the issue of monitoring a directed by the Forest Plan. One item, for example, was to investigate forest assumptions and quantity of old-growth habitat:

I, V	Old Growth Ecosystems	Identify acres and distribution of old growth	GIS with field verification	Acres	3 years	H/H	GIS	Wildlife Staff	$4,000	10% less than or greater than assumed in Forest Plan

There is no indication the FS has conducted such monitoring and considers its implications for the project.

The EA does not disclose the quantity and quality of habitat that is necessary to sustain the viability of the marten.

Wolverine

The EA rejects performing an analysis for wolverines, stating simply: "Analysis area too low in elevation (except Wilderness). No treatments are planned in wolverine habitat." The EA doesn't even disclose what the FS believes to be wolverine habitat "except Wilderness."

The Mission EA does not explain why the wide-ranging wolverine is not expected to occur in the project area. Wolverines use habitat ranging from Douglas-fir and lodgepole pine forests to subalpine whitebark pine forests (Copeland et al., 2007). Lofroth (1997) determined wolverines use habitats as diverse as tundra and old-growth forest. Wolverines are also known to use mid- to low-elevation Douglas-fir forests in the winter (USDA Forest Service, 1993).

The Washington Wildlife Habitat Connectivity Working Group mapped for focal species (including wolverines) around the year 2010. These maps show where wolverines might be expected in the Okanogan-Wenatchee NF.

In its Order dated 4/4/16, the U.S. District Court of Montana ruled: "The United States Fish & Wildlife Service's Withdrawal of its Proposed Rule to list the distinct population segment of the North American wolverine occurring in the contiguous United States as a threatened species under the Endangered Species Act, 79 Fed. Reg. 47,522 (Aug. 13, 2014), is hereby VACATED." Therefore the status of the wolverine is Proposed for listing under the ESA, and the FS must undergo consultation with the U.S. Fish & Wildlife Service. How does the Okanogan NF insure wolverine viability?

Aubry, et al. 2007 note that wolverine range in the U.S. had contracted substantially by the mid-1900s and that extirpations are likely due to human-caused mortality and low to nonexistent immigration rates.

The EA doesn't disclose the FS's strategy and best available science for insuring viable populations of the wolverine. The FS has no scientifically defensible viability strategy for this species.

May et al. (2006) cite: "Increased human development (e.g. houses, cabins, settlements and roads) and activity (e.g. recreation and husbandry) in once remote areas may thus cause reduced ability of wolverines to perform their daily activities unimpeded, making the habitat less optimal or causing wolverines to avoid the disturbed area (Landa & Skogland 1995, Landa et al. 2000a)."

Ruggiero, et al. (2007) state: "Many wolverine populations appear to be relatively small and isolated. Accordingly, empirical information on the landscape features that facilitate or impede immigration and emigration is critical for the conservation of this species."

Roads result in direct mortality to wolverines by providing access for trappers (Krebs et al., 2007). Trapping was identified as the dominant factor affecting wolverine survival in a Montana study (Squires et al. 2007). Female wolverines avoid roads and recently logged areas, and respond negatively to human activities (Krebs et al., 2007)

Ruggiero et al. (1994b) recognized that "Over most of its distribution, the primary mortality factor for the wolverines is trapping." Those authors also state, "Transient wolverines likely play a key role in the maintenance of spatial organization and the colonization of vacant habitat. Factors that affect movements by transients may be important to population and distributional dynamics."

Roads and human density are important factors influencing current wolverine distribution (Carroll et al. 2001b); and wolverine habitat selection is negatively correlated with human

activity – including roads (Krebs et al. 2007). Wolverine occurrence has shown a negative relationship with road densities greater than 2.8 mi/mi^2 (1.7 km/km^2) (Carroll et al. 2001b).

(T)he presence of roads can be directly implicated in human-caused mortality (trapping) of this species. Trapping was identified as the dominant factor affecting wolverine survival in a Montana study (Squires et al. 2007).

Krebs et al. (2007) state, "Human use, including winter recreation and the presence of roads, reduced habitat value for wolverines in our studies."

Wisdom et al. (2000) state:

> Carnivorous mammals such as marten, fisher, lynx, and wolverine are vulnerable to over-trapping (Bailey and others 1986, Banci 1994, Coulter 1966, Fortin and Cantin 1994, Hodgman and others 1994, Hornocker and Hash 1981, Jones 1991, Parker and others 1983, Thompson 1994, Witmer and others 1998), and over-trapping can be facilitated by road access (Bailey and others 1986, Hodgman and others 1994, Terra-Berns and others 1997, Witmer and others 1998).
>
> …Snow-tracking and radio telemetry in Montana indicated that wolverines avoided recent clearcuts and burns (Hornocker and Hash 1981).
>
> Copeland (1996) found that human disturbance near natal denning habitat resulted in immediate den abandonment but not kit abandonment. Disturbances that could affect wolverine are heli-skiing, snowmobiles, backcountry skiing, logging, hunting, and summer recreation (Copeland 1996, Hornocker and Hash 1981, ICBEMP1996f).

Carroll et al. (2001b) state:

> The combination of large area requirements and low reproductive rate make the wolverine vulnerable to human-induced mortality and habitat alteration. Populations probably cannot sustain rates of human-induced mortality greater than 7–8%, lower than that documented in most studies of trapping mortality (Banci 1994, Weaver et al. 1996).
>
> … (T)he present distribution of the wolverine, like that of the grizzly bear, may be more related to regions that escaped human settlement than to vegetation structure.

Wisdom et al. (2000) offered the following strategies:

- Provide large areas with low road density and minimal human disturbance for wolverine and lynx, especially where populations are known to occur. Manage human activities and road access to minimize human disturbance in areas of known populations.
- Manage wolverine and lynx in a metapopulation context, and provide adequate links among existing populations.
- Reduce human disturbances, particularly in areas with known or high potential for wolverine natal den sites (subalpine talus cirques).

The fact that project activities may affect the wolverine gives rise to the requirement to consult under Section 7 of the ESA, in order to comply with that statute.

Fisher

Recently, the U.S. Fish and Wildlife Service stated that listing the fisher under the ESA "may be warranted..." (https://www.federalregister.gov/articles/2016/01/12/2016-00157/endangered-and-threatened-wildlife-and-plants-90-day-findings-on-17-petitions). How does the Okanogan NF insure viability of fisher on the Forest?

The EA rejects analysis for the fisher, because "Considered extirpated in Washington State, except where reintroductions are occurring." This begs the question—are fisher native to the Okanogan NF, or the project area? The EA gives no indication. If it is a native species here, the FS is obligated to analyze and disclose the factors that have led to this situation.

That statement also conflicts with other FS assertions, namely that they occur in Washington, on the adjacent Colville National Forest (Middle-South EA 2017-fisher).

That FS rationale also states: Habitat is similar to that used by marten (although less mesic), which is discussed below." The EA completely glosses over the differences between preferred marten and fisher habitats.

The state of Washington Fisher Recovery Plan states, "The two most significant causes of the fisher's decline were over-trapping by commercial trappers and loss and fragmentation of low to mid-elevation late-successional forests." (Hayes and Lewis, 2006.) The Fisher Recovery Plan includes this map, indicating Washington Fish and Wildlife believe fisher are native to the Okanogan:

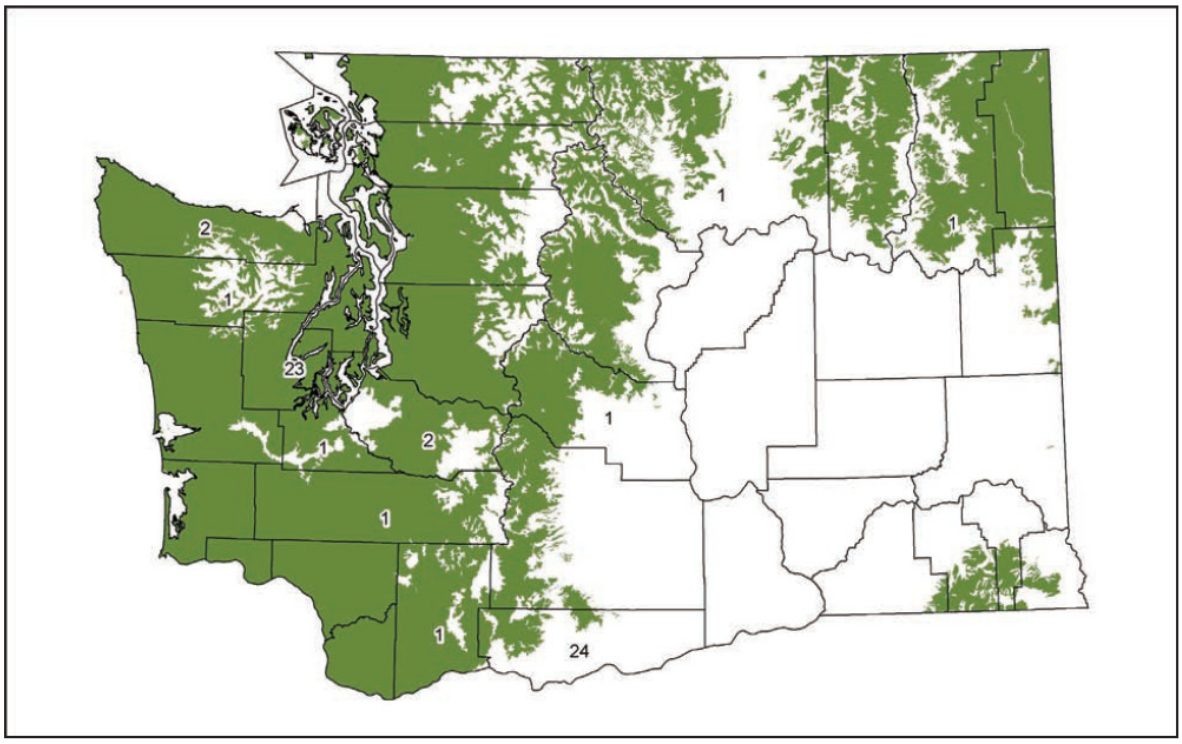


Figure 2. Probable historical distribution (circa 1800) of the fisher in Washington based on specimens (numbers indicated by county), trapping records, and forest zones associated with fisher records (Aubry and Houston 1992) (Forest zones [Cassidy 1997] shaded include: Western Hemlock types, Douglas-fir types, Grand Fir, Cowlitz River (zone), Willamette Valley (zone), Sitka Spruce, Interior Redcedar, Silver Fir, and Subalpine Fir).

Hayes and Lewis, 2006 also state:

> Trapping reduced populations quickly. Despite decades of protection from harvest, fisher populations never recovered in Washington. Fishers use forest structures associated with late-successional forests, such as large live trees, snags and logs, for giving birth and raising their young, as well as for rest sites. Travel among den sites, rest sites, and foraging areas occurs under a dense forest canopy; large openings in the forest are avoided. Commercial forestry removed the large trees, snags and logs that were important habitat features for fishers, and short harvest rotations (40-60 years) didn't allow for the replacement of these large tree structures. Clearcuts fragmented remaining fisher habitat and created impediments to dispersal, thus isolating fishers into smaller populations that increased their risk of extinction. The fisher was listed as endangered in Washington in 1998 by the Washington Fish and Wildlife Commission and is now considered likely extirpated from the state.

Research suggest that fishers are heavily associated with older forests throughout the year. (Aubry et al. 2013, Olsen et al. 2014, Raley et al. 2012, Sauder 2014, Sauder and Rachlow 2014, Schwartz et al. 2013, Weir and Corbould 2010.)

Sauder, 2014 found that "fishers selected landscapes for home ranges with larger, more contiguous patches of mature forest arranged in connected, complex shapes with few isolated patches and open areas comprising $\leq$ 5% of the landscape" (Sauder and Rachlow 2014).

Most studies have found that fishers are reluctant to stray from forest cover and that they prefer more mesic forests (Buskirk and Powell 1994, Olson et al. 2014, Schwartz et al. 2013, Sauder 2014, Sauder and Rachlow 2014, Weir and Corbould 2010). Both Sauder and Rachlow (2014) and Weir and Corbould (2010) predicted the influence of openings on fisher habitat occupancy based on their data. For example, Weir and Corbould predicted that a 5% increase in forest openings would decrease the likelihood of fisher occupancy by 50%. Sauder and Rachlow (2014) suggested that an "increase of open area from 5% to 10% reduces the probability of occupation by fishers by 39%. Sauder and Rachlow (2014) reported that the median amount of open area within fisher home ranges was 5.4%. This was consistent with "results from California where fisher home ranges, on average, contained <5.0% open areas" (Raley et al. 2012).

Sauder and Rachlow (2014) report the average home range size is approximately 12,200 acres and for a female fisher and approximately 24,300 acres for a male fisher. Home ranges generally do not overlap greatly for the individual sexes (21.3% for females and 15.3% for males), but male home ranges can overlap female home ranges. Preferred habitat would likely occur in upland areas and stands composed of cedar and grand fir forests (Schwartz et al. 2013).

From Ruggiero et al. 1994b:

> (T)he fisher is unique to North America and is valued by native and nonnative people as an important member of the complex natural communities that comprise the continent's northern forests. Fishers are an important component of the diversity of organisms found in North America, and the mere knowledge of the fisher's existence in natural forest communities is valued by many Americans.

Ruggiero et al. 1994b discuss habitat disruption by human presence:

> …The fisher's reaction to humans in all of these interactions is usually one of avoidance. Even though mustelids appear to be curious by nature and in some instances fishers may associate with humans (W. Zielinski, pers. obs.), they seldom linger when they become aware of the immediate presence of a human. In this regard, fishers generally are more common where the density of humans is low and human disturbance is reduced. Although perhaps not as associated with "wilderness" as the wolverine (V. Banci, Chapter 5), the fisher is usually characterized as a species that avoids humans (Douglas and Strickland 1987; Powell 1993).

Also Jones, (undated) recognizes:

> Roads are directly correlated with trapper access, and consequently, fisher vulnerability. Even in areas where fishers cannot be legally trapped, trapping pressure for other furbearers (i.e., marten) may contribute significantly to fisher mortality. Roads bisecting or adjacent to preferred habitats (i.e., drainage bottoms) have the greatest potential of increasing a trapper's probability of encountering fishers."

And Witmer et al., 1998 state, "The range and population levels of the fisher have declined substantially in the past century, primarily the result of trapping pressure and habitat alteration through logging (Powell and Zielinski 1994)."

Heinemeyer and Jones, 1994 stated:

> Fishers are susceptible to trapping, and are frequently caught in sets for other furbearers. Additionally, populations are vulnerable to trapping, as even light pressure may cause local extinction. Western fisher populations may have lower natality and higher natural mortality rates as compared to eastern populations. Consequently, western populations may be more susceptible to over-trapping. It has been suggested that incidental captures may limit population growth in some areas.

The EA doesn't disclose the FS's strategy and best available science for insuring viable populations of the fisher. The EA cites no scientifically-based analysis on the spatial and structural requirements for fisher survival and successful reproduction. There is no sound, scientifically-based analysis for the Forest Plan or entire Forest comparing forestwide conditions with habitat metrics required to insure fisher viability. The analyses for other wildlife reveal these same flaws. The EA does not disclose the quantity and quality of habitat that is necessary to sustain the viability of the fisher.

We incorporate the document "Scientific Literature Review" which has a section entitled "Fisher."

Black-backed woodpecker and other Primary Cavity Excavator management indicator species

How does the Okanogan NF insure black-backed woodpecker viability? This is a species which is directly and significantly affected by fire suppression.

The viability of black-backed woodpeckers is threatened by fire suppression and other "forest health" policies which specifically attempt to prevent its habitat from developing. "Insect infestations and recent wildfire provide key nesting and foraging habitats" for the black-backed woodpecker and "populations are eruptive in response to these occurrences" (Wisdom et al. 2000). A basic purpose of the FS's management strategies is to negate the natural processes that the black-backed woodpecker biologically relies on; the emphasis in reducing the risk of stand loss due to stand density coupled with the increased risk of stand replacement fire events. Viability of a species cannot be assured, if habitat suppression is a forestwide policy.

Hutto, 1995 states: "Fires are clearly beneficial to numerous bird species, and **are apparently necessary for some**." (p. 1052, emphasis added.) Hutto, 1995 whose study keyed on forests burned in the 1988 season, noted:

> Contrary to what one might expect to find immediately after a major disturbance event, I detected a large number of species in forests that had undergone stand-replacement fires. Huff et al. (1985) also noted that the density and diversity of bird species in one- to two-

> year-old burned forests in the Olympic Mountains, Washington, **were as great as adjacent old-growth forests**…
>
> …Several bird species seem to be relatively **restricted** in distribution to early post-fire conditions… I believe it would be difficult to find a forest-bird species more restricted to a single vegetation cover type in the northern Rockies than the Black-backed Woodpecker is to early [first 6 years] post-fire conditions. (Emphasis added).

USDA Forest Service 2011c states:

> Hutto (2008), in a study of bird use of habitats burned in the 2003 fires in northwest Montana, found that within burned forests, there was one variable that exerts an influence that outstrips the influence of any other variable on the distribution of birds, and that is fire severity. Some species, including the black-backed woodpecker, were relatively abundant only in the high-severity patches. . **Hutto's preliminary results also suggested burned forests that were harvested fairly intensively (seed tree cuts, shelterwood cuts) within a decade or two prior to the fires of 2003 were much less suitable as post-fire forests to the black-backed woodpecker and other fire dependent bird species. Even forests that were harvested more selectively within a decade or two prior to fire were less likely to be occupied by black-backed woodpeckers.** (Emphasis added.)

Also see the agency's Fire Science Brief, 2009, which states, "Hutto found that Black-backed Woodpeckers fared best on sites unharvested before fire and poorest in the heavily harvested sites."

Hutto, 2008 states, "severely burned forest conditions have probably occurred naturally across a broad range of forest types for millennia. These findings highlight the fact that severe fire provides an important ecological backdrop for fire specialists like the black-backed woodpecker, and that the presence and importance of severe fire may be much broader than commonly appreciated."

Cherry (1997) states:

> The black-backed woodpecker appears to fill a niche that describes everything that foresters and fire fighters have attempted to eradicate. For about the last 50 years, disease and fire have been considered enemies of the 'healthy' forest and have been combated relatively successfully. We have recently (within the last 0 to 15 years) realized that disease and fire have their place on the landscape, but the landscape is badly out of balance with the fire suppression and insect and disease reduction activities (i.e. salvage logging) of the last 50 years. Therefore, the black-backed woodpecker is likely not to be abundant as it once was, and **continued fire suppression and insect eradication is likely to cause further decline.** (Emphasis added.)

The FS continues to manage against severely burned forests, as evident from the project Purpose and Need.

The black-backed woodpecker is a primary cavity nester, and an indicator for species depending upon the process of wildland fire in the ecosystem. Cherry (1997) notes:

> Woodpeckers play critical roles in the forest ecosystem. Woodpeckers are primary cavity nesters that excavate at least one cavity per year, thus making these sites available to secondary cavity nesters (which include many species of both birds and mammals). Black-backed and three-toed woodpeckers can play a large role in potential insect control. The functional roles of these two woodpecker species could easily place them in the 'keystone' species category—a species on which other species depend for their existence.
>
> Wickman (1965) calculated that woodpeckers may eat up to 50 larvae per day that were each about 50 mm in length. The predation on these larvae is significant. It has been estimated that individual three-toed woodpeckers may consume thousands of beetle larvae per day, and insect outbreaks may attract a many-fold increase in woodpecker densities (Steeger et al. 1996). The ability of woodpeckers in to help control insect outbreaks may have previously been underestimated.

Cherry (1997) also notes:

> Black-backed woodpeckers preferred foraging in trees of 34 cm (16.5 in) diameters breast height and (63 ft) 19 m height (Bull et al. 1986). Goggans et al. (1987) found the mean dbh of trees used for foraging was 37.5 cm (15 in) and the mean dbh of trees in the lodgepole pine stands used for foraging was 35 cm (14 in). Steeger et al. (1996) found that both (black-backed and three-toed) woodpecker species fed in trees from 20-50 cm (8-20 in) dbh.
>
> Black-backed woodpeckers excavate their own cavities in trees for nesting. Therefore, they are referred to as primary cavity nesters, and they play a critical role in excavating cavities that are later used by many other species of birds and mammals that do not excavate their own cavity (secondary cavity nesters). Black-backed woodpeckers peel bark away from the entrance hole and excavate a new cavity every year. Other woodpeckers sometimes take over their cavities (Goggans et al. 1987).

Also, FS biologists Goggans et al., 1989 studied black-backed woodpecker use of unburned stands in the Deschutes NF in Oregon. They discovered that the black-backed woodpeckers used unlogged forests more than cut stands. In other words, effects to the black-backed woodpecker accrue from logging forest habitat that has not been recently burned.

FS biologists Hillis et al., 2002 note that "In northern Idaho, where burns have been largely absent for the last 60 years, black-backed woodpeckers are found amid bark beetle outbreaks, although not at the densities found in post-burn conditions in Montana." Those researchers also state, "The greatest concerns for this species, however, are decades of successful fire suppression and salvage logging targeted at recent bark beetle outbreaks." Hillis et al., 2002 also state:

> Black-backed woodpeckers occupy forested habitats that contain high densities of recently dead or dying trees that have been colonized by bark beetles and woodborer beetles (Buprestidae, Cerambycidae, and Scolytidae). These beetles and their larvae are most abundant within burned forests. In unburned forests, bark beetle and woodborer infested

trees are found primarily in areas that have undergone natural disturbances, such as wind-throw, and within structurally diverse old-growth forests (Steeger and Dulisse in press, Bull et al. 1986, Goggans et al. 1987, Villard 1994, Hoffman 1997, Weinhagen 1998).

Bond et al., 2012a explain the need for a conservation strategy for the black-backed woodpecker:

> In California, the Black-backed Woodpecker's strong association with recently burned forest, a habitat that is ephemeral, spatially restricted, and often greatly modified by post-fire logging, as well as the species' relative rarity, may make the woodpecker vulnerable to declines in the state. Additionally, Black-backed Woodpeckers in California are affected by the management of unburned forests – both because pre-fire stand conditions affect the suitability of post-fire habitat for the species, and because a substantial proportion of California's Black-backed Woodpeckers nest and forage at a low population density in unburned forests. Conserving the Black-backed Woodpecker in California likely requires appropriate management and stewardship of the habitat where this species reaches its highest density – recently burned forest – as well as appropriate management of 'green' forests that have not burned recently.

The FS fails to apply the best available science to describe the quantity and quality of habitat that is necessary to sustain the viability of the primary cavity excavators.

Primary Cavity Excavators pileated, three-toed, black-backed, downy, hairy, Lewis', white-headed woodpeckers, northern flickers, and Williamson's and red-naped sapsuckers.
The EA presents **"Rationale for Dismissing from Further Analysis"** for the black-backed woodpecker along with other "Primary Cavity Excavators/management indicator species for dead and defective tree habitat" including pileated woodpecker, three-toed woodpecker, downy woodpecker, hairy woodpecker, Lewis' woodpecker, white-headed woodpecker, northern flickers, Williamson's sapsucker and red-naped sapsucker. It states:

> Snag habitat does exist within the project area… Snags would be created on the 21% of the project area that would be underburned. It would not affect the size or health or primary cavity excavator populations. Youkey (2011) evaluated snag habitat for the forest PCE species using DecAid information and comparisons between current and historic conditions. Appendix A of the Wildlife Report discusses snag management in the project area.

The Mission EA does not disclose limitations for use of the DecAid information, such as "DecAID is not a simulation model" and "DecAID is not a population viability analysis model"[8] (DecAID - Decayed Wood Advisor-Caveats and Cautions).

The EA discloses that management has resulted in less snag habitat, e.g.: "Project area habitat has changed over the last century, and current stands are denser, more uniform, and have fewer large trees in comparison with historical forests." The EA fails to provide reliable numbers on

[8](https://apps.fs.usda.gov/r6_decaid/legacy/decaid/#Spatial%20and%20historic%20distributions%20of%20snags%20and%20down%20wood%20in%20the%20inventory%20data)

existing and predicted snag numbers because the modeling is not validated and the data is not reliable.

"**To the extent feasible**, the largest coarse wood (snags or logs) would be left on-site to satisfy coarse woody material requirements for each treatment unit." (Emphasis added.) This uncertainty is not assurance that cumulatively, habitat structure will actually meet needs of wildlife. The EA fails to explain how "Silvicultural prescriptions **would account for** additional trees that will be required for future coarse wood recruitment in the thinned stands." (Emphasis added.)

"Following the treatments, the stands would be capable of producing large coarse wood at a faster rate for soil development than current conditions." The EA fails disclose the expected time frame, and doesn't even present a quantitative analysis showing there is a meaningful difference between the action alternatives and the no action alternative. The EA does state, "(A) net increase in open roads would occur, and result in additional snag loss" and "Standing dead and down lodgepole pines in excess of snag and large woody debris retention objectives would be removed for firewood or other forest products."

The EA states, ""Past Actions: Fewer large snags occur compared to historical conditions, due to loss of large trees (fewer to become snags and down wood), firewood cutting and danger tree cutting." The EA admits the No Action would be most favorable for addressing the issue: "Competition would also result in mortality of the large trees, producing large snags, which are also important habitat elements."

Forest plan standards include:

6-5 Forestwide, dead tree habitat shall be managed to maintain primary excavator populations to at least 60 percent of their biological potential. In the lodgepole pine working group where existing tree size prevents meeting the guidelines, patches containing the largest dead trees and replacement green trees shall be retained and distributed in the treatment unit to approach populations meeting 60 percent of their biological potential.

6-6 In riparian areas and old growth stands, dead tree habitat shall be managed to maintain primary excavator populations at 100 percent of their biological potential.

6-7 The following table displays the number of trees per acre, by diameter class needed to meet the various management levels:

TABLE 4 - 15: Standing Dead Trees Required per 100 acres.

Dead Tree Management Level	≥10" DBH	≥20" DBH	Total
60%	108	8	116
80%	144	11	155
100%	180	14	194

The EA does not demonstrate management consistency with those standards.

Lorenz et al., 2015 state:

> Our findings suggest that higher densities of snags and other nest substrates should be provided for PCEs (primary cavity excavators) than generally recommended, because past research studies likely overestimated the abundance of suitable nest sites and underestimated the number of snags required to sustain PCE populations. Accordingly, the felling or removal of snags for any purpose, including commercial salvage logging and home firewood gathering, should not be permitted where conservation and management of PCEs or SCUs (secondary cavity users) is a concern (Scott 1978, Hutto 2006).

This means only the PCEs themselves have the ability to decide if a tree is suitable for excavating. The means managers know little about how many snags per acre are needed to sustain populations of cavity nesting species. This must be considered best available science to replace forest plan direction for snag retention.

Spiering and Knight (2005) examined the relationship between cavity-nesting birds and snag density in managed ponderosa pine stands and examined if cavity-nesting bird use of snags as nest sites was related to the following snag characteristics (DBH, snag height, state of decay, percent bark cover, and the presence of broken top), and if evidence of foraging on snags was related to the following snag characteristics: tree species, DBH, and state of decay. The authors state:

> Many species of birds are dependent on snags for nest sites, including 85 species of cavity-nesting birds in North America (Scott et al. 1977). Therefore, information of how many and what types of snags are required by cavity-nesting bird species is critical for wildlife biologists, silviculturists, and forest managers.
>
> Researchers across many forest types have found that cavity-nesting birds utilize snags with large DBH and tall height for nest trees (Scott, 1978; Cunningham et al., 1980; Mannan et al., 1980; Raphael and White, 1984; Reynolds et al., 1985; Zarnowitz and Manuwal, 1985; Schreiber and deCalesta, 1992).

Spiering and Knight (2005) found the following.

> Larger DBH and greater snag height were positively associated with the presence of a cavity, and advanced stages of decay and the presence of a broken top were negatively associated with the presence of a cavity. Snags in larger DBH size classes had more evidence of foraging than expected based on abundance.
>
> Percent bark cover had little influence on the presence of a cavity. Therefore, larger and taller snags that are not heavily decayed are the most likely locations for cavity-nesting birds to excavate cavities.
>
> The association of larger DBH and greater height of snags with cavities is consistent with other studies (Scott, 1978; Cunningham et al., 1980; Mannan et al., 1980; Raphael and White, 1984; Reynolds et al., 1985; Zarnowitz and Manuwal, 1985; Schreiber and deCalesta, 1992).

Spiering and Knight (2005) state that the "lack of large snags for use as nest sites may be the main reason for the low densities of cavity-nesting birds found in managed stands on the Black Hills National Forest. ...The increased proportion of snags with evidence of foraging as DBH size class increased and the significant goodness-of-fit test indicate that large snags are the most important for foraging."

The EA fails to disclose the cumulative snag loss in areas previously logged or subject to other management-caused snag loss.

The EA fails to disclose how much snag loss would be expected because of safety concerns and also from the proposed methods of log removal.

Despite the fact that large snags are below the historic range on the Forest, the EA and Forest Plan monitoring fail to disclose the population abundance of such habitat components or population trends of its MIS. So the EA resorts to arriving at baseless conclusions of insignificance, while admitting deficits of habitat components.

The EA and the Forest Plan/FEIS fail to apply the best available science to describe the quantity and quality of habitat that is necessary to sustain the viability of the primary cavity excavators.

The EA uses focal species as a point of analysis, without disclosing a purpose or definition. Does the FS recognize some regulatory requirements for focal species, or is this just a distraction from real regulatory requirements?

The EA doesn't demonstrate proper survey protocols for Threatened, Endangered, Proposed, Sensitive or other species of concern have been utilized for determining occupancy.

Canada lynx

A big problem with the Forest Plan and Canada Lynx Conservation Assessment and Strategy (LCAS) is that they allow essentially the same level of industrial forest management activities that occurred prior to Canada lynx listing under the Endangered Species Act (ESA).

The EA states, "The project area is in the core area for lynx, where long-term persistence of lynx has been documented. Portions of two lynx analysis units (LAUs) are present in the analysis area." The Mission timber sale and burning project would directly affect 2,132 acres of Canada lynx Critical Habitat. It would also increase open roads in critical habitat by almost 6 miles.

The EA states, "Critical Habitat for lynx will be assessed by the effects of the treatments on the Primary Constituent Elements (PCEs) of the habitat." However, such analysis cannot be found in the EA.

The EA states, "Approximately 1,770 acres of treatment would occur in the LAUs in the analysis area. However, only 58 acres occur within the boreal forest area where lynx are expected." There is no indication of the accuracy or validity of the FS's modeling of "boreal forest area" for the lynx analysis.

The EA states, "The project area is in the core area for lynx, where long-term persistence of lynx has been documented." (176.) Also, "In the (non-Wilderness) project area, 12,890 acres are designated Critical Habitat for lynx. Approximately 4,604 acres are within the mapped lynx habitat." (178.) 2,137 acres of designated Critical Habitat for lynx would be impacted by the Mission project. (EA 191.) How much of this 2,137 acres is within "mapped" lynx habitat? How is "mapped" habitat determined?

The EA uses changes of roads in lynx habitat as an indicator, despite also saying that they don't affect lynx habitat anyway. Please reconcile the EA's opposing positions.

Kosterman, 2014 finds that 50% of lynx habitat must be mature undisturbed forest for it to be optimal lynx habitat where lynx can have reproductive success, and no more than 15% of lynx habitat should be young clearcuts, i.e. trees under 4 inched dbh. This scientific information is not recognized by the EA or in the LCAS. Kosterman, 2014 demonstrates that LCAS standards are not adequate for lynx viability and recovery. The EA also does not acknowledge scientific evidence indicating multistory winter forage habitat is a limiting factor for lynx.

"In matrix habitat, activities that change vegetation structure or condition would not be considered an adverse effect to Critical Habitat unless they would create barriers or impede lynx movement between habitat components." (EA 178.) How might any "activities that change vegetation structure or condition" create a barrier or impede lynx movement? We suspect the FS would never admit any of its activities create such barriers or impediments.

The U.S. Fish & Wildlife Service did not determine critical habitat for lynx at the time the species was listed. U.S. Fish & Wildlife Service was ordered to "undertake prompt rulemaking" in order to determine and designate lynx critical habitat. *Defenders of Wildlife v. Norton,* 239 F.Supp.2d 9, 26 (D.D.C. 2002). "On February 28, 2008, the Service issued the proposed rule designating lynx critical habitat. The final rule was then published on February 25, 2009." *Alliance for the Wild Rockies v. Lyder,* 728 F.Supp.2d 1126, 1143 (D.Mont. 2010) (citing 74 Fed. Reg. 8616). The U.S. Fish & Wildlife Service excluded many large areas from the map in the Final Rule. The Final Rule was challenged and ultimately ruled "arbitrary and capricious" because in determining what habitat was "critical" for lynx, the U.S. Fish & Wildlife Service required evidence of reproduction. *Lyder,* 728 F.Supp. at 1132. The Court held that because the agency required evidence of reproduction for mapped critical habitat, the Final Rule was unlawful and that the agency must re-evaluate and reissue a rule properly designating lynx critical habitat. *Lyder, 728* F.Supp. at 1145.

The Mission EA also does not demonstrate project consistency with the Canada Lynx Conservation Agreement, U.S. Forest Service and U.S. Fish & Wildlife Service, 2005.

The Forest Plan includes monitoring requirements for lynx, such as to monitor population trends and snowshoe hare habitat. The EA doesn't give any indication the monitoring has been conducted as required, nor does it discuss any monitoring results. The Canada lynx was listed under the ESA partly because the FS had no scientifically based viability assurances in forest plans such as the Okanogan NF's.

The EA for this project does not apply the best available science regarding the Canada lynx. The project will result in unauthorized take as defined by Section 9 of the ESA.

The EA fails to present an adequate analysis of what scientists believe is the most limiting type of lynx habitat. Mature multi-story conifer stands in the project area are below the historic range, but there is no cumulative effects analysis.

The current best science indicates that lynx winter foraging habitat is critical to lynx persistence (Squires et al. 2010), and that this habitat should be "abundant and well-distributed across lynx habitat." (Squires et al. 2010; Squires 2009.) Existing openings such as clearcuts not yet recovered are likely to be avoided by lynx in the winter. (Squires et al. 2010; Squires et al. 2006.)

Lynx subsist primarily on a prey base of snowshoe hare, and survival is highly dependent upon snowshoe hare habitat, forest habitat where young trees and shrubs grow densely. In North

America, the distribution and range of lynx is nearly "coincident" with that of snowshoe hares, and protection of snowshoe hares and their habitat is critical in lynx conservation strategies.

Lynx winter habitat, provided only in older, multi-storied forests, is critical for lynx preservation. (Squires et al. 2010.) Winter is the most constraining season for lynx in terms of resource use; starvation mortality has been found to be the most common during winter and early spring. (Squires et al. 2010.) Prey availability for lynx is highest in the summer. (Squires et al. 2013.)

Openings, whether small in uneven-aged management, or large with clearcutting, remove lynx winter travel habitat on those affected acres, since lynx avoid openings in the winter. (Squires et al. 2010.)

Squires et al., 2010 reported that lynx winter habitat should be "abundant and spatially well-distributed across the landscape. Those authors also noted that in heavily managed landscapes, retention and recruitment of lynx habitat should be a priority.

Squires et al. (2013) noted that long-term population recovery of lynx, as well as other species as the grizzly bear, require maintenance of short and long-distance connectivity. The importance of maintaining lynx linkage zones is also recognized by the LCAS, as revised in 2013, which stresses that landscape connectivity should be maintained to allow for movement and dispersal of lynx.

Squires et al. (2013) noted in their research report that some lynx avoided crossing highways; in their own report, they noted that only 12 of 44 radio-tagged lynx with home ranges including 2-lane highways crossed them.

The LCAS recommends, until conclusive information is developed concerning lynx management, the FS retain future options; that is, choose to err on the side of maintaining and restoring habitat for lynx and their prey. To err on the side of caution, the FS would retain all remaining stem exclusion forests for recruitment into lynx winter habitat, so that this key habitat would more closely resemble historic conditions.

As early as the 2000 version, the LCAS noted that lynx seem to prefer to move through continuous forest (1-4); lynx have been observed to avoid large openings, either natural or created (1-4); opening and open forest areas wider than 650 feet may restrict lynx movement (2-3); large patches with low stem densities may be functionally similar to openings, and therefore lynx movement may be disrupted (2-4). Squires et al. 2006a reported that lynx tend to avoid sparse, open forests and forest stands dominated by small-diameter trees during the winter. Squires et al. 2010 again reported that lynx avoid crossing clearcuts in the winter; they generally avoid forests composed of small diameter saplings in the winter; and forests that were thinned as a silvicultural treatment were generally avoided in the winter.

Squires et al. 2010 show that the average width of openings crossed by lynx in the winter was 383 feet, while the maximum width of crossed openings was 1240 feet.

Lynx are highly mobile and generally move long distances [greater than 60 mi. (100 km.)]; they disperse primarily when snowshoe hare populations decline; subadult lynx disperse even when prey is abundant, presumably to establish new home ranges; and lynx also make exploratory movements outside their home ranges. 74 Peg. Reg. at 8617. The contiguous United States is at the southern edge of the boreal forest range, resulting in limited and patchy forests that can support snowshoe hare and lynx populations.

The FS has not completed formal consultation in light of the most recent Critical Habitat designations, which the Ninth Circuit Court of Appeals has ruled is required. Because of this particular failure to consult, the public is not fully informed as to the effects on lynx Critical Habitat Primary Constituent Elements.

We incorporate the document "Scientific Literature Review" which has a section entitled "Lynx."

Grizzly bear
Since grizzly bears are a Threatened species and native to the project area, it is inconsistent with NFMA and the ESA for the FS to exclude this species from habitat analysis and other considerations.

The lack of analysis is reflective of an erroneous perspective that once species are extirpated from an area by human activities, they no longer have a place in the ecosystem, and there is no responsibility for assisting their recovery. The EA fails to apply the best available science to describe the quantity and quality of habitat that is necessary to recovery the North Cascades Ecosystem grizzly bear.

Northern goshawk
"Surveys for goshawks were limited…" (EA 193). The EA does not provide protections for the goshawk if pre-project surveys don't consider best available science for locating the goshawks. Additionally, surveys need to be ongoing, because nest stands are not occupied every year and the logging could eliminate a nest stand.

The EA discloses, "Loss of snags as danger trees during logging would occur." (193.) This is found in the goshawk discussion, but it begs the question, how are protections for <u>any</u> snag-dependent or cavity nesting/denning species effective if the FS has no idea as to the quantity of snag loss during the project?

The EA doesn't disclose the FS's strategy and best available science for insuring viable populations of the northern goshawk, a species whose habitat is significantly altered by logging and other active forest management.

The FS must utilize goshawk survey methodology consistent with the best available science. For example the recent and comprehensive protocol, "Northern Goshawk Inventory and Monitoring Technical Guide" by Woodbridge and Hargis 2006. Also, USDA Forest Service 2000b state:

> A common thread in the interviews was the lack of a landscape approach in providing goshawk habitat well distributed across the Forest (Squires, Reynolds, Boyce). Reynolds was deeply concerned that both alternatives focus only on 600 acres around known goshawk nests. He was concerned that this direction could be keeping the goshawk population artificially low**. Because goshawks move around within their territories, they are very difficult to find (Reynolds). There might be more goshawks on the Forest than currently known (Squires). One or two years of goshawk surveys is not enough (Reynolds). Some pairs may not lay eggs for five years (Reynolds). To get confidence in identifying nesting goshawk pairs, four to six years of surveys are needed (Reynolds).** (Emphasis added.)

Further, the Mission EA doesn't use the best available science disclosing adverse impacts in a roughly 6,000-acre northern goshawk home range or the post-fledging area (PFA). Reynolds et al. 1992 goshawk guidelines recommend ratios of (20%/20%/20%) each in the mid-aged forest, mature forest, and old forest Vegetative Structural Stage (VSS) classes for PFAs and foraging areas. Reynolds et al. 1992 calls for 100% in VSS classes 5 & 6 and 0% in VSS classes 1-4 in nest areas.

In addition, Reynolds et al. 1992 recommend logged openings of no more than 2 acres in size or less in the PFAs, depending on forest type, and logged openings of no more than 1-4 acres or less in size in the foraging areas, depending on forest type. Clough (2000) noted that in the absence of long-term monitoring data, a very conservative approach to allowing logging activities near active goshawk nest stands should be taken to ensure that goshawk distribution is not greatly altered. This indicates that the full 180-acre nest area management scheme recommended by Reynolds et al. (1992) should be used around any active goshawk nest. Removal of any large trees in the 180-acre nesting area would contradict the Reynolds et al. (1992) guidelines.

Crocker-Bedford (1990) noted:

> After partial harvesting over extensive locales around nest buffers, reoccupancy decreased by an estimated 90% and nestling production decreased by an estimated 97%. Decreases were probably due to increased competition from open-forest raptors, as well as changes in hunting habitat and prey abundance.

Moser and Garton (2009) reported that all goshawk nests examined in their study area were found in stands whose average diameter of overstory trees was over 12.2 inches and all nest stands had $\geq$ 70% overstory tree canopy. They described their findings as being similar to those described by Hayward and Escano (1989), who reported that nesting habitat "may be described as mature to overmature conifer forest with a closed canopy (75-85% cover)…."

The FS fails to apply the best available science to describe the quantity and quality of habitat that is necessary to sustain the viability of the northern goshawk.

Regarding migratory birds, the EA states:

> **Direction** for landbird conservation is provided by the Migratory Bird Treaty Act and Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds and MOU 08-MU-1113-2400-264 Memorandum of Understanding between the U.S. Department of Agriculture Forest Service and the U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds. **Guidance** for landbird conservation is provided by the Landbird Strategic Plan and The Conservation Strategy for Landbirds in Oregon and Washington (Altman 2000a; b, and Altman and Holmes 2000).

(Emphases added.) However, the EA does not state what this "Direction" or "Guidance" is, or show how the FS is addressing it.

"Mortality (of Western Gray Squirrels) due to vehicle strikes would continue on 45.3 miles of open roads." (184.) What is the best available science on threats posed to viability of Western Gray Squirrels from motorized traffic?

The EA discloses, "Loss of snags as danger trees during logging would occur." (193.) This is found in the goshawk discussion, but it begs the question, how are protections for any snag-dependent or cavity nesting/denning species effective if the FS has no idea as to the quantity of snag loss during the project?

The EA doesn't demonstrate the insignificance of amending the Forest Plan Management Area prescriptions for winter deer habitat. The EA fails to fully address the scientific basis of the forest plan standards. How many times has the FS amended the forest plan to sidestep this thermal cover standard?

"Disturbance could occur as a result of winter logging, and deer may be temporarily displaced from the area being logged. The Forest winter range is higher elevation than the more heavily used areas on private land that are lower elevation and have less snow." (EA 199.) The EA doesn't analyze or disclose these displacement effects to private landowners.

The EA at 23 states, "photo analysis and field review have clarified that Forest Plan Old Growth does not exist in any proposed thinning or prescribed fire treatment unit." What is the definition of Forest Plan Old Growth that applies to this portion of the Okanogan-Wenatchee NF, and how does it align with ecological definitions?

Pileated woodpecker

The EA dismisses impacts on the presents "Rationale for Dismissing (pileated woodpecker) from Further Analysis": Pileated woodpeckers use habitats similar to those of spotted owls, and effects would be similar. Snag loss would reduce habitat used for nesting, roosting and foraging, and is discussed in the spotted owl section and Appendix A of the Wildlife Report.

The EA doesn't disclose the FS's strategy and best available science for insuring viable populations of the pileated woodpecker. Bull et al. 2007 represents over 30 years of investigation into the effects of logging on the pileated woodpecker and is recent research information on such effects, and contrast the effects of natural disturbance with large-scale logging on Pileated Woodpeckers. Also see Bull et al., 1992, Bull and Holthausen, 1993, and Bull et al., 1997 for biology of pileated woodpeckers and the habitats they share with cavity nesting wildlife.

The Idaho Panhandle NF's Forest Plan's old-growth standards (USDA Forest Service, 1987c) were largely built around the habitat needs of its indicator species, the pileated woodpecker. Bull and Holthausen 1993, provide field tested management guidelines. They recommend that approximately 25% of the home range be old growth and 50% be mature forest.

USDA Forest Service, 1990 indicates measurements of the following variables are necessary to determine quality and suitability of pileated woodpecker habitat:

- Canopy cover in nesting stands
- *Canopy cover in feeding stands*
- Number of potential nesting trees >20" dbh per acre
- Number of potential nesting trees >30" dbh per acre
- Average DBH of potential nest trees larger than 20" dbh
- Number of potential feeding sites per acre
- Average diameter of potential feeding sites

USDA Forest Service, 1990 states, "To provide suitable pileated woodpecker habitat, strips should be at least 300 feet in width…"

This preferred diameter of nesting trees for the pileated woodpecker is notable. McClelland and McClelland (1999) found similar results in their study in northwest Montana, with the average nest tree being 73 cm. (almost 29") dbh. The pileated woodpecker's strong preference for trees of rather large diameter is not adequately considered in the Forest Plan. The FS provides absolutely no commitments for leaving specific numbers and sizes of largest trees favored by so many wildlife species.

B.R. McClelland extensively studied pileated woodpecker habitat needs. McClelland, 1985 states:

> Co-workers and I now have a record of more than 90 active pileated woodpecker nests and roosts, …the mean dbh of these trees is 30 inches… A few nests are in trees 20 inches or even smaller, but the minimum cannot be considered suitable in the long-term. Our only 2 samples of pileateds nesting in trees <20 inches dbh ended in nest failure… At the current time there are many 20 inch or smaller larch, yet few pileateds selected them. Pileateds select old/old growth because old/old growth provides habitat with a higher probability of successful nesting and long term survival. They are "programmed" to make that choice after centuries of evolving with old growth.

McClelland (1977), states:

> (The Pileated Woodpecker) is the most sensitive hole nester since it requires old growth larch, ponderosa pine, or black cottonwood for successful nesting. The Pileated can be considered as key to the welfare of most hole-nesting species. If suitable habitat for its perpetuation is provided, most other hole-nesting species will be accommodated.
>
> Pileated Woodpeckers use nest trees with the largest dbh: mean 32.5 inches;
>
> Pileated Woodpeckers use the tallest nest trees: mean 94.6 feet;
>
> The nest tree search image of the Pileated Woodpecker is a western larch, ponderosa pine, or black cottonwood snag with a broken top (status 2), greater than 24 inches dbh, taller than 60 feet (usually much taller), with bark missing on at least the upper half of the snag, heartwood substantially affected by Fomes laracis or Fomes pini decay, and within an old-growth stand with a basal area of at least 100 sq feet/acre, composed of large dbh classes.
>
> A cluster analysis based on a nine-dimensional ordination of nest tree traits and habitat traits revealed close association between Yellow-bellied Sapsuckers, Mountain Chickadees, and Red-breasted Nuthatches. These three species plus the Pileated Woodpecker and Hairy Woodpecker are relatively grouped by coincident occurrence in old growth. Tree Swallows, Black-capped Chickadees, and Common Flickers are separated from the above five species by their preference for more open areas and their frequent use of small dbh nest trees.
>
> (Most) species found optimum nesting habitat in stands with a major component of old growth, particularly larch. Mean basal area for pileated woodpecker nest sites was 150 square feet per acre. (McClelland. B.R. and others, 1979)
>
> Many large snags are being cut for firewood. Forest managers should limit firewood cutting to snags less than 15 inches in d.b.h. and discourage use of larch, ponderosa pine, and black cottonwood. Closure of logging roads may be necessary to save high-value snags. Logging slash can be made available for wood gatherers.

Lorenz et al., 2015 state:

> Our findings suggest that higher densities of snags and other nest substrates should be provided for PCEs (primary cavity excavators) than generally recommended, because past research studies likely overestimated the abundance of suitable nest sites and underestimated the number of snags required to sustain PCE populations. Accordingly, the felling or removal of snags for any purpose, including commercial salvage logging and home firewood gathering, should not be permitted where conservation and management of PCEs or SCUs (secondary cavity users) is a concern (Scott 1978, Hutto 2006).

This means only the PCEs themselves have the ability to decide if a tree is suitable for excavating. The means managers know little about how many snags per acre are needed to

sustain populations of cavity nesting species. This must be considered best available science to replace forest plan direction for snag retention.

The EA fails to quantify the cumulative snag loss in previously logged areas or subject to other management-caused snag loss such as road accessed firewood cutting. "Snag cutting is allowed for firewood use on 200' on each side of open system roads except in LSRs and riparian reserves."

The EA fails to quantify snag loss would be expected because of safety concerns and also from the proposed methods of log removal.

The EA fails to apply the best available science to describe the quantity and quality of habitat that is necessary to sustain the viability of the pileated woodpecker.

Old growth and other late successional habitats

The EA state, "Mature/old growth stands, winter range and lodgepole pine stands are found in the analysis area and provide important, and often limited, habitats for many wildlife species. The late/old successional habitat was modelled using the EMDS process." However the EA does not give any indication as to the validity of the EMDS process for identifying old-growth that meets the Forest Plan definition. The EA goes on to state, "Large trees will not be harvested" in the late/old successional habitat but notably, it fails to define "large tree" in this context. In other places the EA indicates trees up to 24" dbh will be logged: "Some DMT infected trees between 18 and 24 inches DBH may also be harvested but the need to do this would be weighed against their contribution to elements of Old Forest structure." The FS simply cannot handle natural processes creating habitat conditions that favor wildlife depending on standing dead trees and large down logs. The FS calls for the following "prescriptions":

- "Thin conifers up to 24" DBH with mechanized equipment" over 1280 acres of "Dry Forest[9] Restoration Thin."
- "Thin conifers up to 24" DBH with mechanized equipment" over 160 acres of "Aspen Release Thin."
- "Thin conifers up to 24" DBH with mechanized equipment" over 70 acres of "Moist Forest Thin."
- "Harvest conifers up to 24" DBH with mechanized equipment" over 59 acres of "Variable Retention Regeneration."
- "Thin conifers up to 24" DBH with mechanized equipment" over 284 acres of "Dry Forest Restoration—Dwarf Mistletoe Thin."

The EA doesn't explain it process for claiming that none of these units meets old growth definitions. The EA doesn't disclose the number of "large trees" under any definition that would be logged.

[9] The Forest Plan does not contain a definition of "dry forest." That comes from the Project incorporated Restoration Strategy—not subject to NEPA.

The EA fails to reconcile conflicting statements such as "No Forest Plan Old Growth stands have been included in the project for treatment" and "31 acres of mature/old-growth habitat would be thinned from below to remove smaller trees…" The Forest Plan FEIS Glossary defines old growth in three different ways, suggesting old-growth stands and old growth are synonymous:

> **Old-growth stand (old growth)** - Any stand of trees generally containing the following characteristics 1) contain mature and overmature trees in the overstory and are well into the mature growth stage, 2) will usually contain a multilayered canopy and trees of several age classes, 3) standing dead trees and down material are present; and 4) evidences of man's activities may be present, but do not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand (2)

The Forest Plan FEIS also states:

> **Old Growth** - A forest comprised of many large trees, large snags and numerous large down logs, having a multi-layered canopy of several tree species, the trees showing signs of decadence; the last stage in forest succession

..as well as:

> **Old-growth habitat** - Habitat for certain wildlife that is characterized by overmature coniferous forest stands with large snags and decaying logs.

The adjacent Colville NF's definition of old growth (Green et al., 1992) includes nine different North Idaho old growth types. Defining characteristics described by Green et al., 1992 include:

> Old growth forests encompass the late stages of stand development and are distinguished by old trees and related structural attributes. These attributes, such as tree size, canopy layers, snags, and down trees generally define forests that are in and old growth condition.
>
> Definition
> Old growth forests are ecosystems distinguished by old trees and related structural attributes. Old growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include tree size, accumulations of large dead woody material, number of canopy layers, species composition, and ecosystem function.
>
> (O)ld growth is typically distinguished from younger growth by several of the following attributes:
>
> 1. Large trees for species and site.
> 2. Wide variation in tree sizes and spacing.
> 3. Accumulations of large-size dead standing and fallen trees that are high relative to earlier stages.
> 4. Decadence in the form of broken or deformed tops or bole and root decay.
> 5. Multiple canopy layers
> 6. Canopy gaps and understory patchiness.

Unlike the Okanogan Forest Plan FEIS glossary, Green et al. also provides objective, quantitative criteria for each of its nine different North Idaho old growth types.

The EA states, "FW S&G 5-1: No harvest would take place in mixed conifer old growth stands (A definition of mixed conifer old growth is found in the Glossary)." The EA glossary states:

> Forest Plan Mixed Conifer Old Growth
> As defined by the Okanogan National Forest Land Resource Management Area Plan; a stand of at least 30 acres in size that **contains at least 15 trees per acre of ponderosa pine trees that are 21 inches in diameter at breast height or larger** together with large snags and coarse woody debris. However, it has become accepted that other species of similar girth would also qualify and it is recognized that the lack of snags and coarse woody debris should not disqualify an otherwise qualifying stand from Mixed Conifer Old Growth status." (Emphasis added.)

The Forest Plan definition of mixed conifer old growth is found in the Forest Plan FEIS, and it actually reads:

> **Mixed Conifer Old Growth** - A stand of trees, 30 acres or larger, that has the presence of large pine trees with 15 or more trees per acre greater than 18 inches DBH, presence of large snags with 2 or more snags per acre greater than 12 inches diameter, presence of large down logs with 3 or more per acre 12 inches diameter; presence of a multi-storied canopy (Douglas-fir/pine grass is an exception), and the presence of 50 percent overhead crown closure (20-50 percent crown closure on ponderosa pine dominated stands or dry site Douglas-fir)

The EA thus misinterprets the Forest Plan definition of mixed conifer old growth from one that has large pine trees present, with at least 15 trees (species not specified) greater than 18" dbh, twisting it into a definition that requires 15 large ponderosa pine trees. This is favorable for the tree farming objectives stated in the EA[10] for this project, retaining some of the larger ponderosa pine trees but thinning or removing everything else under the assumption that with less competition the faster growing ponderosa pine trees are the defining character of old growth. Of course, this also ignores the fact that nothing in the EA's revisionist old growth policies recognizes the Forest Plan's desired condition, "Stands meeting old growth definition will remain unaltered except for natural events."

The EA states, "Patches with Large and/or Medium sized trees should not be confused with Forest Plan Old Growth (see Glossary for Definition)." The FS is the one confusing the old growth issue.

The Forest Plan also does say:

> In about 50 years, five percent of the existing mature mixed conifer forest could be expected to become old growth, if retained, and a similar addition would be expected each decade thereafter. Also, old growth habitat may be able to be created from young stands through silviculture (this concept does not have the total support of all scientists), but the results would not be available for at least 180 years. Therefore, the best that can be expected in the RPA planning horizon is to protect what is present today, but over the long run more can be accomplished.

[10] "Vegetation treatments would retain large trees, reduce ladder fuels to protect old growth structure, and set stands on a trajectory towards becoming dry forest old growth habitats, which are currently lacking compared to historical conditions."

The EA paraphrases "Forest-wide Standards and Guidelines" thus: "19-8: Treatment of natural fuels would not occur in old growth stands meeting the criteria for Forest Plan Old Growth.19-9: Fuels treatments in stands managed as future old growth would provide for retention of key old growth components."

However the Forest Plan "Forest-wide Standards and Guidelines" actually state: **"**Sufficient stands that have potential to develop old growth characteristics be identified as replacement old growth to provide for 5% of suitable forest land acres in an old growth condition in perpetuity." "19.8 Treatment of natural fuels shall be prohibited in identified old growth stands." "19.9 In stands managed as future old growth, fuels treatment including prescribed fire shall provide for the retention of all key components of old growth." The EA fails to assure consistency with these Forest-wide Standards and Guidelines.

The Kootenai National Forest 1987 Forest Plan included Appendix 17 and other direction (USDA Forest Service 1987a). We incorporate that appendix as well as USDA Forest Service 1987b which contains a list of "species …(which) find optimum habitat in the "old" successional stage…" Another Kootenai NF document ("Old Growth validation) states that "we've recognized its (old growth) importance for vegetative diversity and the maintenance of some wildlife species that depend on it for all or part of their habitat." We also incorporate the Idaho Panhandle NF's forestwide old-growth planning document USDA Forest Service, 1987d) and the IPNF Forest Plan's old-growth standards (USDA Forest Service, 1987c) because they provide biological information concerning old growth and old-growth associated wildlife species.

Lehmkuhl, et al. (1991) state:

> Competition between interior and edge species may occur when edge species that colonize the early successional habitats and forest edges created by logging (Anderson 1979; Askins and others 1987; Lehmkuhl and others, this volume; Rosenberg and Raphael 1986) also use the interior of remaining forest (Kendeigh 1944, Reese and Ratti 1988, Wilcove and others 1986, Yahner 1989). Competition may ultimately reduce the viability of interior species' populations.
>
> Microclimatic changes along patch edges alter the conditions for interior plant and animal species and usually result in drier conditions with more available light (Bond 1957, Harris 1984, Ranney and others 1981).
>
> Fragmentation also breaks the population into small subunits, each with dynamics different from the original contiguous population and each with a greater chance than the whole of local extinction from stochastic factors. Such fragmented populations are metapopulations, in which the subunits are interconnected through patterns of gene flow, extinction, and recolonization (Gill 1978, Lande and Barrowclough 1987, Levins 1970).

In terms of "quality of habitat" the continued fragmentation of the Okanogan NF is a major ongoing concern. It is documented that edge effects occur 10-30 meters into a forest tract (Wilcove et al., 1986). The size of blocks of interior forest that existed historically before

management (including fire suppression) was initiated must be compared to the present condition. USDA Forest Service, 2004a states:

> Forested connections between old growth patches …(widths) are important because effective corridors should be wide enough to "contain a band of habitat unscathed by edge effects" relevant to species that rarely venture out of their preferred habitats (Lidicker and Koenig 1996 and Exhibit Q-17).
>
> Timber harvest patterns across the Interior Columbia River basin of eastern Washington and Oregon, Idaho, and western Montana have caused an increase in fragmentation of forested lands and a loss of connectivity within and between blocks of habitat. This has isolated some wildlife habitats and reduced the ability of some wildlife populations to move across the landscape, resulting in long-term loss of genetic interchange (Lesica 1996, U.S. Forest Service and Bureau of Land Management 1996 and 1997).

Harvest or burning in stands immediately adjacent to old growth mostly has negative effects on old growth, but may have some positive effects. Harvesting or burning adjacent to old growth can remove the edge buffer, reducing the effective size of old growth stands by altering interior habitats (Russell and Jones 2001). Weather-related effects have been found to penetrate over 165 feet into a stand; the invasion of exotic plants and penetration by predators and nest parasites may extend 1500 feet or more (Lidicker and Koenig 1996). On the other hand, adjacent management can accelerate regeneration and sometimes increase the diversity of future buffering canopy.

The occurrence of roads can cause substantial edge effects on forested stands, sometimes more than the harvest areas they access (Reed, et al. 1996; Bate and Wisdom, in prep.). Open roads expose many important wildlife habitat features in old growth and other forested stands to losses through firewood gathering and increased fire risk.

Effects of disturbance also vary at the landscape level. Conversion from one stand condition to another can be detrimental to some old growth associated species if amounts of their preferred habitat are at or near threshold levels or dominated by linear patch shapes and limited interconnectedness (Keller and Anderson 1992). Reducing the block sizes of many later-seral/structural stage patches can further fragment existing and future old growth habitat (Richards et al. 2002). Depending on landscape position and extent, harvest or fire can remove forested cover that provides habitat linkages that appear to be "key components in metapopulation functioning" for numerous species (Lidicker and Koenig 1996, Witmer et al. 1998). Harvest or underburning of some late and mid seral/structural stage stands could accelerate the eventual creation of old growth in some areas (Camp, et al. 1996). The benefit of this approach depends on the degree of risk from natural disturbances if left untreated.

Effects on old growth habitat and old growth associated species relate directly to … "Landscape dynamics—Connectivity"; and … "Landscape dynamics—Seral/structural stage patch size and shapes."

Harrison and Voller, 1998 assert "connectivity should be maintained at the landscape level." They adopt a definition of landscape connectivity as "the degree to which the landscape facilitates or impedes movement among resource patches." Also:

> Connectivity objectives should be set for each landscape unit. …Connectivity objectives need to account for all habitat disturbances within the landscape unit. The objectives must consider the duration and extent to which different disturbances will alienate habitats. … In all cases, the objectives must acknowledge that the mechanisms used to maintain connectivity will be required for decades or centuries.

(Id., internal citations omitted.) Harrison and Voller, 1998 further discuss these mechanisms:

> Linkages are mechanisms by which the principles of connectivity can be achieved. Although the definitions of linkages vary, all imply that there are connections or movement among habitat patches. Corridor is another term commonly used to refer to a tool for maintaining connectivity. …the successful functioning of a corridor or linkage should be judged in terms of the connectivity among subpopulations and the maintenance of potential metapopulation processes. (Internal citations omitted.)

Harris, 1984 discusses connectivity and effective interior habitat of old-growth patches:

> Three factors that determine the effective size of an old-growth habitat island are (1) actual size; (2) distance from a similar old-growth island; and (3) degree of habitat difference of the intervening matrix. …(I)n order to achieve the same effective island size a stand of old-growth habitat that is surrounded by clearcut and regeneration stands should be perhaps ten times as large as an old-growth habitat island surrounded by a buffer zone of mature timber.

Harris, 1984 discusses habitat effectiveness of fragmented old growth:

> (A) 200-acre (80 ha) circular old-growth stand would consist of nearly 75% buffer area and only 25% equilibrium area. …A circular stand would need to be about 7,000 acres (2,850 ha) in order to reduce the 600-foot buffer strip to 10% of the total area. It is important to note, however, that the surrounding buffer stand does not have to be old growth, but only tall enough and dense enough to prevent wind and light from entering below the canopy of the old-growth stand.

Harris, 1984 believes that "biotic diversity will be maintained on public forest lands only if conservation planning is integrated with development planning; and site-specific protection areas must be designed so they function as an integrated landscape system." Harris, 1984 also states:

> Because of our lack of knowledge about intricate old-growth ecosystem relations (see Franklin et al. 1981), and the notion that oceanic island never achieve the same level of richness as continental shelf islands, a major commitment must be made to set aside representative old-growth ecosystems. This is further justified because of the lack of sufficient acreage in the 100- to 200-year age class to serve as replacement islands in the immediate future. …(A) way to moderate both the demands for and the stresses placed

> upon the old-growth ecosystem, and to enhance each island's effective area is to surround each with a long-rotation management area.

The Mission EA provides no assurance the proposed management scheme ("thinning") will accelerate forest conditions toward old growth at some unspecified time in the future. There is no science or monitoring cited to support such claims. As Pfister et al., 2000 state:

> (T)here is the question of the appropriateness of management manipulation of old-growth stands… Opinions of well-qualified experts vary in this regard. As long term results from active management lie in the future – likely quite far in the future – considering such manipulation as appropriate and relatively certain to yield anticipated results is an informed guess at best and, therefore, encompasses some unknown level of risk. **In other words, producing "old-growth" habitat through active management is an untested hypothesis**. (Emphasis added).

We incorporate the document "Scientific Literature Review" which has a section entitled "Old Growth Forests."

Northern Spotted Owl

The EA did not include an Environmental Baseline as required under the ESA, so we assume the FS is relying on the USFWS for that analysis. That analysis is not available for review. The Environmental Baseline is defined as: "past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process" (50 CFR 402.02). The key purpose of the environmental baseline is to describe the natural and anthropogenic factors influencing the status and condition of ESA-listed species and designated critical habitat in the action area.

We don't believe the draft DN should have been released for the objection period until the Biological Opinion is complete and available for review. This doesn't give the public an entirely clear view of impacts to northern spotted owl (NSO) and their habitat.

We emphasize news about the plight of the northern spotted owl in the incorporated article, "A Slide Toward Extinction." Although the article focuses on issues from a state of Oregon perspective, the problems causing this crisis of extinction for the northern spotted owl (NSO) persist on the OWNF, across northern California, and throughout the species' entire current and former range. The article reports on results of a study by Dugger et al., 2015 which is discussed below.

The Record of Decision for the Northwest Forest Plan (NWFP) expresses an assumption about the NWFP itself:

> (A) spatially-explicit model was run to simulate owl population dynamics for a sample of three of the SEIS alternatives, plus a no-harvest scenario, in order to explore possible northern spotted owl population response under a variety of demographic assumptions. The

> results are consistent with and generally lend support to the hypothesis that **the owl reasonably may be expected to achieve population stability across its range notwithstanding additional loss of its habitat at a conservative rate such as that projected to occur under our decision.** (Emphasis added.)

Dugger et al., 2015 found that northern spotted owl populations are declining in all parts of their range in the Pacific Northwest. Based on 11 study areas across Washington, Oregon and Northern California, a rangewide decline of nearly 4% per year was estimated from 1985 to 2013. This research indicated that since monitoring began spotted owl populations declined 55-77% in Washington, 31-68% in Oregon, and 32-55% percent in California. So the hypothesis of expected population stability forming the basis of the NWFP is disproved. The Mission EA does not address this recent population trend information for the northern spotted owl (NSO).

In addition, more recent data documents continued decline. The Northwest Forest Plan requires annual monitoring of NSO by the US Fish and Wildlife Service (USFWS or FWS) in established study areas. (These results are posted online at https://reo.gov/monitoring/reports/northern-spotted-owl-reports-publications.shtml.) The March 31, 2017 Annual Progress Report admits the NSO population is in significant decline: "The estimate of λ [lambda] from 1985 through the interval 2014-2015 (the interval 2015-2016 was not estimable using random effects models) was 0.977 (95% CI = 0.960, 0.993) on the WCSA, suggesting a declining population because the 95% confidence interval for the estimate of λ did not include λ = 1 (a stationary population)."

These monitoring results—which constitute the best available scientific evidence concerning NSO demographic trends—document a statistically significant decline in NSO populations over the last 5 years. While part of this population decline could be attributable to barred owl colonization, the likelihood is that the FS's timber practices in NSO habitat is largely to blame. Indeed, the FS has acknowledged that the sparse scientific evidence on cause-and-effect relationships between habitat management and NSO vital rates shows a negative correlation between FS "landscape restoration" projects and NSO occupancy. And, correspondingly, the FS does not have any evidence supporting its claim that its projects are beneficial to the NSO. If the FS were to consider the downward trend of NSO populations in the areas where it has implemented timber sales and other land management projects in the context of an adaptive management model, it would certainly change its management approach.

The most recent 3 of the annual NSO monitoring reports all state the NSO population is in a decline that is statistically significant for the past 5+ years. This is clear evidence that current and recent forest management practices are failing unequivocally to recover the NSO, and require drastic changes.

The specific cause(s) of this significant decline is somewhat obscured in the reports because the only factors they examine are good vs. bad years (weather) and barred owls: habitat is neither mentioned nor measured in analyses or discussion. Forsman et al. 2011 looked at percent cover of suitable nesting habitat within 2.4 km circle and found evidence habitat was important. Dugger et al. 2005 and 2016 found both survival and reproduction were positively affected by

the proportion of old-growth forest near the owl territory center. It would be much more informative, given that the study area is supposed to inform forest management, that forest management practices and effects be explicitly analyzed, including how changes in habitat due to logging affects reproduction, survival, and lambda, and not only point to weather and barred owls as the "multiple stressors" causing of owl declines.

Ultimately it does not matter—the species is in grave trouble, and creating more habitat havoc is arbitrary and capricious.

This is strong evidence that the suite of government actions to preserve the NSO—including the NWFP, the NSO Revised Recovery Plan (RRP), state and private land conservation measures, the efforts to control barred owls, and the U.S. Fish & Wildlife Service's conservation measures and terms and conditions in consultation documents—are failing to halt this slide towards extinction. Yet as shown by this Mission project, the FS arbitrarily and capriciously still subscribes to the disproven "hypothesis that the owl reasonably may be expected to achieve population stability across its range notwithstanding additional loss of its habitat" and continues to take risks and facilitate further degradation and destruction of NSO habitat, in the irrational belief that there is enough room for error and management flexibility to commercially log more NSO habitat.

The EA failed to consider the basis for and implications of the fact that the U.S. Fish & Wildlife Service has determined that uplisting the NSO to Endangered may be warranted. In 2015 the U.S. Fish & Wildlife Service stated: "Based on our review of the petition and sources cited in the petition, we find that the petition presents substantial information that the petitioned action may be warranted for the northern spotted owl

So a foundational hypothesis of the NWFP—expected NSO population stability—is disproved. It's time for the FS to reinitiate consultation on the Forest Plan.

The logging of NSO habitat the FS unsustainably and illegally promoted for several decades took all the flexibility out of the situation. There's no more room for error. It's time for the FS to restrain itself, leave the owl's habitat alone, and finally admit that **active management is the problem—not the solution**.

The EA does not disclose how many acres of the Twisp River Late-Successional Reserve (LSR) or Sawtooth LSR are proposed for treatment, or demonstrate these treatments are consistent with the NWFP, the forest plan, and the RRP. Any treatments within these LSRs must be limited to stands 80 years old or younger and be beneficial to the creation and maintenance of late successional forest conditions (NW Forest Plan ROD, page 8). The NEPA document must clearly demonstrate how any treatment meets this requirement.

The overall management emphasis of the Mission project conflicts with the following direction in the RRP:

> It is not our intent, nor do we believe it would be consistent with the above objectives, to do landscape wide treatments for the purpose of excluding disturbance events such as fires, including high-severity fires. On the contrary, we are looking to support the disturbance regimes inherent to these systems and believe our management should be consistent with the counsel of Hessburg *et al.* (2007:21):
>
> > "Restoring resilient forest ecosystems will necessitate managing for more natural patterns and patch size distributions of forest structure, composition, fuels, and fire regime area, not simply a reduction of fuels and thinning of trees to favor low severity fires."

The EA states, "While surveys done in the 1980's and 1990's have documented the presence of spotted owls in the project area, follow-up visits indicated that they were either transient through the area or resident single birds. No nests or activity centers have been located. Recent surveys have not located spotted owls in the project area." The EA does not provide a sufficient cumulative effects analysis to address the question of whether past management has extirpated the NSO from the project area. The EA also does not consider the effect of barred owls on the NSO.

"Approximately 2.2 miles of open road intersect NRF habitat in the analysis area, which could cause disturbance to spotted owls." Is there any forest plan or other programmatic direction limiting roads in northern spotted owl nesting, roosting, foraging (NRF) habitat?

The EA states, "The proposed treatments in the action alternatives …are consistent with the revised recovery plan for spotted owls (USFWS 2011), by treating primarily areas that are not currently providing habitat, to better protect habitat from large scale, high-severity fires and to set appropriate stands (which are very limited in the analysis area) on a trajectory to become habitat in the future." (186.) The EA also states, "The amount of dispersal habitat for spotted owls would be reduced by silvicultural treatments in the short and medium term, likely for a minimum of 10 years, (until the medium and large trees released from understory competition grow enough to provide a high canopy closure). This would make the project area even less suitable for spotted owls than it is already." Is that reduction of habitat consistent with the revised recovery plan for spotted owls?

The EA states, "In east-side habitats of the Washington and Oregon Cascade Range, the only viable conservation strategy is to actively manage fire-prone forests and landscapes to sustain spotted owl habitat (USDA 2012a)." (186.) This begs the question, how did the NSO ever exist in the east-side habitats of the Washington and Oregon Cascade Range prior to active management?

The EA states, "Old forest structural attributes (large trees, large snags and down wood) in these dense overstocked stands are at a high fire risk (Everett et. al. 1997)." A study by Bond et al, 2009 addressed the notion that "High tree mortality due to drought and insects often is assumed to increase fire severity once ignition occurs." Spotted owls forage in high severity burn patches where owl prey species are abundant (Bond 2016). Bond's 2009 work clearly documents that

NSO show a preference for foraging in high severity burned areas. The authors "found no evidence that pre-fire tree mortality influenced fire severity. These results indicate that widespread removal of dead trees may not effectively reduce higher-severity fire in southern California's conifer forests." Also study results "suggest() that harvesting larger-sized trees for fire-severity reduction purposes is likely to be ineffective and possibly counter-productive."

Tingley et al., 2016 note the diversity of habitats following a fire is related to the diversity of burn severities: "(W)ithin the decade following fire, different burn severities represent unique habitats whose bird communities show differentiation over time… Snags are also critical resources for many bird species after fire. Increasing densities of many bird species after fire—primarily wood excavators, aerial insectivores, and secondary cavity nesters—can be directly tied to snag densities…"

Also, research by Odion et al., 2014b finds the FS's NSO habitat thinning regime does more harm than good.

The Revised Recovery Plan (RRP) states, "There are four Recovery Criteria in this Revised Recovery Plan. Recovery Criteria are measurable, achievable goals…" Recovery Criterion 1 is "Stable Population Trend: The overall population trend of spotted owls throughout the range is stable or increasing over 10 years, as measured by a statistically reliable monitoring effort." The recovery effort is clearly moving away from this goal. Recovery Criterion 2 is "Adequate Population Distribution: Spotted owl subpopulations within each province (*i.e.*, recovery unit) (excluding the Willamette Valley Province) achieve viability, as informed by the HexSim population model or some other appropriate quantitative measure." The recovery effort is also clearly moving away from this goal. Recovery Criterion 3 is "Continued Maintenance and Recruitment of Spotted Owl Habitat: The future range-wide trend in spotted owl nesting/roosting and foraging habitat is stable or increasing throughout the range, from the date of Revised Recovery Plan approval, as measured by effectiveness monitoring efforts or other reliable habitat monitoring programs." Again, the recovery effort is failing this goal also. Recovery Criterion 4 deals with Post-delisting Monitoring and is therefore inapplicable here.

The RRP at II-9 raises "Questions that may (sic) for consideration under adaptive management" which include:

> What vegetation management treatments best accelerate the development of forest structure associated with spotted owl habitat functions while maintaining or restoring natural disturbance and provide greater ecosystem resiliency? What are the effects of these vegetation management treatments on spotted owl occupancy, demography, and habitat use immediately following treatment and at specified time periods after treatment? What are the effects of these treatments on spotted owl prey abundance and availability immediately following treatments and at specified time periods after treatment? What are the effects of the above vegetation management treatments on the habitat components that spotted owls and their prey use? How effective are these vegetation management treatments in developing desired forest structure and how long does this development take?

The RRP at III-38 states:

> There are some questions under adaptive management that may be answered within the next several years, the results of which can be applied to future management decisions (*e.g.,* how do spotted owls use areas treated with specific vegetation management prescriptions intended to promote structural features conducive to spotted owl habitat?).

The FS proceeds as if they have already answered those questions, proposing to aggressively log and otherwise degrade owl habitat. The EA indicates 1,054 acres of nesting, roosting, foraging habitat (NRF) would be degraded and 556 acres of dispersal habitat would be degraded.

The RRP states at p. I-9:

> In order to reduce or not increase this potential competitive pressure while the threat from barred owls is being addressed, this Revised Recovery Plan now recommends **conserving and restoring older, multi-layered forests across the range of the spotted owl**. … In addition to addressing the barred owl threat, the Service agrees with scientific experts that it is necessary to **conserve the highest value spotted owl habitat to address the key threats.** (Emphases added.)

The RRP states, "Restoration activities conducted near spotted owl sites should first focus on areas of younger forest less likely to be used by spotted owls and less likely to develop late-successional forest characteristics without vegetation management." Obviously, the amount of mature forest being targeted demonstrates that the Mission timber sale is not consistent with this RRP direction.

The RRP states at p. II-7, 8: "Testing clearly formed hypotheses in a systematic manner under identifiable, bounded settings and monitoring the outcomes will go far in improving future management and developing more resilient policies while minimizing risk to resources." The RRP continues:

> The knowledge gained from testing hypotheses must be documented and applied to future actions if learning is to happen and if the policy or decisionmaking process is to be informed and improved. Thus, it is vital that the question asked as part of the experiment is relevant to managers. To speed the pace of learning, Williams *et al.* (2009) recommend that **alternative management options be applied and tested**, and that these options are sufficiently different to produce observable responses that can be **detected by monitoring**. (Emphases added.)

The RRP states, "There are risks associated with these treatments in their potential to disturb soils, affect long-term productivity, and increase the risk of exotic plant invasions. Managers need to account for and minimize these risks as they plan and implement restoration treatments."

Additionally, in response to comments on the RRP, the USFWS stated:

> The Service acknowledges the risks to treating spotted owl habitat and potential effects on spotted owls. We stress that treatments need to be strategic and focus on restoring and maintaining ecosystem structure, composition and processes… Given the uncertainties,

> …the Service has proposed using adaptive management …to help us learn the effects of current management decisions and inform future decisions.
>
> …(W)e note in the recovery plan the concern with the effectiveness of a widespread treatment of fuels solely for the purpose of reducing fire occurrence, size or amount of burned area; we further note that such treatments should be implemented **only** where they increase the acceptability of wildfire through reducing fire behavior and severity **in specific areas**, such as where it is desirable to meet public safety needs or to save valuable ecosystem elements necessary for resiliency. (Emphasis added.)

And yet the FS proposes to manage in disregard to the cautions expressed by the USFWS and in the RRP, thus contradicting the RRP.

RRP Recovery Action 10 requires the agencies to "Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population." It goes on:

> Where the modeling output and/or examination on the ground indicate that forest stands could and should be enhanced or developed through vegetation management activities to improve long-term habitat conditions, or to create improved habitat for spotted owls, larger habitat patches, or increased connectivity between patches, they should generally be encouraged even if they result in short-term impacts to existing spotted owls. However, such a process should occur where a determination is made that **these longer term goals outweigh short-term impacts**. (Emphasis added.)

Clearly, with the continuing downward trend in spotted owl populations, all nesting, roosting, foraging habitat—and especially critical habitat—must be considered "high value." The short-term impacts that the project would undertake by degrading northern spotted owl habitat cannot possibly be outweighed by speculative "long term goals." The Mission timber sale violates Recovery Action 10.

RRP Recovery Action 11 requires:

> When vegetation management treatments are proposed to restore or enhance habitat for spotted owls (e.g., thinnings, restoration projects, prescribed fire, etc.), consider designing and conducting experiments to better understand how these different actions influence the development of spotted owl habitat, spotted owl prey abundance and distribution, and spotted owl demographic performance at local and regional scales.

Regarding spotted owl prey, the RRP at III-8 states:

> Mixed conifer stands in the eastern Cascades, which include pine species, provide den sites and food resources for bushy-tailed woodrats, an important prey species of spotted owls (Lehmkuhl *et al.* 2006a).
>
> Northern flying squirrels…forage primarily on ectomycorrhizal fungi (truffles), many of which grow better under mesic, or moist, conditions (Lehmkuhl *et al.* 2004).

The EA does not present an adequate analysis of the potential for increased predation on NSOs due to the impacts of the proposed logging. The EA does not demonstrate consistency with RA-10 in the RRP.

The RRP at II-9 also ask questions related to prey species, such as:

- What are the effects of these vegetation management treatments on spotted owl occupancy, demography, and habitat use immediately following treatment and at specified time periods after treatment?
- What are the effects of these treatments on spotted owl prey abundance and availability immediately following treatments and at specified time periods after treatment?
- What are the effects of the above vegetation management treatments on the habitat components that spotted owls and their prey use?
- How effective are these vegetation management treatments in developing desired forest structure and how long does this development take?

Again, the FS proceeds as if the FS already has answered those questions, when in fact they have not, inconsistent with Recovery Action 11.

The RRP states:

> We also stress this cannot be done successfully without an aggressive adaptive management framework to learn from treatments. Land managers should use pilot projects and active management to test or demonstrate techniques and principles (Noon and Blakesley 2006). In the near term, to reduce conflict and potential inconsistencies with existing Federal land management plans, we recommend locating such projects wherever possible in Matrix and Adaptive Management Areas.

The EA failed to consider the basis for and implications of the fact that the USFWS has determined that uplisting the northern spotted owl to Endangered may be warranted. The USFWS stated: "Based on our review of the petition and sources cited in the petition, we find that the petition presents substantial information that the petitioned action may be warranted for the northern spotted owl."

Remedy:
We request the FS take the simplest and most efficient Remedy for the concerns and issues expressed in this Objection–select the No Action alternative included in the EA. If the FS wishes to further pursue the project, the agency must address all the deficiencies identified by this Objection before issuing an EIS.

The EA doesn't analyze or disclose the extent of snowmobiling across the project area. It merely mentions groomed trails. Effects of cross-country travel are not considered. These effects must be considered in the NEPA document.

Noxious weeds
Does the FS monitor the effectiveness of noxious weed treatments under the 2000 Okanogan National Forest Integrated Weed Management Project? If so, what indication is there that noxious weed infestations on the forest are decreasing as a result?

What would be the cost of weed management attributable to the Mission project? What is the annual cost of weed management of the forest?

Despite the mitigation plans, the FS really has no handle on the losses of biodiversity and reductions in land productivity due to proliferating invasive species. "The seeds would slide past along with the soil." The agency seems to be in denial of the fact that every acre disturbed increases the rate of spread. The historic range of variability (HRV) for noxious weeds is zero, and with every acre disturbed the FS is "moving towards" the wrong direction.

What is the Forest's record for duration of weed-free time on a permanent log landing, without the use herbicides?

The EA presents absolutely no quantitative analysis of the impacts of weed spread caused by the project.

Soil productivity
The EA at p. 88 notes:

> **Physical properties of concern** include structure, density, porosity, infiltration, permeability, water holding capacity, depth to water table, surface horizon thickness, and organic matter size, quantity, and distribution. **Chemical properties** include changes in nutrient cycling and availability. **Biological concerns** commonly include abundance, distribution, and productivity of the many plants, animals, microorganisms that live in and on the soil and organic detritus.

(Emphases added.) However, in terms of regulatory mechanisms, the FS only recognizes limits to physical properties. This represents a violation of NFMA.

The EA doesn't disclose that the detrimental soil disturbance (DSD) limits in the R6 Soil Quality Standards had little to do with compliance with NFMA and mostly to do with operational feasibility. USDA Forest Service, 2016a admits that there's no strong empirical connection between what FS Soil Quality Standards focus on as a proxy (detrimental soil disturbance) for what NFMA requires (maintaining productivity). USDA Forest Service, 2016a also acknowledges therefore the FS can't really address its commitments for "sustained yield." It also admits that ripping for soil compaction mitigation isn't necessarily best available science: "A compacted soil will not be 100% mitigated immediately after shallow ripping. It takes time for soil processes to become re-established and native vegetation to reclaim a site. Indirect effects noted above of accelerated soil erosion or noxious weed infestations have the potential to derail the entire land restoration process."

The EA doesn't disclose the effectiveness of any soil mitigations.

"Soil compaction in the project area limits native plant growth, reduces soil biological activity and water infiltration, limits soil productivity, and reduces the resiliency of plant communities to climactic and biological changes over time." (EA 13.) The EA doesn't even demonstrate that the project activities will be consistent with the R6 Soil Quality Standards. Livestock impacts in treatment units aren't quantified at all. DSD from temporary, unauthorized, or decommissioned roads isn't properly quantified as per the R6 methodology. The same is true for motorized recreation impacts.

The EA doesn't disclose the reliability (accuracy) of the DSD measurements used.

"A total of 455 acres of soil treatments are proposed within the grazing units." (EA 243.) What are the causes of the soil damage for which treatments are needed?

The soils analysis adopts the same scare propaganda used for other resources—no logging, the fire will come and ruin the soils. Logging—no such problem. It even makes scientifically-challenged statements such as logging makes soil develop faster, and livestock grazing enhances site productivity.

"Removal of potassium in whole tree harvests is modest in comparison to soil reserves according to (Jurgensen et al. 1981)." (98.) Has the FS measured the potassium balance as affected by previous logging/fuels treatment on the Forest?

"Doing no treatments would continue the long-term, adverse, major impacts on soil compaction in the identified areas." Since other areas outside the treatment units and roads (where the EA doesn't consider DSD) have similarly compacted soils, why does the EA ignore those land productivity, sustained yield, and hydrologic impacts?

"Soils across the project area are derived primarily of volcanic ash over glacial till and glacial fluvial outwash. …Physical characteristics of this volcanic ash include low bulk density (0.65 to 0.90), a dominance of silt and very fine sand-sized particles with weak structural development." (90.) The EA states that such soils are highly susceptible to erosion and displacement, but doesn't disclose their extreme sensitivity to productivity losses due to compaction.

The Nez Perce-Clearwater NF's Lolo Insect & Disease DEIS (2018) discloses that "the exceptionally high porosity and water-holding properties of the Mazama ash cap would likely be irrecoverable." This implies that even temporary roads and compacted skid trails will never recover from a DSD condition. The Nez Perce-Clearwater NF's Hungry Ridge DEIS (2018) states, "(Ash capped soils are) vulnerable to compaction, displacement and erosion due to its un-cohesive nature." Since ash cap soils are highly sensitive to compaction, that means these soils will never recover from a DSD compaction condition—such soil disturbance is essentially irreversible. The EA fails to analyze this issue with the requisite scientific rigor.

"Areas that have lost all or a portion of the ash cap are less biologically resilient following logging or burning." (Id.) The Mission EA fails to disclose the number of acres in the project area that are "less biologically resilient following logging or burning" on ash capped soils. This would logically include areas logged in the past in the project area.

"(R)esource fluxes though ectomycorrhizal (EM) networks are sufficiently large in some cases to facilitate plant establishment and growth. Resource fluxes through EM networks may thus serve as a method for interactions and cross-scale feedbacks for development of communities, consistent with complex adaptive system theory." (Simard et al., 2015.) Has the FS ever considered how management-induced damage to EM networks causes site productivity reductions?

"The big trees were subsidizing the young ones through the fungal networks. Without this helping hand, most of the seedlings wouldn't make it." (Suzanne Simard: http://www.ecology.com/2012/10/08/trees-communicate/) "Disrupting network links by reducing diversity of mycorrhizal fungi… can reduce tree seedling survivorship or growth (Simard et al, 1997a; Teste et al., 2009), ultimately affecting recruitment of old-growth trees that provide habitat for cavity nesting birds and mammals and thus dispersed seed for future generations of trees." (Simard et al., 2013.) Has the Okanogan-Wenatchee NF ever determined if management activities have reduced the diversity of mycorrhizal fungi in any treatment area? If not, such action should be undertaken.

Also see the YouTube video "Mother Tree" embedded within the Suzanne Simard "Trees Communicate" webpage at: https://www.youtube.com/watch?v=-8SORM4dYG8&feature=youtu.be and also see "Trees Talk to Each Other in a Language We Can Learn, Ecologist Claims". Gorzelak et al., 2015:

> …found that the behavioural changes in ectomycorrhizal plants depend on environmental cues, the identity of the plant neighbour and the characteristics of the (mycorrhizal network). The hierarchical integration of this phenomenon with other biological networks at broader scales in forest ecosystems, and the consequences we have observed when it is interrupted, indicate that underground "tree talk" is a foundational process in the complex adaptive nature of forest ecosystems.

The scientists involved in research on ectomycorrhizal networks have discovered connectedness, communication, and cooperation between separate organisms. Such a phenomenon is usually studied within single organisms, such as the interconnections and communications in humans among neurons, sense organs, glands, muscles, other organs, etc. so necessary for individual survival. The Mission EA does not consider the ecosystem impacts from industrial management activities on this mycorrhizal network—or even acknowledge they exist. The industrial forestry management paradigm is unfortunately destroying what it fails to recognize.

"The proposed actions, design criteria, and mitigation measures are in compliance with the Okanogan National Forest Land and Resource Management Plan (LRMP) standards and guidelines 13-9 and 13-10 by **reducing** the amount of soil displacement, compaction, and

puddling." (101, emphasis added.) Here, as in other places, the EA confuses "reduce" with mitigate. The project increases DSD, it does not reduce it. The FS has no monitoring results from the Forest indicating soil rehabilitation actions have taken soils in a DSD condition and made them no longer DSD.

"If the purchaser can implement a harvesting plan that meets the winter soil management objectives then snowplowing and hauling would not take place in winter." (EA 97.) The FS needs to be the entity creating this technically-based plan, since the FS's analysis is relying upon it.

The Mission EA:

- fails to justify use of its limiting of detrimental disturbance methodology as a proxy for complying with NFMA's requirements to protect soil productivity;
- fails to disclose that disclose that soil standards are based on the feasibility of limiting soil damage using typical log extraction methods rather than setting quantitative limits on losses of soil productivity based on ecological sustainability;
- fails to state the applicable Forest Plan requirements and demonstrate project compliance with them;
- fails to analyze and disclose the effects of noxious weeds on land and soil productivity;
- fails to disclose the reliability of FS survey data;
- fails to disclose the full extent of soil restoration needs in project area watersheds;
- fails to consider and disclose validity of FS analysis methodology;
- fails to include a cumulative effects analysis for soils that considers detrimental soil conditions outside of project activity areas;
- fails to include Design Elements/mitigation methods that are demonstrated to be effective in restoring soils to meet soil quality standards, or for preventing new detrimental soil damage.

Forest Plan Soil Standard 13-10 states:

> Ground yarding systems shall be restricted to meet Regional guidelines for soil compaction, displacement, and puddling. No more than 15 percent of an area shall be in a puddled, displaced, or compacted condition following completion of management activities."

Regional guidelines/Region 6 soil quality standards are found in the Forest Service Manual at 2520, R6 Supplement 2500-98-1:

> Recognizing that many forest activities impact soil productivity (e.g., road construction, landings, rock pits, etc.), the Forest Service policy is to limit the extent of these detrimental impacts. The Pacific Northwest Regional policy emphasizes protection over restoration (Forest Service Manual 2500— Watershed and Air Management, R6 Supplement 2500 – 98 – 1). When initiating new activities:
> 4. Design new activities that do not exceed detrimental soil conditions on more than 20% of an activity area. (This includes landings and the permanent transportation system.)

5. In areas where less than 20% detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 20%.
6. In areas where more than 20% detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move toward an improvement in soil quality.

Thus FS adopts a proxy—detrimental soil conditions (DSC)—for determining management compliance with NFMA requirements that **soil productivity** not be permanently impaired.

The Forest Plan and Region 6 soil quality standards are full of loopholes. They basically boil down to a mitigation of soil productivity losses with an entirely uncertain outcome, as explained below. Soil damage can be unlimited as long as the FS makes any effort, no matter how effective, at "moving toward" a net improvement. It doesn't mean soil quality improvements must be measurable, and it doesn't mean actual productivity must be restored.

One set of cumulative soil impacts ignored by the Forest Plan and Region 6 soil quality standards is associated with permanent, or "system" roads. Although every square foot of road is, of course compacted, this compaction is in no way limited by the application of the Region 6 soil quality standards. The same goes for existing or ongoing erosion—no amount of soil erosion on these road templates would violate the Forest Plan or Region 6 soil quality standards. Also, the "displacement" DSC (organic matter layer(s) displaced due to management actions)—practically 100% on permanent/system roads—is not limited in any way by the Region 6 soil quality standards.

Another cumulative impact the Forest Plan and Region 6 soil quality standards ignore is existing or prior management-induced DSC on old log landings left after logging projects for future logging use. They are typically flattened areas which had been compacted or had organic layers displaced to use as temporary log storage and/or log truck loading, and were not recontoured to original slope or decompacted following use. Unless they are being used by the current project (and thus within an "activity area"), they are not limited in number or extent by the Forest Plan or Region 6 soil quality standards. Much like system roads, there are no limits to total DSC from landings set by the Forest Plan or Region 6 soil quality standards, and there is even no requirement their existence a project area be disclosed. Roads and log landings might be limited by other resource considerations such as road densities in sensitive wildlife habitat, but they are not limited by the Forest Plan or Region 6 soil quality standards.

Still more cumulative soil damage the Forest Plan and Region 6 soil quality standards ignores involve existing DSC on areas the FS maintains as part of the "suitable" or productive land base such as timber stands, grazing allotments and riparian zones that are <u>not within the boundaries of any current project activity areas</u>. The Forest Plan and Region 6 soil quality standards do not limit or require disclosure of the existing/prior DSC in such areas, caused by past management activities such as log skidding, partially reclaimed log landings and temporary roads, firelines,

burning of slash piles or other prescribed burns, compaction due to the hooves of livestock in springs, wetlands, or other riparian areas or simply in upland pasture areas. Furthermore, Forest Plan and Region 6 soil quality standards do not compel the FS to take action to restore the soil productivity in such areas because their existing DSC does not matter for determining consistency with the Forest Plan and Region 6 soil quality standards —until the day arrives when another project is proposed and the damaged site in question is included within an "activity area" because it is proposed for yet another round of logging and soil damage. The EA makes no attempt to quantify these cumulative impacts on soil productivity—ignoring management's long-term effects on the productivity of the land.

Discussing very similar R-1 Soil Standards[11], USDA Forest Service, 2016a explains that a major cumulative effect ignored by the standards is the indirect effect of soil damage, or DSD[12], on sustained yield. It states that the Soil Standards "created the concept of 'Detrimental Soil Disturbance' (DSD) for National Forests in Region One as a measure to be used in assessing potential loss of soil productivity resulting from management activities." USDA Forest Service, 2016a further explains (emphases added):

> **Without maintaining land productivity, neither multiple use nor sustained (yield) can be supported by our National Forests**. Direct references to maintaining productivity are made in the Sustained Yield Act "…coordinated management of resources without impairment of the productivity of the land" and in the Forest and Rangeland Renewable Resources Act "…substantial and permanent impairment of productivity must be avoided".
>
> Soil quality is a more recent addition to Forest Service Standards. The Forest and Rangeland Renewable Resources Act (1974) appears to be the first legal reference made to protecting the "quality of the soil" in Forest Service directives. **Although the fundamental laws that directly govern policies of the U.S. Forest Service clearly indicate that land productivity must be preserved, increasingly references to land or soil productivity in Forest Service directives were being replaced by references to soil quality as though soil quality was a surrogate for maintaining land productivity. This was unfortunate, since although the two concepts are certainly related, they are not synonymous.**
>
> Our understanding of the relationship between soil productivity and soil quality has continued to evolve since 1974. Amendments to the Forest Service Manual, Chapter 2550 – Soil Management in 2009 and again to 2010 have helped provide some degree of clarity on this issue and acknowledged that **the relationship is not as simple as originally thought**. The 2009 (2500-2009-1) amendment to Chapter 2550 of the Forest Service Manual states in section 2550.43-5, directs the Washington Office Director of Watershed, Fish, Wildlife, Air and Rare plants to "Coordinate validation studies of soil quality criteria and indicators with Forest Service Research and Development staff to ensure soil quality measurements are appropriate to protect soil productivity" (USFS-FSM 2009). **Inadvertently this directive concedes that the relationship between soil productivity and soil quality is**

[11] A minor difference between the R-1 15% areal extent standard and the R-6 20% areal extent standard is that for R-6, system roads adjacent to a unit are included within the activity area.
[12] Identical to DSC in the R6 Standards.

not completely understood. In the end, the primary objective provided by National Laws and Directives relative to the management of Forest Service Lands continues to be to maintain and where possible potentially improve soil productivity.

USDA Forest Service, 2007 stated:

> Sustained yield was defined in the Kootenai Forest Plan, 1987, (Vol. 1, Chapter VI, Glossary) as "the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the National Forest System without permanent impairment of the productivity of the land." Sustained yield is based on the ability of the land to produce.

Continual and repeated application of projects, hardly limited by the Forest Plan and Region 6 standards, will result in soils maintained at a damaged condition essentially forever. The FS has no quantitative data or inventory of the continuous deficit of soil or land productivity. To the U.S. Department of Agriculture, apparently soil productivity of national forests hardly matters.

The FS's soil proxy—its assertion that up to 20% of an activity area having long-term damage is consistent with NMFA and regulations—is arbitrary. The Mission EA does not cite the scientific basis for adopting its percent numerical limits.

Soil productivity can only be protected if it turns out that the soil standards work. To determine if they work, the FS would have to undertake objective, scientifically sound measurements of what the soil produces (grows) following management activities. But the FS has never done this on the Okanogan NF.

The Forest Plan includes the following monitoring requirements, one of which is designed to determine if logging meets the Forest Plan standard:

SOIL										
E	Soil compaction and displacement	Compliance standards for soil productivity	Field sampling and/or observation	Each	2 years	M/M	1922.7	Range, Watershed, and Timber Staff Officer	$6,000	Greater than 15% compacted, puddled or displaced soil conditions
V	Cumulative effects on soil productivity	Identify and document effects on productivity	Sample representative project sites following project completion	Each	5 years	M/M	1922.7	Range, Watershed, and Timber Staff Officer	$5,000	Significant of potential long term productivity loss
I	Soil and water improvement projects	Accomplish projects in priority order	Review attainment reports	Each	Annual	H/H	1922.7	Range, Watershed, and Timber Staff Officer	$500	Scheduled attainment not done
E	Water quality monitoring of Cumulative effects	Comply with State water quality standards	Evaluation of USDI, Geological Survey data collected off Forest on the Methow, Okanogan and Sanpoil Rivers	Each	3 years	M/M	USDI, Geological Survey Surface Water records 1922.7	Range Watershed and Timber Staff Officer	$500	Any failure to comply with State water quality standards

Since the FS has not following through on required Forest Plan monitoring commitments, the agency has nothing to support the Mission EA's assumption that the Forest Plan and R-6 standards would be met following project activities.

NEPA requires the FS to specify the effectiveness of its mitigations. (40 C.F.R. 1502.16.) The Mission EA fails to specify the effectiveness of its soil damage mitigations. There is no quantitative monitoring data that demonstrates DSC remediation actions have taken Okanogan NF activity areas with DSC amounts violating the standard to a level that complies with the standard.

Of decompaction as a mitigation, USDA Forest Service, 2015a admits:

> ***Anticipated Effectiveness:*** Low to high. Many soil characteristics and operating decisions affect the outcomes of this feature. Forest plan monitoring has shown a 30-60 percent reduction in compaction as measured by bulk density of the soil.

USDA Forest Service, 2005b reports, "It is acknowledged that the effectiveness of soil restoration treatments may be low, often less than 50 percent." (P.3.5-20.)

USDA Forest Service, 2005b states, "Monitoring of winter-logging soil effects conducted by the Forest Soil Scientist on the Bitterroot National Forest over the past 14 years has shown that 58% of the ground-based, winter-logged units failed to meet the R1 SQS. Winter-logging resulted in an average of 16% detrimentally damaged soil." (P. 3.5-21.)

Forest Service Timber Sales Specialist Flatten, 2003 examines the practice of wintertime ground based logging and discusses what winter conditions provide the best protection for the soil resource. He points out the complexities and uncertainties of pulling off successful winter logging that effectively avoids of soil damage, which the Mission EA does not consider. He concludes:

> The conditions necessary to provide protection of the soil resource during winter logging can be both complex and dynamic. Guidelines that take a simplified approach, though well understood during project planning, will likely become problematic once operations begin. The result may be inadequate soil protection or unnecessary constraints on operations. Winter logging guidelines should be developed that incorporate the latest research on snowpack strength and frozen soil and provide measurable criteria for determining when appropriate conditions exist.

USDA Forest Service, 2007c admits that soil displacement is essentially permanent anyway, despite restoration:

> Surface soil loss from roads through displacement and mixing with infertile substrata also has long lasting consequences for soil productivity because of the superiority of the volcanic ash surface layer over subsoils and substrata. (P. 4-76.)

Then there is the issue of the reliability and validity of the soil survey methods used by the FS in this instance. USDA Forest Service, 2012a states:

> The U.S. Forest Service Soil Disturbance Field Guide (Page-Dumroese et al., 2009) was used to establish the sampling protocol.
>
> …Field soil survey methodology based on visual observations, such as the Region 1 Soil Monitoring Guide used here, can produce variable results among observers, and the confidence of results is dependent on the number of observations made in an area (Page-Dumroese et al., 2006). **The existing and estimated values for detrimental soil disturbance (DSD[13]) are not absolute** and best used to describe the existing soil condition. The calculation of the percent of additional DSD from a given activity is an estimate since DSD is a combination of such factors as existing groundcover, soil texture, timing of operations, equipment used, skill of the equipment operator, the amount of wood to be removed, and sale administration. (Emphasis added.)

The rationale for which acres covered by roads to be included as DSC within activity areas appears to be applied arbitrarily. It's not clear that amount of DSC attributable to livestock grazing, temporary roads, unauthorized roads, and landings was included in activity area calculations as required.

Finally, the soil survey methods are not fully described. There is no analysis of soil bulk density—the index necessary to determine detrimental soil compaction as per the R-6 standards. Detrimental soil compaction cannot be determined by mere visual observations. Kuennen, et al., 1979 discovered that although "the most significant increase in compaction occurred at a depth of 4 inches… some sites showed that maximum compaction occurred at a depth of 8 inches… Furthermore, ... subsurface compaction occurred in glacial deposits to a depth of at least 16 inches."

The Mission EA also fails to disclose the areal extent of DSC in any area **outside of** project activity areas. The EA therefore fails to adequately address these cumulative effects.

Management requirements in the Forest Service Manual at 2520, R6 Supplement 2500-98-1, (which the Mission EA mostly fails to cite and demonstrate compliance with) include:

> Use soil quality standards to guide the selection and design of management practices and prescriptions on a watershed scale. **Evaluate existing soil conditions on all ownerships within the watershed** and **consider cumulative effects** with the addition of proposed actions **on** ecosystem sustainability and **hydrologic function**. On a planned activity area, evaluate existing soil conditions and design activities to meet soil quality standards. Document adjustments to management practices, soil conservation practices or restoration techniques necessary to **meet threshold values for the affected soil properties and watershed conditions.** (Emphasis added.)

[13] Detrimental Soil Disturbance (DSD) is equivalent to Detrimental Soil Conditions (DSC).

But no matter how compacted the soils are outside the proposed activity areas, the fact that reduced water infiltration in those other locations is contributing to increased water yield and erosion during storm events—so what? And if the previous logging in those other locations resulted in a scarcity of legacy wood that, if present, would be incorporated into the soil and hold water and transmit nutrients for the next generation's timber stand—so what?

And if those previously disturbed areas outside the proposed activity areas have become prime growing sites for noxious weeds—many species of which are adapted well to damaged, disturbed sites and some of which actively inhibit native vegetation from recovering and therefore the sites exhibit reduced productivity—so what?

We object to the FS's failure to incorporate the best available science and to have the full extent of soil restoration needs in project area watersheds made known. USDA Forest Service, 2009c states, in regards to project area sites where DSC soils were not to be restored by active management: "For the …severely disturbed sites,… "no action" …would **create indirect negative impacts by missing an opportunity to actively restore damaged soils**. These sites would naturally recover in time, approximately 60 to 80 years." (Emphasis added.)

USDA Forest Service, 2009c states:

> Compaction can decrease water infiltration rates, leading to increased overland flow and associated erosion and sediment delivery to streams. Compaction decreases gas exchange, which in turn degrades sub-surface biological activity and above-ground forest vitality. Rutting and displacement cause the same indirect effects as compaction and also channel water in an inappropriate fashion, increasing erosion potential.

Forest Service hydrologist Johnson (1995) noted this effect from his reading of the scientific literature: "Studies by Dennis Harr have consistently pointed out the effects of the compacted surfaces (roads, skid trails, landings, and firelines) on peak flows." Elevated peak flows increase both movement of bedload and suspended sediments.

Harr, 1987 states:

> …a curvilinear relation between amount of compaction and increased flow is shown.
>
> Numerous plans, guidelines, and environmental impact statements have related the predicted amount of soil compaction to a defined threshold of compaction totalling 12 percent of watershed area. …The 12 percent figure is arbitrary. Flow changes at lesser amounts of compaction may also cause adverse impacts. …Without reference to the stream channels in question, we cannot arbitrarily say nothing will happen until the mythical 12 percent figure is surpassed.
>
> In some watersheds, compaction was determined from postlogging surveys, but in others, compaction was taken as the area in roads (including cut and fill surfaces), landings, and skid trails.

USDA Forest Service 2014a states:

> Management activities can result in both direct and indirect effects on soil resources. Direct and indirect effects may include alterations to **physical, chemical, and/or biological properties.** Physical properties of concern include structure, density, porosity, infiltration, permeability, water holding capacity, depth to water table, surface horizon thickness, and organic matter size, quantity, and distribution. Chemical properties include changes in nutrient cycling and availability. Biological concerns commonly include abundance, distribution, and productivity of the many plants, animals, microorganisms that live in and on the soil and organic detritus.

The soil standards employed by the FS focus only on physical properties, having no nondiscretionary mandates to quantify chemical or biological properties. Chemical properties are discussed in Harvey et al., 1994, including:

> The ...descriptions of microbial structures and processes suggest that they are likely to provide highly critical conduits for the input and movement of materials within soil and between the soil and the plant. Nitrogen and carbon have been mentioned and are probably the most important. Although the movement and cycling of many others are mediated by microbes, sulfur phosphorus, and iron compounds are important examples.
>
> The relation between forest soil microbes and N is striking. Virtually all N in eastside forest ecosystems is biologically fixed by microbes... Most forests, particularly in the inland West, are likely to be limited at some time during their development by supplies of plant-available N. Thus, to manage forest growth, we must manage the microbes that add most of the N and that make N available for subsequent plant uptake. (Internal citations omitted.)

The Ninth Circuit, in *Lands Council v. Powell*, is a case where the FS proposed more logging in a watershed that was no longer properly functioning because of the effects of past logging. As the Court noted in that case, "(c)umulative effects analysis requires the (EIS) to analyze the impact of a proposed project in light of that project's interaction with the effects of past, current, and reasonably foreseeable projects… (Here) there is no discussion of the connection between individual harvests and the prior environmental harms from those harvests that the Forest Service now acknowledges." (Id., at 1027.) The same failure of analysis for soil productivity is evident with the Mission EA.

Further compromising soil productivity in the Okanogan NF is the failure to adequately address the spread of noxious weeds, which have the potential effect of reducing site productivity by replacing natural vegetation and competing with same for soil nutrients, moisture, etc. The impacts of invasive plants and/or noxious weeds represent another potential cumulative impact on the productivity of a site that is not accounted for by the Soil Standards. From an ecological standpoint, this is nonsensical, since soil disturbance often provides the opportunity invasive plant species take advantage of to first become established on a site, with the effect of displacing native plant species important to the ecology of the area. These unwelcome plants divert the

productive potential of the soil at a given site to the production of vegetative biomass that native wildlife may not be able to utilize.

USDA Forest Service, 2016a states, "Soil erosion or weed infestations are adverse indirect effects that can occur as a result any the above direct impacts. In both instances, serious land degradation can occur." The Soil Standards do not set any limitations on the total area that is infested by invasive plants in a project area at any given time, nor do they require disclosure of the extent of such weed invasions in a project area and the impacts such losses may have cumulatively on the Forest Service's ability to adequately restock the area within five years of harvest, as required by NFMA.

USDA Forest Service, 2015a indicates:

> Infestations of weeds can have wide-ranging effects. They can impact soil properties such as erosion rate, soil chemistry, organic matter content, and water infiltration. Noxious weed invasions can alter native plant communities and nutrient cycles, reduce wildlife and livestock forage, modify fire regimes, alter the effects of flood events, and influence other disturbance processes (S-16). As a result, values such as soil productivity, wildlife habitat, watershed stability, and water quality often deteriorate.

The FS has no idea how the productivity of the land been affected in the Mission project area and forestwide due to noxious weed infestations, nor how that situation is expected to change. USDA Forest Service, 2005c states:

> Weed infestations are known to reduce productivity and that is why it is important to prevent new infestation sand to control known infestations. …Where infestations occur off the roads, we know that the **productivity of the land has been affected from the obvious vegetation changes**, and from the literature. The degree of change is not generally known. …(S)tudies show that productivity can be regained through weed control measures…

In focusing only on its DSC proxy, the FS avoids quantifying logging-induced losses in **soil productivity**, potentially leading to serious long-term reduction in tree growth.

The very concept of "sustained yield" is based on the ability of the land to sustain tree growth in perpetuity. Since the FS has failed to quantify permanent impairment of the soil forestwide as well as within the project area, any assumption of "sustained yield" is unfounded, the project is inconsistent with the Forest Plan Soil Standard 1(a) requirement that "National Forest System lands will be managed under the principles of multiple use and sustained yield without permanent impairment of land productivity." In sum, the FS's regulatory mechanism for complying with NFMA is a failure.

The Mission EA also fails to consider and use the best available science, in violation of NFMA and additionally, NEPA's requirements that NEPA documents demonstrate scientific integrity. *See* 36 C.F.R. 219.3; 40 C.F.R. 1502.24.

We incorporate the document "Scientific Literature Review" which has a section entitled "Soils."

Remedy: Choose the No Action Alternative. Prepare an EIS to address the scientific and legal issues identified above. In any case, before preparing that EIS, finish the ongoing process of revising the Forest Plan to create soil standards based on the best available science that set measurable, quantitative limits on changes to physical, chemical and biological properties of soils, and also set measurable, quantitative limits on reductions of soil productivity.

- Explain how the soil survey data translate to determinations of the amount of DSC in each activity area.
- Disclose the amount of statistical error that exists for each type of DSC measurement and each type of DSC estimation, providing a statistically sound explanation how accurate those values are, and disclosing the percentage error expected of the existing and estimated values for DSC, and disclosing the odds of each activity area meeting the 20% DSC standard based on the particulars of each unit and logging plan.
- Disclose the cumulative level of DSC over all acres of the project area caused by past management. Disclose these numbers for each subwatershed.
- Disclose the link between current and cumulative soil DSC in project area watersheds to the current and cumulative impacts on water quantity and quality, incorporating the best available science.
- Disclose the full extent of soil restoration needs in these watersheds made known.

Aquatic habitat

The water quality analysis in the Mission EA is inadequate and violates the National Environmental Policy Act (NEPA) and the National Forest Management Act (NFMA). The information provided in the EA and associated documents does not support the FONSI. It does not apply the best available science, or provide monitoring data gathered on the Okanogan NF in arriving at its decision.

The Mission EA:

- fails to accurately disclose sediment amounts and sediment impacts of management actions;
- fails to properly and accurately quantify road-related impacts to water quality and fish;
- fails to provide an analysis that discloses pertinent information as per NEPA requirements and for scientific integrity;
- fails to disclose the livestock grazing impacts to the affected streams in the Project Area.

The Mission project area provides valuable habitat for ESA-listed fish species including Spring Chinook salmon, Summer Steelhead, and Bull Trout, as well as for the **Sensitive species** Westslope Cutthroat trout and Interior Redband Rainbow trout. The EA fails to provide an analysis that explains how viable populations of these species will be insured in project area streams.

The EA states, "Several roads add sediment, increase the drainage network, block fish migration, and reduce woody debris recruitment in the project area." Has the FS surveyed the full lengths of all system and nonsystem roads and all unauthorized roads in the project area to locate all significant sediment sources and erosion sites? Fly et al., 2011 demonstrate a comprehensive inventory of erosion and sediment sources.

Has the FS inspected all culverts in project area streams or only the ones on roads projected for management activities (to determine fish passage and other proper culvert functioning)?

The EA states, "NetMap identified each road segments as being at low, moderate, or high risk for erosion or other effects to aquatic resources based on …four primary factors." However, the EA's ratings of risk are not in any way correlated to measures of sediment or other impacts to aquatic habitat, in order for compliance with the forest plan to be judged.

Similarly, the EA relies upon "miles of road that are hydrologically connected to the stream network" as a "proxy for degree of hydrologic impact from the road system." But nowhere does the EA establish any correlation of miles of road with actual impacts on water quality and fish habitat.

The EA relies upon "Stream Channel Complexity" as an indicator of watershed integrity, explained thus: "Large wood is important for reducing river energy, forming pools, and adding overall habitat complexity. The desired density of wood present in a stream is 105 to 270 pieces/mile of wood greater than 6 inches diameter along with 2-5 pieces/mile of larger wood greater than 18 inches and 35 feet long." (52.) For the existing condition, the EA states:

> The amount of large wood in stream channels ranges from 44.6 to 221.2 pieces per mile at 6 inches diameter and greater. Large log pieces greater than 12" in diameter and over 35 feet in length totaled from 0.7 to 9.7 pieces per mile. The main stem Buttermilk Creek, West Fork Buttermilk Creek, Black Pine Creek, Libby Creek, and North Fork Libby Creek have reaches with coarse wood levels below desired levels, resulting in limited channel complexity that creates desired aquatic habitat.

For an Alternative 2, the EA's analysis of this indicator reads:

> In this alternative, small to large diameter trees would be hand felled on eight miles of fish streams the project area and left onsite, rapidly increasing coarse woody debris levels and thereby improving conditions in important spawning and rearing streams. Once historical levels of stream channel complexity were reached, natural recruitment rates would maintain the amount of coarse woody materials at appropriate levels. The increase in stream complexity would improve a substantial portion of spawning and rearing habitat in the project area and would lead to beneficial, long-term, moderate effects to habitat quality.

However, the EA doesn't say where these 8 miles are located, or if they even correspond to the "reaches with coarse wood levels below desired levels." So the conclusion of "beneficial, long-term, moderate effects to habitat quality" comes off as entirely arbitrary.

(We highlight these portions of the aquatic analysis not only to explain why the EA's cursory level of analysis for aquatic habitat fails NEPA requirements, but also as exemplary of most of the EA's analyses using "indicators" as proxies for analysis of impacts on all resources, or as proxies for demonstrating consistency with programmatic direction.)

The EA identifies sources of cumulative effects to aquatic habitats:

> Both the Buttermilk and Libby Creek sub-watersheds experienced decades of timber harvest, fire suppression, livestock grazing, firewood cutting, dispersed recreation impacts, and road construction with varying effects to aquatic and riparian resources. Implementation of the NWFP and listing fish species as Threatened or Endangered under the Endangered Species Act have substantially reduced activities and impacts within (Riparian Reserves).

Then, the EA claims that "Implementation of the NWFP and listing fish species as Threatened or Endangered under the Endangered Species Act have substantially reduced activities and impacts within RRs." However, these claims are made in the complete absence of numbers for populations of any fish species, of population trends, or of measured trends for habitat conditions. This does not suffice for a cumulative effects analysis or for compliance with programmatic direction or NFMA provisions.

The NWFP requires the FS to (GM-1) "Adjust grazing practices to eliminate impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives. If adjusting practices is not effective, eliminate grazing." The EA does not demonstrate consistency with GM-1.

The EA provides no scientific justification for substituting "pebble count data collected in the project area" (57) for forest plan sediment standard metrics. This violates NEPA and NFMA.

The EA doesn't provide a stream temperature analysis despite the parameter's importance for native fish habitat. Trends for streams with elevated temperatures are omitted from the analysis. The EA assumes without adequate scientific basis that logging and other vegetation removal in riparian areas will not affect temperatures.

Forest Plan Standard 3-2 requires the FS to "Rehabilitate fish habitats where past management activities have adversely affected their ability to support fish populations. Those fish habitats identified as having impacts from management activities shall be managed to show an upward trend with at least a 5% increase in conditions per year until objectives for the habitat are met." The EA simply states, "The project meets this guidance via active and passive means of restoration." FYI, the forest plan's use of the symbol "%" refers to a number, specifically a ratio between two numbers. There are no numbers here. The EA fails to demonstrate an upward trend, and the EA fails to demonstrate the FS is managing consistent with Standard 3-2. This situation is typical of the EA. The FS is not really trying to demonstrate consistency with the Forest Plan, probably because the FS does not really <u>want</u> to manage consistent with the Forest Plan. The FS cannot claim "no significant impacts" in the absence of a genuine analysis and while it ignores the management requirements and constraints of its forest plan. It would be pointless for us to go

through all the forest plan (and other programmatic direction) to point out everything the FS is ignoring. Obviously, the FS knows it is ignoring vast portions of its programmatic requirements, and apparently it is hoping nobody would notice.

The EA ignores the fact that opening the forest canopy in upland sites can raise water temperature in streams.

Is there an imbalance or deficiency in forbs, grasses, or shrubs where Riparian Reserves are proposed for treatment? If so, what are the numbers that document this imbalance or deficiency?

"The soil disturbed by project activities in harvest units adjacent to the perennial streams would be seeded with grasses which would help draw cattle away from perennial riparian areas." (EA 244.) Does the FS have monitoring or research results to verify that claim?

What are the invertebrate and vertebrate riparian-dependent species for which Aquatic Conservation Strategy Objectives were designed to maintain and restore habitat?

The EA does not analyze or disclose the impacts of altered livestock use of riparian areas.

"It us a requirement of the AMP (Allotment Management Plan) to meet allowable use in these riparian areas." (EA 237.) Does the AMP require, or does it merely allow, livestock grazing in ESA-listed fish species' critical habitat?

The EA states, "Decommissioning riparian roads would reduce the fine sediment delivery to streams. Fine sediment levels in Libby Creek would be expected to have a net reduction in the long-term." (84.) Please explain why this is a reasonable conclusion, given that elsewhere the EA indicates funding for road decommissioning is not guaranteed.

The EA (86) states,

> The proposed road maintenance, construction (temporary roads), decommissioning, closure, and log hauling would increase sediment yield. Due to hydrologic connectivity with roads, sediment could reach fish habitat. This increase would last an estimated 1-3 years following treatment. Design Features and Mitigation Measures listed in Appendix D would minimize sediment delivery to streams. Measures like rock armoring perennial stream crossings prior to log hauling and working under dry weather conditions would minimize fine sediment mobilization. The amount of sediment reaching streams, using design features and (Best Management Practices) would be minor.

But the EA doesn't disclose effectiveness of mitigations it employs, and doesn't define "minimize" or "minor." This is not an analysis.

The EA doesn't demonstrate that the claimed fire risk reduction and other alleged benefits from logging 10% (Buttermilk Creek) and 20% (Libby Creek) of the Riparian Reserves balances out the known damages from sediment, reductions of shade and water temperature response, weed

propagation, etc. And though the Forest Plan requires dead tree habitat shall be managed to maintain primary excavator populations at 100% of their biological potential in riparian areas, the EA didn't bother to conduct such an analysis. If fire suppression is causing the Riparian Reserves to not meet this 100%, then why hasn't the FS conducted a NEPA analysis to address this?

Since the EA's analyses for Water Resources is so flawed, the FS cannot assure that project activities won't adversely modify Critical Habitat for ESA-listed fish species.

Wisdom, et al., 2000 (cited in our EA comments) make a very strong scientific case for reducing road densities. Carnefix and Frissell, 2009 make a very strong scientific case for including ecologically-based road density standards:

> Roads have well-documented, significant and widespread ecological impacts across multiple scales, often far beyond the area of the road "footprint". Such impacts often create large and extensive departures from the natural conditions to which organisms are adapted, which increase with the extent and/or density of the road network. Road density is a useful metric or indicator of human impact at all scales broader than a single local site because it integrates impacts of human disturbance from activities that are associated with roads and their use (e.g., timber harvest, mining, human wildfire ignitions, invasive species introduction and spread, etc.) with direct road impacts. Multiple, convergent lines of empirical evidence summarized herein support two robust conclusions: 1) no truly "safe" threshold road density exists, but rather negative impacts begin to accrue and be expressed with incursion of the very first road segment; and 2) **highly significant impacts (e.g., threat of extirpation of sensitive species) are already apparent at road densities on the order of 0.6 km per square km (1 mile per square mile) or less.** Therefore, restoration strategies prioritized to reduce road densities in areas of high aquatic resource value from low-to-moderately-low levels to zero-to-low densities (e.g., <1 mile per square mile, lower if attainable) are likely to be most efficient and effective in terms of both economic cost and ecological benefit. By strong inference from these empirical studies of systems and species sensitive to humans' environmental impact, with limited exceptions**, investments that only reduce high road density to moderate road density are unlikely to produce any but small incremental improvements in abundance, and will not result in robust populations of sensitive species.**

Roads influence many processes that affect aquatic ecosystems and fish: human behavior (poaching, debris removal, efficiency of access for logging, mining, or grazing, illegal species introductions), sediment delivery, and flow alterations (Trombulak and Frissell 2000). (Also see: Gucinski et al. 2001; Wisdom et al., 2000; Pacific Rivers Council, 2010.) We also incorporate The Wilderness Society (2014) which discusses best available science on the ecological impacts of roads.

Frissell, 2014 is the scientist's comments on the Revised Draft Recovery Plan for the Coterminous United States Population of Bull Trout.[14] Frissell, 2014 states:

[14] The final Recovery Plan was essentially the same as the draft on which Frissell, 2014 cited,

> Roads are ecologically problematic in any environment because they affect biota, water quality, and a suite of biophysical processes through many physical, chemical, and biological pathways (Trombulak and Frissell 2000, Jones et al. 2000). The inherent contribution of forest roads to nonpoint source pollution (in particular sediment but also nutrients) to streams, coupled with the extensive occurrence of forest roads directly adjacent to streams through large portions of the range of bull trout in the coterminous US, adversely affects water quality in streams to a degree that is directly harmful to bull trout and their prey. This impairment occurs on a widespread and sustained basis; runoff from roads may be episodic and associated with annual high rainfall or snowmelt events, but once delivered to streams, sediment and associated pollutant deposited on the streambed causes sustained impairment of habitat for salmon and other sensitive aquatic and amphibian species. Current road design, management of road use and conditions, the locations of roads relative to slopes and water bodies, and the overall density of roads throughout most of the Pacific Northwest all contribute materially to this impairment. This effect is apart from, but contributes additively in effect to the point source pollution associated with road runoff that is entrained by culverts or ditches before being discharged to natural waters.

Ongoing and proposed activities will deliver sediment into stream networks. Sediment in streams degrades native fish habitat by filling in interstitial spaces and pools, and decreasing inter-gravel dissolved oxygen concentrations. Deposited sediments harm native fish directly by smothering eggs in redds, altering spawning habitat, and reducing overwintering habitat for fry, and indirectly by altering invertebrate species composition, thereby decreasing abundance of preferred prey.

Road and trail maintenance and use generates sediment by disturbing and loosening soil at stream crossings and other sites within sediment-contributing distance of streams, making any trails and roads within sediment-contributing distance sources of chronic fine sediment (Rhodes, 2002).

The Mission EA also fails to provide any quantitative analysis of the sediment caused by log haul and other vehicle traffic on the roads. Log hauling adds sediment to streams. The Nez Perce-Clearwater NF's Johnson Bar EIS states, "Increased heavy-truck traffic related to log hauling can increase rutting and displacement of road-bed material, creating conditions conducive to higher sediment delivery rates (Reid and Dunne, 1984)." The abstract from Reid and Dunne, 1984 states:

> Erosion on roads is an important source of fine-grained sediment in streams draining logged basins of the Pacific Northwest. Runoff rates and sediment concentrations from 10 road segments subject to a variety of traffic levels were monitored to produce sediment rating curves and unit hydrographs for different use levels and types of surfaces. These relationships are combined with a continuous rainfall record to calculate mean annual sediment yields from road segments of each use level. A heavily used road segment in the field area contributes 130 times as much sediment as an abandoned road. A paved road

> segment, along which cut slopes and ditches are the only sources of sediment, yields less than 1% as much sediment as a heavily used road with a gravel surface.

From an investigation of the Bitterroot Burned Area Recovery Project, hydrologist Rhodes (2002) notes, "On all haul roads evaluated, haul traffic has created a copious amounts of mobile, non-cohesive sediment on the road surfaces that will elevate erosion and consequent sedimentation, during rain and snowmelt events." USDA Forest Service, 2001a also presents an analysis of increased sedimentation because of log hauling, reporting "Increased traffic over these roads would be expected to increase sediment delivery from a predicted 6.30 tons per year to 7.96 tons per year."

The 1998 Bull Trout Biological Opinion (BO) indicates that bull trout are absent when road densities exceed 1.71 mi./sq. mi., depressed when the road density = 1.36 mi./sq. mi. and strong when road density equals or is less than .45 mi./sq. mi. (P. 67.)

Scientific information from government studies conducted for the Interior Columbia Ecosystem Management Project strongly indicates the high negative correlation between road density and fish habitat conditions. USDA Forest Service & USDI Bureau of Land Management, 1996a state:

> High integrity [forests] contain the greatest proportion of high forest, aquatic, and hydrologic integrity of all [] are dominated by wilderness and CLIMATE areas [and] are the least altered by management. [] Low integrity [forests have] likely been altered by past management [] are extensively roaded and have little wilderness. (Pp. 108, 115 and 116).

And USDA Forest Service & USDI Bureau of Land Management (1996) state "Increasing road density is correlated with declining aquatic habitat conditions and aquatic integrity. [] An intensive review of the literature concludes that increases in sedimentation [of streams] are unavoidable even using the most cautious roading methods." (P. 105).

The FS has not completed consultation with the U.S. Fish & Wildlife Service concerning the adequacy of the forest plan in the context of critical habitat designations for bull trout. Therefore, Endangered Species Act compliance is not assured of this Project.

The Mission EA's water quality and fisheries analyses fail to utilize a legitimate site-specific baseline in the aquatics analysis or the cumulative effects analysis. The comparison of the conditions that existed at the time of a legitimate baseline, and the population number and species that existed under those conditions, would provide a good basis for comparison to current existing conditions and fish species and populations. The EA contains no such analysis.

Though the actions on private, state and NF lands are considered, the effects are not sufficiently analyzed to support a finding of no significant cumulative impact on fisheries and the other aquatic resources. Grazing alongside streams on private land is virtually unregulated and has the potential to contribute significant amounts of sediment to the affected streams, further damaging fish populations and habitat.

The FS developed the Watershed Condition Framework[15]:

> The Watershed Condition Framework (WCF) is a comprehensive approach for proactively implementing integrated restoration on priority watersheds on national forests and grasslands. The WCF proposes to improve the way the Forest Service approaches watershed restoration by targeting the implementation of integrated suites of activities in those watersheds that have been identified as priorities for restoration. The WCF also establishes a nationally consistent reconnaissance-level approach for classifying watershed condition, using a comprehensive set of 12 indicators that are surrogate variables representing the underlying ecological, hydrological, and geomorphic functions and processes that affect watershed condition. Primary emphasis is on aquatic and terrestrial processes and conditions that Forest Service management activities can influence. The approach is designed to foster integrated ecosystem-based watershed assessments; target programs of work in watersheds that have been identified for restoration; enhance communication and coordination with external agencies and partners; and improve national-scale reporting and monitoring of program accomplishments. The WCF provides the Forest Service with an outcome-based performance measure for documenting improvement to watershed condition at forest, regional, and national scales.

The EA does not explain how it is applying the WCF approach to watershed restoration.

The Mission EA does not adequately disclose the existing conditions of site specific stream reaches and its effects on water quality, fish and other aquatic resources. The EA fails to disclose such critical information such as stream channel stability assessments on specific reaches, and information regarding the existence and effects of bedload and accumulated sediment.

There is no analysis of scientifically valid, quantitative data gathered on the Forest to determine water flows and its effects on stream bank erosion and channel scouring during spring runoff and/or rain-on-snow (ROS) events. Most segment altering and channel forming events occur during instantaneous flows. There is no documentation in the Mission EA of the daily instantaneous flows during winter and/or spring ROS events for the project area streams.

There are several validated in-stream procedures to evaluate channel morphology and stability. One of these procedures is described in Kappesser, 2002:

> The RSI [Riffle Stability Index] addresses situations in which increases in gravel bedload from headwaters activities is depositing material on riffles and filling pools, and it reflects qualitative differences between reference and managed watersheds…it can be used as an indicator of stream reach and watershed condition and also of aquatic habitat quality. p. 1069

This procedure has been used on National Forests in Virginia and on the Idaho Panhandle National Forests. It can be used to predict susceptibility of stream channels to stream bank

[15] https://www.fs.fed.us/biology/resources/pubs/watershed/maps/Watershed_Condition_Framework2011FS977.pdf

erosion and channel scour which result from high water yields. There is no mention in the EA of any procedure to document the channel stability of the affected streams.

Openings accumulate much more snow than in a forested areas that are not as "open," thus provide a significant contribution to water yield especially during ROS and spring runoff events. The number, mileage and proximity of the roads to the proposed logging units and streams are important because they will also have a significant effect on peak flows and the resultant impact on fish, steam channels and possible flooding.

According to Kappesser, 1992:

> The stability condition of a watershed may be broadly determined by evaluating the level of harvest activity (ECA), its spatial distribution with regard to headwater harvest and rain on snow risk and the density of roading in the watershed with consideration of road location relative to geology and slope. Each of these four factors may [be] evaluated against "threshold" levels of activity characteristic of watersheds … that are known to be stable, unstable, or on a threshold of stability.

ROS events can be the most channel changing, sediment producing events and can have a significant adverse effect on fish and their habitat (Kappesser, 1991b):

> Filling of pools by bedload sediment is seen as a significant factor in the reduction of rearing and overwintering habitat for fish such as West Slope Cutthroat Trout (Rieman and Apperson, 1989). Bedload increases have traditionally been interpreted as the result of channel scour in response to increased peak flows created by timber harvest.

(Also see Kappesser, 1991a.) The Inland Northwest frequently gets at least one mid-winter chinook which is often accompanied by windy and rainy conditions. The warm wind blowing across the snow, especially in relatively open areas on south and southwestern facing slopes between 2,500 to 4,500 feet elevation results in rapid snow melt and high levels of instantaneous water flows.

The Mission EA does not provide any documentation based on monitoring data from these areas that validates model flow and sediment predictions, sediment input effects, or its effects on the affected stream channels. Again, the paucity of scientifically credible monitoring on the Okanogan NF makes it impossible to validate the EA's effects analysis.

Openings accumulate much more snow than in a forested areas that are not as "open," thus provide a significant contribution to water yield especially during ROS and spring runoff events. The number, mileage and proximity of the roads to the proposed logging units and streams are important because they would also have a significant effect on peak flows and the resultant impact on fish, steam channels and possible flooding.

The Mission EA does not adequately disclose the effects of ROS events on site specific drainages that have varying amounts and types of logging, road density, spatial and other characteristics that influence a ROS event.

The Mission EA does not disclose how much aggradation of fine and/or bedload sediment will increase and persist in the affected streams. Knowledge of existing channel stability is crucial in evaluating how the affected streams would respond to a large peak flow event, and consequently how these events would impact water quality and fish habitat. The EA does not include high quality information or expert agency comments, in violation of 40 CFR 1500.1(b) regarding water quality issues associated with the proposed timber sale(s).

There is no disclosure of any scientifically valid, quantitative hydrological monitoring data to determine site specific water flows during peak flow runoff and instantaneous flow measurements during ROS events, and its effects on stream bank erosion and channel scouring. Much potential damage to the affected streams occur during periods of high instantaneous flows.

Abnormal width depth/ratios in streams could be indicative of unstable stream channels. The Mission EA does not disclose whether additional logging and road construction might exacerbate such a problem. The EA does not provide site-specific information/description of stream reaches, especially in areas where there are high levels of embeddedness and aggradation. The EA does not disclose how long the existing embeddedness and accumulated sediment will persist in the affected streams, especially when the proposed project will add a significant amount of sediment.

The Mission EA is not clear regarding the description and amount of current and post-logging and post-fire openings. This information is necessary to understand increases in water yield especially during ROS events. The FS proposes variable retention regeneration logging, resulting in 85% of a total of 59 acres of openings. The 6,617 acres of underburning and other thinning and burning would increase snow accumulation on the ground and cause flashier runoff events.

Openings are very susceptible to ROS events. These events cause rapid runoff which often result in diminished late season flows. This can result in greater than normal late summer flows especially since our summers in the Inland Northwest seem to becoming hotter and drier than historical conditions.

King, 1994 explains that these small areas are particularly sensitive to the increased water yields due to removal of tree canopy:

> Timber removal on 25-37% of the area of small headwater watersheds increased annual water yield by an average of 14.1 inches, prorated to the area in harvest units and roads. Increases in streamflow occurred during the spring snowmelt period, especially during the rising portion of the snowmelt hydrograph. These forest practices also resulted in large increases in short duration peakflows, greatly increasing the sediment transport capacity of these small streams. The cumulative effects of these activities on streamflow in the Main Fork, with only 6.3% of its area in roads and harvest units, were not detectable.

Ziemer, 1998 observed the same phenomenon in his study on flooding and stormflows. Also, King, 1989 observed that “Current procedures for estimating the hydrologic responses to timber

removal of third to fifth order streams often ignore what may be hydrologically important modifications in the low-order streams."

Much logging is in proximity to stream headwaters. The existing and the proposed new road access to these units will also facilitate cattle access to the headwaters of these streams. Access by cattle and the damage they cause to these headwater streams could result in adding significant amounts of sediment resulting in unfavorable width depth ratios that could lead to warming of the affected headwater streams. This potential adverse effect to the streams and fisheries is not considered in the EA.

Kappesser, 1992 stresses the importance and sensitivity of headwater streams:

> Headwaters harvest. Headwaters harvest is known to have a disproportionately large influence on channel condition.
>
> The stability condition of a watershed may be broadly determined by evaluation the level of harvest activity (ECA), **its special distribution with regard to headwater harvest** and rain on snow risk, and the density of roading in the watershed with consideration of road location relative to geology and slope. (Emphasis added.)

A model being used to evaluate existing and proposed sediment production (WEPP) has a confidence levels not suited to accurately reflect sediment production. The WEPP model does not evaluate sediment resulting from water yield, just land based erosion.

USDA Forest Service 1994b states "It is important to realize that all models greatly simplify complex processes and that the numbers generated by these models should be interpreted in light of field observations and professional judgement." (III-77.) Harr, 1987 states:

> Perhaps the most basic of the erroneous beliefs is the idea that <u>simplicity can be willed on the forest hydrologic system</u>. This belief encourages the implementation of simplistic guidelines, the adoption of arbitrary thresholds of concern, and the search for all-encompassing methodologies to predict consequences of forest activities on water resources. These actions occur sometimes with the blessings of hydrologists or soil scientists but other times over their objections. The belief in simplicity has been nurtured by the rapid increase in the use of computer simulation models in forest planning and the desire to accept the output from such models. Another reason for pursuit of simplicity is the current emphasis on planning called for by NFMA; such planning is often conducted under strict time and budgetary constraints.
>
> I must point out that, on the average, the simplistic methodologies may have resulted in fairly prudent forest management. But rather than being viewed as merely a first attempt at solving a problem, they often seem to inhibit further investigation and development. Also, they tend to lead forest managers and some specialists to believe that hydrologic systems really do function in the manner described by the simplistic methodologies.

> Forest hydrologic systems are more complex than one would believe after reading some of the methodologies and procedures that have been proposed to predict cumulative effects of logging on water resources. For example, many of these procedures state that a threshold of harvest activity or intensity will be determined, without specifying how it will be determined or whether it really exists or can be measured. Similarly, implementing a methodology for estimating cumulative effects of harvest operations on water resources does not mean that such cumulative effects either exist or can be measured.
>
> (I)n our desire to simplify, to create a methodology that will predict consequences of harvest activities everywhere or in the average situation, we usually expend considerable energy creating a methodology that predicts reasonably accurately virtually nowhere. We may implement procedures without providing for testing or monitoring the results to see whether the procedures are, in fact, working. In the process, we may even develop a false sense of security that our methodology can really protect soil and water resources.

The Mission EA does not disclose the amount of existing accumulated fine and bedload sediment that remains from the previous logging and road construction. Road and trail maintenance and use generates sediment by disturbing and loosening soil at stream crossings and other sites within sediment-contributing distance of streams, making any trails and roads within sediment-contributing distance sources of chronic fine sediment (Rhodes, 2002).

The Mission EA does not disclose whether the predictions made in previous NEPA documents for projects carried out in these watersheds were accurate, or if project fisheries and water quality objectives were met. Nor does it cite the results of monitoring required under those decisions. Systemic amnesia results in diminished expert credibility.

We incorporate the document "Scientific Literature Review" which has a section entitled "Native Fish and Water Quality."

Cumulative effects

The EA states, "Past management practices, including fire suppression, changed forest vegetation structure, overstory and understory species composition, and spatial patterns in comparison to historical conditions." The EA fails to properly attribute impacts to the project area forests due to two very intrusive management practices—livestock grazing and logging. Instead, it largely attributes "undesired" changes of vegetation to fire suppression. Such an analysis would allow the public and decisionmaker to understand how similar Mission project actions might result in cumulative impacts. Instead, the EA resorts to an uninformative "it is what it is" analysis of cumulative impacts:

> In order to understand the contribution of past actions to the cumulative effects of the proposed action, this analysis relies on current environmental conditions as a proxy for the impacts of past action. This is because existing conditions reflect the aggregate impact of all prior human actions on natural events that have affected the environment and might contribute to cumulative effects.

The FS take such a position in part because "a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain." Apparently, being accountable for past management impacts needs to be avoided, and the way to do that is simply pretend they don't exist. Next, the FS claims, "providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action." On the contrary, quite reasonably, such an analysis would allow the public and decisionmaker to understand how similar Mission project actions might result in impacts similar in kind and intensity as happened previously.

Finally, the EA states, "public scoping for this project did not identify and public interest of need for detailed information on individual past actions." The public is not required, during scoping, to remind the FS to do its duties under NEPA.

The EA indicates livestock grazing would hardly be feasible if logging hadn't already occurred in the project area, and likewise adequate livestock forage would fade away if periodic logging doesn't occur in the future. Also, the EA states that logging roads are needed for "proper grazing distribution." Since these resource extraction activities are connected, the FS errs in conducting separate NEPA analyses.

Travel Management

The EA does not demonstrate the FS is managing the project area or forest consistent with the Travel Management Regulations (36 CFR 212) Subpart A which requires the FS to involve the public while conducting a science-based analysis to identify the minimum road system needed to manage the Forest sustainably. Likewise, The EA does not demonstrate that the FS is managing the project area or Forest consistent with 36 CFR 212 Subparts B and C.

The EA states, "The existing road network costs more to maintain than is available in road maintenance funding." (14.) The trouble is, the EA does not provide an analysis which determines if adequate maintenance funding will exist for the post-project road network, nor does it disclose how deferred maintenance costs might increase or decrease post-project.

With funds being far below what is necessary to keep the road system properly maintained, many roads do not get the maintenance treatments they need on schedule and are falling into a severe state of disrepair. The Mission EA fails to disclose this fiscal reality for the Forest, and doesn't fully analyze the resultant impacts of the undermaintained road system.

To address its unsustainable and deteriorating road system, the FS promulgated the Roads Rule (referred to as "subpart A") in 2001. The rule directs each national forest to conduct "a science-based roads analysis," generally referred to as the "travel analysis process." The FS Washington Office, through a series of directive memoranda, instructed forests to use the Subpart A process to "maintain an appropriately sized and environmentally sustainable road system that is responsive to ecological, economic, and social concerns." These memoranda also outline core elements that must be included in each Travel Analysis Report.

The Washington Office memorandum dated March 29, 2012 (USDA Forest Service, 2012d) directed the following:

- A TAP must analyze all roads (maintenance levels 1 through 5);
- The Travel Analysis Report must include a map displaying roads that will inform the Minimum Road System pursuant to 36 C.F.R. § 212.5(b), and an explanation of the underlying analysis;
- The TAP and Watershed Condition Framework process should inform one another so that they can be integrated and updated with new information or where conditions change.

The December 17, 2013 Washington Office memorandum (USDA Forest Service, 2013b) clarifies that by the September 30, 2015 deadline each forest must:

- Produce a Travel Analysis Report summarizing the travel analysis;
- Produce a list of roads *likely not needed for future use*; and
- Synthesize the results in a map displaying roads that are *likely needed* and *likely not needed in the future* that conforms to the provided template.

The Subpart A analysis is intended to account for benefits and risks of each road, and especially to account for affordability. The TAP must account for the cost of maintaining roads to standard, including costs required to comply with Best Management Practices related to road maintenance.

The Travel Management Regulations at 36 CFR § 212.5 state:

> (b) Road system—(1) *Identification of road system.* For each national forest, national grassland, experimental forest, and any other units of the National Forest System (§ 212.1), the responsible official must identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands. In determining the minimum road system, the responsible official must incorporate a science-based roads analysis at the appropriate scale and, to the degree practicable, involve a broad spectrum of interested and affected citizens, other state and federal agencies, and tribal governments. The minimum system is the road system determined to be needed to meet resource and other management objectives adopted in the relevant land and resource management plan (36 CFR part 219), to meet applicable statutory and regulatory requirements, to reflect long-term funding expectations, to ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance.

The Travel Management Regulations (36 CFR 212) Subpart A requires the FS to identify the minimum road system needed to manage the Forest sustainably. The EA does not demonstrate how it is minimizing the forestwide road system in compliance with the Travel Management Regulations and related Directives.

The main ecological and financial problem facing the OWNF, and national forests throughout the Inland Northwest and U. S. Northern Rocky Mountains, is the existing excessive network of roads. Although the main focus of the Travel Management Rule Subpart A was to be this excessive road network, the FS sidesteps the issue at every juncture—in the design of the Forest

Plan, in the design of projects implementing the original forest plan, and in the systematic avoidance of conducting its duties under Subpart A, which requires the agency to minimize the ecological and economic liabilities of the excessive road network by significantly downsizing it.

Gucinski et al., 2001 recognize the ongoing ecological damage of roads—regardless of the adequacy of maintenance funding:

> Undesirable consequences include adverse effects on hydrology and geomorphic features (such as debris slides and sedimentation), habitat fragmentation, predation, road kill, invasion by exotic species, dispersal of pathogens, degraded water quality and chemical contamination, degraded aquatic habitat, use conflicts, destructive human actions (for example, trash dumping, illegal hunting, fires), lost solitude, depressed local economies, loss of soil productivity, and decline in biodiversity.

The EA does not incorporate the required science-based transportation analysis, and so there was no assessment that identified the unneeded roads. The process the FS used is not consistent with requirements to involve the public in a science-based Travel Analysis Process, create a Travel Analysis Report, and identify roads likely not needed to manage the forest, as required under the Regulations and in the Directives. The EA doesn't even state how the Mission project might or might not be implementing the forestwide minimum road system.

NEPA regulations at 40 CFR § 1502.24 state, under **Methodology and scientific accuracy**: "Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements." The EA violates NEPA in terms of methodology, scientific accuracy, and scientific integrity.

The EA does not analyze the impacts of roads not maintained in conformance to BMP or in compliance with standards because of funding shortfalls, nor does it analyze impacts of roads that go without maintenance because they are unauthorized or non-system.

The EA does not analyze or disclose the project area road system's long-term financial liabilities, nor the associated ecological impacts due to inadequate maintenance funding. The EA rests on the assumption that this project will adequately mitigate the problems chronically posed by the road network by project road work and BMP implementation. USDA Forest Service, 2010t indicates otherwise:

> Constructing and improving drainage structures on Forest roads is an ongoing effort to reduce road-related stream sediment delivery. Although BMPs are proven practices that reduce the effects of roads to the watershed, it is not a static condition. Maintaining BMP standards for roads requires ongoing maintenance. Ecological processes, traffic and other factors can degrade features such as ditches, culverts, and surface water deflectors. Continual monitoring and maintenance on open roads reduces risks of sediment delivery to important water resources.

The EA fails to disclose the temporal effectiveness or non-effectiveness of all the road maintenance and upgrading, merely assuming that the proposed actions will forever mitigate the problems they now exhibit.

Has the FS established road management objectives for all project area roads?

The EA does not disclose the Project Area Road Management Objectives, which were to be developed using the Travel Management Regulations.

The EA does not present a detailed analysis of the conditions of the roads proposed for decommissioning. We are concerned because we've observed with projects on other national forests the FS inflates the restoration value of road decommissioning in cases where the roads pose little or no risk of watershed damage because they are essentially naturally recovered.

The EA states the project "moves toward compliance with 36CFR212.5" (215). Exactly what would total compliance with that regulation require the FS to do?

Also, we've observed instances where the FS plans to use essentially naturally recovered roads during the project without analyzing the impacts of all the soil and hydrological disturbance required to make them drivable: "During project activities, some currently closed NFS roads and unauthorized roads would be opened and maintenance and/or reconstruction activities would occur." (EA at 214.)

Forest Plan standard 8-8 requires, "Off road vehicle opportunities shall be designed to minimize damage to soil, water vegetation, and other resources, to minimize disturbance of wildlife or significant disruption of wildlife habitat, and to minimize conflict with other resources." This is identical to Executive Orders requirements, and the EA fails to address the requirements.

The EA does not give any indication if the surveys which discovered unauthorized (or non-system) roads were comprehensive enough over the entire project area to locate all such routes.

If "unauthorized roads are currently being driven on by highway vehicles" (EA 213) (or by any motorized vehicle, for that matter), what does this say about closure and enforcement effectiveness?

Does the EA include unauthorized and non-system roads with its road density calculations?

The action alternatives include "rocked crossings which require maintenance." (EA 217.) What is the cost of this maintenance, how often would it occur, and what are the environmental impacts if the maintenance doesn't occur?

The EA does not disclose the extent of non-system and user-built roads in the project area.

The EA does not disclose the assigned Maintenance Level for every system road in the project area. Consequently how can environmental and economic effects of these roads be analyzed?

The EA states that logging roads are needed for "proper grazing distribution." Is this considered in the minimum roads analysis? How does the FS account for the erosion and weed spread that "grazing distribution" causes to roads?

Are allotment permittees authorized to clear ML-1 roads when they become impassible due to washouts, debris, etc.?

"Those roads to be decommissioned that are currently used extensively by cattle would be designed to provide cattle access by leaving a trail-space along the edge of the decommissioned road." (EA 246.) What will be the annual cost to taxpayers of maintaining cattle "trail space" on decommissioned roads in the project area?

We incorporate the document "Scientific Literature Review" which has a section entitled "Comprehensive Management of Human Access."

Remedy: Choose the No Action Alternative. Alternatively, prepare an EIS for this project which is tiered to a science-based forestwide Travel Analysis Process so that it is fully consistent with the Travel Management Regulations and related directives, and that incorporates the revised forest-wide TAP and includes alternatives that implement the minimum road system.

Economics

The economics analysis is heavily skewed towards resource extraction, and fails to recognize the economic contributions of wildlands, wilderness, and the recreational activities that people experience in undeveloped areas.

The EA fails to account for fire suppression that taxpayers are expected to foot the bill for, without any say in the matter.

The economics analysis is all about justifying management by expounding upon the benefits to the local economy. On the other hand the costs to U.S. taxpayers for all these local focus benefits are not clearly analyzed or disclosed. The externalized costs of the existing and subsequent environmental damage due to management actions and other human activities are also not considered.

Figure 129 of the EA indicates that "Potential Non-Timber Sale Costs" would total almost $2.5 million, but elsewhere it admits a lot more such costs are unaccounted for. It apparently doesn't estimate Timber Sale Costs. The FS is unable to estimate net value. There is no estimate of the net loss to taxpayers, which is inevitably what would happen.

The EA claims logging "would generate $2.73 million in timber value at the mill." It doesn't say how much the government will receive for the timber, or how that contributes to net benefit.

The EA states, "After logging operations including: felling, skidding, processing, loading, required brush disposal, road maintenance, and required mitigation … there would remain approximately $310,000 that could be used to supplement or support other planned projects." (294.) Nothing in the EA explains the source of that figure. On the same page the EA states that $310,000 are the "Costs directly related to the Timber Sale." Which is it?

From the EA, there is no way to assess the efficiency of alternatives towards the assumed benefits. The costs of units of management activity were not analyzed. One might wonder what the expected costs might be of noxious weed treatments. Forget that. What about the taxpayer investment per board feet produced? Nope. What dollar amount per grazed Animal Unit Month or accumulated pound of beef does the taxpayer spend with its subsidies to the cattle owners? It isn't analyzed anywhere.

Ecosystem services were not analyzed. Check the 2012 Planning Rule for an explanation on why ecosystem services are important.

Botany

The EA does not disclose the results of surveys for all Survey and Manage plant species, nor does it analyze and disclose direct, indirect, and cumulative effects on all S&M species.

What scientific support exists for the premise that the proposed vegetation treatments would "improve population vigor" of moonworts (*Botrychium* spp.)?

Does the FS have effectiveness monitoring results for Sensitive and S&M species?

The EA does not analyze or disclose cumulative effects of livestock on Sensitive and S&M species.

The EA uses the term "Sensitive and Unique habitats" but doesn't explain what it means.

The EA: "Two proposed treatment units (16 and 503) have known populations of *B. crenulatum*. … *B. crenulatum* requires nearly permanent moisture, often occurring in saturated headwater fens and seeps (Farrar 2006). It is usually found in partly shaded to heavily shaded sites at mid to high elevations (Farrar 2005)." Given the definition of *B. crenulatum,* habitat, why doesn't the FS integrate fire ecology into the EA's biological discussion of the species? What is "the range of scientifically acceptable ecological consequences"?

"The action alternatives would have a long-term, beneficial, minor effect on B. crenulatum populations because thinning and prescribed fire treatments would help create more transitory range that would disperse cattle over more ground, thereby reducing the potential for cumulative impacts from grazing and trampling." (EA 230.) Because the *B. crenulatum* habitat is said to be showing only "minimal" cattle use now (probably because cattle forage is shaded out, or because the vegetation is too thick to allow cattle access to cool shady rest areas), it is obvious the effect

of the treatments will increase—not decrease—impacts on *B. crenulatum*. The EA's unreasonable conclusion is in violation of NEPA.

"Conifer encroachment and closed canopies are limiting available nutrients, water and sunlight to the riparian vegetation in unique and sensitive plant habitats." (EA 225.) What is the scientific basis for that statement?

What is the best available science the FS relies upon for analysis of whitebark pine in the Mission EA?

A concern is, livestock grazing impacts on naturally regenerating aspen clones is continuous and ongoing everywhere livestock graze in the vicinity of aspen. This is an example of the FS not publicly disclosing relevant biological research and important biological information in the EA.

The EA states that "(aspen) stands appeared to be healthy and were limited more by conifer shading and disease than by ungulate browsing." How does the FS make that distinction?

Visual quality
"Overall, the rest of the project area would meet a range of Visual Quality Objectives from Retention to Partial Retention to Modification." The EA fails to disclose the objective for each area and demonstrate compliance. The locations for compliance determination are too limited to get an idea of the real visual impacts that the public would experience.

Other general comments
The quality of maps in the EA is extremely poor. Enlarging the electronic versions just increases the blur. This obfuscates the EA's analyses, and violates NEPA. One can hardly tell the locations of proposed treatment units in conjunction with other important features. For one example, unroaded areas.

The EA relies upon "Impact Terms" for the purposes of qualifying direct impacts for every resource area. However, instead of providing quantified impacts or even estimates of measurements, these impact terms are mostly subjective and qualitative. It would be impossible for anyone to verify or monitor such qualitative guesses because they are so subjective. This results in much of the EA's Environmental Consequences section being vague and/or misleading.

Since the North Central Washington Forest Health Collaborative has already, in part, funded development of the Mission project (EA 20-21), the EA must demonstrate how the FS maintains objectivity and avoids bias towards actions that result in financial gain by collaborative members. It fails to do so. How will the chosen contract mechanism maintain the proper distance between the FS and these private entities?

The EA fails to address the inherent conflict of interest posed by the North Central Washington Forest Health Collaborative financial investment and interests, compromising the NEPA process before it began.

The EA indicates "Road closure and decommissioning would be spread out over the period of the project or after completion of the project depending on where and when funding is available." (25) So where the analyses in the EA explicitly state or imply any certainty this work will happen, they are misleading.

The FS rejected the idea of analyzing an action alternative that didn't require Forest Plan amendments for implementation, saying essentially that such an alternative wouldn't meet enough of the Purpose and Need. However, the reasons for fully analyzing such an alternative would be to justify that claim. The range of alternatives is too narrow to comply with NEPA. For example, the EA chooses a "method to protect sensitive ash-capped soils from compaction, rutting, displacement or other disturbances is to operate during the winter when the ground is frozen and snow-covered." The method is, "winter operations would require snowplowing Forest Road 43 and winter access on deer winter range, which would require amending Standards and Guidelines." The EA does not explain why merely dropping activities that disturb the sensitive ash-capped soils isn't worth considering.

Scoping comments not addressed in EA

Finally, we ask that the FS once again consider our earlier comments (a letter from of Sierra Club Upper Columbia River Group/Alliance for the Wild Rockies and a letter from Conservation Congress), which have been largely ignored in the development of the project to this point. We once again ask that you provide the answers and disclosures they requested.

Publishing responses to Scoping Comments on the Project web page on March 28, 2018 (almost two weeks into the Objection period), is hardly responsive to the public.

In closing, we ask that you please keep us fully informed of all further developments on the Mission project. It is our intention that you review the literature cited and include it in the project file. Please contact me if you need a copy of any of these references.

Sincerely,

Jeff Juel, Public Lands Coordinator, WildLands Defense
and National Forest Chair, Sierra Club Upper Columbia River Group
….

And on behalf of:
Michael Garrity
Alliance for the Wild Rockies
….

Denise Boggs, Executive Director
Conservation Congress
….

July 25, 2017

Michael Williams, Forest Supervisor,
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Comments transmitted as an attachment to the following email addresses:
https://cara.ecosystem-management.org/Public/CommentInput?Project=49201 and comments-pacificnorthwest-okanogan-methowvalley@fs.fed.us

Mr. Williams, Ms. Trebon;

I appreciate the opportunity to provide comments on the Revised Draft Mission Restoration Project Environmental Assessment (EA), on behalf of WildLands Defense, Alliance for the Wild Rockies, Conservation Congress and the Upper Columbia Group of the Sierra Club.

We note that the only expressed reason for revising the EA is so the Forest Service (FS) can demonstrate the process of proposing an executing a forest plan amendment is consistent with laws and regulations. The EA describes the forest plan standards to be amended:

> **Management Area Prescription Wildlife MA14-6A and MA26-6A**
> Manage all identified deer winter range for the following well distributed cover:
> **Figure 9. Deer Winter Range Cover Guidance**

Winter Range Cover	MA14 & MA26
Snow intercept Thermal	≥ 15%
Winter Thermal	> 25%
Hiding	≥ 0%
Total:	**≥ 40%**

The EA describes the amendment: "Of the acres of deer winter range cover in proposed treatment units, thinning on up to 25% (746 acres) would reduce (MA14) or further decrease (MA26) winter cover below the S&G. In the project area, MA14 currently has 52% total winter cover, and MA26 has 35% total winter cover. Post-project, both MA14 and MA26 would each have 33% deer winter range cover, a reduction of 7% below S&Gs, with an increase in forage availability in forested stands."

What is the best available science the FS is relying upon to conclude, "Areas of winter range cover that would be reduced below current S&Gs **contain higher tree stocking levels with more canopy closure than existed historically**"? (Emphasis added.)

We incorporate the document "Scientific Literature Review" which has a section entitled "Elk."

What is the best available science the FS is relying upon to conclude these areas have "accompanying higher risk of uncharacteristic crown fire behavior and increased vulnerability to insect outbreaks"?

What is the best available science the FS is relying upon to conclude, "Forested stand composition in deer thermal cover consist of a **higher proportion of shade-tolerant conifers than existed historically** or is **predicted to exist in the future**"? (Emphasis added.) Is the FS considering the science of climate change in its analysis of what "is predicted to exist in the future" and if so, what is that best available science?

Since the FS plans on reducing stand density on 746 acres necessitating the proposed amendment, what is the best available science the FS is relying upon to consider the balance between increasing the rate of fire spread in the wildland urban interface (WUI) caused by the thinning, vs. the claimed benefits of reducing crown fire? What is the best available science the FS is relying upon to consider the balance between reduced moisture holding capacity due to drying from increased solar radiation onto the forest floor in the WUI caused by the thinning, vs. the claimed benefits of reducing crown fire?

Please explain what the long-term plan is to maintain the allegedly safer conditions in the WUI, in the context of the regrowth of small trees, brush, etc. in the years following the forest thinning. Please disclose the best available science the FS is relying on to plan for this vegetation regrowth over time.

Please consider the information we have already provided to the FS in our previous EA comments covering these subjects, in which we cite scientific research that calls into question the assumptions stated and inherent in the revised EA's justification for the forest plan amendment. We note that the EA uses the same kind of justifications for treatments beyond the WUI, so many of our comments not specific to the amendment area apply there.

The EA states, "Mule deer populations in Washington Department of Wildlife's Region 2, where the project is located, have experienced a gradual long-term decline in numbers which is attributed to reduced shrub diversity, declining productivity of aging shrubs and lack of recruitment of new shrubs **due to fire suppression**…" (Emphasis added.) What is the FS's plan for curtailing its destructive fire suppression policies in the project area, including best available science?

The EA states, "Region 6 Regional Forester Sensitive Species that would be affected by thinning as allowed by the amendment include gray flycatchers, white-headed woodpeckers, western gray squirrels, and Northern goshawk." Please disclose the best available science the FS is relying upon for analysis of direct, indirect, and cumulative effects on each of those species along with the sensitive Westslope Cutthroat and Interior Redband Rainbow trout. Please disclose the best available science the FS is relying upon for analysis of direct, indirect, and cumulative effects on the Canada lynx, grizzly bear, northern spotted owl, Spring Chinook, Summer Steelhead, Bull Trout and gray wolf.

We incorporate the document "Scientific Literature Review" which has sections entitled "Wildlife" and Habitat Fragmentation."

In closing, we ask that you please keep us fully informed of all further developments on the Mission project.

Sincerely,

Jeff Juel, Public Lands Coordinator, WildLands Defense
and National Forest Chair, Sierra Club Upper Columbia River Group
….

And on behalf of:
Michael Garrity
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….

Denise Boggs, Executive Director
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….

Sincerely submitted,

/S/

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