November 6, 2018

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Sent via email to: objections-chief@fs.fed.us

Subject: Objection regarding the Revised Colville Forest Plan

On behalf of the Upper Columbia River Group of the Sierra Club and Alliance for the Wild Rockies, this is an Objection to the Colville National Forest Land Management Plan (hereinafter, "LMP" or "Forest Plan") and its accompanying draft Record of Decision (draft ROD) which selects Alternative P, and Final Environmental Impact Statement (FEIS). The Responsible Official is the Regional Forester of the USDA Forest Service Pacific Northwest Region.

Adoption of Alternative P as the LMP would directly and significantly harm objectors and their members, who stand to be directly and significantly affected by the actions authorized and implemented under the Colville Forest Plan. Such actions would adversely impact and harm the natural qualities of the Colville National Forest, and would further degrade the watersheds and wildlife habitat. Individuals and members use the Colville National Forest for quiet recreation, enjoyment of the natural world, and other forest related activities.

Selection of Forest Plan Alternative P would not be in accordance with the legal requirements of the National Environmental Policy Act (NEPA), 42 U.S.C. 4321 et seq., and its implementing regulations, the National Forest Management Act (NFMA) 16 U.S.C. 1600 et seq., and its implementing regulations, the Administrative Procedures Act, 5 U.S.C. Sec. 706, and its implementing regulations, the Multiple-Use Sustained Yield Act and its implementing regulations, the Forest and Rangeland Renewable Resources Planning Act of 1974 and its implementing regulations, the Clean Water Act, and its implementing regulations, state water quality regulations, and the Endangered Species Act (ESA) and its implementing regulations.

Within this objection, we incorporate our previous comments on the Draft Colville National Forest Proposed Revised Land and Resource Management Plan (DFP) and its accompanying Draft Environmental Impact Statement (DEIS), dated July 5, 2016. This is especially necessary and appropriate because of Forest Service (FS) failure to provide adequate responses to our July 5, 2016 comments, as we discuss below.

The LMP/Alternative P will leave our children with an unaffordable and bloated road network that cannot be adequately maintained, will continue to spread noxious weeds throughout the Forest, displace wildlife from essential habitats, and degrade water quality and aquatic habitats through disruption of watershed function. The LMP overemphasis on "active management" will fleece taxpayers to line the pockets of the extractive industries through make-work projects that cause great harm to the environment and the public's opportunities to enjoy it.

FAILURE OF FOREST PLAN DIRECTION

We raised this issue in our July 5, 2016 comments at pp. 1-3.

The language found in "Consistency with the Plan Components" (Appendix A) results in very weak LMP direction. Generally, Plan Components lack strong, binding direction that would compel managers to accomplish measurable outcomes in a specified timetable, and feature little restraint of management discretion and potential mis-prioritization.

To be consistent with a Desired Condition, a project needs to only vaguely "make progress toward" it or even "be neutral" in regards to such progress. It's also okay to make negative progress toward a Desired Condition in the short-term. Generally the FS defines "short-term" to be less than 20 years, meaning such negative effects can persist over the entire lifespan of the revised Forest Plan. It's also okay to make negative progress for the long-term if this is occurs—also vaguely—"in a negligible way." Clearly, Desired Conditions don't compel management action nor limit management. As the LMP states, "Congress allocates the Forest Service budgets on an annual basis, which may **or may not be sufficient to implement proposed annual activities or meet desired conditions**." (Emphasis added.)

So we have in the LMP FW-DC-WR-01. (Natural Disturbance Regime of Aquatic and Riparian Systems): "National Forest System lands contribute to the distribution, diversity, and resiliency of watershed and landscape-scale features, including natural disturbance regimes, of the aquatic, riparian, and wetland ecosystems to which plant and animal species, populations, and communities are adapted. Subbasin scale is used for Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning." The first sentence sounds like wishful thinking, and the second sentence in the context of a Desired Condition means it never has to be done. Same with FW-DC-WR-02, FW-DC-WR-03, FW-DC-WR-04, FW-DC-WR-05, FW-DC-WR-06, FW-DC-WR-07, FW-DC-WR-08, FW-DC-WR-09, FW-DC-WR-10, FW-DC-WR-11, FW-DC-WR-12, FW-DC-WR-13, and FW-DC-WR-14.

FW-DC-WR-17. (Roads in Key Watersheds) "Roads in key watersheds are not a risk to the function of soil and water resources. Roads do not disrupt hydrologic or aquatic habitat function or threatened and endangered species biological and behavioral attributes." As is the case here, LMP desired conditions are often just wishful thinking, because the LMP lacks any mandate to actually achieve these great conditions. Besides, it's impossible for roads to <u>not</u> risk function of soil and water resources.

Similarly, Objectives ("concise projections of measureable, time-specific intended outcomes") compel management action in a very limited manner. For the vast majority of Objectives, the time frame for achieving the outcome is 15 years—approximately the entire lifespan of the LMP. Furthermore, how progress toward Objectives would be measured is not specified, again too discretionary. In terms of management restraint, an authorized activity under the LMP must not "prevent the attainment of any applicable objectives." The meaning of "attainment" is highly subjective and discretionary, and could well be judged by the agency only at the end of this 15 years, rendering such limitations of no practical effect.

And even if the objective were to be accomplished, its lack of ambition is astounding, such as FW-OBJ-WR-06. (Key Watershed Road Treatments): "Reduce road-hydrologic connectivity and sediment delivery on roads through storm damage risk reduction treatments, full hydrologic decommissioning, and other accepted treatment measures on 116 miles of hydrologically connected road within 15 years of forest plan implementation." Accomplish a bit of all that over less than ten miles annually, and you accomplish your objective. With the chronic watershed and soil damage being caused by the thousands of miles of roads on the CNF, with the inability to afford annual maintenance on much of it, the list of roads on "deferred maintenance list—the agency's insincerity is glaring.

Standards set "constraints upon project and activity decision making." Unfortunately, as we discuss in other sections, the FS has not included much in the way of meaningful Standards, to the degree that protections for the various resources is not assured and ecological and economic sustainability is left hanging by the LMP.

LMP standard FW-STD-LG-02 is an example of vague, unenforceable language. "(A)dequate forage is available for deer and elk on summer and winter ranges" is fine, but what "adequate" means is anybody's guess.

The LMP's overall lack of meaningful Standards is counter to the regulations. Most LMP standards have no constraining value whatsoever. For example, FW-STD-AIR-01 (Air Quality) states, "Activities comply with the national standards set forth in the Clean Air Act, and any State and local requirements for air pollution control. Planned ignitions shall follow all Washington State smoke regulations to reduce the potential impacts of smoke." This is merely a re-statement of other laws and regulations, which the FS must adhere to regardless of inclusion of this "standard." Other LMP standards that fall in this category are FW-STD-VEG-03, FW-STD-VEG-04, FW-STD-VEG-05, FW-STD-VEG-06, FW-STD-VEG-07, FW-STD-VEG-08, FW-STD-VEG-09,

Since the other laws and regulations already constrain management, such "standards" are unnecessary. Merely re-stating other laws accomplishes nothing, except possibly to make it appear to the casual reader that the LMP contains meaningful standards.

A substantial number of the LMP standards are watered down or rendered unenforceable due to the inclusion of "Desired Condition" language perhaps with the intent to make the DCs they refer to as more nondiscretionary than they really are. The LMP fails, however. For example, FW-STD-WR-01 and MA-STD-RMA-09, MA-STD-RMA-10.

Many standards are written to be undistinguishable from guidelines because they basically "provide operational practices and procedures" as guidelines are defined. For example, FW-STD-WR-02 "All projects shall be implemented in accordance with best management practices…" See also FW-STD-WR-03, FW-STD-WR-03, FW-STD-WR-04, FW-STD-WR-05, FW-STD-IS-01, FW-STD-AS-01, Other standards contain language that include undefined terminology that leaves them highly discretionary or unenforceable, often because of loophole language. For only one example, FW-STD-WR-01.

And FW-GDL-VEG-03 (Large Tree Management)—which ought to be a clear, mandatory standard instead of a guideline, purports to protect large trees from logging, but all the loopholes make it ineffective and unenforceable:

- Trees need to be removed to meet, promote, or maintain desired conditions for structural stages (see FW-DC-VEG-03. Forest Structure).
- Trees need to be removed to control or limit the spread of insect infestation or disease.
- Trees need to be removed where strategically critical to reinforce, facilitate, or improve effectiveness of fuel reduction in wildland-urban interfaces.
- Trees need to be removed to promote special plant habitats (such as, but not limited to, aspen, cottonwood, whitebark pine).

The above exemptions could easily be applied to practically every acre proposed for logging, merely by adopting justifications found in every timber sale NEPA document over at least the past 20 years.

Other standards are basically statements of other policy that don't really direct managers any more—and certainly less than—that existing policy. For example, FW-STD-VEG-01. Wildland Fire:

> Protect human life as the single, overriding priority. Set priorities among protecting human communities and community infrastructure, other property and improvements, and natural and cultural resources based on the values to be protected, human health and safety, and the costs of protection. Once people have been committed to an incident, the highest value to be protected is human resources. After protection of human life, all other protection decisions are to be made based on values to be protected, human health and safety, and the costs of protection.

The above may be great policy, but including it as a standard in the LMP does nothing to increase safety above and beyond the job description and evaluation requirements of fire managers responsible for making decisions during fire events. There will be no NEPA documents that invoke FW-STD-VEG-01.

Guidelines "provide operational practices and procedures" and would theoretically set limitations on management actions. For the most part unfortunately, the LMP's Guidelines are worded as to be unenforceable, containing the word "should" rather than more definitive "shall." The word, "should", although according to the dictionary imparts duty and obligation, is not the Forest Service's preferred interpretation, as the FS has gotten a court to rule in Lands Council v. McNair:

> "We cannot conclude that (should) creates a mandatory rule that strictly limits… ." Rather, this Court explained, "[t]he section is cast in suggestive (i.e., "should" and "may") rather than mandatory (e.g., "must" or "only") terms…"

Furthermore, actions are allowed to deviate from the exact wording of a Guideline as long as they are "as effective in meeting the purpose of the guideline to contribute to the maintenance or attainment of the relevant **desired conditions and objectives**" (emphasis added). Since this defines "purpose" of an Objective in terms of consistency with the vague and discretionary Desired Conditions and Objectives, it can be seen why that allowance is a huge loophole. Also, the purpose of most guidelines is not stated or is vague or obscure.

LMP guideline FW-GDL-SCE-01 (Scenic Integrity Levels) has so many loopholes it's clear that scenery protection cannot be enforced. This is also evident with other Scenery plan components.

The LMP also states, "When deviation from a guideline does not meet the original intent, however, a plan amendment is required." Again, this "original intent" is usually vaguely stated at best.

FW-GDL-VEG-05 and FW-GDL-AS-06 are merely re-statements of the Roadless Conservation Area Rule (regulation), which the FS must adhere to regardless of inclusion in the LMP. Merely re-stating other regulations accomplishes nothing. Since the other regulations already constrain management, these guidelines are unnecessary.

There are guidelines which also merely state policy and accomplish nothing meaningful, or authorize some action(s) that no law or regulation otherwise prohibits it, such as FW-GDL-VEG-04. (Planned and Unplanned Ignitions) "Use of planned and management of unplanned ignitions may be authorized. Objectives and strategies for all unplanned ignitions shall be identified at the time of the fire."

Given the discretionary, vague language which constrains practically nothing, the "Focused Restoration" Management Area is not distinguishable from the "General Restoration" (in other words, Heavy Logging) Management Area. The "suitable uses" allowed are identical.

The last Plan Component is "Suitability of Areas." Actions are only allowed if the Forest Plan identifies them as "suitable" for the particular location. Unfortunately, in some cases the LMP fails to disclose any objective criteria by which the Forest Service has determined suitability as per NFMA and planning regulations. In some cases suitability determinations are quite logical or determined by other laws, for example commercial use firewood gathering is not allowed in Wilderness. In other cases these determinations seem arbitrary, for example temporary road construction in the Management Area (MA) Special Interest Areas and in the MA Backcountry (non-motorized) is deemed "suitable."

The FS's obscure and arbitrary methodology for determining the suitability of areas for certain types of management actions is quite troubling because, as noted by in the LMP, the determinations of suitability can "only be changed by a plan amendment."

Although Suitability is the Plan Component which seems to be most limiting of management activities, the LMP contains another huge loophole allowing unsuitable uses. All the decisionmaker has to do is to claim, no matter how arbitrarily: "The use is appropriate for that location's desired conditions and objectives." Again, see the above critiques of Desired Conditions and Objectives.

Although to the casual or unsuspecting reader the LMP might seem to be more limiting on commercial logging because of areas being classed as unsuitable, it writes the agency a big loophole. All the Forest Service needs to do is claim the commercial logging project is "not for the purpose of timber production"—wave the wand and declare, "timber harvest is a restoration tool." The public in general is not aware that 100% of the logging project NEPA documents for at least the past 15 years on the CNF have included Purpose and Need statements that state the logging is needed as a tool to "restore" something or for making the forest "more resilient" or make some similar justification. So, for Alternative R, old growth may seem to be conceptually emphasized ("an expanded late forest structure reserve network"). In reality the Forest Service would apply no different management philosophy for this alternative than it would with Selected Alternative P, since the FEIS presents no different Alternative R vegetation Desired Conditions, Standards, Objectives, or Guidelines and since Alternative R "retains a (timber) production oriented general forest."

In reality, as applied for this revision process "unsuitability for timber" is a meaningless concept.

The LMP also deviates from the regulations by only generally identifying "Suitability of Areas" for various "uses." So "Suitable uses" are designated in the LMP in tables for each of the Management Areas rather than there being the results of a process that examines specific areas of the Forest for suitability. The 1982 regulations define "Suitability: The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone."

So the Forest Service has ignored NFMA regulations requirements such as 36 CFR § 219.14 (Timber resource land suitability) which state:

> During the forest planning process, lands which are not suited for timber production shall be identified in accordance with the criteria in paragraphs (a) through (d) of this section.
> (a) During the analysis of the management situation, data on all National Forest System lands within the planning area shall be reviewed, and those lands within any one of the categories described in paragraphs (a) (1) through (4) of this section shall be identified as not suited for timber production--
>
> > (1) The land is not forest land as defined in § 219.3.
> > (2) Technology is not available to ensure timber production from the land without irreversible resource damage to soils productivity, or watershed conditions.
> > (3) There is not reasonable assurance that such lands can be adequately restocked as provided in § 219.27(c)(3).
> > (4) The land has been withdrawn from timber production by an Act of Congress, the Secretary of Agriculture or the Chief of the Forest Service.

The Forest Service has also ignored NFMA regulations requirements at 36 CFR § 219.20 (Grazing resource) which state:

> In forest planning, the suitability and Potential capability of National Forest System lands for producing forage for grazing animals and for providing habitat for management indicator

> species shall be determined as provided in paragraphs (a) and (b) of this section. Lands so identified shall be managed in accordance with direction established in forest plans.
> (a) Lands suitable for grazing and browsing shall be identified and their condition and trend shall be determined. The Present and potential supply of forage for livestock, wild and free-roaming horses and burros, and the capability of these lands to produce suitable food and cover for selected wildlife species shall be estimated. The use of forage by grazing and browsing animals will be estimated. Lands in less than satisfactory condition shall be identified and appropriate action planned for their restoration.
> (b) Alternative range management prescriptions shall consider grazing systems and the facilities necessary to implement them; land treatment and vegetation manipulation practices; and evaluation of pest problems; possible conflict or beneficial interactions among livestock, wild free-roaming horses and burros and wild animal populations, and methods of regulating these; direction for rehabilitation of ranges in unsatisfactory condition; and comparative cost efficiency of the prescriptions.

The Forest Service also ignored NFMA regulations requirements at 36 CFR § 219.21 under "Recreation resource" which states, "Forest planning shall identify…The physical and biological characteristics that make land suitable for recreation opportunities."

Because of the weak direction of Plan Components, the differences between the LMP's revision alternatives are merely superficial, which is in violation of NEPA. Management actions would instead be directed by the political whims reflected in Congressional budget allocations, by local politicians, and by other entities with vested financial interests. Citizens whose legitimate public interests contrast with those of the political and financially vested would have little recourse, except for the courts. Land managers and members of project interdisciplinary teams, who would by far hold the most sway against political and financial interests during Forest Plan design and implementation have, unfortunately, little career incentive to intervene on behalf of other values, and much incentive to go along with resource extraction.

It is clear that the various management emphases of the FEIS alternatives would lead to the very same management outcomes. The Forest Service is closed-minded to other scientific perspectives and applications of logic and reason, such as with our proposed Alternative C. The result of implementation of Alternative P would be more unsustainable human activities.

The LMP defines "Other Content" (material that is not a plan component) as follows:

> This plan also includes material that is not a plan component. This information is background and typically clarifies limits of authority, definitions, management guidance, application of management guidance, and applicability of analysis. Projects and activities are not expected to be consistent with this background material. Changes to this material do not require a Forest Plan amendment. Other content that is not considered plan direction includes roles and contributions, management challenges, possible management actions, strategies and monitoring.
>
> All maps and photos within the Plan are for reference unless otherwise noted as a plan component.

As a result, the meaningfulness of some plan language which seems to set management direction is rendered ambiguous and vague. For example, "The prioritization of fuels treatments within WUI **will follow** the National Fire Plan, the Healthy Forests Restoration Act-PL108-148, and individual community wildfire protection plans. Individual fuels reduction projects and their relationships to WUI **are defined on a project basis**" (directive language emphasized). The LMP allows managers to completely ignore such non-plan component direction.

Another example is, "In 2010, the national forests throughout the United States were mandated to assess the current condition of NFS watersheds utilizing the Watershed Condition Framework (WCF). …Once essential projects in existing (priority) subwatersheds are completed, additional priority subwatersheds will be identified through the WCF process. … The responsible official will select Priority Watersheds through WCF based on an interdisciplinary analysis and evaluation. In addition, the responsible official will reach out to local, State, Tribal, other Federal agencies, and interest groups when identifying priority watersheds (FSH 1909.12, chapter 20, section 22.31). … The watershed analysis process is described in detail in the Colville Aquatic and Riparian Conservation Strategy (see FEIS, Appendix H). … watershed analyses shall be conducted or updated prior to: proposing changes to Riparian Management Area (RMA) widths, timber salvage or construction of facilities in RMAs, or construction of permanent system roads in RMAs." Whereas some of all of this might be sound management direction, because it's "other content" all of this is completely discretionary.

CLIMATE CHANGE AND CARBON SEQUESTRATION

We raised this issue in our July 5, 2016 comments at pp. 3-8.

The Committee of Scientists, 1999 recognize the importance of forests for their contribution to sustainability and contributing to global carbon cycles. And the 2011 draft NFMA regulations recognize that forests provide "Benefits… including… Regulating services, such as long term storage of carbon; climate regulation…"

The FS refused to consider scientific research and opinion that recognizes the critical challenge posed by climate change to global ecosystems and these national forests. Some politicians, bureaucrats, and industry profiteers pretend there's nothing to do about climate change because it isn't real. The FS acknowledges it's real, pretends it can do nothing, provides but a limited focus on its symptoms and—like those politicians and profiteers—ignores and distracts from the causes of climate change they enable.

The bias found in the "scientific" discussions presented in the FEIS concerning climate change is far more troubling than the document's bias on other topics, because consequences of unchecked climate change would be disastrous for food production, water supplies, and thus would lead to complete turmoil for all human societies. This is an issue as serious a nuclear annihilation (although at least with the latter we're not already pressing the button).

It is clear that the management of the planet's forest is a nexus for addressing this huge crisis of our times. Yet the FEIS fails to even disclose the amount of carbon dioxide (CO_2) emissions created by Forest Plan implementation, or consider the best available science on the topic. This is immensely unethical.

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.

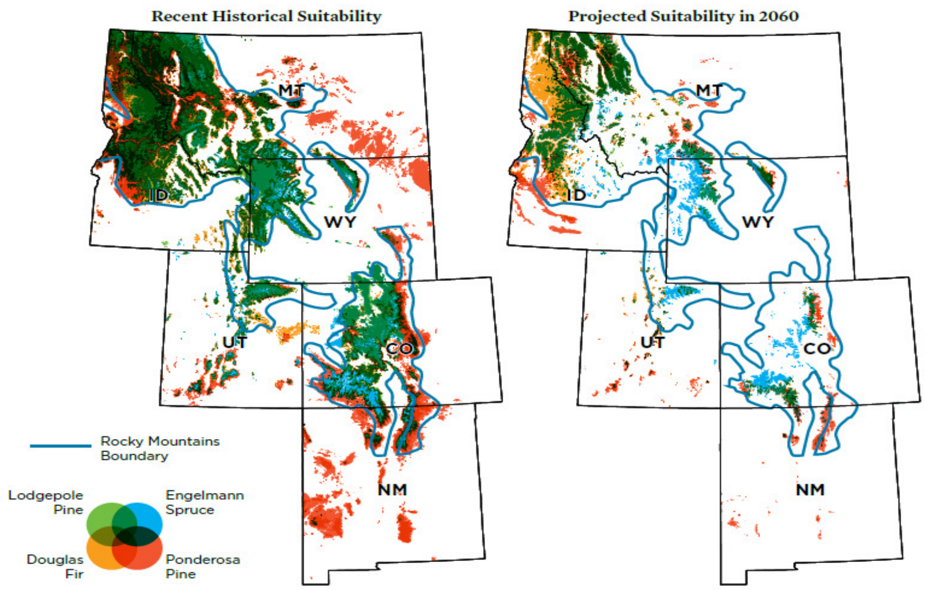
Former US Forest Service Chief Abigail Kimbell and Hutch Brown (in USDA Forest Service, 2017b) discuss some effects of climate change on forests:

> Even if global greenhouse gas buildups were reversed today, global temperatures would continue to rise for the next hundred years, bringing regional warming, changes in precipitation, weather extremes, severe drought, earlier snowmelt, rising sea levels, changes in water supplies, and other effects. As it is, global greenhouse emissions are still rising, exacerbating all of these long-term effects. The capacity of many plant and animal species to migrate or adapt will likely be exceeded. Ecosystem processes, water availability, species assemblages, and the structure of plant and animal communities and their interactions will change. 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.

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 Forest Plan and its FEIS have no scientific basis for claims or assumptions 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 contemplated under forest plan implementation.

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.

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."

DellaSala and Koopman, 2015 conclude:

> Wildfire is not increasing compared to historic periods – Wildfires, including very large ones, for the most part, are not increasing in western forests based on published accounts that use historical baselines. Recent increases (past few decades) in acres burned in places (e.g., Sierra Mountains) are ostensibly due to a climate signal but even those have less fire today compared to historical times when fire was much more prevalent.
>
> Large fires are driven more by climate than fuels – Large fires are mainly controlled by extreme weather events, and extreme events are likely to increase as the climate changes.
>
> Most carbon is stored, not emitted, during fires – Large fires are not currently big emitters of carbon dioxide given that fine fuels, not large trees, are combusted and most carbon remains stored in dead trees on site with sequestration rapidly following re-vegetation post-fire.
>
> Maturing natural forests are not accumulating more fuels – As the time between fires increases in mixed-severity fire systems, this is not necessarily associated with higher fire risk presumably due to shading of combustible understory plants as forests mature. Tree plantations accumulate unnaturally high fuel loads and are the biggest fire risk.

Thinned areas and fire outbreaks are unlikely to overlap – Because fires in any single location are extremely rare, the chance of thinned areas, even over large landscapes, encountering fire within the timeframe that thinning is most effective is very low. Thinning over large landscapes is a net emitter of carbon dioxide. To reduce emissions, thinning should be limited to small trees, areas nearest homes, and plantations.

Biomass is "renewable" only over long time frames while drastic greenhouse gas emissions cuts are needed over shorter time frames – There is a mismatch between the deep and immediate cuts that are needed to prevent catastrophic climate change and the emissions trajectory associated with using biomass for energy production, which immediately releases energy production, which immediately releases decades to centuries of carbon stored in forests to the atmosphere and requires many decades of regrowth to sequester that carbon again.

Biomass can produce higher CO2 emissions than coal – The amount of carbon dioxide released from woody biomass combustion per unit of energy produced is comparable to coal and much larger than oil and natural gas.

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 in the U.S. Northern Rockies 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.)

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.”

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.

In a literature review, Simons (2008) states, "Restoration efforts aimed at the maintenance of historic ecosystem structures of the pre-settlement era would most likely reduce the resilient characteristics of ecosystems facing climate change (Millar and Woolfenden, 1999)." The analysis areas have been fundamentally changed, so the agency must consider how much native forest it has fundamentally altered compared to historic conditions before prescribing "treatments". And that includes considering the effects of human-induced climate change. Essentially, this means considering new scientific information on all kinds of changes away from historic conditions.

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."[1]

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.

[1] The CNF revision DEIS contains no definition of carbon sequestration.

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 FS has not taken a "hard look" at how the Forest Plan would be in accord with the agency's 2010 National Roadmap for Responding to Climate Change, which includes guidance to:

a. Assess vulnerability of species and ecosystems to climate change
b. Restore resilience
c. Promote carbon sequestration
d. Connect habitats, restore important corridors for fish and wildlife, decrease fragmentation and remove impediments to species migration.

The National Fish, Wildlife and Plants Climate Adaptation Strategy (https://www.wildlifeadaptationstrategy.gov/) describes climate change effects and emphasizes conservation of habitats and reduction of non-climate stressors to help fish and wildlife adapt.

The FEIS fails to provide comprehensive estimates of the total amount of carbon dioxide (CO_2) or other greenhouse gas emissions caused by Forest Service management actions and policies—forestwide, regionally, or nationally. Instead, the FEIS makes selective use of science to suggest its agency actions and policies would be net neutral or would even help carbon sequestration, flying in the face of science and common sense. The agency policymakers seem comfortable maintaining a position that they need not take any leadership on this issue, and obfuscate via this FEIS to justify their failure of leadership.

The FEIS suggests the CNF is a net carbon sink (although as recently as the 1990s the same modeling indicates the Forest was a net source). However, the Forest Service fails to properly analyze and disclose how particular management actions cause trends in one direction or another. So for example, the FEIS fails to present any modeling of forest stands under different management scenarios. The best scientific information strongly suggests that management that involves removal of trees and other biomass is a source of atmospheric CO_2—unsurprisingly the FEIS doesn't state that simple fact. If the Forest Service really believes its carbon modeling can provide meaningful information, it should model the carbon flux over time for all of its proposed stand management scenarios for each of the forest types found on the CNF.

The FEIS also ignores CO_2 and other greenhouse gas emissions from several 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 most emissions associated with livestock grazing. The FEIS does not list these under incomplete or unavailable information, so the Forest Service is simply ignoring the impacts of these management and other authorized activities.

Such greenhouse gas sources can be quantified. Kassar and Spitler (2008) for example, 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.

The FEIS also ignores the cumulative CO_2 emissions from forest management on other ownerships in the region or beyond. Since (as the DEIS reveals) "Harvested Wood Products" are a net source of CO_2 emissions on national forests in the Pacific Northwest Region, and given the less regulated logging on non-federal ownerships, clearly timber management continues to be a net source of CO_2. Omitting such a cumulative effects analysis allows the agency to avoid describing the opportunity found on national forests to counterbalance some CO_2 emissions from other forest ownerships, resulting in a range of alternatives where none really address climate change. This is a violation of NEPA, as well as the public trust.

The FEIS misleads the public, distracting from the emerging scientific consensus that removing wood or **any** biomass from the forest only makes the problem worse. The science on climate change supports the idea that forest policies must shift away from logging if carbon sequestration is genuinely an emphasis.

Mackey, et al 2013 "clarify some well-established fundamentals of the global carbon cycle that are frequently either misunderstood, or seemingly overlooked." They 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 <u>do not</u> attribute this potential to "increasing forest resilience to disturbance" or the kind of forest "restoration" implied by the Forest Plan or this FEIS.

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.

- 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.

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.

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. The authors state:

> 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.) That leads to the following scientific discussion of the effect of "**land-management practices"** (ignored in the FEIS) because the latter are contributing to increased atmospheric CO_2 and thus climate change. Van der Werf, et al. 2009 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 that need to be avoided. He also reviews and assesses some of the more common proposals as well as his general scientific concerns about the forest system as a place to store carbon.

Hanson, 2010 addresses the FEIS false notion that wildland fires should be suppressed for carbon storage:

> 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.

How can our national forest be considered “suitable” for activities that contribute to—rather than reduce—the greatest threat to the Earth’s biosphere? The present level of carbon dioxide (CO_2) in Earth’s atmosphere is already dangerous and not sustainable under any definition of the word.

A landmark report from the United Nations’ scientific panel on climate change paints a far direr picture of the immediate consequences of climate change than previously thought and says that avoiding the damage requires transforming the world economy at a speed and scale that has "no documented historic precedent."

The report, issued October 8, 2018 by the Intergovernmental Panel on Climate Change, a group of scientists convened by the United Nations to guide world leaders, describes a world of worsening food shortages and wildfires, and a mass die-off of coral reefs as soon as 2040—a period well within the lifetime of much of the global population.

The report "is quite a shock, and quite concerning," said Bill Hare, an author of previous I.P.C.C. reports and a physicist with Climate Analytics, a nonprofit organization. "We were not aware of this just a few years ago." The report was the first to be commissioned by world leaders under the Paris agreement, the 2015 pact by nations to fight global warming.

The authors found that if greenhouse gas emissions continue at the current rate, the atmosphere will warm up by as much as 2.7 degrees Fahrenheit (1.5 degrees Celsius) above preindustrial levels by 2040, inundating coastlines and intensifying droughts and poverty. Previous work had focused on estimating the damage if average temperatures were to rise by a larger number, 3.6 degrees Fahrenheit (2 degrees Celsius), because that was the threshold scientists previously considered for the most severe effects of climate change.

The new report, however, shows that many of those effects will come much sooner, at the 2.7-degree mark.

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.

Like all forests, the CNF 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 Forest Service must take a leadership role to maintain and increase carbon storage on publicly owned forests, in order to help mitigate climate change effects.

Global climate change is caused by the cumulative buildup of greenhouse gases, including CO_2, in the atmosphere. Logging only adds to the cumulative total carbon emissions so it must be minimized. Logging will not only transfer carbon from storage to the atmosphere but future regrowth cannot 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 the National Environmental Policy Act (NEPA), the National Forest Management Act (NFMA) and the Endangered Species Act (ESA) (e.g., 40 CFR § 1502.16; 16 USC §1604(g); 36 CFR §219.12; ESA Section 7; 50 CFR §§402.9, 402.14). All net carbon emissions from management activities represent "irretrievable and irreversible commitments of resources."

Respected experts say that the atmosphere might be able to safely hold 350 ppm of CO_2.[2] 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 greenhouse gas (GHG) emissions. Well, now that cushion is completely gone. We are already at about 400 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

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

additional emissions that our earth systems can tolerate. In fact, we need to be removing carbon, not adding carbon to the atmosphere.[3] How could we do that? By growing forests. Logging moves us away from our objective while conservation moves us toward our objective.

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.

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 CO_2 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. (Also 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.)

Moomaw and Smith, 2017 state:

> Multiple studies warn that carbon emissions from soil due to logging are significant, yet under-reported. One study found that logging or clear-cutting a forest can cause carbon emissions from soil disturbance for up to fifty years. Ongoing research by an N.C. State University scientist studying soil emissions from logging on Weyerhaeuser land in North Carolina suggests that "logging, whether for biofuels or lumber, is eating away at the carbon stored beneath the forest floor."

[3] "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

Moomaw and Smith, 2017 examined the scientific evidence implicating forest biomass removal as contributing to climate change:

> All plant material releases slightly more carbon per unit of heat produced than coal. Because plants produce heat at a lower temperature than coal, wood used to produce electricity produces up to 50 percent more carbon than coal per unit of electricity.
>
> Trees are harvested, dried, and transported using fossil fuels. These emissions add about 20 percent or more to the carbon dioxide emissions associated with combustion.

Harmon and Law (2016) wrote the following in a letter to members of the U.S. Senate in response to a bill introduced that would essentially designate the burning of trees as carbon neutral:

> The [carbon neutrality] bills' assumption that emissions do not increase atmospheric concentrations when forest carbon stocks are stable or increasing is clearly not true scientifically. It ignores the cause and effect basis of modern science. Even if forest carbon stocks are increasing, the use of forest biomass energy can reduce the rate at which forest carbon is increasing. Conservation of mass, a law of physics, means that atmospheric carbon would have to become higher as a result of this action than would have occurred otherwise. One cannot legislate that the laws of physics cease to exist, as this legislation suggests.

Nitrous oxide, a by-product generated by the microbial breakdown of nitrogen in livestock manure, is a potent greenhouse gas completely ignored by the FEIS. Also, the digestion of organic materials by livestock is a large source of methane emission—another GHG not even mentioned in the FEIS. Methane is a far more potent substance than CO_2 causing climate change.

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 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 GHG 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.

Moomaw and Smith, 2017 conclude:

> With the serious adverse consequences of a changing climate already occurring, it is important to broaden our view of sustainable forestry to see forests …as complex ecosystems that provide valuable, multiple life-supporting services like clean water, air, flood control, and carbon storage. We have ample policy mechanisms, resources, and funding to support conservation and protection if we prioritize correctly.
>
> …We must commit to a profound transformation, rebuilding forested landscapes that sequester carbon in long-lived trees and permanent soils. Forests that protect the climate also allow a multitude of species to thrive, manage water quality and quantity and protect our most vulnerable communities from the harshest effects of a changing climate.
>
> Protecting and expanding forests is not an "offset" for fossil fuel emissions. To avoid serious climate disruption, it is essential that we simultaneously reduce emissions of carbon dioxide from burning fossil fuels and bioenergy along with other heat trapping gases and accelerate the removal of carbon dioxide from the atmosphere by protecting and expanding forests. It is not one or the other. It is both!
>
> Achieving the scale of forest protection and restoration needed over the coming decades may be a challenging concept to embrace politically; however, forests are the only option that can operate at the necessary scale and within the necessary time frame to keep the world from going over the climate precipice. Unlike the fossil fuel companies, whose industry must be replaced, the wood products industry will still have an important role to play in providing the wood products that we need while working together to keep more forests standing for their climate, water, storm protection, and biodiversity benefits.
>
> It may be asking a lot to "rethink the forest economy" and to "invest in forest stewardship," but tabulating the multiple benefits of doing so will demonstrate that often a forest is worth much more standing than logged. Instead of subsidizing the logging of forests for lumber, paper and fuel, society should pay for the multiple benefits of standing forests. It is time to value U.S. forests differently in the twenty-first century. We have a long way to go, but there is not a lot of time to get there.

THE FOREST PLAN AND FEIS FAIL TO ADDRESS THE ROOT CAUSE OF MOST OF THE ONGOING ECOLOGICAL DAMAGE ON THE FOREST—ROADS.

We raised this issue in our July 5, 2016 comments at pp. 8-13, 24, 29, and 43.

The FEIS admits that the Forest Service "can no longer afford to properly maintain the road system at current operational maintenance levels." Unfortunately, the FEIS barely touches on the huge ecological liability of this excessive forest road network. Forest Service scientists Gucinski et al. (2001) identify many of the highly adverse impacts of forest roads. Concerning road density impacts on fish populations, they note:

> (I)ncreasing road densities and their attendant effects are associated with declines in the status of four non-anadromous salmonid species. These species are less likely to use highly roaded areas for spawning and rearing and, if found, are less likely to have strong populations. This consistent pattern is based on empirical analysis of 3,327 combinations of known species' status and subwatershed conditions, limited primarily to forested lands administered by the Forest Service and the Bureau of Land Management.

The FEIS doesn't explain how the FS proposes to afford maintaining the road system in the Colville NF when the funding doesn't exist, nor adequately analyze and disclose the impacts because as a result, watershed conditions will continue to deteriorate from naturally increasing erosion of roads. In other words, the FEIS fails to consider the long-term budget shortfalls for road maintenance in the Forest, and doesn't analyze or disclose the ecological impacts of this ongoing situation.

The general lack of funding to maintain roads enables continuing erosion and sediments which damage instream aquatic habitat features. Many impacts are because so many existing forest roads were built prior to the accumulation of empirical and scientific evidence revealing the old road designs were ecological liabilities. Undersized or undermaintained culverts are an example, which tend to blow out during flooding events which turn out to be not that unusual. Culverts have also been placed in a manner—or eroded to the point where—fish passage is blocked in one or both directions. Forest Service hydrologist Johnson (1995) identifies other significant hydrological liabilities of old forest roads.

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 roadless 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).

A plethora of scientific information indicate the highly significant nature of departures from historic conditions that are the impacts on forest ecosystems caused by motorized travel routes and infrastructure. From the Wisdom et al. (2000) Abstract:

> Our assessment was designed to provide technical support for the ICBEMP and was done in five steps. … Third, we summarized the effects of roads and road-associated factors on populations and habitats for each of the 91 species and described the results in relation to **broad-scale patterns of road density.** Fourth, we mapped classes of the current abundance of source habitats for four species of terrestrial carnivores in relation to **classes of road density** across the 164 subbasins and used the maps to identify areas having high potential to support persistent populations. And fifth, we used our results, along with results from other studies, to describe broad-scale implications for managing habitats deemed to have undergone long-term decline and for managing species negatively affected by **roads or road-associated factors**. (Emphases added.)

Carnefix and Frissell, 2009 state:

> 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.** (Emphases added.)

Likewise, Wisdom, et al. (2000) state:

> Our analysis also indicated that >70 percent of the 91 species are affected negatively by one or more factors associated with roads. Moreover, maps of the abundance of source habitats in relation to classes of road density suggested that road-associated factors hypothetically may reduce the potential to support persistent populations of terrestrial carnivores in many subbasins. Management implications of our summarized road effects include the potential to mitigate a diverse set of negative factors associated with roads.

The FEIS discloses that "Road densities in riparian areas are higher than general road densities." Obviously, the Forest Service could address much of the ecological issues on the CNF by significantly reducing the road system, starting in riparian areas. Instead of demonstrating leadership on this issue, however, the LMP includes no direction whatsoever mandating a reduced road network, and little direction to stop its growth. And none of the alternatives address this highly significant environmental issue either, in violation of NEPA. The DEIS admits, "The local population's MIS/focal species status is rated functioning at risk or not properly functioning in most subwatersheds" on the CNF. Also, "in no subbasin, for any MIS/focal species, is there support for the conclusion the populations are currently viable."

So where's the direction to improve the situation? The only nondiscretionary road density standard in the DFP was FW-STD-WR-03, which states, "There shall be no net increase at any time in the mileage of National Forest System roads in any key watershed." Yet that didn't limit the increase in road density due to temporary roads, which are allowed to persist on the landscape indefinitely. FW-STD-WR-03 was watered down even further in the LMP with FW-STD-WR-06 which states, "In Key Watersheds and in subwatersheds with ESA critical habitat for aquatic species that are functioning properly with respect to roads, there will be no net increase (at least one mile of road-related risk reduction for every new mile of road construction) in system roads that affect hydrologic function."[4] Whereas this standard addresses somewhat the growth of the excessive road network in key watersheds, it fails to reduce it. What the LMP has instead is highly discretionary direction found in Desired Conditions:

> MA-DC-GR-05. Road densities vary across the management area; however, there are no more than 2 miles of National Forest System road per square mile within the General Restoration Management Area within each subwatershed.
>
> MA-DC-FR-05. Road densities vary across the management area; however, there are no more than 1 mile of National Forest System road per square mile within the Focused Restoration Management Area within each subwatershed.
> Others?

The Forest Service's 2001 Roadless Area Conservation Rule FEIS states: "The use of temporary roads may have the same long lasting and significant ecological effects as permanent roads, such as the introduction of nonnative vegetation and degradation of stream channels." Practically all vegetation management projects nowadays include utilization of "temporary" roads, yet even though temporary roads would allegedly be decommissioned after the logging is completed, there is a likelihood that the FS would later construct another "temporary" road on these same sites for the next round of "treatments." The Forest Plan lacks is a programmatic limitation on the use of temporary roads, so their long-term effects can be quantified.

It is concerning that, as the DEIS states, "Since road density desired conditions do not consider closed ML 1 roads, they do not adequately address the potential impacts of the road system on hydrologic and aquatic function and habitat."

How this plays out with LMP implementation with projects will be a lot of excuses why the FS cannot significantly "make progress toward" those DCs or respond to the ecological liabilities of

[4] Nor is there an objective definition of "system roads that affect hydrologic function."

its excessive road network. Case in point: the CNF's June 2016 Environmental Assessment for the North Fork Mill Creek timber sale. It stated:

> Many …comments concerned the extent of roads and their effects on water quality, as well as the construction and decommissioning of roads. Roads were a concern with regard to erosion, sediment delivery to streams, and other hydrologic-process related issues including the effects from peak flows, mass wasting (e.g., landslides), the need for or lack of maintenance, adjacency to streams, problem water crossings, and locating roads on unstable slopes.
>
> Concerns regarding decommissioning of roads reflected a desire to maintain access to National Forest System lands for forest management, dispersed recreation, grazing allotment management, public safety, and future management of the forest. Public safety concerns were expressed that fire suppression would not be possible if the roads are decommissioned and that access should be maintained for public safety reasons, including but not limited to fire suppression and search and rescue needs.
>
> The interdisciplinary team responded to this concern, along with findings of road planning, to **remove the proposed decommissioning of closed National Forest System roads from the proposed action.** (Emphasis added.)

Whereas the Forest Service had wide discretion to decommission roads in that project area (including those in the project area recommended for removal in the 2014 Forestwide Travel Analysis Report), the agency instead bowed to political pressure and the decision resulted in no net reduction in system roads.

There was reason to be hopeful when, to address its unsustainable and deteriorating road system, the Forest Service promulgated Travel Management Regulations (TMR) at 36 CFR § 212. At CFR § 212.5, Subpart A of the TMR states:

> (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 "science-based roads analysis" required under Subpart A of the TMR is generally referred to as the "travel analysis process" or TAP. The Forest Service 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 their 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

Then in June 2014 the CNF releases its Forest-wide Travel Analysis Report (TAR). It states, "Travel analysis process results will assist the Colville National Forest in addressing issues related to roads. It will be used to inform future analyses, decisions, and specific actions." Unfortunately, the CNF did not properly engage the public during its TAP, the resulting forestwide TAR was not science based, did not arrive at an affordable and ecologically sustainable minimum road system, and basically sanctioned the status quo in terms of roads. The Forest Service has not carried forth anything from the TAR into forest plan revision—its analysis was not at all informed by the CNF's forestwide TAR. This forest plan revision process failed to do the job.

The FEIS states, "As part of the process in determining what an appropriate road system might look like on the Colville National Forest, the Forest developed a Travel Analysis Report pursuant to Subpart A of the 2005 Travel Management Rule." Regarding Subpart A, under "The Roads Policy" the FEIS also states:

> In January 2009, new directives (Forest Service Manual (FSM) 7700 and Forest Service Handbook (FSH) 7709) regarding travel management were put into effect to make them consistent with and to facilitate implementation of the agency's travel management rule. This direction gives managers a scientific analysis process to inform their decision-making. It directs the agency to maintain a safe, environmentally sound road network that is responsive to public needs and affordable to manage, but that calls for unneeded roads to be considered for decommissioning or conversion to other uses, such as trails.

> These final directives consolidate direction for travel planning for both NFS roads and NFS trails in FSM 7710 and FSH 7709.55. The final directives rename roads analysis "travel analysis" and streamline some of its procedural requirements. In addition, for purposes of designating roads, trails, and areas for motor vehicle use, the final directives expand the scope of travel analysis to encompass trails and areas being considered for designation.

The FEIS states, "Decisions on road decommissioning would be made at the project level based on information provided by resource specialists and recommendations contained in the Forest's most recent Travel Analysis Report pursuant to subpart A of the 2005 Travel Management Rule." Yet as mentioned above, a recent project analysis demonstrate the Forest Service's refusal to be guided by its forestwide TAR.

The FEIS doesn't disclose if the Forests are being managed in compliance with the Travel Management Regulations at 36 CFR § 212 Subpart A. It's clear the FS fails to take seriously its responsibilities under Subpart A because the Forest Plan contains no Plan Components that require a significant reduction in the forest road system or identification and implementation of the Minimum Road System, and takes no explicit direction from the Travel Management Regulations.

The FEIS indicates, based on expected budget trends, "Roadwork on the Forest will average 20 miles per year of reconstruction, construction or decommissioning over the life of the plan."

It's clear the Forest Service fails to take seriously its responsibilities under the Travel Management Regulations at 36 CFR § 2125, Subpart A, because as stated above, the LMP contains no Plan Components that require a significant reduction in the forest road system or identification and implementation of the Minimum Road System, and takes no explicit direction from the Travel Management Regulations at 36 CFR § 2125, Subpart A. The FEIS and LMP violate the Travel Management Regulations.

The science on roads is clear. From U.S. government Interior Columbia Basin studies, Wisdom, et al. (2000) state:

> 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 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. (Emphases added.)

So under the LMP, the road system will continue to deteriorate because its extent would continue to be unaffordable. The FEIS fails to analyze or disclose the extent of the impacts from that ongoing situation. The FEIS also fails to present an economics analysis that considers the direct, indirect, and cumulative costs of roads.

The LMP and FEIS do not consider or incorporate best available science in the formulation of alternatives and disclosure of impacts, in violation of NEPA and NFMA.

REVISED FOREST PLAN FAILS TO ASSURE ABUNDANT POPULATIONS OF NATIVE FISH AND WILDLIFE, AND CANNOT EVEN COMMIT TO MAINTAINING MINIMUM VIABLE POPULATIONS.

We raised this issue in our July 5, 2016 comments at pp. 13-17.

How logical and reasonable it would be to take at-risk species or species highly dependent upon components of the ecosystem that have been depleted by past logging or are otherwise known to be harmed by the management regime, create a spatial and temporal description of how the landscapes at various nested levels would look to assure those species' abundance and distribution (based on best available biological science), and then design a Forest Plan to achieve those conditions (or at least allow natural processes to restore them). Instead, we have hundreds of pages of documents designed to obfuscate from accomplishing anything resembling that task.

The LMP relies upon achieving its Vegetation direction as a surrogate for restoring wildlife habitat. As the FEIS states:

> Coarse filter conservation focuses on assuring adequate representation of ecosystem diversity, and is generally accomplished by comparing the current condition of landscape structure and composition to a set of reference conditions. Management direction then addresses the landscape components that have departed from reference conditions to assure adequate representation across the plan area. A fine-filter approach may be needed if the coarse-filter does not adequately provide ecosystem conditions needed to maintain populations

In subsequent sections of this objection we discuss the inadequacy of the FEIS's analyses for "landscape structure and composition" and above we discussed the failure of Plan Components to adequately serve as the "fine filter."

The FEIS fails to acknowledge the controversy of the coarse filter approach. Years ago, as the FS began a process of revising NFMA regulations, the agency commissioned the Committee of Scientists. The Committee of Scientists (1999), take issue with a management focus that emphasizes manipulation of habitat as the primary management methodology for insuring wildlife viability, "…in recognition that focusing only on composition, structure, and processes may miss some components of biological diversity."

The FEIS provides inadequate scientific basis for demonstrating the coarse filter approach using vegetative plan direction would "provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the plan area" as conceptualized by the Forest Service in its 2012 Planning Rule.

As is discussed in other sections of this objection, LMP fine-filter components (desired conditions, objectives, standards, and guidelines) are too minimal and would fail to protect biological diversity and species viability.

Noon, et al. 2003 indicate there is insufficient scientific support for the LMP approach: "Reliance on such 'coarse-filter' assessment techniques is problematic because there tends to be poor concordance between species distributions predicted by vegetation models and observations from species surveys."

Noon, et al. 2003 recommend implementing a fine filter approach with the coarse filter approach:

> Many rare and declining species are limited primarily by the availability of suitable habitat (Wilcove et al. 1998), and the viability of such species depends to a great extent on how much of their habitat is conserved. Population viability analysis (PVA) is an in-depth method of fine-filter assessment used to evaluate habitat loss or similar risk factors for specific species (Boyce 2002, Shaffer et al. 2002).
>
> An assessment approach that includes both coarse and fine filters and PVA was recommended by the Committee of Scientists to the US Forest Service and incorporated into the 2000 NFMA regulations (COS 1999). In addition to rare and at-risk species, the committee recommended that two groups of species be evaluated using fine filters—those that provide comprehensive information on the state of a given ecosystem (indicator species) and those that play significant functional roles in ecosystems (focal species). The latter category includes species that contribute disproportionately to the transfer of matter and energy (e.g., keystone species), structure the environment and create opportunities for additional species (e.g., ecological engineers), or exercise control over competitive dominants, thereby promoting increased biotic diversity (e.g., strong interactors). Thus, fine-filter assessments might be needed for 10 to 50 of the 200 to 1100 species typically evaluated in regional planning efforts carried out by the Forest Service and may need to include select invertebrates as well as vertebrates and plants.
>
> Formal PVAs are needed only for species in decline or at high risk or for species with such functional significance that their loss might have unacceptable ecological effects. Many methods of viability assessment exist to accommodate diverse sources and amounts of data (Beissinger and Westphal 1998, Andelman et al. 2001). All methods explicitly or implicitly require some sort of model that relates population dynamics to environmental variables, including variables affected by management. The range of available methods offers a tradeoff between complexity of analysis and generality of results.
>
> Population viability analysis is neither inherently difficult nor expensive, but it does require thoughtful model choice and construction and good judgment in the implementation of analyses. Perhaps the most demanding aspect of building realistic PVA models for assessment of alternative management scenarios is acquisition of sufficient data to yield accurate and precise parameter estimates (Beissinger and Westphal 1998). These models then permit reliable assessments of alternative management scenarios (Noon and McKelvey 1996). The choice of models and data collection methods depends in part on the life history characteristics of the species to be assessed, the quality and quantity of existing data, the time and money available for additional data acquisition, and the resolution and extent of analysis (Beissinger and Westphal 1998, Andelman et al. 2001).

> An expert panel convened by the National Center for Ecological Analysis and Synthesis, at the request of the Forest Service, concluded that "viability assessment is an essential component of ongoing forest management and forest planning processes. A variety of methods can and should be incorporated into viability assessments" (Andelman et al. 2001, p. 136). A scientifically credible approach to management of a diversity of plant and animal communities in US national forests and national grasslands combines coarse-filter and fine-filter approaches to identify conservation targets, including the judicious use of PVA for focal species and species at risk. Scientifically valid and pragmatic management does not require that the status of all species be directly assessed. But failure to detect declining species and to address the putative threats to their persistence leaves only the prohibitive provisions of the Endangered Species Act to serve as a safety net.

However, the quality of what Noon et al. 2003 recommend far exceeds what the FS has done with the Colville LMP.

Also, Andelman et al. 2001 provide this caution concerning how the Colville NF uses historical information:

> (B)ecause existing landscapes typically differ from historical landscapes in many aspects, methods are needed to evaluate existing capabilities of the landscape to provide for species viability, and to project future probabilities that the landscape can continue to support the species.

This raises the issue of monitoring. The Committee of Scientists (1999) state:

> **Habitat alone cannot be use**d 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.** (Emphases added.)

The Plan Components provide a few token measures for protecting and restoring wildlife and fish habitat, however they fail to address important biological needs or recognize ecological relationships between key habitat components and the natural processes that create and maintain them.

Vegetative conditions simply cannot be used as a substitute or proxy for monitoring populations, as the Forest Service's own science clearly indicates. The complex and subtle interplay between animals and vegetative components, structure, pattern, and processes is not well-understood, Offering Plan Components for Vegetation as wildlife viability assurance is smoke and mirrors, assuring not viable populations of wildlife but perpetual manipulation of vegetation.

The DEIS states at pp. 165-166:

> Direction for management of species differs between the 2000/2005/2008 and 1982 planning rules in regards to viability and sustainability of species. Under the 2000, 2005, and 2008 Planning Rules, National Forests were required to assess "the contribution of National Forest System (NFS) lands to the sustainability of ecosystems and species" as opposed to "maintaining viable population of species." …Given that the 1982 planning rule is again in place, the objective of this evaluation (starting in 2010) was to refine the current

"ecological sustainability" model where appropriate to ensure the evaluation approach addresses "species viability" criteria of the 1982 planning, while meeting the intent of the 2012 planning rule.

The above is quite confusing. Since the forest plan revision process is using the 1982 planning rule, one might assume that the following direction, found in the FEIS, is still required:

> Under the 1982 planning rule, national forests were required to manage habitat in order to maintain viable populations of existing species in planning areas. The planning rule further defines a viable population as "one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area."

However, based on other analyses in the DEIS it appears that instead of accepting its duty to insure viability, the LMP and FEIS analyze things in terms of their "**contribution to**" the viability of species. This is reminiscent of LMP Desired Conditions, which never need be achieved. Apparently viable populations of wildlife need not to be reached during the life of the LMP.

Our comments on the DFP and DEIS on this subject were extensive, and included:

> The DEIS further dodges and weaves, identifying various categorizations of species. These include Management Indicator Species (MIS), focal species, sensitive species, species at risk, species of concern, surrogate species, and species of (management) interest. The DEIS says that there are scientific problems with the MIS and/or focal species approach, but for aquatic species, the DEIS uses it anyway. The DEIS fully rejects the MIS/focal species approach in favor of surrogate species for terrestrial wildlife. Again, the DEIS is confusing. The DEIS defines surrogate species using very technical terms that sound similar to the definition of MIS, and is ultimately unsuccessful in discriminating between the two concepts.
>
> There are overlaps between the above categories of species and also species listed under the Endangered Species Act. The overlap often just leads to more confusion or—perhaps it's about obfuscation. So whereas the CNF's June, 2011 Proposed Action for forest plan disclosed that the Pacific fisher has been extirpated from the Forest, this DEIS apparently replaces this "Sensitive" species with four other "surrogate species" (Pileated Woodpecker, American Marten, Northern Goshawk, Woodland Caribou—see Table 152). Since "it is not expected that the population dynamics of a surrogate species would necessarily represent the population dynamics of another species" (DEIS at 379) one might wonder how recovery of a species once found on the Forest—the fisher, now extirpated—can be achieved by managing its habitat as if it were a Pileated Woodpecker, American Marten, Northern Goshawk, or Woodland Caribou. Of course that explanation is not provided.
>
> It appears that, whereas for some categories of species such as Sensitive, of which there is concern about viability, when the dust settles on the revised forest plan those species' viability concerns will evaporate without scientific explanation.

> For aquatic species, "MIS/focal species local population condition was evaluated using data on fish distribution, population status and abundance, habitat and genetic connectivity, and impact of non-native species." DEIS at 180. The DEIS doesn't say why MIS/focal/surrogate terrestrial species' local population conditions were **not** "evaluated using data on …distribution, population status and abundance, habitat and genetic connectivity, and impact of non-native species." Is this because the data is incomplete and/or unavailable?

The Forest Service now explains it this way, in the FEIS:

> The Forest selected "surrogate species" to assess current aquatic species status and later to assess the potential effects of alternatives on species viability. There are many aquatic native and non-native species that inhabit streams and rivers on the Forest. It is not possible to analyze viability for all the aquatic species present in subbasins within Colville National Forest. The surrogate species serve as surrogates for other aquatic vertebrate and invertebrate species. The surrogate species also act as the management indicator species, so the selected species are referred to as MIS/surrogate species.

However, the term "MIS" or "management indicator species" <u>does not occur anywhere in the LMP</u>. Instead, the term "surrogate species" is used.

Also, the LMP states: "**Surrogate species** represent other species that share similar habitat and risk factors **and include Region 6 sensitive species, state-listed species, or other species for which the published literature has identified concerns for their viability**." (Emphases added.) Yet in perpetuating the confusion and obfuscation, LMP Table C-1 <u>separates</u> surrogate species from Region 6 sensitive species, "Management interest" species, and "Federal and WNHP State rank" species.

Furthermore, whereas the LMP contains multiple plan components for Sensitive plant species generally, <u>the LMP contains no Plan Components</u> for "Region 6 sensitive species, state-listed species, or other species for which the published literature has identified concerns for their viability" nor for "Management interest" species, or "Federal and WNHP State rank" species with a limited exception for the Sensitive bald eagle and peregrine falcon.

The Committee of Scientists (1999) states:

> Given the importance of monitoring for ecological sustainability, a critical step will be to broadly define ecological attributes to include any biotic or abiotic features of the environment that can be measured. The convention has been to refer to the measured attributes as "indicator variables" under the assumption that their values are indicative of the integrity of the larger ecosystem to which they belong. The Committee adopts this definition and extends it to include the concept of focal species. These are species that fulfill the indicator criterion and provide specific insights into the biological diversity of the ecological system at different scales.

The Committee of Scientists (1999) also suggests a pool of potential focal species:

The key characteristic of a focal species is that its status and time trend provide insights to the integrity of the larger ecological system. The term "focal" includes several existing categories of species used to assess ecological integrity:

1) Indicator species: species selected because their status is believed to (1) be indicative of the status of a larger functional group of species, (2) be reflective of the status of a key habitat type; or (3) act as an early warning of an anticipated stressor to ecological integrity. The presence of fish in a river is an indicator of water quality.
2) Keystone species: species whose effects on one or more critical ecological processes or on biological diversity are much greater than would be predicted from their abundance or biomass (e.g., the red-cockaded woodpecker creates cavities in living trees that provide shelter for 23 other species).
3) Ecological engineers: species who, by altering the habitat to their own needs, modify the availability of energy (food, water, or sunlight) and affect the fates and opportunities of other species (e.g., the beaver).
4) Umbrella species: species who, because of their large area requirements or use of multiple habitats encompass the habitat requirements of many other species (e.g., deer).
5) Link species: species that play critical roles in the transfer of matter and energy across trophic levels or provide a critical link for energy transfer in complex food webs. For example, prairie dogs in grassland ecosystems efficiently convert primary plant productivity into animal biomass. Prairie dog biomass, in turn, supports a diverse predator community.
6) Species of concern: species that may not satisfy the requirement of providing information to the larger ecosystem but because of public interest will also be monitored and assessed for viability. Such species include some threatened and endangered species, game species, sensitive species, and those that are vulnerable because they are rare.

Consistent with its narrow attention to process and function in SCC selection, the LMP fails to recognize the important keystone function of beaver. The FEIS recognizes:

> Beginning in the mid-1800s, fur trapping was one of the most widespread uses, resulting in significant declines in beaver populations. Beaver dams in small streams alter hydrology, geomorphology, and habitat, increasing water and sediment storage (Pollack et al. 2003). Beaver dams also dissipate stream energy, provide channel stability, and create diverse aquatic habitat (Gurnell 1998). **Loss of beaver populations has affected hydrology and sediment dynamics and has contributed to channel incision and lowering of groundwater levels (Pollack et al. 2003) across the Forest.** (Emphasis added.)

See "Science Discussion_ Beavers as a Keystone Species – A Rattlin' Blog" (https://arattlinblog.wordpress.com/2015/10/27/science-discussion-beavers-as-a-keystone-species/#more-149) for an explanation of beaver as a keystone species.

The LMP fails to set meaningful thresholds for population viability. Schultz (2010) concludes that "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." In the absence of meaningful thresholds of habitat loss and no monitoring of wildlife populations at the Forest level, projects will continue to degrade habitat across the CNF over time. (See also Schultz 2012.)

Traill et al., 2010 and Reed et al., 2003 are published, peer-reviewed scientific articles addressing how "minimum viable populations" can be estimated, and how they have been drastically underestimated in past. The FEIS does not identify the best available science to make quantitative minimum viable population determinations for wildlife species on the CNF.

Traill et al., 2010 state:

> To ensure both long-term persistence and evolutionary potential, the required number of individuals in a population often greatly exceeds the targets proposed by conservation management. We critically review minimum population size requirements for species based on empirical and theoretical estimates made over the past few decades. This literature collectively shows that thousands (not hundreds) of individuals are required for a population to have an acceptable probability of riding-out environmental fluctuation and catastrophic events, and ensuring the continuation of evolutionary processes. The evidence is clear, yet conservation policy does not appear to reflect these findings, with pragmatic concerns on feasibility over-riding biological risk assessment. As such, we argue that conservation biology faces a dilemma akin to those working on the physical basis of climate change, where scientific recommendations on carbon emission reductions are compromised by policy makers. There is no obvious resolution other than a more explicit acceptance of the trade-offs implied when population viability requirements are ignored. We recommend that conservation planners include demographic and genetic thresholds in their assessments, and recognise implicit triage where these are not met.

Assuring viability of most wildlife species is forestwide issue. The cumulative effects of carrying out multiple projects simultaneously across a national forest makes it imperative that population viability be assessed at least at the forestwide scale (Marcot and Murphy, 1992; also see Ruggiero et al., 1994a). Since the Forest Service fails to make strong, science-based commitments to manage the habitat for all these species in its revised forest plan, the agency is obviously not up to the task of complying with NFMA's diversity requirements.

Whereas for MIS the 1982 Planning Rule required "Population trends of the management indicator species will be monitored and relationships to habitat changes determined", the LMP Monitoring Program reveals that the Forest Service makes no commitment to monitor population trends of ANY species.

Several plan components basically boil down as direction to use logging to "restore." For example, FW-OBJ-WL-04 (Restoration of Late-Successional Forest Habitat and Associated Surrogate Species): "…focus activity in previously treated areas that are now early to mid-successional forest to enhance large tree development." Components FW-OBJ-WL-05, FW-OBJ-WL-06, FW-STD-WL-09, FW-GDL-WL-05, FW-GDL-WL-14 exhibit the same problem. The FEIS fails to provide scientific support that the agency's logging/fuel reduction regime will actually benefit wildlife over any timeframe.

Standard FW-STD-WL-01 (Nest Sites) would seasonally protect four species, but only if active nest sites are "known." It doesn't use best available science for conducting surveys in proposed project areas, nor does it utilize the science of those species to make sure protections from management disturbance are adequate.

Again, Guideline FW-GDL-WL-18 (Nest Sites) would seasonally protect some bird nest areas, but only if active nest sites are "known." It doesn't use best available science for conducting surveys in proposed project areas, nor does it utilize the science of those species to make sure protections from management disturbance are adequate.

Standard FW-STD-WL-10 and Guideline FW-GDL-WL exhibit a similar problem, seasonally protecting only "known" woodland caribou calving habitat and common loon brood-rearing areas, respectively, without providing direction to actually search for the species on the Forest.

Standard FW-STD-WL-12 (Large Snag Habitat) would protect a lot of snags > 20" dbh during logging, but the loophole "unless they pose a safety hazard" is huge. The FEIS presents no analysis of how much snag loss has resulted with this policy, or would result under the LMP. Also, the LMP allows management activities to result in loss of such trees within 200 feet of roads, likely because many would be taken by firewood cutters. This loss is not quantified in the FEIS.

Standard FW-STD-WL-13 (Bighorn Sheep and Disease Transmission) isn't specific enough regarding prohibiting domestic sheep grazing "**adjacent to** bighorn sheep source habitats."

Guideline FW-GDL-WL-01 (Hiding Cover for Wildlife) provides inadequate numerical amounts of cover habitat, based upon inadequate scientific information.

Guideline FW-GDL-WL-13 (Mule Deer, White-tailed Deer, and Elk Habitat – Human Activities) contains an all-encompassing loophole allowing winter logging to displace these ungulates.

The LMP accepts "salvage" of timber from burned area without questioning consistency with best available science. Guideline FW-GDL-WL-15 (Fire-dependent Surrogate Wildlife Species) fails to provide any quantitative protections for such species, only vaguely requiring "availability of suitable post-fire habitats … above the desired condition measured at the sub-basin scale." We incorporate Attachment 1 as our contribution of best available science on this topic.

The LMP has no Standard to protect the amount and distribution of old growth to resemble historic conditions. The LMP contains no requirement to manage for the amount and distribution of old growth that has been determined by scientific research to be necessary in order to sustain old-growth associated wildlife species. The LMP doesn't mention "old growth" anywhere!

Although the DEIS stated that road "zone of influence" is a better indicator of habitat condition, zone of influence is not a metric used with any mandatory, non-discretionary Plan Component.

The FEIS states, "A key assumption of the landscape restoration approach that is represented in two of the alternatives (proposed action and alternative P) is that by strategically locating restoration treatments, landscape fire movement can be altered, and the risk to adjacent late-successional and old forest habitat is reduced." As we discussed in our comments and elsewhere in this objection, this paradigm of providing for wildlife habitats by emphasizing vegetation management is extremely flawed.

The FEIS indicates that the alternatives impacts on viability outcomes was determined by modeling. The limitations of the models were not disclosed, violating NEPA.

A 2000 Northern Region forest plan monitoring and evaluation report provides an example of the agency itself acknowledging the problems of data that was old and incomplete, leading to the limitation of models the FS typically uses for wildlife analyses for old-growth MIS 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.

An open, **independent peer review process** was described twelve years ago by the Committee of Scientists (1999):

> 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.

Schultz (2010) recommends peer review of large-scale assessments and project level 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.

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).

The Ninth Circuit Court of Appeals has 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). Assuring viability of most wildlife species is forestwide issue. Since the Forest Service cannot make strong, science-based commitments to manage the habitat for all these species in the LMP, the agency is obviously not up to the task of complying with NFMA's diversity requirements.

Under the assumption that Alternative R really would reduce logging on the CNF, the FEIS indicates "this alternative would provide greater habitat for snag-dependent surrogate wildlife species than any other alternative, and would improve the viability outcomes for snag-dependent surrogate wildlife species."

The LMP and FEIS fail to consider the best available science in the design of Plan Components, formulation of alternatives and disclosure of impacts, in violation of NEPA and NFMA.

AQUATIC SPECIES DIVERSITY AND VIABILITY, WATER QUALITY, AQUATIC AND RIPARIAN HABITAT

We raised this issue in our July 5, 2016 comments at pp. 9, 15, and 26 among other places.

The hydrology analysis bases a lot of impacts on water quality (and therefore fish) on the sediment risk from roads, however the impacts of logging due to elevated water yield impacts and compacted soils in units are not evaluated. This underestimates the FEIS's impacts on fish populations.

The DEIS states that "the narrow (Riparian Management Objectives) do not provide the same flexibility for adaptive management as the aquatic and riparian plan components in the proposed action and alternatives R, P, and O." This is actually not a good feature of alternatives R, P, and O, because "adaptive management" actually means increased and widespread logging in riparian areas—the impacts of which are erroneously assumed negligible in the FEIS.

However, riparian area protections essentially all go out the window in the LMP. This is emphasized by the statement, "Instead, management activities designed to benefit aquatic and riparian-dependent resources and move the landscape toward desired conditions are allowed and encouraged within them."

Riparian logging and mechanical "fuel treatments" can adversely impact aquatic and riparian habitats and species, and retard ecosystem recovery (Dwire et al. 2010). Menning et al. 1996 indicate that wider zones may be warranted for headwater streams associated with steep and unstable slopes.

The LMP standard FW-STD-WR-01 (Properly Functioning Watersheds) is an example of a standard that has important terminology and sounds ambitious, but key terminology is undefined, discretionary desired conditions are incorporated, and many loopholes are included to the degree that the standard constrains nothing:

> When aquatic and riparian **desired conditions** are being achieved and watersheds are functioning properly, projects shall maintain **those conditions**. When aquatic and riparian desired conditions are not yet achieved or watersheds have impaired function or are functioning-at-risk and to the degree that project activities would contribute to those

> conditions, projects shall restore or not retard attainment of desired conditions. **Short-term adverse effects** from project activities **may be acceptable** when they support long-term recovery of aquatic and riparian **desired conditions**. **Exceptions to this standard** include situations where Forest Service authorities are limited. In those cases, project effects toward attainment of **desired conditions** shall be **minimized** and not retard attainment of **desired conditions** <u>to the extent possible</u> **within Forest Service authorities**. (Emphases added.)

The LMP would weaken direction from previous Forest Plan/INFISH requirements, which did not accomplish much restoration of native fish habitats or achieve abundant populations of native fish during 23-plus years of implementation. One of the major ways the LMP weakens INFISH is by opening the flood gates to allowing logging—and including logging machines—to occur in INFISH Riparian Habitat Conservation Areas which are now called Riparian Management Areas (RMAs) in the LMP. The LMP states, "RMAs are not 'no touch' buffers. Instead, management activities designed to benefit aquatic and riparian-dependent resources and move the landscape toward desired conditions are allowed and encouraged within them."

The LMP and FEIS might make it sound like logging within RMAs would be the exception. However, the FS's whole purpose for such loopholes (which emphasize "restoration" in RMAs using, unsurprisingly, logging) is to make logging in RMAs commonplace. Standard MA-STD-RMA-01 (Aquatic and Riparian Conditions) is so full of loopholes and vague language, it constrains practically nothing.

In fact, if one tries to find nondiscretionary restraint from widespread clearcutting in RMAs in the LMP, one will fail.

Guideline MA-GDL-RMA-03 (Landings, Skid Trails, Decking, and Temporary Roads) states: "Landings, designated skid trails, staging, or decking should not occur in RMAs, unless there are no other reasonable alternatives…" Since the purpose and intent of the loophole is to allow these activities, the guideline constrains nothing. To imply that simply not creating such disturbances is not a "reasonable alternative" is ridiculous. Similarly, MA-GDL-RMA-04 (Road Construction) and MA-GDL-RMA-05 (Temporary Road Reconstruction) provide more wiggle room for industrial machines than constraint.

The Forest Service fails to provide scientific support for these premises that claim vague "careful management" isn't highly risky. The Forest Service should be prioritizing rehabilitating existing sediment sources in damaged riparian zones, not risking them with more industrial activities.

Standard MA-STD-RMA-03 (Personal Fuelwood Cutting) is worthless. There is nothing in there that actually enforces the idea that removing valuable dead wood from RMAs is ecologically damaging. Oddly, MA-SU-RMA-01 sanctions such activity if it's "commercial" but bans firewood cutting for personal use.

FW-STD-WR-06 (Road Construction and Hydrologic Risk Reduction in Key Watersheds) contains language such as "no net increase" or "net decrease" which seem to constrain management, but as it turns out—not much. Given the loopholes, the guideline allows unlimited increases of temporary roads in these “Key Watersheds and in subwatersheds with ESA critical habitat” during projects. And nothing in the LMP actually mandates measurable reductions of existing roads, which is what is needed to recover bull trout populations.

MA-GDL-RMA-15 (Recreation Management – Existing Facilities): “Consider removing, or relocating, or re-designing existing recreation facilities that are not meeting desired conditions in RMAs or are in active floodplains.” Manager: “I considered removing that heavily eroding trail, but we don’t have much funding, and spending the money just didn’t seem reasonable.” No accountability.

MA-GDL-RMA-19 (“…when burning masticated fuels within RMAs”) and MA-GDL-RMA-20 (“Direct ignition in RMAs should not be used unless…”) merely sanction damage.

See: “Where did 300ft buffer come from?” for rationale for strong protection of RMAs.

US Fish and Wildlife Service, 2010 provides a discussion of biological effects of sediment on bull trout and other fish.

USDA Forest Service, 2017c explains that native westslope cutthroat trout have declined due to habitat degradation:

> The distribution and abundance of westslope cutthroat trout has declined from historic levels (less than 59 percent of historically occupied stream habitat) across its range, which included western Montana, central and northern Idaho, a small portion of Wyoming, and portions of three Canadian provinces (Liknes and Graham 1988, Shepard et al. 2005). Westslope cutthroat trout persist in only 27 percent of their historic range in Montana. Due to hybridization, genetically pure populations are present in only 2.5 percent of that range (Rieman and Apperson 1989). Introduced species have hybridized or displaced westslope cutthroat trout populations across their range. Hybridization causes loss of genetic purity of the population through introgression. Within the planning area, genetically pure populations of westslope cutthroat trout are known to persist in Ruby Creek (MFISH 1992, 2012). Some of these remaining genetically pure populations of westslope cutthroat trout are found above fish passage barriers that protect them from hybridization, but isolate them from other populations.
>
> Brook trout are believed to have displaced many westslope cutthroat trout populations (Behnke 1992). Where the two species co-exist, westslope cutthroat trout typically predominate in higher gradient reaches and brook trout generally prevail in lower gradient reaches (Griffith 1988). This isolates westslope cutthroat trout populations, further increasing the risk of local extinction from genetic and stochastic factors (McIntyre and Rieman 1995).
>
> Habitat fragmentation and the subsequent isolation of conspecific populations is a concern for westslope cutthroat trout due to the increased risk of local and general extinctions. The probability that one population in any locality will persist depends, in part on, habitat quality and proximity to other connected populations (Rieman and McIntyre 1993).

> Therefore, the several small, isolated populations left in the Forest are at a moderate risk of local extirpation in the event of an intense drainage-wide disturbance.
>
> Habitat degradation also threatens the persistence of westslope cutthroat trout throughout their range. Sediment delivered to stream channels from roads is one of the primary causes of habitat degradation. Sediment can decrease quality and quantity of suitable spawning substrate and reduce overwintering habitat for juveniles which reduces spawning success and increases overwinter mortality. Roads can also alter the drainage network of a watershed and thereby increase peak flows. The end result of increased peak flows is decreased channel stability and accelerated rates of mass erosion. Across their range the strongest populations of westslope cutthroat trout exist most frequently in the wilderness, Glacier National Park, and areas of low road densities or roadless areas (Liknes and Graham 1988, Marnell 1988, Rieman and Apperson 1989, Lee et al. 1997).

The Kootenai NF's Flower Creek Forest Health project EA states:

> Fine sediment can greatly reduce the capability of winter and summer rearing habitats and decrease survival to emergence when sediment levels reach 30% or greater (Shepard et al. 1984). Fine sediment may have the greatest impact on winter rearing habitat for juvenile salmonids. Fine sediments can cap or fill interstitial spaces of streambed cobbles. When interstitial rearing space is unavailable, juvenile salmonids migrate until suitable wintering habitat can be found (Hillman et al. 1987). Fine sediment can also alter macroinvertebrate abundance and diversity.

Frissell, 2014 states:

> 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.

In their Forest Service Intermountain Research Station report, "Demographic and Habitat Requirements for Conservation of Bull Trout", Rieman and McIntyre (1993) state:

> We believe that successful conservation of bull trout depends on identifying core areas that contain bull trout populations with the demographic characteristics needed to ensure their

> persistence and with the habitat needed to sustain those characteristics. Bull trout in these core areas are the primary sources for recolonization if other areas fail, so their habitat productivity, life-history diversity, and genetic diversity need to be protected from excessive fishing, abusive land-use practices, and competition with introduced exotic species.
>
> … Identifying core areas and developing mechanisms to protect the fish populations and the habitat they rely on is the basic requirement to ensure persistence of bull trout throughout their range. … We have identified five criteria that should guide the selection and development of core areas for bull trout conservation:
>
> - Core Areas Must Be Selected To Provide All Critical Habitat Elements
> - Core Areas Should Be Selected From the Best Available Habitat or From the Habitat With the Best Opportunity To Be Restored to High Quality
> - A Core Area Must Provide for Replication of Strong Subpopulations Within Its Boundaries
> - Core Areas Should Be Large Enough To Incorporate Genetic and Phenotypic Diversity, but Small Enough To Ensure That the Component Populations Effectively Connect
> - Core Areas Must Be Distributed Throughout the Historic Range of the Species

The FS assumes that project work will adequately mitigate the problems chronically posed by the road network using BMP implementation, despite the fact that the FS knows otherwise. The FS admits such problems in a non-NEPA context (USDA Forest Service, 2010t):

> 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 FEIS fails to recognize that "continual monitoring and maintenance" is necessary following project completion. Also in a non-NEPA context, a forest supervisor (Lolo National Forest, 1999) frankly admits that projects are a "chance to at least correct some (BMP) departures rather than wait until the funding stars align that would allow us to correct all the departures at once."

Without the sufficient funding to maintain its road system in a timely manner, all the BMP implantation that can be mustered in the context of project implementation will only be a short term fix, and the road system will remain an ecological liability.

The LMP does not contain a monitoring and maintenance plan for culverts that will be left on closed roads. The USFWS Biological Opinion of the Effects to Bull Trout and Bull Trout Critical Habitat from Road Management Activities on National Forest System and Bureau of Land Management Lands in Western Montana (2015) states:

> Culverts that remain in the road behind gates and berms that are not properly sized, positioned, and inspected …have an increased risk for failure by reducing awareness of

potential maintenance needs. The accumulation of debris has the potential to obstruct culverts and other road drainage structures. Without maintenance and periodic cleaning, these structures can fail, resulting in sediment production from the road surface, ditch, and fill slopes. The design criteria to address drainage structures left behind gates and berms require annual monitoring of these structures.

Comprehensive monitoring of the effectiveness of logging road BMPs in achieving water quality standards does not demonstrate the BMPs are protecting water quality, nor does it undermine the abundant evidence that stormwater infrastructure along logging roads continues to deposit large quantities of sediment into rivers and streams (Endicott, 2008). Even as new information becomes available about BMP effectiveness, many states do not update their logging road BMPs, and some states have retained BMPs that have been discredited for some time, such as using fords when they are known to have greater water quality impacts than other types of stream crossings. (Id.) If the measure of success is whether a nonpoint source control program has achieved compliance with state water quality standards, the state forest practices programs have failed.

Again, these programs are only triggered when active logging operations occur. The lack of a requirement in most states to bring existing, inactive logging roads and other forest roads up to some consistent standard results in many forest roads that are not currently being used for logging falling through the regulatory cracks and continuing to have a negative impact on our water quality. Currently, only the State of Washington requires that old roads be upgraded to comply with today's standard BMPs. Across most of the country, the oldest, most harmful logging roads have been grandfathered and continue to deliver sediment into streams and rivers. (Id.)

BMPs are "largely procedural, describing the steps to be taken in determining how a site will be managed," but they lack "practical in-stream criteria for regulation of sedimentation from forestry activities." (Id.) The selection and implementation of BMPs are often "defined as what is practicable in view of 'technological, economic, and institutional consideration." (Id.) The ultimate effectiveness of the BMPs are therefore impacted by the individual land manager's "value system" and the perceived benefit of protecting the resource values as opposed to the costs of operations. (Id.)

Ziemer and Lisle (1993) note a lack of reliable data showing that BMPs are cumulatively effective in protecting aquatic resources from damage. Espinosa et al., 1997 noted that the mere reliance on BMPs in lieu of limiting or avoiding activities that cause aquatic damages serves to increase aquatic damage. Even activities implemented with somewhat effective BMPs still often contribute negative cumulative effects (Ziemer et al. 1991b, Rhodes et al. 1994, Espinosa et al. 1997, Beschta et al. 2004).

In analyses of case histories of resource degradation by typical land management (logging, grazing, mining, roads) several researchers have concluded that BMPs actually increase watershed and stream damage because they encourage heavy levels of resource extraction under the false premise that resources can be protected by BMPs (Stanford and Ward, 1993; Rhodes et al., 1994; Espinosa et al., 1997). Stanford and Ward (1993) termed this phenomenon the "illusion of technique."

The extreme contrast between streams in roaded areas vs. unroaded areas found on the Lolo NF (Riggers, et al. 1998) is a testament to the failures of the agency's BMP approach.

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. We incorporate The Wilderness Society (2014) which discusses some of the best available science on the ecological impacts of roads.

Furthermore, the FEIS economic analysis cannot assure sources of funds needed to maintain the road system. When the project mitigation stops, the trajectory for fish habitat conditions will be downward. Beschta et al., 2004 state:

> (R)oad and landing construction is expensive and can siphon limited funds away from effective restoration measures, such as obliteration and maintenance. The backlog in maintenance of U.S Forest Service roads has been estimated to be several billion dollars (U.S. Department of Agriculture Forest Service 2000), and road construction inevitably adds to this seemingly insurmountable backlog.

The Watershed Condition Framework (WCF) lays out a six-step process whereby all sixth-field watersheds will be classified according to their condition and prioritized for restoration according to watershed action plans. Implementation will be tracked and monitored. Condition class is determined according to a standardized process that employs 12 metrics. These crude metrics are aggregated to generate a single index of watershed condition that places every watershed in one of only three categories: functioning, functioning at risk or impaired. The goal of the WCF is to move watersheds to an improved condition class through restoration actions. As the guidance notes, the current WCF framework emphasizes improvement and therefore lacks a performance accountability mechanisms for protection and maintenance of current watershed condition, which is often a priority management goal [USDA FS, 2010, p. 12) ("Implementing the National Best Management Practices Implementation and Effectiveness Monitoring Program is expected to provide the Forest Service with a partial mechanism for capturing the costs and benefits of actions taken to maintain watershed condition"). In general, the individual metrics are more informative about restoration needs than the index itself, and additional watershed-specific information is needed to craft management actions that effectively address aquatic restoration priorities.

CANADA LYNX

We raised this issue in our July 5, 2016 comments more generally about wildlife at p. 14-17 and other places.

The LMP states, "The Canada Lynx Conservation Assessment and Strategy (2013 version) was used to develop management direction." However the LMP does not adopt the Canada Lynx Conservation Assessment and Strategy (LCAS) itself as direction. Although some plan components are similar to the LCAS, overall the protections afforded by the LMP are weaker.

In nearby national forests, the Forest Service used the LCAS to prepare amendments to forest plans via the Northern Rockies Lynx Management Direction (NRLMD). The NRLMD contains standards, guidelines, etc. similar to the LCAS. The LMP, the LCAS, and the NRLMD do not consider the best available science nor assure viability of Canada lynx populations. (See folder entitled "NRLMD Participation".)

A major problem with the LMP is that it allows with few limitations the same level of industrial forest management activities in lynx habitat that occurred prior to Canada lynx ESA listing. And plan components are ridden with loopholes (e.g., FW-STD-WL-02, FW-STD-WL-04, and FW-STD-WL-06

Guideline FW-GDL-WL-08 (Transportation System within the Kettle-Wedge Core Area) contains protective language but it's defined vaguely ("results in increased traffic speed and volume") and is too discretionary ("should be avoided" "should not be located"). This must be written as a mandatory standard with clear definitions.

The current best science indicates that lynx winter foraging habitat is critical to lynx persistence (Squires et al. 2010). Lynx winter habitat is best provided by older, multi-storied forests (Id.).

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.) Whether small in uneven-aged management, or large with clearcutting, opening remove lynx winter travel habitat on those affected acres (Squires et al. 2010). Guideline FW-GDL-WL-09 (Habitat Connectivity within the Kettle-Wedge Core Area) doesn't recognize the adverse impacts of openings unless they are "greater than 300 feet wide with less than 10 percent overstory canopy" which ignores best available science.

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.)

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 LMP does not include scientifically-based direction that would protect connectivity between Lynx Analysis Units (LAUs) in the Kettle-Wedge Core Area and beyond, into other historically occupied lynx habitat.

Standard FW-GDL-WL-10 (Kettle-Wedge Core Area - Lynx Analysis Unit Adjustment) allows reductions in the geography protected in the LMP, but this should only occur within a forest plan amendment process and with U.S. Fish & Wildlife Service formal consultation.

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.

Recent scientific findings undermine LMP direction for management of lynx habitat. This raises a scientific controversy the FEIS fails to resolve.

For one, Kosterman, 2014 found 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. Young regenerating forest should occur only on 10-15% of a female lynx home range, i.e. 10-15% of a Lynx Analysis Unit (LAU). This renders inadequate the agency's assumption in the NRLMD that 30% of lynx habitat can be open, and that no specific amount of mature forest needs to be conserved. Kosterman, 2014 demonstrates that LMP standards are not adequate for lynx viability and recovery.

Also, the LMP essentially assumes that persistent effects of vegetation manipulations other than regeneration logging and some "intermediate treatments" are essentially nil. However, Holbrook, et al., 2018 "used univariate analyses and hurdle regression models to evaluate the spatio-temporal factors influencing lynx use of treatments." Their analyses "indicated …there was a consistent cost in that lynx use was low up to ~10 years after **all silvicultural actions**." (Emphasis added.) From their conclusions:

> First, we demonstrated that lynx clearly use silviculture treatments, but there is a ~10 year cost of implementing any treatment (thinning, selection cut, or regeneration cut) in terms of resource use by Canada lynx. This temporal cost is associated with lynx preferring advanced regenerating and mature structural stages (Squires et al., 2010; Holbrook et al., 2017a) and is consistent with previous work demonstrating a negative effect of precommercial thinning on snowshoe hare densities for ~10 years (Homyack et al., 2007). Second, if a treatment is implemented, Canada lynx used thinnings at a faster rate post-treatment (e.g.,~20 years posttreatment to reach 50% lynx use) than either selection or regeneration cuts (e.g., ~34–40 years post-treatment to reach 50% lynx use). Lynx appear to use regeneration and selection cuts similarly over time suggesting the difference in vegetation impact between these treatments made little difference concerning the potential impacts to lynx (Fig. 4c). Third, Canada lynx tend to avoid silvicultural treatments when a preferred structural stage (e.g., mature, multi-storied forest or advanced regeneration) is abundant in the surrounding landscape, which highlights the importance of considering landscape-level composition as well as recovery time. For instance, in an area with low amounts of mature forest in the neighborhood, lynx use of recovering silvicultural treatments would be higher versus treatments surrounded by an abundance of mature forest (e.g., Fig. 3b). This scenario captures the importance of post-treatment recovery for Canada lynx when the landscape context is generally composed of lower quality habitat. Overall, these three items emphasize that both the spatial arrangement and composition as well as recovery time are central to balancing silvicultural actions and Canada lynx conservation.

So Holbrook et al., 2018 fully contradict LMP assumptions that clearcuts/regeneration can be considered useful lynx habitat as early as 20 years post-logging.

Results of a study by Vanbianchi et al., 2017 also conflict with LMP assumptions: "Lynx used burned areas as early as 1 year postfire, which is much earlier than the 2–4 decades postfire previously thought for this predator." The LMP erroneously assumes clearcutting/regeneration logging have basically the same temporal effects as stand-replacing fire as far as lynx re-occupancy.

Kosterman, 2014, Vanbianchi et al., 2017 and Holbrook, et al., 2018 demonstrate LMP direction is inadequate for lynx viability and recovery, as the LMP assumes.

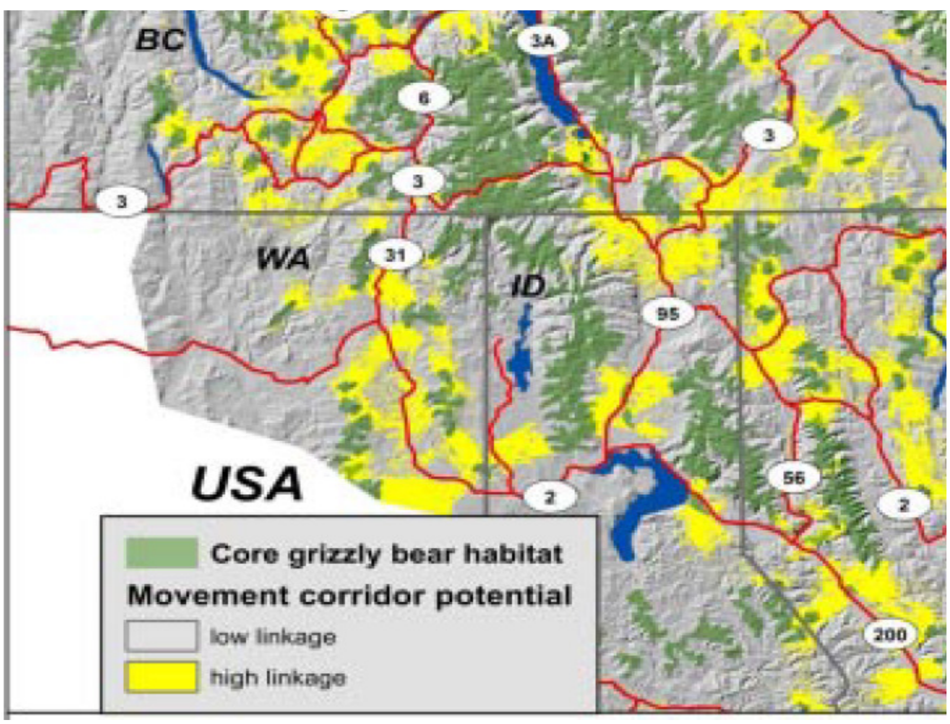
The FEIS also fails to adequately consider the cumulative impacts on lynx due to trapping or from use of the road and trail networks in the CNF.

The LMP does not assure that Canada lynx and their habitats will be protected on the Colville NF. The FS and U.S. Fish & Wildlife Service has not utilized best available science to assure habitat protections and population recovery.

GRIZZLY BEAR

We raised this issue in our July 5, 2016 comments more generally about wildlife at p. 14-17 and other places.

Proctor et al., 2015 conducted grizzly bear habitat connectivity mapping showing core grizzly bear habitat and high linkage potential in parts of the CNF:



Similar to the Canada Lynx, LMP plan components are based upon programmatic direction employed in adjacent geography—core habitats, total motorized round density (TMRD) and open motorized route density (OMRD)—but are weaker than the other programmatic direction. That programmatic direction is the Forest Plan Amendments for Motorized Access Management within the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones (Access Amendments) which amended forest plans of the Kootenai National Forests Lolo National Forest, and Idaho Panhandle National Forests (IPNF). It provides direction for the adjacent portions of the very same Selkirk Mountains Grizzly Bear Recovery Area on the IPNF which even extends into Washington.

The Access Amendments themselves provide inadequate protections for the grizzly bear and are not based upon best scientific information. We incorporate documents in the folder entitled "Acc Amend Participation") within this objection.

LMP standard FW-STD-WL-07 (Grizzly Bear Recovery Area - Road Densities) would allow road densities to exceed recommendations from best available science in the LeClerc BMU, and requires minimum percent core amounts less than recommendations from best available science in the LeClerc BMU. This standard also allows "bermed" roads to intrude into core and be omitted from road density calculations. Yet the FEIS fails to evaluate road closure effectiveness, for the purpose of eliminating human access behind such closures. (See AWR's Amended Complaint for case CV-18-67-DWM for the purposes of explaining how roads affect wildlife, how pervasive are ineffective closures on national forest land, and also for forest plan consultation requirements.) Also, Platt, 1993 observed ineffective closures in his survey of road closure compliance.

The LMP is not a scientifically defensible plan to protect or recover grizzly bears. LMP plan components are far too discretionary, vague, and ridden with loopholes.

Standard FW-GDL-WL-11 (Forest Management Activities) is focused too narrowly on the recovery area and reveals the standard for road density and core don't protect from many management and other human disturbances.

Reducing roads and their impacts would benefit not only grizzly bears, but most other natural aspects of the ecosystem, as the Access Amendments[5] Draft SEIS states:

- Alternative D Modified would convert the most roads and consequently would provide the highest degree of habitat security and a lower mortality risk to the **Canada lynx**. (P. 70.)
- Alternative D Modified would provide a higher degree of habitat security (for **gray wolves**) than Alternative E Updated… (P. 74.)
- Alternative D Modified … could contribute to a cumulative increase in habitat security for **black-backed woodpeckers** (and **pileated woodpeckers**) because timber sales or other ground disturbing or vegetation management activities would be less likely to occur in Core Areas. Newly dead trees that support wood boring beetle populations would be less likely to be removed during vegetation management activities or by woodcutters. Alternative D Modified could provide slightly more secure habitat than Alternative E Updated. (P. 84, 112.)

[5] Not selected, but Alternative D would have restricted road densities the most and protected the most Core of all alternatives analyzed. (Amended forest plans for the Kootenai, Idaho Panhandle, and Lolo National Forests concerning Selkirk and Cabinet-Yaak Ecosystems Grizzly Bear subpopulation.)

- Alternative D Modified … could contribute to a cumulative increase in habitat security because timber sales or other ground disturbing or vegetation management activities would be less likely to occur in Core Areas. Snags would be less likely to be removed during vegetation management activities or by woodcutters. Alternative D Modified could provide slightly more secure habitat (for **Townsend's big-eared bats, flammulated owls, fringed myotis bats**) than Alternative E Updated. (Pp. 85, 86, 95.)
- Alternative D Modified and Alternative E Updated provide different levels of habitat security (for **peregrine falcon, fisher, wolverine**) based on the relative amount of wheeled motorized vehicle access. (Pp. 87, 89, 91.)
- Alternative D Modified, which closes the most miles of road in suitable habitat, would be the preferred alternative for the western toad. (P. 101.)
- Alternative D Modified closes the most miles of road in suitable habitat and would provide the greatest benefits for the **goshawk**. (P. 103.)
- Alternative D Modified, which closes the most miles of road in suitable habitat, would be the best Alternative for **elk**. (P. 104.)
- Alternative E Updated would provide some security and reduced vulnerability (for **moose**), but not as much as Alternative D Modified. (P. 104.)
- Although Alternative D Modified and Alternative E Updated would benefit **mountain goats**, Alternative D Modified would improve security and reduce the risk of displacement more than Alternative E Updated. (P. 109.)
- Alternative D Modified would improve security (for **pine marten**) more than Alternative E Updated. (P. 110.)

This demonstrates how habitat protections for the grizzly bear benefit habitat for other species.

Great Bear Foundation et al., 2009 discusses in detail how the Access Amendments would lead to a significant deterioration in an already unacceptable baseline condition for grizzly bears and demonstrate how the Forest Service does not utilize best available science for the grizzly bear.

Schwartz et al. (2010) noted that management for grizzly bears requires not only the provision of security area, but control of open road densities between security areas. Otherwise, grizzly bear mortality risks will be high as bears attempt to move across highly roaded landscapes to another security area. There must be direction in the forest plan regarding existing road densities located outside of and between security areas.

The LMP fails to provide scientifically defensible habitat protections outside the Selkirk Mountains Grizzly Bear Recovery Area which would allow for a larger protected zone and/or natural augmentation from outside the recovery area. The FS has no cogent methodology that provides scientifically defensible habitat protections inside the recovery area that would facilitate functional connectivity between and among BMUs. The Forest Plan fails to provide any scientific basis that baseline road densities in linkage zones can support grizzly bear population natural augmentation or recovery.

"Our analysis shows that grizzly bears have little or no opportunity to select home ranges with lower road density or higher percentages of core… Because grizzly bears could not have selected home ranges having more core area and lower road densities, and there has been no growth in the population, there is no basis to conclude the proposed access standards are sufficient to insure the recovery of the Cabinet-Yaak and Selkirk grizzly bear populations" (Merrill 2003).

FISHER

We raised this issue in our July 5, 2016 comments at p. 14.

The fisher is a species whose historic range includes the Colville NF. Old-growth forest, very large live tree habitat, and very large dead tree habitat us essential for fisher. Given the cumulative effects of past management activities on and surrounding the CNF, such habitat components are well below the range of conditions under which the fisher evolved. The LMP arbitrarily rejected the fisher from the Species of Conservation Concern (SCC) list or Sensitive species list for the CNF.

In response to comments on the DFP, the Forest Service reject any inclusion of or consideration for the pacific fisher in the LMP:

> (B)ecause the fisher has been extirpated from the Colville National Forest (Lofroth et al. 2010), it was recommended by members of the Interagency Fisher Biology Team that it not be used as a surrogate species at this time. Instead, other species known to be currently present on the Forest and associated with old forest habitat conditions be used to evaluate old forest species and ecosystem viability. On the Colville National Forest, the recovery of fisher will require more than managing for habitat, and will likely require a population reintroduction effort as is happening in other parts of Washington by the Washington Department of Fish and Wildlife. Such an effort is beyond the scope of what is addressed in a forest plan.

So the agency evades accountability for management actions that helped to extirpate the species, and evades responsibility for recovering the species. The situation is the same for the woodland caribou (extirpated), but its inclusion on the list of endangered species is the only reason why the LMP recognizes that species.

The Forest Service cannot even get its story straight regarding fisher. After the FS ignored the fisher completely in the original North Fork Mill Creek A to Z Environmental Assessment, public comments called the FS on the fact that its revised forest plan Proposed Action implicated FS management actions in extirpating the fisher from the CNF. Subsequently the FS backtracked in later versions of that EA and with the Middle-South Environmental Assessment, saying there are recent "probable sightings" of the fisher on the CNF. The final version of the North Fork Mill Creek A to Z EA states, "Although there is no specific management for the species in the Forest Plan, effects and mitigation measures that are relevant to pine marten (and other old-growth associated species) would apply to fisher as well." Next, the Middle-South EA changed the FS's tune, stating "although both species prefer late and old structural stands, fisher typically use lower elevation, more mesic forests than do pine marten." The FS never provided an explanation of why a species so rare on the CNF had been removed from the R-6 list of Sensitive species for the CNF.

The state of Washington Fisher Recovery Plan states, "The fisher …is listed as a state endangered species (WAC 232-12-011) and has probably been extirpated from Washington. 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:

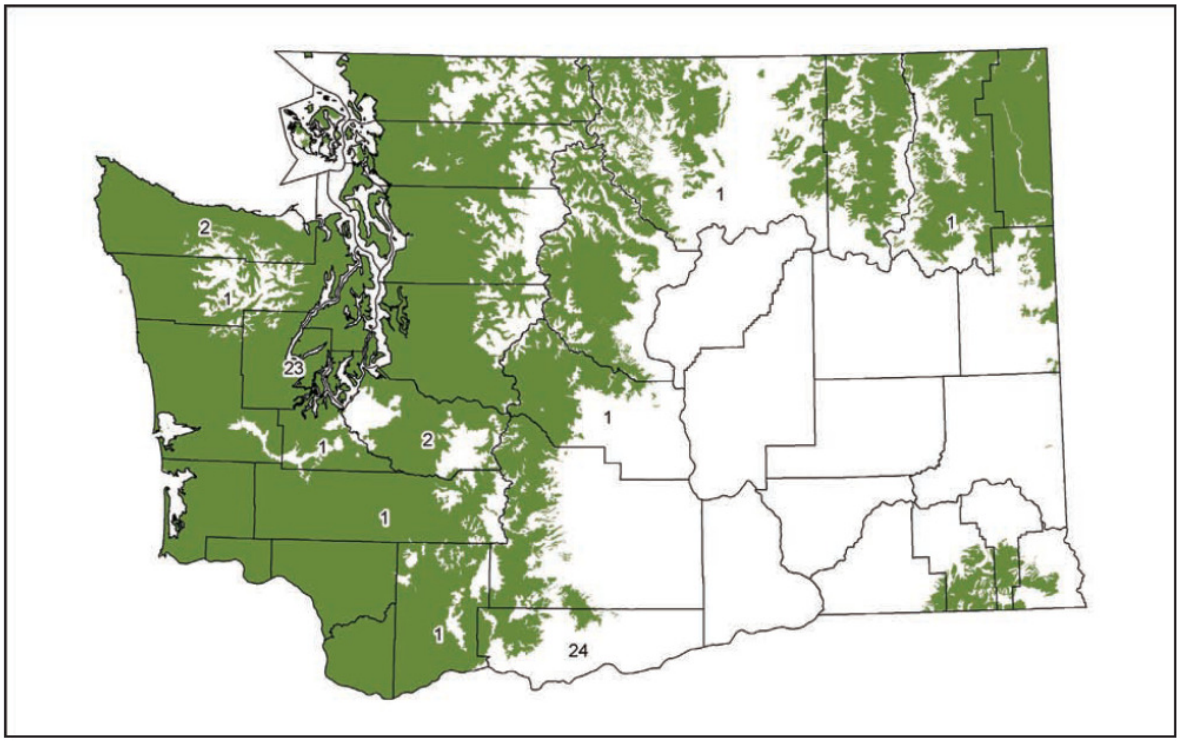


Figure 2. Probable historical distribution (circa 1800) of the fisher in Washington based on specimens (numbers indicated by county), trapping records, and forest zones associated with fisher records (Aubry and Houston 1992) (Forest zones [Cassidy 1997] shaded include: Western Hemlock types, Douglas-fir 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.

The LMP includes no coherent viability strategy for fisher protection. The Forest Plan and FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the fisher.

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).

Ruggiero et al. 1994b state:

> (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.
>
> 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 address risk from trapping of fishers:

> 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 DEIS does not include a quantitative cumulative effects analysis for fisher considering trapping and use of the road and trail networks in the CNF. Hayes and Lewis, 2006 state "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 also present a science synthesis in the context of a recovery plan for fisher in the state of Washington. 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.

Scientific research strongly suggests 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 ≤ 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 (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).

WOLVERINE

We raised this issue in our July 5, 2016 comments more generally about wildlife at p. 14-17 and other places.

Wolverines use habitat ranging from Douglas-fir and lodgepole pine forest to subalpine whitebark pine forest (Copeland et al., 2007). Lofroth (1997) in a study in British Columbia, found that 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).

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.

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."

Results from Scrafford et al., 2018:

> …show that roads, regardless of traffic volume, reduce the quality of wolverine habitats and that higher-traffic roads might be most deleterious. We suggest that wildlife behavior near roads should be viewed as a continuum and that accurate modeling of behavior when near roads requires quantification of both movement and habitat selection. Mitigating the effects of roads on wolverines would require clustering roads, road closures, or access management."

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.

The Analysis of the Management Situation Technical Report for Revision of the Kootenai and Idaho Panhandle Forest Plans states:

> Direct mortality (related to access) from trapping, legal hunting, and illegal shooting has impacted all wide-ranging carnivores (e.g. lynx, wolverine, grizzly and black bears, wolves)…
>
> …Wolverine populations may have declined from historic levels, as a result of over-trapping, hunting, habitat changes, and intolerance to human developments. As the amount of winter backcountry recreation increases, wolverine den sites may become more susceptible to human disturbance.

Given the uncertain status of wolverine within the United States and elsewhere, there is growing concern regarding the potential negative effects of winter recreation on wolverine and particularly in areas potentially used by female wolverine for reproductive denning (Carroll et al. 2001, Rowland et al. 2003, May et al. 2006, Copeland et al. 2007, Krebs et al. 2007).

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 LMP includes no such scientifically-based strategies for wolverine protection.

We also incorporate USDA Forest Service, 1993 as best available science concerning the wolverine on the CNF.

The Forest Plan includes no coherent viability strategy for wolverine. The Forest Plan and FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the wolverine.

PILEATED WOODPECKER

We raised this issue in our July 5, 2016 comments at p. 14.

At p. 158 the LMP cites requirements of this plan to conform to 2012 Planning Rule monitoring plan requirements regarding the status of focal species to assess the ecological conditions. A highly logical species for Species of Conservation Concern or focal species would be the pileated woodpecker, an MIS under the original Forest Plan.

The pileated woodpecker also fits the definition of a keystone species (therefore being an appropriate focal species). USDA Forest Service 2011c states:

> Many types of disturbances, such as timber harvest, fuel reduction, road construction, blow-down, wildland fire, or insect or disease outbreaks, can affect old growth habitat and old growth associated species. This is well illustrated by **the pileated woodpecker, a "keystone" species**, which provides second-hand nesting structures for numerous old growth species such as boreal owls, kestrels, and flying squirrels (McClelland and McClelland 1999, Aubry and Raley 2002). A disturbance can reduce living tree canopy cover to levels below that needed by the pileated woodpecker's main food source, carpenter ants, forcing the pileated to forage and possibly nest elsewhere. Carpenter ants, which live mostly in standing and downed dead wood, can drastically reduce populations of species such as spruce budworm (Torgersen 1996), the most widely distributed and destructive defoliator of coniferous forests in Western North America. (Emphasis added.)

The Committee of Scientists, 1999 defines Keystone species as a:

> …species whose effects on one or more critical ecological processes or on biological diversity are much greater than would be predicted from their abundance or biomass (e.g., the red-cockaded woodpecker creates cavities in living trees that provide shelter for 23 other species).

Science and logic don't support the FEIS assumption that Forest Plan implementation would be sustainable for the pileated woodpecker using only the coarse filter approach. This is partially the inadequate science the FEIS provides, and also the misuse of science.

The LMP employs a "large tree"[6] (≥ 20 inches d.b.h.) category, meaning trees of that size are, in limited instances, protected from logging. No category of tree with a minimum size substantially larger than 20 inches d.b.h. is recognized by the LMP. It fails to address habitat needs of wildlife species relying on much larger trees for life cycle needs, such as the pileated woodpecker, and it ignores the cumulative impacts of decades of focusing logging on very largest trees. So for instance, 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

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

Results of a study by McClelland and McClelland (1999) found the average nest tree being 73 cm. (almost 29") dbh. The pileated woodpecker's strong preference for trees of this girth is not adequately considered in the LMP. Effectively, the Forest Plan provides absolutely no commitment for leaving adequate numbers and sizes of largest trees favored by the pileated woodpecker and other wildlife species.

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

B.R. McClelland has extensively studied the pileated woodpecker habitat needs. McClelland, 1985 (a letter to the Flathead NF forest supervisor) 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 <u>minimum</u> 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

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[6] E.g., FW-GDL-VEG-03

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.

Mealey, 1983 stated: "Well distributed habitat is the amount and location of required habitat which assure that individuals from demes, distributed throughout the population's existing range, can interact. Habitat should be located so that genetic exchange among all demes is possible." That document also provides guidance for pileated woodpecker habitat distribution.

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 primary cavity excavators themselves, such as the pileated woodpecker, are able to decide if a tree is suitable for excavating. This also means managers know little about how many snags per acre are needed to sustain populations of cavity nesting species. Lorenz et al., 2015 must be considered best available science to replace inadequate forest plan direction for snag retention.

The Forest Service's Vizcarra, 2017 notes that researchers "see the critical role that mixed-severity fires play in providing enough snags for cavity-dependent species. Low-severity prescribed fires often do not kill trees and create snags for the birds."

On the same subject, Hutto 2006, notes from the scientific literature: "The most valuable wildlife snags in green-tree forests are relatively large, as evidenced by the disproportionate number of cavities in larger snags (Lehmkuhl et al. 2003), and are relatively deteriorated (Drapeau et al. 2002)."

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. These 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."

Dudley & Vallauri, 2004 state:

> Up to a third of European forest species depend on veteran trees and deadwood for their survival. Deadwood is providing habitat, shelter and food source for birds, bats and other mammals and is particularly important for the less visible majority of forest dwelling species: insects, especially beetles, fungi and lichens. Deadwood and its biodiversity also play a key role for sustaining forest productivity and environmental services such as stabilising forests and storing carbon.
>
> Despite its enormous importance, deadwood is now at a critically low level in many European countries, mainly due to inappropriate management practices in commercial forests and even in protected areas. Average forests in Europe have less than 5 per cent of the deadwood expected in natural conditions. The removal of decaying timber from the forest is one of the main threats to the survival of nearly a third of forest dwelling species and is directly connected to the long red list of endangered species. Increasing the amounts of deadwood in managed forests and allowing natural dynamics in forest protected areas would be major contributions in sustaining Europe's biodiversity.
>
> For generations, people have looked on deadwood as something to be removed from forests, either to use as fuel, or simply as a necessary part of "correct" forest management. Dead trees are supposed to harbour disease and even veteran trees are often regarded as a sign that a forest is being poorly managed. Breaking up these myths will be essential to preserve healthy forest ecosystems and the environmental services they provide.
>
> In international and European political processes, deadwood is increasingly being accepted as a key indicator of naturalness in forest ecosystems. Governments which have recognised the need to preserve the range of forest values and are committed to these processes can help reverse the current decline in forest biodiversity. This can be done by including deadwood in national biodiversity and forest strategies, monitoring deadwood, removing perverse subsidies that pay for its undifferentiated removal, introducing supportive legislation and raising awareness.

Bate et al. (2007), found that snag numbers were lower adjacent to roads due to removal for safety considerations, removal as firewood, and other management activities. Other literature has also indicated the potential for reduced snag abundance along roads (Wisdom et al. 2000).

The FEIS 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.

As well as the above, we incorporate the following as best available science concerning the pileated woodpecker: Bull et al. 2007; Bull and Holthausen, 1993; Bull, et al., 1990; Bull, et al., 1992; Bull et al., 1997; and Wisdom et al. 2000.

The LMP includes no scientifically sound viability strategy for the pileated woodpecker. The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the pileated woodpecker.

PINE MARTEN

We raised this issue in our July 5, 2016 comments at p. 14.

The pine marten were MIS under the original forest plan. The FEIS fails to acknowledge the failure of the FS to monitor as required under the 1986 forest plan. Population trends were never determined. The Regional Forester arbitrarily rejected the marten from the SCC list. The pine marten is a species whose habitat is significantly altered by thinning and other active forest management (Moriarty et al., 2016; Bull and Blumton, 1999; Hargis et al., 1999; Wasserman et al., 2012; Wisdom et al. 2000; Ruggiero et al. 1994b; USDA Forest Service, 1990.

The Forest Plan includes no coherent viability strategy for pine marten. The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the pine marten.

NORTHERN GOSHAWK

We raised this issue in our July 5, 2016 comments at p. 14.

Guideline FW-GDL-WL-19 (Northern Goshawk Nesting Sites) fails to provide mandatory, nondiscretionary protections and doesn't require surveys to find "active nest sites." The Forest Service 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.)

Best available science implicates management 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 conflict with 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)…."

In addition to the above, we incorporate USDA Forest Service, 2005e and Wisdom et al. 2000 as best available science concerning the northern goshawk.

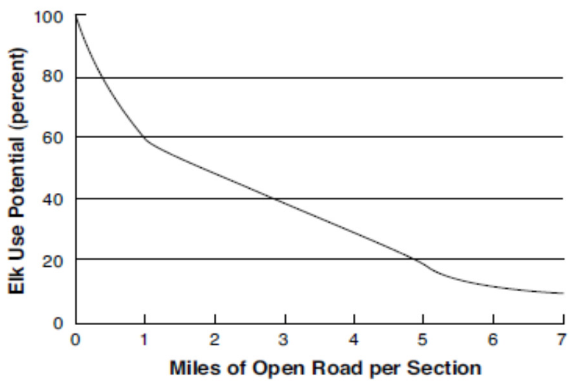
The Forest Plan includes no coherent viability strategy for northern goshawk protection. The Forest Plan and FEIS fail to describe the quantity and quality of habitat necessary to sustain the viability of the northern goshawk.

ELK

We raised this issue in our July 5, 2016 comments more generally about wildlife at p. 14-17 and other places.

The LMP lacks strong, binding standards for maintaining adequate habitat effectiveness and security cover for elk. Christensen, et al. (1993) is a Forest Service publication on elk habitat effectiveness. Meeting a minimum of 70% translates to a road density of about 0.75 miles/ mi^2 in key elk habitat, as shown in their graph:

5. Levels of habitat effectiveness:



Motorized access via trail, road, or oversnow adversely impact habitat for the elk. Servheen, et al., 1997 indicate that motorized trails increase elk vulnerability and reduce habitat effectiveness, and provide scientific management recommendations.

As a big game species, elk were MIS under the original forest plan.

Ranglack, et al. 2017 investigated habitat selection during archery and rifle hunting seasons.

Also, the FEIS fails to provide a meaningful analysis of cumulative impacts for winter conditions. Wintertime is an especially critical time for elk, and stress from avoiding motorized activities takes its toll on elk and populations.

LMP standard FW-STD-LG-02 (Deer and Elk Summer and Winter Range) states, "Livestock shall be managed within range allotments so that adequate forage is available for deer and elk on summer and winter ranges." This should be restated to specify what "adequate forage" means.

OWLS

We raised this issue in our July 5, 2016 comments more generally about wildlife at p. 14-17 and other places.

We incorporate Hayward and Verner, 1994 as best available science concerning the flammulated owl, great gray owl, and boreal owl on the Colville NF. We also incorporate Wright, et al. (1997) as best available science concerning the flammulated owl.

The Forest Plan includes no coherent viability strategy for owl species. The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain their population viability.

BLACK-BACKED WOODPECKER

We raised this issue in our July 5, 2016 comments more generally about wildlife at p. 14-17 and other places.

The black-backed woodpecker is a primary cavity nester, and a Focal species for "post-fire salvage harvest." The viability of the black-backed woodpecker is threatened by fire suppression and other forest 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 Forest Service's management strategies, as revealed in LMP management direction, 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 is not assured because habitat suppression is LMP direction.

The Boise National Forest adopted the black-backed woodpecker as MIS in its revised forest plan in 2010:

> The black-backed woodpecker depends on fire landscapes and other large- scale forest disturbances (Caton 1996; Goggans et al. 1988; Hoffman 1997; Hutto 1995; Marshall 1992; Saab and Dudley 1998). It is an irruptive species, opportunistically foraging on outbreaks of wood-boring beetles following drastic changes in forest structure and composition resulting from fires or uncharacteristically high density forests (Baldwin 1968; Blackford 1955; Dixon and Saab 2000; Goggans et al.1988; Lester 1980). Dense, unburned, old forest with high levels of snags and logs are also important habitat for this species, particularly for managing habitat over time in a well-distributed manner. These areas provide places for low levels of breeding birds but also provide opportunity for future disturbances, such as wildfire or insect and disease outbreaks (Dixon and Saab 2000; Hoyt and Hannon 2002; Hutto and Hanson 2009; Tremblay et al. 2009). Habitat that supports this species' persistence benefits other species dependent on forest systems that develop with fire and insect and disease disturbance processes. The black-backed woodpecker is a secondary consumer of terrestrial invertebrates and a primary cavity nester. Population levels of black-backed woodpeckers are often synchronous with insect outbreaks, and targeted feeding by this species can control or depress such outbreaks (O'Neil et al. 2001). The species physically fragments standing and logs by its foraging and nesting behavior (Marcot 1997; O'Neil et al. 2001). These KEFs influence habitat elements used by other species in the ecosystem. Important habitat elements (KECs) of this species are an association with medium size snags and live trees with heart rot. Fire can also benefit this species by stimulating outbreaks of bark beetle, an important food source. Black-backed woodpecker populations typically peak in the first 3–5 years after a fire. This species' restricted diet renders it vulnerable to the effects of fire suppression and to post-fire salvage logging in its habitat (Dixon and Saab 2000).
>
> … Black-backed woodpeckers are proposed as an MIS because of their association with high numbers of snags in disturbed forests, use of late-seral old forest conditions, and relationship with beetle outbreaks in the years immediately following fire or insect or disease outbreaks. Management activities, such as salvage logging, timber harvest, and firewood collection, can affect KEFs this species performs or KECs associated with this species, and therefore **its role as an MIS would allow the Forest to monitor and**

> **evaluate the effects of management activities on identified forest communities and wildlife species.** (Emphasis added.)

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 the agency's Fire Science Brief, 2009 states, "Hutto found that Black-backed Woodpeckers fared best on sites unharvested before fire and poorest in the heavily harvested sites", raising a concern about logging for forest restoration that is not addressed in the DEIS or Assessment: How does pre-fire logging affect the future suitability of these forests to post-disturbance specialists?

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 Forest Service proposes to manage against severely burned forests, according to the LMP.

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

> 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) notes that:

> 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, Forest Service 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.

Forest Service 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.

As well as the above, we also incorporate the following as best available science concerning the black-backed woodpecker on the Colville NF: Lorenz et al., 2015; Vizcarra, 2017; Wisdom et al. 2000; Hutto (2008); Hutto (2006).

The Forest Plan includes no coherent viability strategy for black-backed woodpecker. The Forest Plan and FEIS fail to describe the quantity and quality of habitat necessary to sustain black-backed woodpecker population viability.

OLD GROWTH

We raised this issue in our July 5, 2016 comments at p. 15.

As we point out above, the LMP doesn't recognize old-growth forests as worthy of protection or any mention at all. This contradicts longstanding Forest Service policy. The CNF's 1988 Forest Plan FEIS recognizes that:

> Old growth forest is of concern for several reasons. It is usually found on productive forest land; it has unique aesthetic qualities, and it provides habitat components essential to many organisms, for which the relationships of only a few have just begun to be studied.

The Forest Service Chief's "Position Statement on National Forest Old Growth Values" (found in Green et al., 1992) states:

> **The Forest Service recognizes the many significant values associated with old growth forests**, such as biological diversity, wildlife and fisheries habitat, recreation, aesthetics, soil productivity, water quality, and industrial raw material. Old growth on the National Forests will be managed to provide the foregoing values for present and future generations. Decisions on managing existing old growth forests to provide these values will be made **in the development** and implementation **of forest plans.**
>
> **Old growth values shall be considered** in designing the dispersion of old growth. This may range from **a network of old growth stands for wildlife habitat** to designated areas for public visitation. In general, areas to be managed for old growth values are to be distributed over individual National Forests with **attention given to minimizing the fragmentation of old growth into small isolated areas**. (Emphases added.)

Green et al., 1992 state:

> Both NFMA and WO direction prescribe an ecological approach to old growth that **considers old growth as a key element in providing for biological diversity.** Old growth dependent and associated species are provided for by supplying the full range of the diversity of late seral and climax forest community types that make up habitat for these species. (Emphasis added.)

During the first round of Forest Plan development, Juday (1978) discussed in detail how the protection of old-growth forests greatly sustains the many uses of our national forests, as mandated by the Multiple Use-Sustained Yield Act and the National Forest Management Act. Prior to the emergence of the threatened viability of the northern spotted owl, he drew a parallel between the highly endangered black-footed ferret and old-growth associated wildlife in the Pacific Northwest:

> A network of old growth enclaves could help to avoid such a development in remnant Northwest old growth vertebrates. Such a network could be a "gene bank" for selections of desired crop tree characteristics; it is periodically necessary to infuse crops with new disease-resistant genes or to select for newly desired characteristics. Areas of unstable soils where logging would be expensive and likely to cause soil damage could be left covered with trees and allowed to mature into old growth. Small watersheds of prime importance for aquatic productivity, either directly or for control of the water quality in downstream spawning areas, would be suitable as old growth enclaves. As we noted earlier, the highest quality of water for human consumption comes from undisturbed forests.

The LMP completely fails to provide adequate direction recognizing old growth as a key element for maintaining and preserving biological diversity on the Colville NF. The FEIS ignores best available science.

It would be consistent with LMP direction for the Forest Service to conduct widespread obliteration of what little old growth remains on the Colville National Forest. LMP implementation would eventually result in the complete diminishment of "the many significant values associated with old growth forests" expressed in the Forest Service Chief's Position Statement On National Forest Old Growth Values found in Appendix C of the Green et al., 1992 document, which the CNF has utilized as its old-growth criteria since early in original forest plan implementation.

All old-growth forest areas, other unlogged or lightly logged forests, and most others should 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. (Harmon et al., 2002; Harmon, 2001; Harmon et al., 1990; Homann et al., 2005; Solomon et al., 2007; Turner et al., 1995; Turner et al., 1997; Woodbury et al., 2007.)

In 2001, the CNF (USDA Forest Service 2001e) stated:

> In order to comply with NFMA the Forest Plan established forest-wide management direction, goals, objectives, and guidelines for old-growth habitat and management indicator species (MIS). Guidelines for managing indicator species habitats are found on pages 4-38 to 4-42 of the Forest Plan. According to the Forest Plan, application of these required measures should ensure that each indicator species, and all other animals that use the same habitat, would persist over time. In other words, populations should remain **viable**.

The 1988 Forest Plan old growth direction is partly MA-1[7] - Old Growth Dependent Species Habitat. "The goal is to provide essential habitat for wildlife species that require old growth forest components, and contribute to the maintenance of a diversity of wildlife habitats and plant communities." (Id.) Also:

> In addition to the management prescription areas, the Forest Plan created a network of special management areas for certain old-growth dependent wildlife species. …Pine Marten Management Areas, and …Pileated Woodpecker Management Areas. (Id.)

Core habitat areas for pine marten are intended to also provide for the long-term viability of (the Northern Three-toed) woodpecker (Forest Plan, Appendix K-24). Each marten area is large enough to provide for two nesting pairs of woodpeckers." (Id.)

The 1988 Forest Plan states a commitment and intent to "Inventory … old growth forests…" (p. 2-21). The 1988 Forest Plan and FEIS asserted:

> The Forest is contracting a new vegetation inventory from which more precise information on old growth and other forest and vegetative characteristics can be interpreted. This inventory will be available for implementation and monitoring of the Forest Plan. (Forest Plan FEIS.)

However, the CNF has maintained no forestwide old-growth inventory. (See Attachment 2) The failure to inventory old growth is not a mere paperwork exercise. The barred owl, pileated woodpecker, and pine marten are 1988 forest plan MIS associated with mature to old growth forest habitats. (USDA Forest Service 2001e.)

The 1988 Forest Plan FEIS disclosed that under forest plan implementation:

> The only old growth and large sawtimber will be in stands that are preserved or managed under longer rotations for recreation, wildlife habitat, or other specific purposes. Such

[7] "(B)arred owls core areas." (USDA Forest Service 2001e)

management areas or prescriptions are necessary to maintain diversity across the Forest. …Under all alternatives, old growth forest and snags, especially in the larger size classes, will continue to decline throughout the portions of the Forest on which timber management is practiced. This will compound the direct and indirect effects previously discussed.

Also from the 1988 Forest Plan FEIS:

> The Management Prescriptions and Standards and Guidelines will result in a fragmented habitat pattern, with small islands of old-growth habitat scattered throughout the Forest, many of which are large enough to support only one breeding pair of the indicator species for which they were prescribed. The smaller species dependent on these habitats may be isolated into subpopulations, with no normal route for genetic exchange.
>
> …Old growth also occurs, and will continue to occur, in the unsuitable lands in Management Areas 5, 6, 7, and 8. These will provide some larger areas of old growth which might support greater population segments of small animals, and multiple pairs of larger ones, so that chances of viability will be enhanced.
>
> Never-the-less, there is information needed regarding old-growth habitat and ecosystem needs. Information Needs are listed in Chapter 2 of the Plan, to identify the areas in which sufficient information was lacking to confidently predict responses to the proposed actions. **Monitoring of management indicator species populations and their habitats will be necessary to assess whether they are responding as anticipated. This monitoring is in the Monitoring Plan in Chapter 5 of the Forest Plan.** (Emphasis added.)

The FS has not published an annual Forest Plan Monitoring and Evaluation Report for many years, despite forest plan requirements. Again we note that the CNF proposed using the "old growth inventory" as a way to meet Forest Plan wildlife monitoring requirements. (1988 Forest Plan at 5-20.) But that isn't all—the other wildlife monitoring requirements for old-growth and cavity dependent species found in Chapter 5 of the 1988 Forest Plan fell off the FS's radar screen. Such monitoring requirements were mandated by NFMA regulations, in order to assure that populations weren't trending toward extinction or extirpation.

Along with population trend monitoring requirements, the 1988 Forest Plan and FEIS stated a need to perform actions to help insure viability of MIS wildlife species:

> Of the many ecosystems found in wildlands, several were identified as having particular current importance in forest planning. Old growth, riparian/aquatic, upper slope ecosystems, and human interactions within the Forest environment are examples where more information would be desirable to test planning assumptions **as future plans are developed.**
>
> Species that depend on snags or components of old growth forest for survival and/or reproduction are provided for in old growth Management Areas, and in the Forestwide Standards and Guidelines for marten, pileated woodpecker and northern three-toed woodpecker. Since most of these units are merely under extended rotations, they may not be the best quality for, or contain sufficient amounts of, all the components needed to support all of the species that they are expected to support. **Monitoring will be necessary**

> for distribution of habitat units maintained to meet needs of mature and old growth forest-dependent species, and to ensure that all needed habitat components are provided in sufficient supply within those units**. Snag distribution, characteristics, and use will need to be monitored** to maintain a data base of trends in snag habitat and dependent species. (Emphases added.)

The 1988 Forest Plan MA 1 management goal is to "Provide essential habitat for wildlife species that require old growth forest components, and contribute to the maintenance of diversity of wildlife habitats and plant communities." Of MA 1, the Forest Plan requires:

> Old growth management areas will be at least 600 acres in size. They may be managed as a whole or separated into a "core area" and "foraging areas." Core areas are delineated on planning maps and allocated to Management Area 1. They will consist of old growth forest in a contiguous unit of 300 acres or more, the units being generally no more than twice as long as wide. General crown closure will be 60-100 percent (greater than 80 percent preferred) with relatively open understory.

The 1988 Forest Plan habitat management strategy for assuring viability of wildlife, especially mature/old-growth associated species and cavity habitat dependent species, has been tenuous due to simple logistical problems of finding suitable habitat at pre-established grid locations due either to past management or natural conditions. This is demonstrated by pervasive geographic habitat relocations of MA 1 during the timber sale design process, throughout Forest Plan implementation. (See Attachment 4 which is a "List of Amendments: Colville NF as of July 17, 2008" from the CNF website:
http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_034850.doc.)

Furthermore, CNF biologist M. Borysewicz describes the forestwide situation as: "many, if not most of our reserved core habitat areas for pine marten do not meet the desired stand characteristics…" (See Attachment 3).

The 1988 Forest Plan included provisions that could have determined if viable populations of wildlife are persisting while intensive habitat modifications were implemented in the form of forest management—if the FS would have observed them. These provisions could have validated the utilization of MA 1 and MIS habitat blocks as forest plan habitat protection/viability assurance strategies. Those provisions were the Forest Plan requirements for inventorying and monitoring. But the FS failed to follow them. **This was not disclosed in the LMP FEIS**.

Thus, the habitat proxy relied upon by the Colville NF under the 1988 forest plan for assuring viability of many of the species discussed in this objection fails, legally and scientifically. And despite implementing its original forest plan for 30 years, the FS failed to conduct scientifically sound population trend monitoring of wildlife species associated with old growth—thus missed an opportunity to validate the habitat proxy.

USDA Forest Service, 1987a states:

> Richness in habitat translates into richness in wildlife. Roughly 58 wildlife species on the Kootenai (about 20 percent of the total) find optimum breeding or feeding conditions in the "old" successional stage, while other species select old growth stands to meet specific

> needs (e.g., thermal cover). Of this total, **five species are believed to have a strong preference for old growth and may even be dependent upon it for their long-term survival** (see Appendix I[8]). While individual members or old growth associated species may be able to feed or reproduce outside of old growth stands, **biologists are concerned that viable populations of these species may not be maintained without an adequate amount of old growth habitat.**
>
> Wildlife richness is only a part of the story. Floral species richness is also high, particularly for arboreal lichens, saprophytes, and various forms of fungus and rots**. Old growth stands are genetic reservoirs for some of these species, the value of which has probably yet to be determined.** (Bold emphases added.)

USDA Forest Service 1987b contains a list of "species …(which) find optimum habitat in the "old" successional stage…" Kootenai National Forest, 1991 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." USDA Forest Service, 1987d provides biological information concerning old growth and old-growth associated wildlife species.

USDA Forest Service 1987a considers smaller patches of old growth to be of lesser value for old-growth associated wildlife:

> A unit of 1000 acres would probably meet the needs of all old growth related species (Munther, et al., 1978) but does not represent a realistic size unit in conjunction with most other forest management activities. On the other hand, units of 50-100 acres are the smallest acceptable size in view of the nesting needs of pileated woodpeckers, a primary cavity excavator and an old growth related species (McClelland, 1979). However, **managing for a minimum size of 50 acres will preclude the existence of species which have larger territory requirements**. In fact, Munther, et al. (1978), report that **units of 80 acres will meet the needs of only about 79 percent of the old growth dependent species** (see Figure 1). Therefore, while units of a minimum of 50 acres may be acceptable in some circumstances, 50 acres should be the exception rather than the rule. Efforts should be made to provide old growth habitat in blocks of 100 acres or larger. …**Isolated blocks of old growth which are less than 50 acres and surrounded by young stands contribute very little to the long-term maintenance of most old growth dependent species**. (Bold emphasis added.)

The Forest Plan and FEIS do not sufficiently dealt with the issue of fragmentation, road effects, and past logging on old-growth associated species' habitat. 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

[8] USDA Forest Service 1987b.

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."

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.)

Hutto, et al., 2014 set out to understand the ecological effects of forest restoration treatments on several old-growth forest stands. They found:

> Relative abundances of only a few bird species changed significantly as a result of restoration treatments, and these changes were characterized largely by **declines in the abundances of a few species associated with more mesic, dense-forest conditions, and not by increases in the abundances of species associated with more xeric, old-growth reference stand conditions.** (Emphasis added.)

The Colville NF has conducted no research or monitoring comparing pre- and post-logging old growth occupancy by or abundance of the wildlife species with strong biological associations with old growth. Biologically speaking, the FS refuses to check in with the real experts to see if logged old growth is still functioning as their habitat.

Defining characteristics of old growth discounted by the Forest Plan are acknowledged by Green et al., 1992:

> 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.

Green et al., 1992 also recognize that “Rates of change in composition and structure are slow relative to younger forests.” The FS fails to acknowledge that there’s no science to support the implication that development of old-growth character can be accelerated.

Yanishevsky (1994) points out the inadequacy of maintaining merely “minimum” amounts of habitat such as snags and old growth.

SPECIES OF CONSERVATION CONCERN

We raised this issue in our July 5, 2016 comments at pp. 14-15.

The 2012 Planning Rule defines Species of Conservation Concern (SCC) as: "a species of conservation concern is a species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area."

The LMP recognizes that forest plan Monitoring questions must address the requirements at 36 CFR 219.12 (a)(5) (the 2012 Planning Rule), which states that monitoring programs must contain one or more monitoring questions to the status of a select set of the ecological conditions required under § 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and **maintain a viable population of each species of conservation concern.**

It is clear under the 2012 Planning Rule that the Regional Forester is free to arbitrarily determine the SCC list, which is the way it's been also for Sensitive species.

The 1988 Forest Plan includes standard 3, which requires:

> Management indicator species groups will be managed as follows: (Note: Areas within which habitat units are to be confined will be no more than twice as long as wide. Distribution of habitat units is measured center to center. Prescribed distances are averages and may vary up to 20 percent. If suitable habitat does not currently exist in the proper distribution, timber stands will be managed to provide it at the earliest possible time.)
>
> **Pileated Woodpecker** - Within Douglas-fir and cedar/hemlock working groups, within a 1,000 acre unit: maintain 300 acres of conifers in seral/stages VI and/or V, (Thomas, et. al, 1979) per pair for reproducing.
>
> Maintain a minimum average of two hard snags/per acre more than 12 inches DBH within the 300 acre reproductive area. Forty-five of these 600 snags should be more than 20 inches DBH.
> When possible maintain reproductive area in 300 contiguous acres. If not possible, habitat may be arranged in blocks no less than 50 acres and no more than 1/4 mile apart.
>
> Maintain a minimum average of two hard snags/per acre more than ten inches DBH on an additional 300 acres for feeding.
>
> Distribution is five miles.
>
> **Northern Three-toed Woodpecker** - Within subalpine fir working groups and lodgepole pine components of other timber working groups, maintain 75 acres of conifers in seral stages VI and/or V, distributed every two miles. Maintain a minimum average of two hard snags per acre more than ten inches DBH, within the 75 acre reproductive area. Forty-five of these 150 snags should be more than 12 inches DBH.
>
> **Primary Cavity Excavators** - Maintain dead and defective tree habitat capable of supporting at least 60 percent of the potential population of primary cavity nesters within

land areas that are generally no larger than normal harvest unit size. These densities will be maintained through the full rotation on these areas by providing for green replacement trees.

In early successional stages (grass/forb, seedlings, and saplings) of even-age management, the required snags will be managed in patches wherever the existing distribution of snags and live trees allows. In stands with a forested structure (uneven-age management or mid-to-late stages of even-age management) either patches of snags or more evenly distributed snags are acceptable.

Where adequate snags are not currently available to meet the management requirement (MR) direction (20 percent) in each 40-acre area, created snags should be used to meet that direction as nearly as possible. If snags cannot be created, higher snag levels can be managed in adjacent areas and averaged with the low levels in deficient areas to meet MR direction.

Specific numbers and sizes of snags will be identified to fit the species needs for the particular habitat being managed using appropriate guidelines from Thomas, et. al. (1979). Retain hardwood trees; i.e., cottonwood and aspen.

Manage to provide a minimum of two down, dead trees per acre. Minimum size of these logs will be 15 feet long and 14 inches diameter at the small end. If logs of this size are not available, the largest available ones will be left.

Franklin's Grouse - Within Management Areas 5, 6, 7, and 8, in areas of extensive lodgepole pine, maintain a distribution of age classes so that within each area of 5,000 acres, at least 1,000 acres are less than 20 years of age. In addition, maintain at least 50 percent of the early age class lodgepole stands in an unthinned condition. Precommercial thinning may occur on these stands after the average tree age exceeds 20 years. Meet this standard within the intent of overall management area objectives.

Optimum unit size is 20 acres or less, however, size may approach 40 acres. Density of open roads through these stands will not exceed one mile per square mile except during active projects (to protect lynx habitat).

Blue Grouse - In park-like or open timber on and near ridgetops, maintain mature limby Douglas-fir or subalpine fir at a rate of at least eight or more trees per acre, either individuals or in groups. Insure hiding cover around at least 50 percent of the perimeter of each spring or other water source, with no break in cover exceeding 600 lineal feet along the waters edge.

Raptors and Great Blue Heron - Manage the nest sites and surrounding areas to insure their continued usefulness to the respective species.

Beaver - Maintain or enhance beaver habitat.

Furbearers - Most furbearers are within one or more management indicator species groups. Other forest management activities that may adversely effect furbearer habitat or populations are responsible for mitigation of those effects.

Waterfowl - Maintain or enhance waterfowl habitats.

Northern Bog Lemming -The northern bog lemming is a management indicator species on the Colville National Forest by virtue of its limited habitat which could foreseeably be reduced by management activities. The management goal for the northern bog lemming is to maintain at least the 1980 habitat capability.

Marten - Every 2 to 2 1/2 miles, provide units of at least 160 acres of conifer timber in successional stages VI (old growth), or V (Mature) where stage VI is not currently available. These stands will have crown cover of 50 to 100 percent and will be of species composition that will provide habitat suitable for marten. Within these units preserve natural snag densities and windthrown trees. Minimum objectives will be two snags per acre more than 12 inches DBH, of which at least one in every seven acres will be more than 20 inches DBH, and at least six down trees per acre, preferably with root wads attached.

The LMP FEIS does not disclose if the CNF has been being managed consistent with these standards, so there has been no assurance of viability of the 1988 Forest Plan Management Indicator Species. And no monitoring was conducted to be able to disclose the population abundance or population trends of the 1988 Forest Plan MIS.

Several species associated with forest conditions adversely affected by management were not included in the SCC or focal species list, some of them currently considered Sensitive under the 1988 Forest Plan, the above MIS, or both. Sensitive species are defined as “those plant species identified by the Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trend in numbers, density or habitat capability that would reduce a species distribution.” The Forest Service fails to present a scientifically defensible analysis for Sensitive species or MIS which justifies the agency’s apparent conclusion that there is no concern about a downward trend in numbers, density or habitat capability that would reduce those species’ distributions. For the Regional Forester to not list them as SCC, MIS, surrogate or focal would be arbitrary and capricious.

HABITAT CONNECTIVITY AND FRAGMENTATION

We raised this issue in our July 5, 2016 comments at pp. 15, 43.

The LMP does not include adequate management direction for habitat connectivity and linkage zones. The FEIS does not present an analysis of the quality of habitat in linkage zones.

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. 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.
>
> 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. (Internal citations omitted.)

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 Colville 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.

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.

STRUCTURE, FUNCTION, AND COMPOSITION

We raised this issue in our July 5, 2016 comments at p. 13.

The 2012 Planning Rule directs that forest plans prepared under that Rule include plan components to "maintain or **restore structure, function, and composition,** taking into account: …**System drivers, including dominant ecological processes, disturbance regimes, and stressors**…" (Emphasis added.) The Colville NF LMP does not include scientifically sound management direction for **structure, function, and composition**, and the FEIS does not present an adequate analysis of for **structure, function, and composition**.

The FS has recognized that natural processes are vital for achieving ecological integrity. USDA Forest Service, 2009a incorporates "ecological integrity" into its concept of "forest health" thus:

> "(E)cological integrity": Angermeier and Karr (1994), and Karr (1991) define this as: The

capacity to support and maintain a balanced, integrated, and adaptive biological system having the **full range of** elements and **processes** expected in a region's natural habitat. "…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 the natural habitat of the region." **That is, an ecosystem is said to have high integrity** if its full complement of native species is present in normal distributions and abundances, and **if normal dynamic functions are in place and working properly.** In systems with integrity, the "…capacity for self-repair when perturbed is preserved, and minimal external support for management is needed." (Emphases added.)

Noss 2001, 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 (emphases added):

> 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.

The most complex web of biodiversity is found on the forest floor, in the organic layers of soil. Harvey et al., 1994, scratch the surface of this this ecological complexity:

> 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.)

Fungi are not animals, they're not plants. Yet they perform keystone functions in the ecology of the forest. Without fungi, little of the diversity in the forest would be possible.

Simard et al., 2015 have conducted research on relationships between some fungi and plants, how nutrient transfers are facilitated by fungal networks. The authors state, "resource fluxes through 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." The FEIS fails to examine such important ecological functions, and the LMP provides no assurance these functions will be maintained as the FS carries on with its narrowly informed industrial forest management regime.

"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/.) Simard et al., 2013 state, "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." (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 this one on the "Wood Wide Web" on Facebook: https://www.facebook.com/BBCRadio4/videos/2037295016289614/.

Also, 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.
>
> Complex Adaptive Systems
> Underground 'tree talk' is a foundational process in the complex adaptive nature of forest ecosystems. Since plants form the basis of terrestrial ecosystems, their behavioural interactions, feedbacks and influences are important in generating the emergent properties of ecosystems (Levin 2005). Given the connectivity inherent in the formation of MNs[9] and the impressive array of plant behavioural interactions that can be mediated through them, plant behaviour and MNs are intricately linked. In the interior Douglas-fir forests of British Columbia, seedlings regenerate within the MN of old conspecific trees. The architecture of

[9] MN = mycorrhizal network

> the MN is scale-free, where hub trees are highly connected relative to other trees in the forest (Beiler et al. 2010), and this is characteristic of a complex adaptive system (Simard et al. 2013; Beiler et al. 2015). The scale of the MN is at least on the order of tens of metres (Beiler et al. 2010) and potentially much larger, with a single fungus sometimes spanning hundreds of hectares of forest (Ferguson et al. 2003). Recent work on the diversity of plant–fungal connections in forests revealed multiple levels of nestedness in the associations between host plants and fungal symbionts (Toju et al. 2014; Beiler et al. 2015). Each individual component (plant or fungus) of the ecosystem-wide network will, therefore, have a different potential to influence the behaviour of every other individual based on the extent, diversity and hierarchical level of its connections. As discussed above, the connections created by mycorrhizal fungi are agents for both positive (Song et al. 2010) and negative (Achatz et al. 2014) feedbacks to complex adaptive plant behaviour, which lead to self-organization of ecosystems (Simard et al. 2013; Beiler et al. 2015). Resilience is an emergent property of the interactions and feedbacks in scale-free networks (Levin 2005). Targeted loss of hub trees, however, can cross thresholds that destabilize ecosystems. Through the study of MNs, we are beginning to characterize the connections that are important to behaviour of system agents and thus ecosystem stability.

Also see Song et al., 2015; Beiler et al., 2009; and "Dying Trees Can Send Food to Neighbors of Different Species via Wood-Wide Web".

The scientists involved in research on ectomycorrhizal networks have discovered connectedness, communication, and cooperation between separate organisms. Such phenomena are usually studied within single organisms, e.g. the interconnections in humans (between neurons, sense organs, glands, muscles, and other organs) necessary for individual survival. The FEIS fails to consider the ecosystem impacts from industrial management activities on this mycorrhizal network, and the LMP is written in virtual ignorance of such vital organisms, processes and components. The industrial forestry management paradigm would inevitably destroy what it fails to recognize.

VEGETATION MANIPULATION

We raised this issue in our July 5, 2016 comments at pp. 18-22, 23, 38-42.

The DEIS states on p. 5, "In the past 10 to 15 years, fire acres in eastern Washington have increased with amplified severity reflective of higher fuels levels and tree mortality influences, along with longer fire seasons." The DEIS thus sets a pattern of distorting the science, ignoring the overwhelming evidence that prevailing weather conditions are what govern the behavior of the fires that affect the most acreage in any given year. The FEIS continued this unsavory pattern. The Forest Service is misleading the public in an attempt to gain acceptance for its timber agenda: "Experimental work has shown that these increasing trends can be reduced through active management when applied at a landscape scale (Schwilk et al. 2009)." (Id.)

Furthering this ruse is the agency's use of the concept "resilience." The vegetation Desired Condition, FW-DC-VEG-03, is the template for LMP direction: "Forest structural classes are resilient and compatible with maintaining characteristic disturbance processes such as wildland fire, insects, and diseases." The DEIS defines "resilience" as "The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks." However, the Forest Service provides absolutely nothing 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 one are interested. In this case, that variable is resilience, and how the agency measures it in the ecosystem.

Mostly what is "learned" about resilience from the FEIS is, it's what 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 "learned" is that nothing that happens naturally, without management, will increase resilience. In other words, from the Forest Service's perspective, resilience can only be manufactured, engineered, or imposed by management. The term "resilience" as used by the FEIS and LMP is little but a distractor, a word that sounds impressive but has little practical meaning.

The FEIS states:

> Vegetation composition for the planning area is classified based on plant association groups (PAGs), which are groups of plant associations with similar moisture and temperature regimes. The PAG data was produced in 2012 and covers the entire Colville National Forest (Henderson 2012). Forested PAGs are assigned to a Landfire biophysical setting (BpS), and a common name vegetation type. Table G-1 below shows the crosswalk between plant association, PAG, Landfire BpS, and vegetation type. Table G-2 and Table G-3 show the common names for the PAGs and plant associations. Landfire biophysical settings represent vegetation that may have been dominant on the land before European settlement and are based on an approximation of the historical disturbance regime (LANDFIRE 2007). These biophysical settings provide a good description of general vegetation characteristics, along with historical disturbance regimes, successional pathways, and basic spatial information. They also provide a link between the vegetation analysis and the fire/fuels analysis.

The FEIS thus states that the Desired Conditions for vegetation are designed around the Historic Range of Variability (HRV). Since climate change scenarios are expected lead to temperature, weather pattern, and precipitation amounts and patterns that differ from the "historical disturbance regimes" that resulted in the Forest Service's assumed HRV, it makes no sense for the LMP to rely on static Desired Conditions to "increase resilience against climate change." The range of expected forest conditions under climate change are not known.

LMP Table 5 ["Desired condition for forest structure (HRV)"], within FW-DC-VEG-03, sets direction for logging to shove the forest toward, generally, a range of percentages for the various forest structure age/conditions. Yet the LMP and FEIS fail to cite any scientific study or data set the agency used to set these Desired Condition percentages.

Similarly, other vegetation Desired Conditions have no basis in sound science or reliable data (e.g., Table 6, Table 7, Table 8). This violates NEPA's requirements for scientific integrity.

The FEIS assumes that natural fire regimes operating here would maintain much of the CNF in open conditions with widely spaced mature and old trees—much ponderosa pine with some Douglas-fir. The FEIS 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 assumption that fuel treatments under the LMP will result in likely or predictable later wildland fire effects is of considerable scientific doubt (Rhodes and Baker, 2008).

The LMP refers to "uncharacteristic conditions that support larger scale and more persistent insect outbreaks" and "stand conditions that cause an increase of tree growth loss and mortality by native root diseases and dwarf mistletoes." This demonizing of the natural agents of tree mortality and natural processes is inconsistent with best available science, and should not set direction via plan components, as does the LMP, towards "minimizing" such effects.

Also, desired condition FW-DC-IPM-01 is: "Unwanted plant, animal (vertebrate and invertebrate), and pathogen species are prevented, suppressed, contained, controlled or eradicated. Native insects and plant and animal disease pathogens exist at endemic levels. Forests are managed for resilience to pests and pathogens and to maintain native plant communities." And FW-OBJ-IPM-01 is "Damaging plant, animal, and insect pest outbreaks are prevented, suppressed, contained, controlled, or eradicated in a timely manner in accordance with proactive pest response plans." And FW-STD-IPM-01 requires "Use an integrated pest management approach to design projects to minimize or eliminate risks of adverse effects from treatment while effectively responding to the pest."

Harvey et al., 1994 state:

> Although usually viewed as pests at the tree and stand scale, insects and disease organisms perform functions on a broader scale.
>
> …Pests are a part of even the healthiest eastside ecosystems. Pest roles—such as the removal of poorly adapted individuals, accelerated decomposition, and reduced stand density—may be critical to rapid ecosystem adjustment.
>
> …In some areas of the eastside and Blue Mountain forests, at least, the ecosystem has been altered, setting the stage for high pest activity (Gast and others, 1991). This increased activity does not mean that the ecosystem is broken or dying; rather, it is demonstrating functionality, as programmed during its developmental (evolutionary) history.

Castello et al. (1995) state:

> Pathogens help decompose and release elements sequestered within trees, facilitate succession, and maintain genetic, species and age diversity. Intensive control measures, such as thinning, salvage, selective logging, and buffer clearcuts around affected trees remove crucial structural features. Such activities also remove commercially valuable, disease-resistant trees, thereby contributing to reduced genetic vigor of populations.
>
> Fire, insects & disease are endemic to western forests and are a natural process for allowing the forest to self-thin. This provides for greater diversity of plant and animal habitat than logging can achieve. In areas that have been historically and repeatedly logged there is less diversity of native plants, more invasive species, and less animal diversity.

The FEIS describes the vegetation models and the data sets used by the modeling. The FEIS and LMP do not define "model" but in the Nez Perce-Clearwater National Forest's Clear Creek Integrated Restoration Project Final EIS, the Forest Service 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." (G-14.) From www.thefreedictionary.com "empirical" is defined:

> 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.

So models are "theoretical" in nature and by implication somehow based in observation or experiment that support the hypotheses of the models. This also implies that models describe reality, but to a limited degree. That is why he Ninth Circuit Court of Appeals has declared that an EIS must disclose the limitations of its models in order to comply with NEPA. However, the FEIS does not disclose the limitations of these vegetation models.

The validity of vegetation models utilized in the FEIS's analyses have not been established for how agency utilizes them. No studies are cited which establishes their content validity, and no independent expert peer review process of the models has occurred.

There's also no indication that the vegetation type categories or the structure class definitions are, scientifically speaking, valid for the purposes for which the Forest Service employs them in FEIS analyses.

Since the entire basis of the LMP's Desired Conditions are based upon vegetation modeling that has not been examined for reliability, validity, or limitations, the LMP's set of vegetation management premises are a house of cards facing an imminent windstorm. Further compounding the situation is a joker in the deck, climate change, which the models ignore.

And because the LMP and FEIS assume that making progress toward Desired Conditions is mostly all that's required in order to protect, restore, and maintain terrestrial and aquatic species' populations, it's easy to see how this entire management paradigm is destined to fail.

For alternatives that retain the Eastside Screens 21" rule, the DEIS states, "Once trees within a stand grow larger than 21 inches d.b.h., the number of management options is essentially restricted to fire, and there is little opportunity to reduce densities and create early structure or maintain open structure types." However this is contradicted elsewhere: "If the landscape is above HRV, then large trees could be cut to achieve specific objectives." So which is it?

The FEIS describes Alternative R:

> (A)lternative R would maintain the fixed reserves management approach for late-successional and old forest habitat similar to the no action alternative, it also would include species-specific management direction for surrogate wildlife species …that are associated with these late-successional habitat structures through proposed plan components for large trees, retention of snag habitat, and down woody debris."

But as the FEIS indicates, Alternative R would engineer this habitat—there's no place for natural processes to create the habitat outside Wilderness: "timber harvest would be used as a management tool in the late forest structure MA to maintain and improve resiliency of the late and old forest habitat components (e.g., structure such as large and old trees, large snags, and downed wood)." In other words, the timber agenda would dominate, tree farmers would have their way over the vast majority of the Forest. Any apparent difference between this and other alternatives is not real.

There is no analysis of the current landscape pattern of specific forest landscapes, comparing them to the reference conditions, using data gathered in the CNF to describe both reference and current conditions. The LMP has very limited data to describe the reference condition of landscapes. Yet the LMP prescribes mostly mechanical treatments, to reduce tree density to different degrees across the landscape, without adequately demonstrating that the treatment effects would actually mimic the landscape pattern of reference conditions. The CNF does not use any scientifically-validated or peer reviewed metrics to describe the complex landscape pattern created predominantly by fire and therefore reflective of the vegetative HRV. Therefore the CNF cannot make any assurances that its management actions result in habitat conditions for wildlife that actually contribute to viability for wildlife, to adequately compensate for the unavoidable adverse effects of the mechanical treatments.

Frissell and Bayles, 1996 reinforce our skepticism about the heavy emphasis on vegetative HRV the Forest Plan utilizes, providing a scientific perspective like our concerns:

> …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.)

So by chasing its Desired Conditions for vegetation, the CNF fails to factor in many other factors of the landscape that have highly adverse effects on the landscape. Below is a list of HRVs for other factors which have been heavily impacted by management. These are factors the LMP makes no commitments to significantly improve upon, in contrast to its major emphasis on vegetation (mostly logging):

Road density	zero
Noxious weed occurrence	zero
Miles of long-term stream channel degradation ("press" disturbance)	zero
Culverts	zero
Human-induced detrimental soil conditions	<1%
Maximum daily decibel level of motorized devices	zero
Acres of significantly below HRV snag levels for many decades	zero

In his book, Among Whales ocean biologist Roger Payne has the following to say about the same kind of hubris represented by the Forest Service'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 Forest Service'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. Regarding this characteristic agency hubris, Frissell and Bayles (1996) comment:

> 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.

The FEIS discloses, "Based on the …budget trend, this analysis assumes …The expected amount of acres treated (prescribed fire, mechanical fuels, stand improvement activities, or timber harvest) will remain constant over the life of the forest plan, approximately 6,000 to 12,000 acres per year on average." That means for the expected 15-year life of the revised forest plan, only up to 180,000 acres would be manipulated by active management. The FEIS does not disclose the impacts the Forest Service believes would be ongoing with so little of the Forest meeting Desired Conditions at any given time.

FW-STD-VEG-04. **"**If individual harvest openings created by even-aged silvicultural practices are proposed that would exceed 40 acres, then NFMA requirements regarding public notification and approval shall be followed. These opening size limits shall not apply to the size of areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm." This highlights a problem there is an undefined category of natural processes the Forest Service calls "catastrophe", which defines an economic loss of opportunity as the catastrophe rather than something being ecologically harmful.

WILDLAND FIRE

We raised this issue in our July 5, 2016 comments at pp. 7-8, 18, 20-24.

The wildland fire issue is, in many ways, the most daunting and perplexing one facing management of the CNF. On one hand, the LMP and FEIS implicate it as a looming "catastrophe", a threat to life and property, a natural force to be controlled at all costs—even if those costs bust the agency budgets. On the other hand, it is recognized as a vital creative force that sustains practically all components of the forest ecosystems—wildlife, fish, soil productivity, species composition, landscape pattern and structure. In addressing the issue of wildland fire, the revision of the forest plan is at the crossroads where overall management of the CNF can shift boldly towards sustainably, or lurch onward towards ecological disintegration. Unfortunately, the Forest Service lurches onward instead of shifting boldly.

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.

The pressing unmet need for public education on this issue, coupled with the vested economic interests in carrying on fire suppression (limited only by equipment and firefighter availability), other political forces that prioritize timber over ecology, and the culture of the agency itself (favoring manipulation and control rather than embracing wildness)—all stand as significant barriers to accomplishing the necessary change in fire policy.

The FEIS touts the benefits of most action alternatives because the revised forest plan would direct that wildland fire be less suppressed and more accepted. However, the LMP does not provide solid Plan Components that would effectively reduce the incentives of managers to order as much fire suppression as available resources would allow. So the FEIS fails to provide an analysis what really would happen—perpetual "fuel treatment" via industrial logging to mitigate perpetual fire suppression.

The FEIS claims, "Fire suppression on Federal lands has led to fuels accumulation in some fire types, resulting in wildfires that are uncharacteristic in both fire effects and scale." The FEIS makes similar statements about insect outbreaks ("pests") in the Forest. There are, however, no scientific bases established for such claims. No examples of "uncharacteristic" disturbances are mentioned, probably because with such specifics, any claim of their being "uncharacteristic" could easily be refuted. The Forest Service is using this "uncharacteristic" scare as propaganda to mask its real agenda, perpetual "fuel treatment" via industrial logging to mitigate perpetual fire suppression.

FEIS Table 60 "summarizes the change in fire return intervals for each vegetation type." That data does not describe a normal range for fire return intervals, only a single statistic for most vegetation types. The FEIS doesn't even state how abnormal a fire return interval outside of 50-150 years would be for Mesic Mixed Conifer. The validity of this analysis is highly questionable.

For fire, under Environmental Consequences the FEIS states, "This analysis examines how the plan alternatives address the risk of uncharacteristic wildfire and how well they contribute to returning wildfire to a more natural role." The FS thus sends the public on a wild goose chase for uncharacteristic wildfire, distracting from its perpetual "fuel treatment" agenda.

In order to assume that "fire severity, and fire return intervals would closely match actual conditions in the future" the Forest Service must deny the reality of climate change.

Under the Forest Service's Selected Alternative P, "Seventy-four percent of the landscape exhibits a departure from natural fire process and would remain predisposed to losing key ecosystem components, which could threaten late forest structure and timber production. Losing key ecosystem components in late forest structure would impact dependent surrogate wildlife species habitat (Gaines 2015)." This pretty much shreds the rest of the FEIS's and LMP's optimistic "making progress toward" analyses.

Clearly, the Plan Components need much stronger direction and certainty for use of wildland fire and its resource benefits.

The FEIS and LMP are not clear as to how the existence of the increasing WUI and the Community Wildfire Protection Plans comprise policy and direction the Forest Service and revised forest plan must follow. Our understanding is that the WUI has been defined, and can be re-defined, without any NEPA process. The LMP does not even show the current location of the WUI. Given the uncertain location of the WUI, the FEIS cannot possibly analyze the implication of LMP implementation of WUI management.

Experience shows the countless dangers faced by firefighters, to the degree that public safety ought to be genuinely at risk before decisions are made to risk firefighter safety. And although we disagree about the extent of the WUI, we welcome a dialogue that would result in agreement where firefighting will be understood as a given likelihood (a more reasonably defined WUI) vs. where potential losses to lives would be nonexistent if a fire is allowed to burn and where private property risks are minimal. Because of the importance of dealing with this issue, these two "management area" classifications are more important than most of those in the LMP. As stated above, however, they must be established in the context of NEPA rather than by county governments, and therefore be subject to the test of good science and full and fair analysis, unlike present WUI delineations.

The CNF has never adequately analyzed and disclosed the forestwide cumulative impacts of its current policy of all-out fire suppression, and nothing in the LMP or FEIS indicates the management of wildland fire in the Forest will be any different under LMP implementation.

The FEIS fails to disclose the limitations of the Fire Regime Condition Class modeling, which is the primary justifying analysis tool supporting the EA's Purpose and Need. In another document, the Colville NF (USDA Forest Service 2012c) 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.

Fire Regimes are used by the FEIS to support the position that there are significant departures of the forest from historic fire processes and vegetation conditions. The FEIS 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.

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.)

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."

Also see DellaSala et al., 2018 who summarize some of the latest science around top-line wildfire issues, including areas of scientific agreement, disagreement, and ways to coexist with wildfire. It is a synopsis of current literature written for a lay audience and focused on six major fire topics:

1. Are wildfires ecological catastrophes?
2. Are acres burning increasing in forested areas?
3. Is high severity fire within large fire complexes (so called "mega-fires") increasing?
4. What's driving the recent increase in burned acres?
5. Does "active management" reduce wildfire occurrence or intensity?
6. Will more wildfire suppression spending make us safer?

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).

Zald and Dunne, 2018 state, "intensive plantation forestry characterized by young forests and spatially homogenized fuels, rather than pre-fire biomass, were significant drivers of wildfire severity."

In his testimony before Congress, DellaSala, 2017 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" and "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" and makes "recommendations for moving forward based on best available science."

The FEIS 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 FEIS simply does not disclose how the vegetation patterns that have resulted from past logging and other management actions would influence future fire behavior.

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 publishers 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). The 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).

News articles in the printed media also recognize the ecological benefits of wildland fires and better forest policy (See the folder entitled "News Articles").

Scientific information contradicts some of the premises upon which the LMP 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."

Ultimately the LMP and FEIS reflect 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 Forest Service rigs the game, as the "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.

Little in the FEIS informs the public about wildland fire ecology. The FS seems institutionally incapable of recognizing the highly restorative and beneficial effects of wildland fire, irrationally maintaining a position that management alone restores forests. The FEIS reflects an extremely narrow bureaucratic perspective which completely misses the uniqueness of the biological diversity found in early post-fire forests, as illustrated by news reporters and the scientists and other people interviewed for the articles in the document we incorporate, "News Media and Fire Ecology."

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…"

Wales, et al. 2007 modeled various potential outcomes of fire and fuel management scenarios on the structure of forested habitats in northeast Oregon. They projected that the natural disturbance scenario resulted in the highest amounts of all types of medium and large tree forests combined and best emulated the Natural Range of Variability for medium and large tree forests by potential vegetation type after several decades. Restoring the natural disturbances regimes and processes is the key to restoring forest structure and functionality similar to historical conditions.

The FEIS 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 Forest Service's best interest to know what sort of long-term financial commitments it is making. Further, the FEIS fails to disclose the inherent uncertainties of perpetually funding these activities, and the implications of their being left undone.

The Forest Service has no detailed long-term program for maintaining the allegedly safer "fuel" conditions, including how often areas will be treated in the future following proposed treatments, or how areas not needing treatment now will be treated as the need arises. The public needs to 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.

Also, many direct and indirect effects of fire suppression are also ignored in the FEIS. 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 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.”

Scientific information concerning fire suppression became a major theme of the Interior Columbia Basin Ecosystem Management Project (ICBEMP) in the 1990s: “Aggressive fire suppression policies of Federal land-managing agencies have been increasingly criticized as more has been learned about natural fire cycles." (USDA FS & USDI BLM 1996, p. 22.) Also, "Substantial changes in disturbance regimes—especially changes resulting from fire suppression, timber management practices, and livestock grazing over the past 100 years—have resulted in moderate to high departure of vegetation composition and structure and landscape mosaic patterns from historical ranges." (USDA FS & USDI BLM 2000, Ch. 4. P. 18.)

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."

Kauffman (2004) suggests that current FS fire suppression policies are what is catastrophic, and that fires are beneficial:

> 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.)

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.

Wisdom et al., 2000 note that the 1988 Forest Plan MIS Lewis' woodpecker is associated closely with recent burns and responds favorably to stand-replacing fires.

The LMP perpetuates the Smoky Bear myth that protection from fire is a promise that the government can and should make. The LMP 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 LMP 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 FS 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.

Cohen, 1999 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.)

The Forest Plan FEIS fails to provide an adequate analysis of the cumulative effects of fire suppression, given that the FS is unable to "allow fire occurrence under conditions other than extremes." That's because the fires the FS successfully suppresses are under non-extreme conditions, which affect the forest in ways the FS wants prescribed fires to do, but which the agency has an inadequate budget to implement.

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[10] as recommended by Utah State University, and the Firewise USA website by the National Fire Protection Association[11] for examples of educational materials.

SOIL, THE MOST FUNDAMENTAL FOREST RESOURCE

We raised this issue in our July 5, 2016 comments at pp. 24-26.

Vegetative conditions are directly related to soil productivity, which has been damaged by past management activities on the Colville National Forest. The LMP and FEIS are not based upon the best available science regarding soil productivity.

The LMP fails to conform to the Regulations' requirement to "Conserve soil … resources and not allow significant or permanent impairment of the productivity of the land" since it does not contain a single, meaningful forestwide soil standard. The only soil standard, FW-STD-SOIL-01, sets "Minimum effective ground cover following any soil-disturbing activity" without providing a meaningful way of measuring "percent effective ground cover."[12] This standard does not constrain or direct management.

There is absolutely no limit to the amount of soil loss or damage that is allowed in livestock grazing allotments or pastures, logging or burning units, temporary roads or landings, etc.

The FEIS cannot disclose the impacts on soil productivity due to the LMP's lack of regulation. Losses of soil productivity due to foreseeable increases in noxious weeds is not addressed.

This situation points out the lack of currently existing reasonable regulatory mechanisms for protecting soil productivity on the national forests as discussed by Lacy, 2001.

The FEIS states, "Forest Service Manual (FSM) Chapter 2550 Soil Management directs soil resource management on National Forest System lands." But the FEIS did not disclose this direction. It states:

> All alternatives include Region 6 soil quality standards with a 20-percent detrimental soil disturbance threshold to limit the cumulative effects to soils if multiple treatments across multiple timeframes are placed on the landscape.

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[10] https://extension.usu.edu/ueden/ou-files/Firewise-Landscaping-for-Utah.pdf

[11] http://www.nfpa.org/Public-Education/By-topic/Wildfire/Firewise-USA/The-ember-threat-and-the-home-ignition-zone

[12] FW-STD-SOIL-01 was originally a Guideline (FW-GDL-SOIL-02) in the DFP and was likely changed to a standard because our DFP comments pointed out the failure of the DFP to contain even a single soil standard.

> The proposed action and alternatives comply with the standards and guidelines described in the Forest Service Manual and Handbook, Region 6 Soil Quality Standards and Guidelines (1998c),

Yet nothing in the LMP mentions anything about a 20-percent detrimental soil disturbance threshold or specifically adopts the Region 6 Soil Quality Standards and Guidelines. The Forest Service Manual can be changed without public involvement. The Forest Service is free to treat the Region 6 Soil Quality Standards and Guidelines as "other content" it can ignore.

The FEIS states, "The FSM identifies six soil functions: soil biology, soil hydrology, nutrient cycling, carbon storage, soil stability and support, and filtering and buffering. In order to provide multiple uses and ecosystem services in perpetuity, these six soil functions need to be active and effectively working." Yet the impacts of forest plan implementation from the various alternatives' land management practices is not analyzed or disclosed in the FEIS. This violates NEPA.

Under "Past Management Impacts on Soil Quality and Productivity" the FEIS presents no quantified analyses of past management activities. Further, the FEIS fails to analyze and disclose the impacts of the alternatives on the six soil functions the FSM identified. This violates NEPA.

The decrease in future timber yield due to cumulative soil damage forestwide is not quantified in the FEIS. Even if timber were the only accepted use of the CNF, it would make no sense for the Forest Service to never factor in management-induced decreases in productivity, leading to unanticipated significant reductions over time in timber yields. USDA Forest Service, 2007 stated:

> Sustained yield was defined… 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 lands' ability to produce.

The forestwide extent of soils with permanently impairment or experiencing long-term detrimental impacts must be quantified to address the "sustained yield." The DEIS fails to analyze or disclose these cumulative impacts.

Booth, 1991 explains the relationship between soil quality conditions and hydrology:

> Drainage systems consist of all of the elements of the landscape through which or over which water travels. These elements include the soil and the vegetation that grows on it, the geologic materials underlying that soil, the stream channels that carry water on the surface, and the zones where water is held in the soil and moves beneath the surface. Also included are any constructed elements including pipes and culverts, cleared and compacted land surfaces, and pavement and other impervious surfaces that are not able to absorb water at all.
>
> …The collection, movement, and storage of water through drainage basins characterize the hydrology of a region. Related systems, particularly the ever-changing shape of stream channels and the viability of plants and animals that live in those channels, can be very

sensitive to the hydrologic processes occurring over these basins. Typically, these systems have evolved over hundreds of thousands of years under the prevailing hydrologic conditions; in turn, their stability often depends on the continued stability of those hydrologic conditions.

> Alteration of a natural drainage basin, either by the impact of forestry, agriculture, or urbanization, can impose dramatic changes in the movement and storage of water. …Flooding, channel erosion, landsliding, and destruction of aquatic habitat are some of the unanticipated changes that …result from these alterations.
>
> …Human activities accompanying development can have irreversible effects on drainage-basin hydrology, particularly where subsurface flow once predominated. Vegetation is cleared and the soil is stripped and compacted. Roads are installed, collecting surface and shallow subsurface water in continuous channels. …These changes produce measurable effects in the hydrologic response of a drainage basin.

The LMP is not consistent with NFMA or the regulations and directives, and the FEIS does not conform to NEPA requirements.

The FEIS fails to disclose the scientific controversy surrounding proper design of soil standards. As indicated in the DEIS, the CNF had adopted the Region 6 Soil Quality Standards (R6-SQS). The Region 6 Soil Quality Standards are very similar to the Soil Quality Standards (R1-SQS) adopted by USFS Region 1 in 1999. USDA Forest Service, 2016a states that the R1-SQS "created the concept of 'Detrimental Soil Disturbance' (DSD[13]) 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 explains:

> **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 –

[13] Also known as Detrimental Soil Conditions, or "DSC."

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 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.

(Emphases added.) On this same theme, the FEIS did not disclose that the R6-SQS detrimental soil conditions (DSC) areal extent limit is based on feasibility of timber sale implementation rather than concerns over soil productivity. Discussing the R1-SQS, USDA Forest Service, 2008a explains:

> Powers (1990) cites that the rationale bulk density is largely based on collective judgment. The FS estimates that a true productivity decline would need to be as great as 15% to detect change using current monitoring methods. Thus the soil-quality standards are set to detect a decline in potential productivity of at least 15%. This does not mean that the FS tolerates productivity declines of up to 15%, **but merely that it recognizes problems with detection limits.** (Emphasis added.)

However, Powers refers to separate and distinct thresholds when he discusses 15% **increases in bulk density**, which is a threshold of when soil compaction is considered to be detectable, and 15% **areal limit**[14] **for detrimental disturbance**, which is the soil quality standard limit for DSD (including compaction from temporary roads and heavy equipment, erosion resulting from increased runoff, puddling, displacement from skid trails, rutting, etc.). With that caveat, what Powers had to say in relation to the soil quality standard is quite revealing (as pointed out by Nesser, 2002):

> (T)he 15% standard for increases in bulk density originated as the point at which we could reliably measure significant changes, considering natural variability in bulk density… (A)pplying the **15% areal limit** for detrimental damage is not correct... that was never the intent of the 15% limit… and **NFMA does not say that we can create up to 15% detrimental conditions**, it says basically that we cannot create significant or permanent impairment, period... . (Emphases added.)

USDA Forest Service 2008b states, "The 15% change in aerial extent realizes that timber harvest and other uses of the land result in some impacts and impairment that are unavoidable. **This**

[14] The 1988 Forest Plan included a standard, "The total acreage of all detrimental soil conditions should not exceed 20 percent of the total acreage within the activity area including landings and system roads" similar to the R-6 SQS, "Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area. (This includes the permanent transportation system.)" The R-1 SQS used 15% while not including system roads within activity areas.

limit is based largely on what is physically possible, while achieving other resource management objectives." (Emphasis added.) So the R6-SQS limits are based on feasibility of ground-based logging methodology implementation rather than concerns over soil productivity; and additionally we have the bulk density increase limit is based upon the limitations of detection by Forest Service measuring methods—again, not concerns over soil productivity.

So the R6-SQS—and now the LMP—allow a significant percentage of an activity area to be DSC over the long term. The Forest Service claims this is consistent with NMFA and regulations. This is arbitrary, and not supported by any science measuring or estimating the losses in soil, site or land productivity expected under this management regime. Page-Dumroese et al. 2000 emphasize the importance of validating soil quality standards using the results of monitoring:

> Research information from short- or long-term research studies supporting the applicability of disturbance criteria is often lacking, or is available from a limited number of sites which have relative narrow climatic and soil ranges. …Application of selected USDA Forest Service standards indicate that **blanket threshold variables applied over disparate soils do not adequately account for nutrient distribution within the profile or forest floor depth. These types of guidelines should be continually refined to reflect pre-disturbance conditions and site-specific information.** (Emphases added.)

Eighteen years later, the Forest Service can cite no science supporting their application of blanket threshold variables applied over disparate soils.

Soil productivity can only be protected if it turns out that the soil standards work. To determine if they work, the Forest Service would have to undertake objective, scientifically sound measurements of what the soil produces (grows) following management activities. But the FEIS doesn't cite such science.

We turn now to proper implementation of the soil standards. The FEIS does not cite the results of forest plan implementation monitoring to verify a central LMP assumption—that the soil quality standards would adequately limit soil damage.

The Forest Plan adopts a proxy—detrimental soil conditions (DSC)—rather than more direct measures of management-induced losses or reductions of soil productivity. We are aware of no scientific information based upon CNF data that correlates the proxy (areal extent of DSC in activity areas) to metrics of long-term reductions in soil productivity in activity areas, in order to validate the use of the proxy as a scientifically meaningful estimate of changes in soil productivity.

The proxy results in some levels of observable or measurable soil damage to be completely discounted because it falls below an arbitrary threshold—even though it may cumulatively affect the productivity of the soil.

Page-Dumroese, et al., 2007 discuss wildly variable results of different soil compaction instruments, which indicates the FS must explain the limitations of the compaction survey methodology. So for example, merely used a shovel test for determining compaction, without providing a scientific basis for its accuracy or validity, is arbitrary and capricious.

The FEIS not disclose how soil and land productivity has been affected forestwide due to soil disturbing activities and noxious weed infestations. USDA Forest Service, 2005a states:

> Noxious weed presence may lead to physical and biological changes in soil. Organic matter distribution and nutrient flux may change dramatically with noxious weed invasion. Spotted knapweed (Centaurea biebersteinii D.C.) impacts phosphorus levels at sites (LeJeune and Seastedt, 2001) and can hinder growth of other species with allelopathic mechanism. Specific to spotted knapweed, these traits can ultimately limit native species' ability to compete and can have direct impacts on species diversity (Tyser and Key 1988, Ridenour and Callaway 2001).

The FEIS does not disclose the total existing percent of DSC on the CNF. The cumulative amount of existing soil damage over the entire Forest has implications for every other resource including water quality and the development of old-growth forests and even sustained yield of timber. The public deserves to know the scale of total area needing soil restoration.

The FEIS does not cite monitoring results addressing any FS assumptions that soil damage mitigations work as intended. The FEIS does not disclose the efficacy of noxious weed treatments being carried out on the CNF under previous weed treatment programs.

The methodology for "activity areas" inherently encourages gerrymandering areas never logged into project "activity areas", helping to artificially dilute the amount of effective detrimental soil disturbance from previously logged units by creating a more favorable average.

Lacy, 2001 examines the importance of soils for ecosystem functioning and points out the failure of most regulatory mechanisms to adequately address the soils issue. From the Abstract:

> Soil is a critical component to nearly every ecosystem in the world, sustaining life in a variety of ways—from production of biomass to filtering, buffering and transformation of water and nutrients. While there are dozens of federal environmental laws protecting and addressing a wide range of natural resources and issues of environmental quality, there is a significant gap in the protection of the soil resource. Despite the critical importance of maintaining healthy and sustaining soils, conservation of the soil resource on public lands is generally relegated to a diminished land management priority. Countless activities, including livestock grazing, recreation, road building, logging, and mining, degrade soils on public lands. This article examines the roots of soil law in the United States and the handful of soil-related provisions buried in various public land and natural resource laws, finding that the lack of a public lands soil law leaves the soil resource under protected and exposed to significant harm. To remedy this regulatory gap, this article sketches the framework for a positive public lands soil protection law. This article concludes that because soils are critically important building blocks for nearly every ecosystem on earth, a holistic approach to natural resources protection requires that soils be protected to avoid undermining much of the legal protection afforded to other natural resources.

Lacy, 2001 goes on:

> Countless activities, including livestock grazing, recreation, road building, logging, mining, and irrigation degrade soils on public lands. Because there are no laws that directly address and protect soils on the public lands, consideration of soils in land use planning is usually only in the form of vaguely conceived or discretionary guidelines and monitoring requirements. This is a major gap in the effort to provide ecosystem-level protection for natural resources.
>
> The rise of an "ecosystem approach" in environmental and natural resources law is one of the most significant aspects of the continuing evolution of this area of law and policy. One writer has observed that there is a
>
>> fundamental change occurring in the field of environmental protection, from a narrow focus on individual sources of harm to a more holistic focus on entire ecosystems, including the multiple human sources of harm within ecosystems, and the complex social context of laws, political boundaries, and economic institutions in which those sources exist.
>
> As federal agencies focus increasingly on addressing environmental protection from a holistic perspective under the current regime of environmental laws, a significant gap remains in the federal statutory scheme: protection of soils as a discrete and important natural resource. **Because soils are essential building blocks at the core of nearly every ecosystem on earth, and because soils are critical to the health of so many other natural resources—including, at the broadest level, water, air, and vegetation—they should be protected at a level at least as significant as other natural resources.** Federal soil law (such as it is) is woefully inadequate as it currently stands. It is a missing link in the effort to protect the natural world at a meaningful and effective ecosystem level.
>
> … This analysis concludes that the lack of a public lands soil law leaves the soil resource under-protected and exposed to significant harm, and emasculates the environmental protections afforded to other natural resources.

The R6-SQS and LMP direction is full of loopholes. Furthermore, they basically boil down to a mitigation of soil productivity losses with an entirely uncertain outcome, as explained below.

The FS states:

> The Forest Service Soils Manual (FSM 2550; November 2010) and Region 1 Soil Quality Standards provide guidelines and methods to show compliance with the National Forest Management Act (NFMA). The objectives of the Region 1 Soil Quality Standards (R1 SQS) include managing National Forest System lands "without permanent impairment of land productivity and to maintain or improve soil quality", similar to the NFMA. Region 1 Soil Quality Standards are based on the use of six physical and one biological attribute to assess current soil quality and project effects. These attributes include compaction, rutting, displacement, severely-burned soils, surface erosion, soil mass movement, and organic matter.[15]

The Soil and Water Conservation Practices Handbook (FSH 2509.22) states:

[15] Jam Cracker Environmental Assessment, Lolo National Forest, 2016

Practice 11.01 – Determination of Cumulative Watershed Effects
OBJECTIVE: To determine the cumulative effects or impact on beneficial water uses by multiple land management activities. Past, present, or reasonably foreseeable future actions in a watershed are evaluated relative to natural or undisturbed conditions. Cumulative impacts are a change in beneficial water uses caused by the accumulation of individual impacts over time and space. Recovery does not occur before the next individual practice has begun.

EXPLANATION: The Northern and Intermountain Regions will manage watersheds to avoid irreversible effects on the soil resource and to produce water of quality and quantity sufficient to maintain beneficial uses in compliance with State Water Quality Standards. Examples of potential cumulative effects are: 2) excess sediment production that may reduce fish habitat and other beneficial uses; 3) water temperature and nutrient increases that may affect beneficial uses; 4) compacted or disturbed soils that may cause site productivity loss and increased soil erosion; an 5) increased water yields and peak flows that may destabilize stream channel equilibrium.

IMPLEMENTATION: As part of the NEPA process, the Forest Service will consider the potential cumulative effects of multiple land management activities in a watershed which may force the soil resource's capacity or the stream's physical or biological system beyond the ability to recover to near-natural conditions. A watershed cumulative effects feasibility analysis will be required of projects involving significant vegetation removal, prior to including them on implementation schedules, to ensure that the project, considered with other activities, will not increase sediment or water yields beyond or fishery habitat below acceptable limits. The Forest Plan will define these acceptable limits. The Forest Service will also coordinate and cooperate with States and private landowners in assessing cumulative effects in multiple ownership watersheds.

The FS has at times recognized that amounts of soil compaction and other measures of DSC across a watershed accumulates over space and time to harm watersheds. From USDA Forest Service, 2008f:

> Many indirect effects are possible if soils are detrimentally-disturbed… Compaction can indirectly lead to decreased water infiltration rates, leading to increased overland flow and associated erosion and sediment delivery to stream. Increased overland flow also increases intensity of spring flooding, degrading stream morphological integrity and low summer flows.

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.

The Bitterroot National Forest admits that subwatersheds which have high levels of existing soil damage could indicate a potential for hydrologic and silviculture concerns. (USDA Forest

Service, 2005b, p. 3.5-11, 12.) USDA Forest Service, 2007c acknowledges that soil conditions affect the overall hydrology of a watershed:

> Alteration of soil physical properties can result in loss of soil capacity to sustain native plant communities and reductions in storage and transmission of soil moisture that may affect water yield and stream sediment regimes. (P. 4-76, emphasis added.)

Kuennen et al. 2000 (a collection of Forest Service soil scientists) state:

> An emerging soils issue is the cumulative effects of past logging on soil quality. Pre-project monitoring of existing soil conditions in western Montana is revealing that, where ground-based skidding and/or dozer-piling have occurred on the logged units, soil compaction and displacement still are evident in the upper soil horizons several decades after logging. Transecting these units documents that the degree of compaction is high enough to be considered detrimental, i.e., the soils now have a greater than 15% increase in bulk density compared with undisturbed soils. Associated tests of infiltration of water into the soil confirm negative soil impacts; **the infiltration** rates on these compacted soils are several-fold slower than rates on undisturbed soil.
>
> …**The effects of extensive areas of compacted and/or displaced soil in watersheds along with impacts from roads, fire, and other activities are cumulative.** A rapid assessment technique to evaluate soil conditions related to past logging in a watershed is based on a step-wise process of aerial photo interpretation, field verification of subsamples, development of a predictive model of expected soil conditions by timber stand, application of this model to each timber stand through GIS, and finally a GIS **summarization of the predicted soil conditions in the watershed.** This information can then be combined with an assessment of road and bank erosion conditions in the watershed to give a holistic description of watershed conditions and to help understand cause/effect relationships. **The information can be related to Region 1 Soil Quality Standards to determine if, on a watershed basis, soil conditions depart from these standards.** Watersheds that do depart from Soil Quality Standards can be flagged for more accurate and intensive field study during landscape level and project level assessments. **This process is essentially the application of Soil Quality Standards at the watershed scale with the intent of maintaining healthy watershed conditions**. (Emphases added.)

Nothing in the FEIS specifically addresses the hydrological implications of the cumulative soil damage caused by past management in Forest watersheds. Kootenai NF hydrologist Johnson, 1995 noted this effect from reading the scientific literature: “Studies by Dennis Harr have consistently pointed out the effects compacted surfaces (roads, skid trails, landings, and firelines) on peak flows.” Elevated peak flows harm streams and rivers by increasing both bedload and suspended sediment.

While Harr, 1987 rejects absolute thresholds for making determinations of significant vs nonsignificant levels of soil compaction in watersheds, he nevertheless refers to his experience as Johnson 1995 (above) noted:

> …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.

The FS has at times even quantified past DSC across watersheds of various sizes. USDA Forest Service 2005d states:

> **Cumulative effects may also occur at the landscape level, where large areas of compacted and displaced soil affect vegetation dynamics, runoff, and water yield regimes in a subwatershed.** About 4,849 acres are currently estimated to have sustained detrimental compaction or displacement in the American River watershed due to logging, mining, or road construction. … About 4,526 acres are currently estimated to have sustained detrimental compaction or displacement in the Crooked River watershed due to logging, mining, and road or trail construction.
>
> …An estimated 73 percent (208) of past activity areas on FS lands in American River (and an estimated 69 percent (166) of past activity areas on FS lands in Crooked River) today would show detrimental soil disturbance in excess of 20 percent. (Emphasis added.)

A recent Idaho Panhandle National Forests forest plan monitoring report (USDA Forest Service 2013a) revealed the relatively high frequency of violating the 15% standard. Other units of the national forest system have monitored DSC with very mixed results (e.g., Reeves et al., 2011). The point is, as weak as the standards are, even FS pledges to meet standards must be taken with a grain of salt.

Then there is the issue of the thoroughness, reliability and validity of the soil survey methods used by the FS. 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) 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.)

Geist et al., 1990 describe a methodology using a sampling grid, and they demonstrate that taking bulk soil density samples is quite feasible. This is necessary because deep, not necessarily visible subsurface compaction has been detected long after logging activities (e.g. Page-Dumroese, 1993).

Craigg and Howes (in Page-Dumroese, et al. 2007) state:

> Meaningful soil disturbance standards or objectives must be based on measured and documented relationships between the degree of soil disturbance and subsequent tree growth, forage yield, or sediment production. Studies designed to determine these relationships are commonly carried out as part of controlled and replicated research projects. The paucity of such information has caused problems in determining threshold levels for, or defining when, detrimental soil disturbance exists; and in determining how much disturbance can be tolerated on a given area of land before unacceptable changes in soil function (productive potential or hydrologic response) occur. Given natural variability of soil properties across the landscape, a single set of standards for assessing detrimental disturbance seems inappropriate.

Craigg and Howes (in Page-Dumroese, et al. 2007) state:

> Each soil has inherent physical, chemical, and biological properties that affect its ability to function as a medium for plant growth, to regulate and partition water flow, or to serve as an effective environmental filter. When any or a combination of these inherent factors is altered to a point where a soil can no longer function at its maximum potential for any of these purposes, then its quality or health is said to be reduced or impaired (Larson and Pierce 1991).

Page-Dumroese, et al., 2007 discuss wildly variable results of different soil compaction instruments, which indicates the FS must explain the limitations of the compaction survey methodology. Merely used a shovel test for determining compaction, without providing a scientific basis for its accuracy or validity, is arbitrary and capricious.

Recent research reveals even more profound biological properties of forest soil. "(R)esource fluxes through 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.) The FS has never considered how management-induced damage to EM networks causes site productivity reductions.

Amaranthus, Trappe, and Molina (in Perry, et al., 1989a) recognize "mycorrhizal fungus populations may serve as indicators of the health and vigor of other associated beneficial organisms. Mycorrhizae provide a biological substrate for other microbial processes."

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

Another cumulative impact the LMP ignores is the existing or prior management-induced DSD on old log landings kept on the land for future use. They are typically flattened areas which had been compacted or had organic layers displaced to use as temporary log storage and log truck loading, and in many cases 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 extent by the LMP. Much like system roads, there are no limits to total DSC from landings set by the LMP, and there are no requirement that their extent in any 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 LMP.

Still more cumulative soil damages the LMP ignores involve existing DSC on areas the Forest Service maintains as part of the "suitable" or productive land base such as timber stands, grazing allotments and riparian zones that are not within the boundaries of any current project activity areas. The LMP does not limit or require disclosure of the existing/prior DSC in such areas, possibly 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, the LMP does not compel the Forest Service to take actions that might restore the soil productivity in such areas because their existing DSC does not matter for determining consistency with the LMP —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 a new round of logging and soil damage.

USDA Forest Service, 2009c admits, in regards to project area sites where DSD 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**. (Emphasis added.)

The FEIS does not disclose that DSC limits are based upon the amount of damage that is operationally feasible, not scientific data that measures land and soil productivity losses caused by DSC.

DSC is merely a proxy for soil productivity. The FS lacks science to validate the SQS methodology for use as a soil productivity proxy.

Discussing the R1-SQS, USDA Forest Service, 2008a states:

> Powers (1990) cites that the rationale bulk density is largely based on collective judgment. The FS estimates that a true productivity decline would need to be as great as 15% to detect change using current monitoring methods. Thus the soil-quality standards are set to detect a decline in potential productivity of at least 15%. This does not mean that the FS tolerates productivity declines of up to 15%, **but merely that it recognizes problems with detection limits.** (Emphasis added.)

It is important to point out, however, that Powers refers to separate and distinct thresholds when he talks about 15% increases in bulk density, which is a threshold of when soil compaction is considered to be detectable, and 15% areal limit for detrimental disturbance, which is the soil quality standard threshold for how much of an activity area can be detrimentally disturbed (including compaction from temporary roads and heavy equipment, erosion resulting from increased runoff, puddling, displacement from skid trails, rutting, etc.). With that caveat, what Powers has to say in relation to the soil quality standard is quite revealing (as quoted in Nesser, 2002):

> (T)he 15% standard for increases in bulk density originated as the point at which we could reliably measure significant changes, considering natural variability in bulk density… (A)pplying the **15% areal limit** for detrimental damage is not correct... (T)hat was never the intent of the 15% limit… and **NFMA does not say that we can create up to 15% detrimental conditions**, it says basically that we cannot create significant or permanent impairment, period... (Emphasis added.)

There are more direct indices of losses in soil productivity due to management activities. A FS report by Grier et al., 1989 adopted as a measure of soil productivity: "the total amount of plant material produced by a forest per unit area per year." They cite a study finding "a 43-percent reduction in seedling height growth in the Pacific Northwest on primary skid trails relative to uncompacted areas" for example. And in another FS report, Adams and Froehlich (1981) state:

> Measurements of reduced tree and seedling growth on compacted soils show that significant impacts can and do occur. Seedling height growth has been most often studied, with reported growth reductions on compacted soils from throughout the U.S. ranging from about 5 to 50 per cent.

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."

Cullen et al. (1991) concluded: (M)ost compaction occurs during the first and second passage of equipment." Page-Dumroese (1993), investigating logging impacts on volcanic ash-influenced soil, stated: "Moderate compaction was achieved by driving a Grappler log carrier over the plots twice." Page-Dumroese (1993) also cited other studies that indicated "Large increases in bulk density have been reported to a depth of about 5 cm with the first vehicle pass over the soil." Williamson and Neilsen (2000) assessed change in soil bulk density with number of passes and found 62% of the compaction to the surface 10cm came with the first pass of a logging machine. In fine textured soils, Brais and Camire (1997) demonstrated that the first pass creates 80 percent of the total disturbance to the site. Adams and Froehlich (1981) state, "(L)ittle research has yet been done to compare the compaction and related impacts caused by low-pressure and by conventional logging vehicles."

We note that it doesn't matter how sensitive the soils, how steep the land, how poor the site is for growing trees, the LMP areal limits are the same.

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. (P. 3-279.)

The LMP definition of DSC considers only alterations to physical properties, but not chemical or biological properties. The LMP is not consistent with best available science.

One of these biological properties is represented by naturally occurring organic debris from dead trees. The LMP recognizes the importance of limiting the ecological damage that logging causes due to retaining inadequate amounts of large woody debris, but set no firm, mandatory quantitative limits on these losses caused by logging and slash burning.

Some 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.)

NEPA requires that the FS specify the effectiveness of its mitigations. (40 C.F.R. 1502.16) The FEIS fails to specify the effectiveness of its mitigation of DSC. There is no <u>quantitative</u> monitoring data that demonstrates DSC remediation activities have taken an activity area with DSC amounts over the percentage limit to an amount that no longer violates the standard.

USDA Forest Service 2005d states:

> **Decompaction** can at least **partly restore** soil porosity and productivity. Soil displacement that mixes or removes the volcanic ash surface layer reduces soil moisture holding capacity, which may be **irreversible and irretrievable**. (Emphasis added.)

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

The FEIS does not disclose the degree to which the productivity of the land and soil has been affected in the Forest due to noxious weed infestations, and how that situation is expected to change in the coming years and decades. The Forest's noxious weed treatment program is mitigation for management activities which exacerbate the spread of noxious weeds. The FEIS fails to disclose the effectiveness of this mitigation.

The Lolo NF's Jam Cracker EA states:

> Any activity that exposes soil has the potential to accelerate weed spread. Factors limiting weed spread are shade from tree canopies, higher soil moisture, needle and grass litter that provides a mulch-like covering of the ground, lack of exposed soil, and native plant competition.

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 often proposes winter logging as mitigation. Evidence that winter logging can affect vegetative production in the absence of significant ground disturbance was collected by Sexton (1994) and summarized by USDA Forest Service (2000a) in a study in central Oregon in postfire ponderosa pine stands, logged over snow. Sexton found that biomass of vegetation produced 1 and 2 years after postfire logging was 38 percent and 27 percent of that produced in postfire unlogged stands. He also found that postfire logging decreased canopy cover, increased exotic plant species, increased graminoid cover, and reduced overall plant species richness. Pine seedlings grew 17 percent taller on unlogged sites in this short-term study. Ground based winter logging may not be effective mitigation for soil impacts and may impede recovery of the burned area.

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 SQS. Winter-logging resulted in an average of 16% detrimentally damaged soil." (P. 3.5-21.)

FS 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. 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.

The Forest Service also 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. (USDA Forest Service, 2007c, Page 4-76.)

Continual and repeated application of the LMP will result in soils maintained at a damaged condition essentially forever: "Activity units that have had little prior disturbance will show a greater incremental increase in potential detrimental disturbance than those units that **already contain a network of existing skid trails**. Little to no increase in disturbance is expected there because equipment would **re-use existing skid trails** and move on slash mats whenever possible." (Emphasis added.) Again, the FS has no quantitative data on the resulting continuous deficits in soil and land productivity. To the U.S. Department of Agriculture, such soil damage in national forests hardly matters at all.

FEIS ANALYSIS AND FOREST PLAN DIRECTION REGARDING LIVESTOCK GRAZING IS ABYSMAL

We raised this issue in our July 5, 2016 comments at pp. 4, 6, 24, 26-30, 35, 42-43.

Much scientific literature and many agency assessments affirm the adverse ecological impacts of livestock grazing on wildland ecosystems. In a literature review investigating livestock as a contributor to noxious weed spread, Belsky and Gelbard, 2000 state:

> At the landscape and regional scales, livestock grazing is one of several factors causing and enhancing the invasion of alien weeds into grassland, shrubland, and woodland communities; but at the community scale, livestock may be the major factor causing these invasions. Most studies find that plant communities grazed by domestic livestock contain a greater density, frequency, or cover of nonindigenous plants than ungrazed communities.

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 and Blumenthal, 1997 investigate these impacts livestock grazing causes to stand dynamics and soils of upland forests of the Interior West.

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.

Elsewhere, the CNF has acknowledged that "Natural and constructed barriers keep cattle in the allotment and allow herding to be more effective. Timber harvest and burning have the potential to remove natural barriers that restrict cattle movement." (USDA Forest Service 2001e at 128.)

USDA Forest Service 2001e at p. 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 below figure at page 126, explaining some effects of livestock grazing on streams and riparian areas:

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,

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.

> 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.

Scientists Letter, 2011 contains a discussion of some of the well-documented, widely known direct, indirect, and cumulative environmental impacts of current livestock grazing on national forest lands, which focuses on national forests west of the Rockies.

USDA Forest Service, 2012c (CNF's Power Lake Vegetation Management Project 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 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 FEIS. These are the very conditions that the Forest Service uses as justification for most projects on the CNF (Purpose and Need), and attributes almost exclusively to fire suppression. The authors 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.

(Also see Katie Fite Declaration.)

There are high levels of embeddedness in the streams due to cattle grazing on CNF lands and elsewhere. This could significantly impair fish spawning success. The CNF's Aladdin Allotment Complex EA states:

> High levels of embeddedness exist in a majority of the reaches surveyed within the allotments. A major factor affecting the level of embeddedness is the existing amount of soil movement from sloughing stream banks. This is primarily occurring in the pastures where cattle use is highest.

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."

The FEIS states, "The revised plan proposes no changes in the status, location, or boundaries of permitted range allotments or type of livestock." This is perhaps best explained where the FEIS states:

> Eliminating grazing is inconsistent with Forest Service policy. Opening and closing allotments or changing allotment boundaries are site-specific decisions not made in this forest plan revision process. The revised land and resource management plan and alternatives identify suitable uses (including grazing) for each management area and the FEIS discloses the effects of grazing on other resources. Alternatives are not designed to change boundaries, end grazing, or make site-specific changes to allotments. The revised land and resource management plan describes management direction, such as desired conditions for the variety of vegetation types within grazing allotments, that may result in future changes to allotment management plans.

The lack of scientific integrity of the FEIS's livestock analysis approaches that of its climate change analysis. For example, the DEIS states, "It has been hypothesized that grazed areas resulting in a lower soil water-holding capacity and lower temperature sensitivity of soil respiration might release less carbon dioxide (CO_2) to the atmosphere through soil respiration under future precipitation and temperature scenarios." There you go—solve the climate crisis by increasing livestock grazing.

The FEIS then trots out "science" in support, however nothing it cites actually resulted from direct measures of the claimed or modeled CO_2 benefits. The FEIS fails to address the conclusions of conflicting science, such as "Grazing and trampling reduces the capacity of soils to sequester carbon, and through various processes contributes to greenhouse warming." (Beschta et al., 2012).

The FEIS doesn't analyze or disclose noxious weed spread due to livestock grazing. The FEIS doesn't analyze or disclose soil damage due to livestock grazing. The FEIS doesn't analyze or disclose riparian habitat damage due to livestock grazing. The FEIS doesn't analyze or disclose the interaction between upland vegetation changes due to livestock grazing, fire behavior, and forest composition. The FEIS doesn't analyze or disclose the expected annual infrastructure maintenance and installation costs paid for by taxpayers for the benefit of livestock grazing. The FEIS does not analyze or disclose the costs and impacts of Wildlife Services destruction of wildlife species at the behest of grazing interests.

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

The FEIS 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.

O'Brien et al. (2003) found that four indicators were useful for describing the range condition and functionality of rangelands at many scales. The indicators include presence or absence of noxious weeds, percent ground cover, plant species composition, and percent shrub cover. Adequate data and analysis for these rangeland health indicators is not considered by the FEIS, revealing that the Forest Service has not conducted a thorough and scientifically based suitability and capability determinations. Furthermore, there are no standards in the LMP that direct such a determination be undertaken at the allotment-specific level.

From the perspective of best available science, the Forest Service utterly fails in relation to climate change, climactic conditions and livestock grazing. In 2016, the USDA published a study titled, "Effects of Drought on Forests and Rangelands in the United States: A Comprehensive Science Synthesis" (Vose et al., 2016) that includes information on the effects of drought on rangelands and adaptive strategies for managing livestock. According to the report, "The most obvious and arguably the single most important strategy for adapting to drought is reduction in stocking rate because plants that have been overgrazed or cropped too frequently are less able to recover after drought (Hart and Carpenter 2005)."

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

- 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 CO_2 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.

Given the overwhelming evidence that livestock grazing is have a negative impact on riparian and aquatic ecosystems across the planning area, even though INFISH has been in place for over two decades, a reasonable person would expect the Forest Service to develop new and more stringent strategies to improve conditions and implement them as soon as possible. Unfortunately, the Forest has decided to go in completely the opposite direction. Gone are the measurable quantitative objectives of INFISH to be replaced mostly by Desired Conditions that can only be measured qualitatively. Absent are any objectively measurable and quantitative allowable use limits. Absent from the Plan direction is a bank alteration threshold with enough specificity to be objectively measured. Also disturbing, no changes will be made to any grazing allotment or authorization in the entire planning area until site-specific analysis is completed and the allotment management plan revised. Considering the track record for the CNF in terms of collecting data, monitoring, compliance checks, and actually completing NEPA analysis for AMP revisions, this is fundamental abrogation of responsibility that is contrary to law and is arbitrary and capricious.

The FEIS ignores the fact that existing financial and personnel limitations are unlikely to change in the future, which has led to inadequate monitoring and assessment of permittee compliance.

There is no accurate and updated analysis of capability or carrying capacity. There is no serious analysis of drought or climate change in terms of livestock grazing practices. In most cases this is likely a result of the Forest's admitted failure to properly manage the range program, monitor conditions, or collect quantitative data but it is also a cover up to mask the serious consequences of this failure as it relates to future management decisions. The truth is that the CNF is terribly degraded from permitted livestock grazing and the situation is likely to get worse under all alternatives due to the increasing pressures of climate change and the continuing spread of invasive plants throughout the Forest. This will be compounded by the continued financial and personnel limitations that will surely plague the grazing program for decades to come.

The Forest Service must honestly asses the capacity of the agency to manage the grazing program and adjust the scope of the grazing program to reflect reality. In the short term, the CNF must adopt interim standards to protect riparian and aquatic habitats that are measurable and demonstrable to permittees. The authority for the CNF to modify existing grazing permits to apply interim standards is found at 36 CFR 222.4(a)(7), which states the authorized officer may modify permits immediately if the purpose of the modification is to bring the livestock grazing activity into conformance with current situations brought about by changes in law, regulation, executive order, forest or grassland plan, allotment management plan, or other management needs.

The CNF can then dedicate available resources to compliance with the standards until such time as AMP revisions can be accomplished. Failure to do so violates federal law including the requirement to prevent unnecessary and undue degradation of public lands. In the case of this FEIS, the Forest Service fails to even analyze any alternative that contain interim standards or actual changes to grazing management in the near term. This is a clear violation of NEPA that must be remedied.

The LMP objective, FW-OBJ-LG-01 directs that "Within 5 years of a decision being made to implement an Allotment Management Plan, relocate or reconstruct, at least 75 percent of the identified range infrastructure (for example, water developments, fences, loading chutes, and holding structures) that has become non-functional or in need of replacement." In regards to fences at least, this objective enables ongoing ecological damage to continue for years after the problem is identified.

The following are Forest Plan monitoring requirements that the CNF has routinely ignored forestwide:

1. Annual Report on compliance with AUM restrictions
2. Annual Review of compliance with range-improvement schedule
3. Annual Report on utilization of forage

4. Monitor Conditions of Riparian and Range resources on 10% of allotments every year.
5. Results of monitoring will be incorporated in annual operating plans and Allotment Management Plans

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 FEIS violates NEPA in terms of methodology, scientific accuracy, scientific integrity, and failure to properly analyze and disclose cumulative effects.

WEEDS

We raised this issue in our July 5, 2016 comments at pp. 21, 24, 30, and 35.

Nothing even suggest that weeds are being reduced on the Forest, even though the Forest Service has been relying upon measures such as "the Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision (USDA Forest Service 2005)" which would be "common to all alternatives."

The FEIS admits, "Alternative P would result in an elevated level of risk for invasive plants compared to the no-action alternative and that which has been experienced under the existing 1988 Plan. This is because the amount of suitable forestlands is predicted to increase."

Despite the token measures now being taken, as the FEIS admits the soil disturbing actions would only worsen the problem. The LMP contains no direction to reign in its unsustainable management, including weed spread. The impacts on other key resources from this out-of-control weed spread are not analyzed or disclosed in the FEIS.

What is the purpose for the DEIS presenting Table 43, which predicts that acres of noxious weeds would be reduced from over 20,000 to zero in 15 years? The DEIS says it's unrealistic, and "only being used as an analysis tool." Why use tools that don't work?

SCIENTIFIC INTEGRITY

We raised this issue throughout our July 5, 2016 comments, including at pp. 16-17, 19-21, 23, 30-35.

The FS failed to conduct a Science Consistency Review for the draft or final Forest Plan, or for the DEIS's and FEIS's analyses. The process of "Science Consistency Review" was designed by Forest Service scientists (Guldin et al. 2003, and Guldin et al. 2003b.) 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.** (Emphasis added.)

In other words, the FS can <u>cite</u> all the "best available science" it wants in preparing a forest plan or amendment, but it's another matter entirely whether or not such proposals are <u>consistent with</u> the cited science. Guldin et al., 2003 suggest the review ask and answer the following four questions:

1. Has applicable and available scientific information been considered?
2. Is the scientific information interpreted reasonably and accurately?
3. Are the uncertainties associated with the scientific information acknowledged and documented?
4. Have the relevant management consequences, including risks and uncertainties, been identified and documented?

Similarly, independent scientific review team Hayes, et al., 2011 conducted a "Science Review of the United States Forest Service Draft Environmental Impact Statement for National Forest System Land Management." The reviewers considered the following three questions:

1. Does the information accurately reflect the current peer-reviewed scientific literature and understanding? If not, what is missing or incorrectly presented?
2. Based on the current peer-reviewed scientific literature and understanding: does the documentation on environmental effects adequately respond to levels of uncertainty and limitations? If not, please describe what is missing or incorrect, and how the documentation can be improved.
3. What, if any, differing viewpoints should be included that are not mentioned in the DEIS regarding the effects of alternatives on climate change, restoration and resilience, watershed and water protection, diversity of plants and animal communities, sustainable use of public lands to support vibrant communities, forest threats, and monitoring.

Nie and Schembra, 2014 recommend that the agency solicit independent feedback on it use of science:

> The 1997 (Tongass National Forest) Plan was written using an innovative process whereby scientists within the Pacific Northwest Research Station (an independent research arm of the USFS) were assembled into risk assessment panels "to assist decisionmakers in interpreting and understanding the available technical information and to predict levels of risk for wildlife and fish, old growth ecosystems, and local socioeconomic conditions resulting from different management approaches."172 In this case, "science consistency

> checks" were used as a type of audit to ensure that the policy and management branch writing the Tongass Plan could not misrepresent or selectively use information in ways not supported by the best available science. The process, at the very least, facilitated the consideration of best available science when writing the Tongass Plan, even if parts of the Tongass Plan were based on factors going beyond science.

Also, in response to an appeal of its 1997 forest plan revision, the Black Hills National Forest was directed by the FS Washington Office to re-evaluate their Revised Forest Plan for its ability to meet diversity and viability requirements set in existing laws, and correct any deficiencies. FS biologists "interviewed accredited scientific experts to obtain information on Region 2 sensitive species for use during the Phase I Amendment" in order to remedy deficiencies in their revised forest plan. (USDA Forest Service 2000b.) Similarly, the Boise National Forest consulted with an independent scientist to review portions of their "Wildlife Conservation Strategy" proposed to amend their revised forest plan. And a Science Consistency Review was undertaken by the FS in the process of designing the Sierra Nevada Forest Plan Amendments.

Schultz (2010) provides a critique of FS wildlife analyses, and recommends peer review of large-scale assessments and project level 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.

Given the highly controversial nature of the Forest Plan, it is inexcusable and unreasonable that the FS has not undertaken a Science Consistency Review process.

The FS has not disclosed the reliability of all the data used as input for the models used in planning process, or for design of Desired Conditions and other Forest Plan Elements. Since "an instrument's data must be reliable if they are valid" (Huck, 2000) this means the data must accurately measure that aspect of the world it is claimed to measure, or else the data are unreliable. 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.

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."

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."

During litigation of a timber sale on the Kootenai NF, the Forest Service 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 Forest Service raised in the context of 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.

The document, "USDA-Objectivity of Statistical and Financial Information" is instructional on the topic of data reliability.

There is nothing cited in the FEIS that indicates the FS has performed validation of the models for the way they were used to support the FEIS's analyses. There is no documentation of someone using observation or experiment to support the models' inherent hypotheses. Ziemer and Lisle, 1993 state: "For any model or evaluation procedure, independent verification is essential. First, individual modules must be tested by comparing predicted and measured values under a variety of field conditions at differing sites. Then, functioning of the entire model must be evaluated under a wide array of field conditions. Finding an adequate model verification program is rare; however, finding unverified model predictions for important management and policy decisions is common."

The validity of habitat and other modeling utilized in land management plan development and the quality of scientific research are important topics. The documents, "USDA-Objectivity of Regulatory Information" and USDA-Objectivity of Scientific Research Information are instructional on this topic.

The next level of scientific integrity is the notion of "validity." 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 FEIS analyses have not been established for how agency utilizes them. No studies are cited which establishes their content validity, and no independent expert peer review process of the models has occurred.

So even if FS data input to a model is reliable, that still leaves open the question of model validity. In other words, are the models scientifically appropriate for the uses for which the Forest Service is utilizing them?

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).

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.)

A KNF project EIS (USDA Forest Service, 2007a) notes the limitations of modeling methodology the FS has relied upon for wildlife analyses:

> In 2005, the Regional Office produced a Conservation Assessment of the Northern goshawk, black-backed woodpecker, flammulated owl, and pileated woodpecker in the Northern Region (Samson 2005). This analysis also calculated the amount of habitat available for these species, but was based on forest inventory and analysis (FIA) data. FIA data is consistent across the Region and the state, but **it was not developed to address site-specific stand conditions for a project area.** In some cases, these two assessments vary widely in the amount of habitat present for a specific species. (P. 116.)

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

Scientific credibility	Has the framework gained credibility through publication of results, application of results, or other mechanisms to suggest acceptance by an array of professionals?	0 = limited credibility 1 = at least 1 publication of results using this framework, or other application of the modeling framework
Output definition	Is the output well defined and will it translate to something that can be measured?	1 = difficult 2 = moderate 3 = easy

A scientist from the research arm of the Forest Service, Ruggiero, 2007 stated, "Independence and objectivity are key ingredients of scientific credibility, especially in research organizations that are part of a natural resource management agency like the Forest Service. Credibility, in turn, is essential to the utility of scientific information in socio-political processes."

Ruggiero, 2007 points out that the Forest Service's scientific research branch **is distinct** from its management branch:

> The Forest Service is comprised of three major branches: the National Forest System (managers and policy makers for National Forests and National Grasslands), Research and Development (scientists chartered to address issues in natural resource management for numerous information users, including the public), and State and Private Forestry (responsible for providing assistance to private and state landowners). This article is directed toward the first two branches.
>
> The relationship between the National Forest System and the Forest Service Research and Development (Research) branches is somewhat hampered by confusion over the respective roles of scientists (researchers) and managers (policy makers and those that implement management policy). For example, some managers believe that scientists can enhance a given policy position or management action by advocating for it. This neglects the importance of scientific credibility and the difference between advocating for one's research versus advocating for or against a given policy. Similarly, some scientists believe the best way to increase funding for research is to support management policies or actions. But, as a very astute forest supervisor once told me, "Everyone has a hired gun…they are not credible…and we need you guys [Forest Service Research] to be credible."

The Forest Service Manual (FSM) provides direction on how to implement statutes and related regulations. FSM 4000 – Research and Development Chapter 4030 states: "To achieve its Research and Development (R&D) program objectives, the Forest Service shall ... maintain the R&D function as a **separate entity** … with clear accountability through a system that **maintains scientific freedom…**" (Emphasis added).

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).

So with Ruggiero, 2007 the Forest Service itself recognizes there is 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.

Schultz (2010) provides a critique of FS wildlife analyses, and 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.

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.**

Sullivan et al. 2006 contrast peer-reviewed literature with gray literature 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 FEIS 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.

Darimont, et al., 2018 advocate for more transparency in the context of government conclusions about wildlife populations, stating:

> Increased scrutiny could pressure governments to present wildlife data and policies crafted by incorporating key components of science: transparent methods, reliable estimates (and their associated uncertainties), and intelligible decisions emerging from both of them. Minimally, **if it is accepted that governments may always draw on politics, new oversight by scientists would allow clearer demarcation between where the population data begin and end in policy formation** (Creel et al. 2016b; Mitchell et al. 2016). Undeniably, social dimensions of management (i.e., impacts on livelihoods and human–wildlife conflict) will remain important. (Emphasis added.)

In a news release accompanying the release of that paper, the lead author states:

> In a post-truth world, **qualified scientists are arm's length now have the opportunity and responsibility to scrutinize government wildlife policies and the data underlying them.** Such scrutiny could support transparent, adaptive, and ultimately trustworthy policy that could be generated and defended by governments. (Emphasis added.)

Roger Sedjo, member of the Committee of Scientists convened to advise the agency for the design of a new planning rule, expresses his concerns about the discrepancy between forest plans and Congressional allocations, imbalanced and unsustainably implemented forest plans:

> (A)s currently structured there are essentially two independent planning processes in operation for the management of the National Forest System: forest planning as called for in the legislation; and the Congressional budgeting process, which budgets on a project basis. The major problem is that there are essentially two independent planning processes occurring simultaneously: one involving the creation of individual forest plans and a second that involves congressionally authorized appropriations for the Forest Service. Congressional funding for the Forest Service is on the basis of programs, rather than plans, which bear little or no relation to the forest plans generated by the planning process. There is little evidence that forest plans have been seriously considered in recent years when the budget is being formulated. Also, the total budget appropriated by the Congress is typically less than what is required to finance forest plans. Furthermore, the Forest Service is limited in its ability to reallocate funds within the budget to activities not specifically designated. **Thus, the budget process commonly provides fewer resources than anticipated by the forest plan and often also negates the "balance" across activities that have carefully been crafted into forest plans. Balance is a requisite part of any meaningful plan.** Finally, as noted by the GAO Report (1997), fundamental problems abound in the implementation of the planning process as an effective decision making instrument. **Plans without corresponding budgets cannot be implemented. Thus forest plans are poorly and weakly implemented at best**. Major reforms need to be implemented to coordinate and unify the budget process.

(Committee of Scientists, 1999 Appendix A, emphases added) The problems Sedjo identifies as being attributable to not funding all aspects of forest planning and implementation—including monitoring—persist to this day and are evident in the LMP and its planning process.

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.

The FEIS violates NEPA in terms of methodology, scientific accuracy, and scientific integrity.

ECONOMICS

We raised this issue in our July 5, 2016 comments at pp. 2, 10-11, 12-13, 21, 22-23, 26-27, 30, 35, 36, 37, 42, 43, 44.

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 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.

From the FEIS, 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 over the life of the revised forest plan, as they vary per alternative. Forget that. What about the taxpayer investment per board feet produced? Nada. What dollar amount per grazed Animal Unit Month or accumulated pound of beef does the taxpayer spend with its subsidies to the ranchers? It isn't in there.

What would it cost to achieve Desired Conditions for road densities for each alternative under the revised forest plan, for the 15 years of expected implementation? Nothing there.

The FS fails to consider the wide body of research revealing that counties adjacent to Wilderness areas and National Parks show better economic sustainability than counties heavily reliant upon resource extraction.

Ecosystem services were not properly analyzed. Check the 2012 Planning Rule for why this is important.

WILDERNESS, ROADLESS AREAS, WILD AND SCENIC RIVERS

We raised this issue in our July 5, 2016 comments at pp. 8, 35-36, and 43.

"In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness."

—The Wilderness Act of 1964

The process that the Forest Service used to evaluate roadless lands for potential wilderness recommendation is of concern. The criteria were not used properly. The overwhelming public sentiment expressed in public comments on the Roadless Area Conservation Rule was to maintain the wild character of these areas. There is no rational reason to manage any of the Roadless Areas in any manner that would reduce their Wilderness character and therefore diminish the chances that Congress would designate them under the Wilderness Act.

The FEIS fails to disclose all the benefits to wildlife, water, fish, soil, recreation, climate stability, and local communities attributable to an alternative with maximum acreage of land recommended for Wilderness protection.

The FEIS fails to consider the wide body of research revealing that counties adjacent to Wilderness areas and National Parks show better economic sustainability than counties heavily reliant upon resource extraction. This skewed use of science violates NEPA.

AWR supports enacting the Northern Rockies Ecosystem Protection Act (NREPA), a bill that has been introduced into Congress numerous times. https://allianceforthewildrockies.org/nrepa/ NREPA is the only comprehensive solution for protecting our national heritage which lies in the mountains, meadows, and rivers of the Northern Rocky Mountains.

NREPA will protect the invaluable ecosystems of the Rocky Mountains bio-region by creating biological corridors that connect existing wilderness and roadless areas.

NREPA-protected lands will stretch across almost 20 million acres of public domain in Idaho, Montana, Washington, Oregon, and Wyoming—including the Colville National Forest.

NREPA protects 1,810 miles of headwaters rivers which feed three different oceans. Wild, Scenic and Recreational River designations will protect these rivers and safeguard ancient migration routes for numerous species of salmon, steelhead, and native trout including bull trout. World-class rafting and boating opportunities will also be preserved while assuring steady flows of high quality water for downstream users.

As the Draft EIS for the forest plan revision process for the Helena-Lewis & Clark National Forest (2018) explains:

> The best remaining trout habitat conditions are found in wilderness and unroaded landscapes (Hitt & Frissell, 2000; Kershner, Bischoff, & Horan, 1997; Rhodes, McCullough, & Espinosa, 1994; USDA, 1995b). Across the west, roadless areas tend to contain many of the healthiest of the few remaining populations of native trout, which are crucial to protect (Kessler, Bradley, Rhodes, & Wood, 2001). Most of the recommended wilderness would be located in areas already designated inventoried roadless areas. These areas are a source of high quality water essential to the protection and restoration of native trout. The high quality habitats in roadless areas help native trout compete with non-native trout, because degraded habitats can provide non-natives with a competitive advantage (Behnke, 1992). Roadless areas tend to have the lowest degree of invasion of non-native

salmonids (Huntington, Nehlsen, & Bowers, 1996). Areas of low road density also act as the foundation for the needed restoration of larger watersheds.

Undeveloped natural lands provide numerous ecological benefits. They safeguard biodiversity, enhance ecosystem representation, facilitate connectivity (Loucks et al., 2003; The Wilderness Society, 2004; Strittholt and DellaSala, 2001; DeVelice and Martin, 2001), and provide high quality or undisturbed water, soil, and air resources (Anderson et al. 2012; DellaSala et al., 2011). They also serve as ecological baselines to facilitate better understanding of our impacts to other landscapes (Arcese and Sinclair, 1997).

Numerous articles in the scientific literature similarly recognize the contribution of roadless and undeveloped lands to biodiversity, connectivity, and conservation reserve networks. For example, Loucks et al. 2003 examined the potential contributions of roadless areas to the conservation of biodiversity, and found that more than 25% of Inventoried Roadless Areas (IRAs) are located in globally or regionally outstanding ecoregions and that 77% of IRAs have the potential to conserve threatened, endangered, or imperiled species. Arcese and Sinclair (1997) highlight the contribution that IRAs could make toward building a representative network of conservation reserves in the United States, finding that protecting those areas would expand eco-regional representation, increase the area of reserves at lower elevation, and increase the number of large, relatively undisturbed refugia for species. Crist et al., 2005 looked at the ecological value of roadless lands in the Northern Rockies and found that protection of national forest roadless areas, when added to existing federal conservation lands in their study area, would: 1) increase the representation of virtually all land cover types on conservation lands at both the regional and ecosystem scales, some by more than 1000%; 2) help protect rare, species-rich, and often-declining vegetation communities; and 3) connect conservation units to create bigger and more cohesive habitat patches. Roadless lands also provide high quality water and watersheds. Anderson et al., 2012 assessed the relationship of watershed condition and land management status, and found a strong spatial association between watershed health and protective designations. DellaSala et al., 2011 found that undeveloped and roadless watersheds are important for supplying downstream users with high-quality drinking water, and that developing those watersheds comes at significant costs associated with declining water quality and availability.

Scientific research articulates a multitude of reasons why remaining roadless areas should be protected. Roadless areas can be used as benchmarks for assessing the ecological integrity (e.g. genes, species, and assemblages) and processes (e.g., pollination, demography, biotic interactions, nutrient and energy dynamics, and metapopulation processes) expected in natural habitats (see Karr and Chu, 1995, Pimentel 2000). The species-rich native communities found in roadless areas are more likely to withstand invasions (Gelbard and Harrison, 2005). Planning is predicated on conserving a sufficient number of ecosystem replicates within protected areas in order to meet representation targets fundamental to conservation of species and ecological sustainability (Noss and Cooperrider, 1994). The Forest Service would advance ecosystem representation targets by solidifying protection for roadless areas (Strittholt and DellaSala 2001), a goal issued at the international level by both the Millennium Ecosystem Assessment, 2005 and the Convention on Biological Diversity (United Nations Environmental Programme, 2002). Roadless areas contribute disproportionately to landscape and regional connectivity (Strittholt and DellaSala, 2001), a critical component of adaptation strategies for climate change, and should be protected as climate refugia.

Scientific research notes that unroaded areas provide important undisturbed habitat for numerous forest-dependent species of concern. The importance of such areas is not appreciably diminished by the vanishing evidence of limited levels of prior management. In such areas natural disturbance processes are the dominant factors influencing forest succession and habitat dynamics, and therefore exhibit a high capacity for self-recovery.

Virtually without exception, comparative scientific studies find that ecological integrity remains highest in areas that remain unroaded and unmanaged and is lowest in areas that have been roaded and managed. As the density of roads increases, aquatic integrity and wildlife security decreases, while the risk of catastrophic wildfire and the occurrence of exotic weeds increases. The simplest and most cost-effective thing the Forest Service can do to maintain and restore aquatic and ecosystem integrity is to stop building roads and to obliterate in an environmentally sound manner as many roads as possible. This conclusion is supported by the following:

> Much of this [overly dense forest] condition occurs in areas of high road density where the large, shade-intolerant, insect-, disease- and fire-resistant species have been harvested over the past 20 to 30 years. ...Fires in unroaded areas are not as severe as in the roaded areas because of less surface fuel, and after fires at least some of the large trees survive to produce seed that regenerates the area. Many of the fires in the unroaded areas produce a forest structure that is consistent with the fire regime, while the fires in the roaded areas commonly produce a forest structure that is not in sync with the fire regime. ...In general, the effects of wildfires in these areas are much lower and do not result in the chronic sediment delivery hazards exhibited in areas that have been roaded. (USFS 1997a, pages 281-282).
>
> The U.S. Fish and Wildlife Service ...found that bull trout are exceptionally sensitive to the direct, indirect, and cumulative effects of roads. Dunham and Rieman ...demonstrated that disturbance from roads was associated with reduced bull trout occurrence. They concluded that conservation of bull trout should involve protection of larger, less fragmented, and less disturbed (lower road density) habitats to maintain important strongholds and sources for naturally recolonizing areas where populations have been lost. (USFS, 2000.)
>
> Hitt and Frissell ...showed that over 65% of waters that were rated as having high aquatic biological integrity were found within wilderness-containing subwatersheds. ...Trombulak and Frissell concluded that ...the presence of roads in an area is associated with negative effects for both terrestrial and aquatic ecosystems including changes in species composition and population size. (USFS, 2000 pp 3-80, 81).
>
> High integrity [forests] contain the greatest proportion of high forest, aquatic, and hydrologic integrity of all ... are dominated by wilderness and roadless 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. (USFS, 1996a, pp. 108, 115 and 116).

> 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. (USFS, 1996b page 105). This study suggests the general trend for the entire Columbia River basin is toward a loss in pool habitat on managed lands and stable or improving conditions on unmanaged lands. (McIntosh et al., 1994).
>
> The data suggest that unmanaged systems may be more structurally intact (i.e., coarse woody debris, habitat diversity, riparian vegetation), allowing a positive interaction with the stream processes (i.e., peak flows, sediment routing) that shape and maintain high-quality fish habitat over time. (Id).
>
> (A)llocate all unroaded areas greater than 1,000 acres as Strongholds for the production of clean water, aquatic and riparian-dependent species. Many unroaded areas are isolated, relatively small, and most are not protected from road construction and subsequent timber harvest, even in steep areas. Thus, immediate protection through allocation of the unroaded areas to the production of clean water, aquatic and riparian-dependent resources is necessary to prevent degradation of this high quality habitat and should not be postponed. (USFWS et al., 1995).
>
> High road densities and their locations within watersheds are typically correlated with areas of higher watershed sensitivity to erosion and sediment transport to streams. Road density also is correlated with the distribution and spread of exotic annual grasses, noxious weeds, and other exotic plants. Furthermore, high road densities are correlated with areas that have few large snags and few large trees that are resistant to both fire and infestation of insects and disease. Lastly, high road densities are correlated with areas that have relatively high risk of fire occurrence (from human caused fires), high hazard ground fuels, and high tree mortality. (USFS, 1996b page 85). These findings indicate that roadless areas in general will take adequate care of themselves if left alone and unmanaged, and that concerted reductions in road densities in already roaded areas are absolutely necessary.

Indeed, other studies conducted by the Forest Service indicate that efforts to “manage” our way out of the problem are likely to make things worse. By “expanding our efforts in timber harvests to minimize the risks of large fire, we risk expanding what are well established negative effects on streams and native salmonids. ...The perpetuation or expansion of existing road networks and other activities might well erode the ability of [fish] populations to respond to the effects of large scale storms and other disturbances that we clearly cannot change.” (Reiman et al., 1997).

Unroaded areas greater than about 1,000 acres, whether they have been inventoried or not provide valuable natural resource attributes that must be protected. Additionally, scientific research on roadless area size and relative importance is ongoing. Such research acknowledges variables based upon localized ecosystem types, naturally occurring geographical and watershed boundaries, and the overall conditions within surrounding ecosystems. In areas where considerable past logging and management alterations have occurred, protecting relatively ecologically intact roadless areas even as small as 500 acres has been shown to be of significant ecological importance. Roadless area attributes that must be protected include: water quality;

healthy soils; fish and wildlife refugia; centers for dispersal, recolonization, and restoration of adjacent disturbed sites; reference sites for research; non-motorized, low-impact recreation; carbon sequestration; refugia that are relatively less at-risk from noxious weeds and other invasive non-native species, and many other significant values. (See Forest Service Roadless Area Conservation FEIS, November 2000.)

A growing number of scientific studies indicate the significant value of roadless areas between 1,000 acres and 5,000 acres. (Strittholt and DellaSala, 2001; DeVelice and Martin 2001; Loucks et al. 2003; Crist et al. 2005; Nott et al. 2005). And in a letter to the President urging the protection of roadless areas, 136 scientists noted:

> There is a growing consensus among academic and agency scientists that existing roadless areas–**irrespective of size**–contribute substantially to maintaining biodiversity and ecological integrity on the national forests. The Eastside Forests Scientific Societies Panel, including representatives from the American Fisheries Society, American Ornithologists' Union, Ecological Society of America, Society for Conservation Biology, and The Wildlife Society, recommended a prohibition on the construction of new roads and logging within existing (1) roadless regions larger than 1,000 acres, and (2) **roadless regions smaller than 1,000 acres that are biologically significant**…. Other scientists have also recommended protection of all roadless areas greater than 1,000 acres, at least until landscapes degraded by past management have recovered…. As you have acknowledged, a national policy prohibiting road building and other forms of development in roadless areas represents a major step towards balancing sustainable forest management with conserving environmental values on federal lands. In our view, a scientifically based policy for roadless areas on public lands should, at a minimum, protect from development all roadless areas larger than 1,000 acres and **those smaller areas that have special ecological significance because of their contributions to regional landscapes**. (Scientists Roadless letter, 1997; emphases added.)

There is strong consensus among land managers, and within the independent scientific community, that these small roadless areas serve as refugia for many species of wildlife, and wild fishes. Furthermore, they can act as biological corridors between larger pieces of undisturbed habitat islands.

Roadless areas down to 1000 acres in size are extremely important to fisheries:

> These [unroaded] areas [over 1000 acres] may be extremely important to Bulltrout and other Inland Fishes. . . .Failure to protect these areas until we have [some insight into what the effects of entry might be] will hasten the listing of inland fishes. (U. S. Fish and Wildlife Service, 1996.) Recent scientific literature emphasizes the importance of unroaded areas greater than 1,000 acres as strongholds for the production of fish and other aquatic and terrestrial species, as well as sources of high quality water. (Henjum et al. 1994; Rhodes et al. 1994.)
>
> For successful Section 7 ESA consultation, the ICBEMP [Interior Columbia Basin Ecosystem Management Project] should allocate all unroaded areas greater than 1,000 acres as Strongholds for the production of clean water, aquatic and riparian-dependent species. Many unroaded areas are isolated, relatively small, and most are not protected

> from road construction and subsequent timber harvest, even in steep areas. Thus, immediate protection through allocation of the unroaded areas to the production of clean water, aquatic and riparian-dependent resources is necessary to prevent degradation of this high quality habitat and should not be postponed [until after further analysis]. (USFWS, NMFS and EPA, Advance Draft Aquatic Conservation Strategy, submitted to the ICBEMP November 8, 1995, page 5)
>
> (S)mall fragments of roadless areas in the watershed serve as the anchor points for restoring riparian vegetation, water quality, and fish habitat. (Anderson et al. 1993.)

The Regional Directors of the Environmental Protection Agency, the National Marine Fisheries Service and the Fish and Wildlife Services also stated in a letter to the Executive Steering Committee of ICBEMP, October 26, 1995:

> A review of the designated land-use allocation at the Columbia Basin level is essential to focus management on aquatic and riparian-dependent species conservation to meet the legal obligations under the Clean Water Act (CWA), Endangered Species Act (ESA), National Forest Management Act, and Federal Land Policy and Management Act (FLPMA) . . . . We strongly support preservation of existing roadless areas greater than 1000 acres within FS/BLM lands . . . for aquatic resource conservation.

Obviously, there is overwhelming scientific support for the protection of smaller roadless areas due to the biological uniqueness of these areas and because of the extensive ecological damage caused by roads and road building.

A major flaw in the roadless inventory process, which carried over into the Roadless Rule EIS process, is that the agency refused to look much beyond the stale, out-of-date roadless inventories in the 1986 Forest Plans. And the Colville NF continues this rigid perspective.

The revised Forest Plan must include a Standard requiring, during site-specific project NEPA analyses, roadless area boundaries be re-evaluated and updated, utilizing standard procedures, in order to evaluate unroaded areas contiguous with Inventoried Roadless Areas, Wilderness Study Areas, or designated Wilderness for their Wilderness character and eligibility for Wilderness designation. This would be consistent with Forest Service policy concerning the "Roadless Expanse" in Region 1 document "Our Approach to Roadless Area Analysis of Unroaded Lands Contiguous to Roadless Areas" (12/2/10). That document is based on judicial history regarding the Roadless Area Conservation Rule. It 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 FEIS conflicts with the 2015 Chapter 70 directive which clearly recognizes criteria (at 71.1) for including areas in the revision roadless inventory which may not necessarily be within past or current roadless inventories, for possibly being recommended for wilderness at the conclusion of the forest plan revision process. As the directive states at section 71, "The inventory is intended to be reasonably broad and inclusive, based on the inventory criteria set out in this section and additional information provided to the Responsible Official through the required opportunities for public and government participation (sec. 70.61 of this Handbook)."

Longstanding case law from the Ninth Circuit Court of Appeals also directs the Forest Service to analyze the wilderness characteristics of uninventoried roadless lands.

We support the fact all motorized activity is deemed not suitable in recommended wilderness. However, that should extend to all Inventoried Roadless Areas.

Further, the LMP states that "existing mountain bike use" would be "suitable" in Recommended Wilderness. Multiple lawsuits over proliferation of machines in Wilderness Study Areas reveal the Forest Service failure to anticipate and respond correctly to the technological evolution of ATVs, snowmobiles, and other over-snow machines, and now the agency threatens to drop the ball regarding mountain bikes. The agency must anticipate the proliferation of electrical battery assisted mountain bikes by addressing them in forest plan revision.

The Forest Service should incorporate into the forest plan a standard (or at least a Goal or Desired Condition) that livestock grazing allotments be retired in designated Wilderness and Recommended Wilderness, so that such areas have the wild character intended by the Wilderness Act.

In the Management Area "Wilderness-Congressionally Designated" (WCD) the LMP is far too weak in protecting Wilderness values. In violation of the Wilderness Act, it breaks Wilderness into Semi-Primitive and Primitive Zones. Both fail to adopt "Leave NO Trace" principles as LMP standards, (retaining campsites and other impacts) and it's worse in the Semi-Primitive Zone. It also directs the creation of a "network of large group campsites" in violation of the Wilderness Act.

Also, the Minimum Requirements Decision Guide has not been demonstrated to be consistent with the Wilderness Act and should not be an LMP standard (MA-STD-WCD-04).

MA-STD-WCD-05 (Human Developments – Primitive Zone) states, "No user-created human developments (such as game hangers, benches, firepits, tables) may be established in the primitive zone." This implies such uses can be permanently or indefinitely established in the Semi-Primitive Zone, which is illegal.

MA-GDL-KCRA-02 (Communication Facilities) – "Communication facilities essential for provisional uses may be co-located with Forest Service repeaters." This is the "We've already degraded the Wilderness with one structure, what's the big deal about adding another insult" rationale for allowing an unnecessary installation in Wilderness. It's also illegal under the Wilderness Act.

Other plan components such as MA-GDL-WCD-02, MA-GDL-WCD-04, MA-GDL-WCD-05, MA-GDL-WCD-06, MA-GDL-WCD-07 and MA-GDL-WCD-09 unnecessarily suggest loopholes for nonconforming uses and should be dropped.

There is no reason why any of the above nonconforming uses should be allowed in Recommended Wilderness, either.

In enacting the Wild and Scenic Rivers Act (Act), Congress envisioned a robust network of protected river corridors in adopting the following national policy:

> (C)ertain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.

So the CNF revision process should err on the side of protecting these environments for current and future generations, in as natural a condition as possible.

The Act recognizes that some streams or rivers now showing signs of development may still be eligible: “The existence …of low dams, diversion works, and other minor structures at the time any river is proposed for inclusion in the national wild and scenic rivers system shall not automatically bar its consideration for such inclusion.” Although the term “minor” is subjective, we believe the policy as stated in the Act requires erring on the side of caution—not simply eliminating streams currently exhibiting impacts.

Existing uses in Wild and Scenic Rivers, potential Wild and Scenic Rivers, and their river corridors that are/would be nonconforming under the Wild and Scenic Rivers Act must be subject to a forest plan Standard that prohibits them, or removes them where they exist.

Also, the Forest Service must anticipate and respond correctly to technological advances with watercraft, which potentially affect the wild character of designated and potential Wild and Scenic Rivers.

Plan components for Kettle Crest Recreation Area (KCRA) hardly constrain management or require managers to respect natural qualities, basically directing for the highest scenic integrity objectives, which are subjective and discretionary anyway. The KCRA designation basically cements into the LMP existing motorized uses incompatible with wilderness character.

COLLABORATION

We raised this issue in our July 5, 2016 comments at pp. 36-37.

The proponents of alternative B consider it good balance because it proposes the most CNF acreage as Recommended Wilderness. However, the very small increment of protection via recommended wilderness provided by Alternative B, over and above the existing protections availed by the Roadless Area Conservation Rule, do not justify the increased level of industrialization this alternative promotes. As described in the DEIS:

> Implementation of alternative B is expected to contribute the least to MIS/focal species viability compared to all alternatives except the no-action alternative (table 70 in the no-action alternative). The relatively low contribution is due to maintaining the current amount of road mileage on the Forest, a significant amount of the Forest in the Active Management MA and the relatively small number of key watersheds. Alternative B also maintains the INFISH ACS, which after 20 years is showing some slow improvement in stream habitat, but most subwatersheds and stream habitat is, and may be expected to continue to be, in a functioning at risk or not properly functioning state with watershed conditions not generally considered conducive for strong fish populations.
>
> …the pace of watershed restoration is not increased from current levels.

The DEIS also estimates that, for terrestrial ecosystems the intensity of logging under Alternative B would cause the most impact of all alternatives except for No Action.

The DEIS evaluates the other collaborated alternative, O, as being second worst for terrestrial and aquatic ecosystems, except for No Action.

The nature of these two alternatives is not surprising, given the narrow interests represented at the tables of the two collaborative syndicates. The much wider public interest of the owners of this national forest, in general, is not of much concern of narrow vested interests.

A significant danger is that private, local interests are being elevated by the magic wand of "collaboration" over and above the interests of the owners of the land in general, the American public—regardless of where those Americans live or whether or not they can attend collaborative meetings to make sure their interests are being heard.

Nie and Metcalf, 2015 provide a social science analysis of the problems posed by collaboration. Among the many problems, it's clear that most environmental groups don't have the resources to participate meaningfully in long processes created by the collaborators. The authors cite an earlier inquiry in stating, "Organizational resources and capacity were found to be significant factors shaping the decision about whether to collaborate or sue. If trends in collaboration continue, says the author, '[W]e will see a marginalization of smaller, ideologically pure environmental groups [and] their values will not be included in decision making because they are unable or unwilling to collaborate…'."

Nie and Metcalf document perceptions of several negative outcomes of collaboration, from the perspective of those skeptical of the process.

- The under-representation of conservation interests in many collaborative efforts, a perception that there is a heavy skew of the membership of the group against conservation and in favor of the folks who are impacting the environment.

- An inappropriate and often dominant role played by the Forest Service in some collaborative processes.

- Those making a profit from federal lands will dominate these processes because they have the organizational and financial capacity and resources to participate over the long haul.

- Collaboration sets up two classes of citizens, those who are part of the process and those who aren't, even if the latter participate fully in the NEPA process.

- Collaboration weeds out dissent and opposition and is most conducive to defending the status quo.

- Collaboration is undermining, subverting, and disempowering the more democratic NEPA process.

- There is a contrast between an exclusive and self-selected set of (often) paid interest groups participating in a collaborative versus a more broad-based and inclusive public participation process governed by NEPA.

- Collaborative groups having a disproportionate amount of influence with the Forest Service.

- Collaborative group recommendations precede NEPA analysis, and there is an implicit understanding the collaborative group's recommendation will be implemented, rendering the NEPA process a pro forma exercise.

- Laws such as the ESA are designed to be used and enforced by citizens, who forgo such rights by being included in collaborative groups.

- Collaborative groups do not consider the best available science on resource management.

- Collaborative groups promote logging which is a pretense or price to be paid for genuine forest restoration.

Dukes and Firehock, 2001 wrote a guide for environmental advocates which includes a set of principles. The collaborators to whom the FEIS attributes as proponents of alternatives included in full FEIS analysis would never subscribe to those collaborative principles.

A BETTER ALTERNATIVE

We requested a science based alternative with several elements in our July 5, 2016 comments at pp. 37-44. We proposed a **Citizen Alternative** (C) informed by sound scientific principles and sets a positive future for the Colville National Forest, one which emphasize the outstanding wild, natural and appropriate recreational values for this remarkable place. It would also take advantage of the opportunity to create economic benefits through citizen appreciation of nature while providing genuine restoration work such as road decommissioning.

The Forest Service dismissed such an alternative vaguely and falsely stating, "Because of the multiple use and sustained yield requirement of NFMA…"

Each of the alternatives currently featured in the FEIS can be conceptualized as being from the Industrial/Anthropocentric paradigm, as described by Wuerthner, 2006a:

- Views fire as a threat
- Thinks in terms of utility (use and exchange value)
- Takes a narrow/specialist view
- Considers the short term
- Promotes the welfare of individuals
- Has a simplistic understanding of how natural systems function
- Sees natural processes as mechanical and able to be controlled
- Ignores extinction
- Advocates biologically unsustainable solutions
- Holds human cleverness to be the measure of the appropriateness of any action

In contrast, the philosophy and worldview defining an Alternative C is "Ecological/Biocentric" (Id):

- Sees fire as an integral part of the ecosystem
- Thinks in terms of intrinsic worth (existence is valued for its own sake)
- Takes a wide/holistic view
- Considers the long term
- Promotes the public welfare
- Has a nuanced understanding of the complexity of natural systems
- Recognizes that nature operates beyond human control
- Considers species extinction to be a critical issue.
- Advocates biologically sustainable solutions
- Holds nature's wisdom to be the measure of the appropriateness of any action

Alternative C does not mean no active management, nor would it institute a total "hands off" approach to management, or end all commercial uses entirely. Instead, it would reduce such uses to levels that are truly sustainable, based upon independently peer-reviewed scientific analyses.

Alternative C would replace the presently proposed Desired Conditions by focusing on natural processes as the creators of Desired Conditions, instead of their being instituted artificially. What the Forest Service has promoted with its LMP 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 wildfire, to facilitate the extraction of commercial resources for human use.

Ecological resilience, which the FEIS implies the agency is instituting, is not the absence of natural disturbances like wildfire or beetle kill, rather it is the opposite (DellaSala and Hanson, 2015, Chapter 1, pp. 12-13). What the FS is promoting 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 wildfire, to facilitate the extraction of commercial resources for human use. This is the antithesis of ecological resilience and conservation of native biodiversity. Ecological resilience is the ability to ultimately return to predisturbance vegetation types after a natural disturbance, including higher-severity fire. This sort of dynamic equilibrium, where a varied spectrum of succession stages is present across the larger landscape, tends to maintain the full complement of native biodiversity on the landscape. (Thompson et al., 2009).

Ultimately the FEIS and LMP reflect an overriding bias favoring resource extraction via "management" needed to "make progress toward" selected Desired Conditions, such as a certain numbers, species, and sizes/ages of trees and snags, along the way neglecting many other structures and compositional features, and especially the ecological processes ("function") driving these ecosystems. Essentially the Forest Service rigs 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 would be at odds with natural **processes—**the real drivers of the ecosystem. McClelland (undated) criticizes the aim to achieve desired conditions by the use of mitigation measures calling for retention of specific numbers of certain habitat structures:

> The snags per acre approach is not a long-term answer because it **concentrates on the <u>products</u> of ecosystem processes rather than the processes themselves**. It does not address the most critical issue—long-term perpetuation of diverse forest habitats, a mosaic pattern which includes stands of old-growth larch. **The processes that produce suitable habitat must be retained or reinstated by managers. Snags are the result of these processes** (fire, insects, disease, flooding, lightning, etc.).

(Emphases added.) Wales, et al. 2007 modeled various potential outcomes of fire and fuel management scenarios on the structure of forested habitats in northeast Oregon. They projected that the **natural disturbance scenario resulted in the highest amounts of all types of medium and large tree forests combined** and best emulated the Natural Range of Variability for medium and large tree forests by potential vegetation type after several decades. Restoring the natural disturbances regimes and processes is the key to restoring forest structure and functionality similar to historical conditions.

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.

In other words, the Desired Conditions the LMP relies upon must be evaluated in the context of how realistic—or even "desirable"—achieving them really is in the context of rapidly changing climate.

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) ask:

> 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 Forest Service's strategy of "making progress toward" Desired Conditions (e.g., resilience) basically focuses upon static conditions, instead of the natural dynamics of the ecosystem. An abundance of scientific evidence suggests that Desired Conditions conceptually be replaced with **desired future dynamics,** to align with best available science. Kauffman, 2004 states:

> 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.

Desired Conditions must be instead written as **desired future dynamics** in order to be consistent with the best available science. Hessburg and Agee (2003) for example, 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.) Likewise, 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.) There is plenty of support in the scientific literature for such an approach. 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.)

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.)

Alternative C would reduce carbon emissions and promotes climate stability by emphasizing carbon-storage in trees, down wood, and soils in the forest. Alternative C would reduce the use of motorized vehicles and fossil fuels.

Alternative C would protect all roadless areas so they maintain the characteristics necessary to be designated as Wilderness by Congress in the future.

Alternative C would maintain and/or restore the elements which characterize good native fish habitat and high water quality by including enforceable standards that protect clean and cold water and complex, connected and comprehensive habitats.

Alternative C would protect and restore soils, the building blocks for healthy tree and vegetation growth so vital for wildlife food and shelter by including meaningful and enforceable standards to protect soils as required by law.

Alternative C would curtail domestic livestock grazing so it does not negatively affect watersheds and fish habitat.

Alternative C would allow fire to perform its necessary ecosystem rejuvenating function over much of the forest, saving fire suppression costs markedly.

Alternative C would allow insects and disease to play their ecological functions.

Alternative C would allow natural recovery and restoration in areas damaged by past development practices.

Alternative C would allow protect old-growth forest habitat and allows mature forests to develop old-growth characteristics such as large snags, down woody material and other habitat components so vital for many wildlife and bird species.

Alternative C would curtail clearcutting and other silvicultural prescriptions that leave large openings, which cause edge effects that fragment the landscape.

Alternative C would adopt enforceable standards that are informed by monitoring. Management activities which risk water and soil resources, wildlife habit or other ecological components would only be allowed if monitoring determines that current conditions are meeting standards and the activity won't degrade natural resources.

Alternative C would provide wildlife linkage corridors so that animals can move unimpeded across the landscape, facilitating migration and genetic interchange, and emphasizes connecting old-growth forest habitat.

Alternative C would reduce the roads network to improve wildlife security and watershed integrity, while also providing good paying restoration jobs. Alternative C would use a scientific approach to set the minimum road system necessary to manage the forest within expected budgets. Alternative C would reduce road maintenance costs to an affordable level by calibrating the road system to these anticipated future budgets. Alternative C would set maximum road density standards to minimize the backlog in road maintenance and meet the biological needs of terrestrial and aquatic species.

Alternative C would provide a diversity of recreational and access opportunities by emphasizing non-motorized access.

Alternative C would include Plan Components reflecting the agency's duty to designate motorized trails and areas to minimize impacts to forest resources and other users as required by Executive Order 11989 and 36 CFR 212.55 and recently affirmed in a federal court decision (see Idaho Conservation League v. Guzman, 2011 WL 447456 (D. Idaho Feb. 4, 2011)).

In failing to fully analyze an Alternative that recognizes the scientific basis for prioritizing natural dynamics to achieve the restoration objectives of the Forest Plan, the FS violates NEPA.

FOREST PLAN MONITORING

We raised this issue in our July 5, 2016 comments at pp. 13, 16, 21, 33, 35, 43, and 44.

LMP management direction is open to so much agency discretion with regards to Desired Conditions, etc. that the Forest Service is unlikely to know if their attainment is being approached. The Monitoring Program and the ideals of "adaptive management" can only be realized with strong Plan Components backed by monitoring elements based upon their achievement and compliance, with scientifically-based monitoring design.

The National Forest Management Act requires periodic revision of forest plans in order to facilitate adaptive management with public involvement. There is the need to provide continuity between plans to the extent that adaptive management requires. NFMA is very clear that forest plans are to be revised periodically based upon lessons learned from continuous monitoring and evaluation in the field of the environmental impacts from forest plan implementation. Whatever was learned from nearly three decades of monitoring the implementation of the 1988 forest plan is not disclosed in the FEIS.

The LMP states, “Monitoring Component: this provides a monitoring program that evaluates how the on-the-ground management is maintaining or making progress toward desired conditions and objectives of this plan. The Plan provides the items to be monitored per the monitoring and evaluation requirements found at 36 CFR 219.12 of the 2012 Rule. **Details on methodology, data storage, and responsibility are not considered plan components and are not included in the plan.”** (Emphasis added.) In other words, how all that monitoring is to be carried out is completely discretionary.

Furthermore, what details that are included reveal so much management bias that they don’t really measure ecological progress or damage. Or else the thing to be monitored is written in vague, “desired conditions” language. So if you want to know, “To what extent are management activities and natural disturbance processes trending toward desired conditions for structure/structural stage and fire regime condition class (FRCC), and increasing resistance and resiliency to disturbance factors including climate change?” Just measure the acres logged, in other words the acres jerked into “forest by structure and vegetation type compared to the desired condition” or other such nonsense.

MON-VEG-01-05: “Number of acres **influenced by** insects.” (Emphasis added.) This is a bad thing?

MON-VEG-03 asks, “To what extent are management activities moving hazardous fuels toward desired conditions within WUI?” Since such desired conditions are merely defined by carrying out “fuel reduction” in any manner whatsoever, measuring “Acres of hazardous fuel treatments within the WUI” accomplishes nothing. Of course, there can be no real metric for reducing hazardous fuels, since it’s an illegitimate concept anyway.

We discuss in the Aquatics section the fallacy of MON-WTS-01-01: “Change in watershed condition class.” What about actually measuring riparian conditions indicative of ecological functioning?

Want to know “Are management actions contributing to improved watershed condition class within focus, key, and priority watersheds, and other watersheds identified for restoration? Just measure “Miles of roads treated that are a high risk to watershed and aquatic habitat function”—no need to measure fish populations, spawning success, redd conditions, cobble embeddedness, or any other measure of **sediment** (which is how the roads damage those natural features).

As it turns out, the LMP Monitoring Plan is chock full of similarly ineffective methodology and Orwellian circular logic.

COMPLIANCE WITH NFMA PLANNING REGULATIONS

We raised this issue in our July 5, 2016 comments at p. 44.

The CNF elected to use the provisions of the 1982 planning rule for the plan revisions. Yet a striking feature of the LMP is the relative absence of explicit reference to the 1982 36 CFR 219 planning rule—the guiding NFMA implementing regulations. This makes it difficult to see how the LMP is prepared and meant to be consistent with and grounded in regulations written to fundamentally guide planning under NFMA.

Also, the FEIS makes references to the 2012 Planning Rule. Neither the LMP nor the FEIS sort out the confusion of exactly what portions of which rules must be taken as legally binding direction.

NATIONAL ENVIRONMENTAL POLICY ACT

Regarding responses to comments, this issue could only be raised now. In regards to forest plan monitoring, we raised this issue in our July 5, 2016 comments at pp. 44.

Reading FEIS Appendix E. Response to Public Comments, we find our comments were largely ignored, mischaracterized, and/or downplayed. It becomes extremely difficult for the public to learn about FS policy and management when the agency provides little or no feedback on the concerns expressed in comments at earlier phases of the public process. The public cannot make fully informed judgments at this Objection stage when the agency evades its responsibilities to properly engage with the public.

For only one of many examples we could point out, our comments on the DEIS included:

> The DEIS states, "Forest Service Manual (FSM) Chapter 2550 Soil Management directs soil resource management on National Forest System lands." If that is true, the DEIS must disclose this direction, and analyze the impacts implied from this direction. The DEIS vaguely mentions "Region 6 Soil Quality Standards" but again, the DEIS and DFP fail to disclose them.

The DEIS was presenting ambiguous discussion of important policy concerning protection of soil, and our comment requested clarity. Yet the Forest Service failed to respond to this comment.

National Environmental Policy Act (NEPA) regulations at 40 CFR § 1502.9 require "Final environmental impact statements shall respond to comments as required in part 1503 of this chapter." 40 CFR § 1503.4(a) ("Response to comments") states: **"**An agency preparing a final environmental impact statement shall assess and consider comments both individually and collectively, and shall respond by one or more of the means listed below, **stating its response in the final statement**. (Emphasis added.)

Those regulations further require the FS to make changes in response to comments or "Explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response."

Since the FS's responses to comments are so inadequate, the FEIS violates NEPA.

Next, we are obliged to point out hot the Forest Service's failures to monitor a directed by the 1988 Forest Plan has compromised the FEIS's ability to analyze and disclose cumulative effects.

The FEIS fails to disclose that most monitoring and evaluation as required by the 1988 Forest Plan has not been conducted. As a result, the Analysis of the Management Situation and Forest Plan FEIS were not adequately informed.

The 1988 Forest Plan states:

> At intervals established in this Forest Plan, implementation will be evaluated to determine how well objectives have been met, how accurate effects and cost projections are, and how closely management standards and guidelines have been applied. Based upon an evaluation of the monitoring results, the Interdisciplinary Team shall recommend to the Forest Supervisor such changes in management direction, revisions, or amendments to the Forest Plan as deemed necessary. The action prescribed by the Forest Supervisor will depend upon the significance of the monitoring results. The magnitude of the change from predicted conditions is an important factor, as is the risk associated with the change. Procedures prescribed by the National Environmental Policy Act will be followed by the Forest Supervisor in determining the appropriate action.

The LMP further explains how forest plan implementation monitoring <u>was supposed to work</u>:

> Monitoring includes testing assumptions, tracking changes, and measuring management effectiveness and progress toward achieving or maintaining the plan's desired conditions or objectives. Monitoring information should enable the Forest to determine if a change in plan components or other plan management guidance may be needed, forming a basis for continual improvement and adaptive management.

Regarding the original forest plan for the Kootenai National Forest, the agency has stated, "The Forest Plan and the process used to develop it represents agreements on the management and uses of the …Forest among a wide variety of publics, agencies, Indian tribes, organizations, and individuals, it is a negotiated understanding with the public." What is at stake is nothing less than the integrity of the land resource management program, for if the Forest Service is able to leave behind a trail of broken promises and decimated habitat and forget its previous failures to maintain its "negotiated understanding with the public" by the simple expedience of adopting a new set of vague and non-binding "guidance" and objectives, then the entire forest planning process will have been rendered a sham that disenfranchises the public of its own irreplaceable resources, while paying lip service to far-sighted statutory requirements like safeguarding species biodiversity and soils and land productivity.

The intent of NFMA is that forest plan revision is adaptive management to correct mistaken assumptions of the earlier plan.

The National Forest Management Act states:

> "The Congress finds that …
> (2) the public interest is served by the Forest Service, Department of Agriculture, in cooperation with other agencies, assessing the Nation's renewable resources, and developing and preparing a national renewable resource and program, **which is periodically reviewed and updated**;
> …(5) be revised (A) from time to time when the secretary finds conditions in a unit have significantly changed, but at least every fifteen years, and (B) in accordance with the

> provisions of subsections (e) and (f) of this section and public involvement comparable to that required by subsection (d) of this section.
> …(d) The Secretary shall provide for public participation in the development, review, and revision of land management plans…

The failure to monitor leads to inadequate empirical basis for professional judgment or conclusions made in the FEIS. This also frustrates a major purpose of forest plan revision, and is also not in compliance with Executive Order 11514, which provides that Agencies shall develop programs and measures to protect and enhance environmental quality and shall assess progress in meeting the specific objectives of such activities. When the FS simply scraps their strategies (e.g., INFISH, dropping a list of Management Indicator Species, administratively fumbling the list of Sensitive species)—all of which the FS previously stated was necessary to insure diversity of plants and animals—it is incumbent on the agency to explain why, and what they learned from implementing (or failing to implement) the previous strategy/forest plan. The FEIS has failed to do so.

Executive Order 11514 also provides that Agencies shall develop procedures to ensure the fullest practicable provision of timely public information and **understanding of Federal plans and programs** with environmental impact in order to obtain the views of interested parties. The FS has failed to do so.

The FEIS also fails to provide an analysis of how well past FS management projects met the goals, objectives, desired conditions, etc. stated in NEPA documents, and how well the projects conformed to forest plan standards and guidelines.

Finally, there is nothing in the Forest Plan which holds managers accountable for failing to carry out forest plan implementation monitoring.

COMPLIANCE WITH THE TRAVEL MANAGEMENT RULE SUBPART B AND MINIMIZATION CRITERIA

We raised this issue in our July 5, 2016 comments at pp. 36, 43-44.

The Forest Plan and FEIS fail to meet the minimization criteria found in the Travel Management Rule (36 C.F.R. § 212 Subparts B and C) and associated Executive Orders.

The Forest Plan includes direction authorizing or sanctioning current locations of off-road and over-snow motorized and mechanized uses. It does this by incorporating the Motor Vehicle Use Map, implicitly adopting other previous decisions, and adopting Plan Components that in some cases allow and in other cases prohibits motorized and mechanizes uses either forestwide or in particular management areas or other geographically distinct areas. For the Management Area "Backcountry motorized" the LMP decides such areas are suitable for motorized recreation. Standard MA-STD-BCM-01 (Trail Use) states, "Motorized, mechanized and non-motorized modes of travel **are allowed** on system trails. If conflicts occur between types of trail users, **motorized use will be given priority** over non-motorized modes of travel." However the FEIS analyses do not comply with the Travel Management Rule and associated Executive Orders.

The FEIS failed to demonstrate that it implemented or applied the Travel Management Rule/Executive Orders minimization criteria in the route designation process, consistent with the objective of minimizing impacts. The FEIS does not adequately reflect how the FS applied the minimization criteria in its motorized trail and area designations.

When designating off-road vehicle trails and areas, federal agencies are required to minimize damage to forest resources, disruption of wildlife, and user conflicts. Exec. Order No. 11,644 § 3(a), 37 Fed. Reg. 2877 (Feb. 8, 1972), as amended by Exec. Order No. 11,989, 42 Fed. Reg. 26,959 (May 24, 1977). The FS must locate designated trails and areas in order to minimize the following criteria: (1) damage to soil, watershed, vegetation, and other public lands resources; (2) harassment of wildlife or significant disruption of wildlife habitat; and (3) conflicts between off-road vehicle use and other existing or proposed recreational uses. 36 C.F.R. § 212.55(b)(1)-(3). See also, WildEarth Guardians v. USFS, 790 F.3d 920 (9th Cir. 2015).

By sanctioning many current routes without properly applying the Executive Order minimization criteria, the FS has acted in a manner that is arbitrary, capricious, an abuse of discretion. The FEIS fails to take a hard look at impacts from off-road vehicle trails and areas, and those impacts will significantly affect the quality of the human environment.

Also, the Forest Plan would perpetuate user conflicts. The majority of forest visitors enjoy quiet, non-motorized forms of recreation. A key element of the minimization criteria is to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses. 36 C.F.R. § 212.55(b)(3).

The Forest Plan provides no specific strategy, funding sources or design criteria to ensure effective law enforcement to address illegal motorized use. There is high probability that unauthorized routes will continue to be created, further causing conflict with non-motorized users.

The FEIS does not cite or utilize best available science concerning off-road motorized and mechanized use impacts on wildlife. Other sections of this Objection cite scientific evidence on these topics. <u>How</u> motorized access impacts on wildlife are to be minimized or avoided is not discussed in the FEIS.

REMEDY

We request the FS prepare a Supplemental EIS that addresses the analytical and scientific issues identified in this objection, and simultaneously undertake the Science Consistency Review process (Guldin, et al., 2003) for the Supplemental EIS.

We request the Supplemental EIS takes a hard look at the science of climate change.

We request the FS prepare and publicize written responses to comments on the draft forest plan/DEIS, as NEPA requires.

We request the FS include, for full analysis and comparison to other alternatives, Alternative C as conceptually outlined in our DEIS comments and herein. We remain prepared to advise the agency on the composition of such an ecological/biocentric alternative.

CONCLUSION

Objectors remain committed to participating in the development of ecologically sound management direction for this national forest.

Sincerely submitted,

/s/

Sincerely,

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