

Data Submitted (UTC 11): 9/8/2019 7:00:00 AM

First name: Jeff

Last name: Juel

Organization: Alliance For The Wild Rockies

Title:

Comments: September 9, 2019

Sandpoint Ranger Station

Attn: Michelle Norton

1602 Ontario Street

Sandpoint, ID 83864

Comments transmitted via email to: michelle.norton@usda.gov. Please acknowledge timely receipt.

Ms. Norton;

These are comments on the Scoping Notice for the Buckskin Saddle Integrated Restoration Project proposal, on behalf of Alliance for the Wild Rockies (AWR).

Several aspects of the Buckskin Saddle Integrated Restoration Project (Buckskin Saddle) proposal raise questions of significant and cumulative effects, necessitating the preparation of an Environmental Impact Statement under the National Environmental Policy Act (NEPA). The massive logging and road construction proposed, including thousands of acres of clearcut-type logging would not be "insignificant" under any definition, nor without cumulative effects. The proposal would also adversely affect the roadless characteristics and wilderness potential of roadless area. And there are so many "purposes" claimed for the project, and serving them all will create significant conflicts.

The Buckskin Saddle project would implement the 2015 revised Forest Plan. In carrying out its mission, AWR has participated in the public processes concerning management of the Idaho Panhandle National Forests (IPNF) since the early days of original 1987 Forest Plan implementation, and has taken legal action a few times to force the Forest Service (FS) to manage in conformance with environmental laws such as the Endangered Species Act (ESA), the National Forest Management Act (NFMA), and the National Environmental Policy Act (NEPA). AWR also participated fully in the public process as the FS developed its revised Forest Plan, including commenting at every stage and submitting a formal objection. And because the FS provided essentially no relief in response to the formal objection, AWR incorporates the documentation of public participation in the revised Forest Plan public process within these comments on the Buckskin Saddle proposal. By implementing the revised Forest Plan with this project, the FS would be operating outside of environmental laws and regulations.

AWR participated in the public process during the development of the Access Amendments, and we incorporate AWR's comments and appeal of that Decision within these comments. AWR also participated during the public process as the Northern Rockies Lynx Management Direction (NRLMD) was developed, and continues to believe that the Forest Plan/NRLMD does not consider the best available science. AWR incorporates the documentation of its participation in the NRLMD public process within this comment on the Buckskin Saddle proposal.

Necessary Elements for Project analysis:

[middot] Disclose all IPNF Forest Plan direction for logging/burning projects and explain how the project complies with them;

[middot] Explain how the project will comply with forest plan big game hiding cover requirements;

[middot] Disclose the location and acreages of past, current, and reasonably foreseeable logging, grazing, and roadbuilding activities within the project area;

[middot] Solicit and disclose comments from the Idaho Department of Fish and Game regarding the impact of the project on wildlife habitat;

[middot] Solicit and disclose comments from the Idaho Department of Environmental Quality regarding the impact of the project on water quality;

[middot] Disclose the biological assessment for the candidate, threatened, or endangered species with potential and/or actual habitat in the project area;

[middot] Disclose the biological evaluation for the sensitive and management indicator species (MIS) with potential and/or actual habitat in the project area;

[middot] Disclose the snag densities in the project area, and the method used to determine those densities;

[middot] Disclose the current, during-project, and post-project road densities in the project area;

[middot] Disclose the IPNF's record of compliance with state best management practices regarding stream sedimentation from ground-disturbing management activities;

[middot] Disclose the IPNF's record of compliance with its monitoring requirements as set forth in its 1987 and revised forest plans;

[middot] Disclose the IPNF's record of compliance with the additional monitoring requirements set forth in previous DN/FONSI and RODs on the IPNF;

[middot] Disclose the results of the field surveys for threatened, endangered, sensitive, and rare plants in each of the proposed units;

[middot] Formally consult with the U.S. Fish and Wildlife Service (USFWS) on the impacts of this project on candidate, threatened, or endangered wildlife, fish, and plant species;

Also please address the following questions and issues:

[middot] Will this project exacerbate existing noxious weed infestations and start new infestations?

[middot] Do unlogged old growth forest store more carbon than the wood products that would be removed from the same forest in a logging operation?

[middot] What is the cumulative effect of national forest logging on U.S. carbon stores? How many acres of national forest lands are logged every year? How much carbon is lost by that logging?

[middot] Please list each visual quality standard that applies to each unit and disclose whether each unit meets its respective visual quality standard. A failure to comply with visual quality Forest Plan standards violates NFMA.

[middot] For the visual quality standard analysis please define "ground vegetation," i.e. what age are the trees, "re-establishes," "short-term," "longer term," and "revegetate."

[middot] Please disclose whether you have conducted surveys in the project area for this project for all threatened, endangered, sensitive and management indicator species (MIS).

[middot] Please disclose how often the project area has been surveyed for all MIS, sensitive, threatened, and endangered species suspected to inhabit the project area.

[middot] Would the habitat be better for all MIS, sensitive, threatened, and endangered species if roads were removed in the project area?

[middot] What is the USFWS position on the impacts of this project on all candidate, threatened, and endangered species?

[middot] Have you conducted ESA consultation?

[middot] Please provide us with the full Biological Evaluations/Assessments for the all threatened, endangered, sensitive, and MIS species.

[middot] What is wrong with uniform forest conditions?

[middot] Have insects and tree diseases contributed to a diverse landscape?

[middot] Disclose the level of current noxious weed infestations in the project area and the cause of those infestations;

[middot] Disclose the impact of the project on noxious weed infestations and native plant communities;

[middot] Disclose the amount of detrimental soil disturbance that currently exists in each proposed unit from previous logging and livestock grazing activities;

[middot] Disclose the expected amount of detrimental soil disturbance in each unit after ground disturbance and prior to any proposed mitigation/remediation;

[middot] Disclose the expected amount of detrimental soil disturbance in each unit after proposed mitigation/remediation;

[middot] Disclose the analytical data that supports proposed soil mitigation/remediation measures;

[middot] Disclose the timeline for implementation;

[middot] How do you define a healthy forest¹?

[middot] Disclose the funding source for non-commercial activities proposed.

[middot] Disclose the current level of old growth forest in each third order drainage in the project area;

[middot] Disclose the method used to quantify old growth forest acreages and its rate of error based upon field review of its predictions;

[middot] Disclose the historic levels of mature and old growth forest in the project area;

[middot] Disclose the level of mature and old growth forest necessary to sustain viable populations of old-growth associated wildlife species in the area;

[middot] Disclose the amount of mature and old growth forest that will remain after implementation;

1 The Scoping Notice states, "The area is experiencing declining forest health, based on annual forest health surveys[hellip]"

[middot] Disclose the amount of current habitat for old growth and mature forest dependent species in the project area;

[middot] Disclose the amount of habitat for old growth and mature forest dependent species that will remain after project implementation;

[middot] Disclose the method used to model old growth and mature forest dependent wildlife habitat acreages and its rate of error based upon field review of its predictions;

[middot] Disclose the amount of big game (moose and elk) hiding cover, winter range, and security currently available in the area;

[middot] Disclose the amount of big game (moose and elk) hiding cover, winter range, and security during project implementation;

[middot] Disclose the amount of big game (moose and elk) hiding cover, winter range, and security after project implementation;

[middot] Disclose the method used to determine big game hiding cover, winter range, and security, and its rate of error as determined by field review;

[middot] Disclose and address the concerns expressed by the Planning Team in the draft Five-Year Review of the Forest Plan regarding the failure to monitor population trends of MIS, the inadequacy of the Forest Plan old growth standard, and the failure to compile data to establish a reliable inventory of sensitive species on the Forest;

[middot] Disclose the actions being taken to reduce fuels on private lands adjacent to the project area and how those activities/or lack thereof will impact the efficacy of the activities proposed for this project;

[middot] Disclose the efficacy of the proposed activities at reducing wildfire risk and severity in the project area in the future, including a two-year, five-year, ten-year, and 20-year projection;

[middot] Disclose when and how the IPNF made the decision to suppress natural wildfire in the project area and replace natural fire with logging and prescribed burning;

[middot] Disclose the cumulative impacts on the Forest-wide level of the IPNF policy decision to replace natural fire with logging and prescribed burning;

[middot] Disclose how Project complies with the Idaho Roadless Rule;

[middot] Disclose the impact of climate change on the efficacy of the proposed treatments;

[middot] Disclose the impact of the proposed project on the carbon storage potential of the area;

[middot] Disclose the baseline condition, and expected sedimentation during and after activities, for all streams in the area;

[middot] Disclose maps of the area that show the following elements:

1. Past, current, and reasonably foreseeable logging units in the project area;
2. Past, current, and reasonably foreseeable livestock grazing allotments in the project area;
3. Density of human residences within 1.5 miles from the project unit boundaries;
4. Hiding cover in the project area according to the Forest Plan definition;
5. Old growth forest in the project area;
6. Big game security areas;
7. Moose winter range.

The Scoping Notice makes a preliminary determination that the impacts of this proposal will be documented in an Environmental Assessment. We believe that use of an EA is only appropriate in the context of a national forest being managed in accordance to its forest plan, NFMA, and best available science, and also in the context of a detailed narrative of the project area evaluating management performance of past FS actions. Please disclose the best available science the FS is relying upon to support the Buckskin Saddle proposed action.

Using the EA process means the FS would not be required to provide written responses to public comments, rendering the notion of public involvement rather meaningless. We believe the FS is obligated to prepare an EIS, and provide written responses to all comments at every stage.

Project activities and their environmental impacts will extend beyond the mapped project area boundary shown on the map, and the FS is obligated to acknowledge and disclose those impacts. The FS should utilize an

analysis area formed by the watershed boundaries encompassing all the logging and any other proposed active management.

It is vital that the results of past monitoring be incorporated into this project analysis and planning. We request the following be disclosed:

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

Please provide an analysis of how well those past FS projects met the goals, objectives, desired conditions, etc. stated in the corresponding NEPA documents, and how well the projects conformed to forest plan standards and guidelines.

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

The Forest Plan revision process itself violated NEPA and NFMA and failed to utilize the best available science. Implementing actions under the Forest Plan would be significant. Therefore these comments identify legal deficiencies of the Forest Plan as well as the project proposal.

Please provide an analysis to determine if implementation of past management activities contributed to the claimed deficiency in resiliency.

The FS's "desired conditions" rationale is inconsistent with a more holistic ecosystem management approach, which acknowledges the forest's capability of operating in a self-regulatory manner. For example, 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.

[hellip]Pests are a part of even the healthiest eastside ecosystems. Pest roles[mdash]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. (Emphasis added.)

Would the above statement—made by government scientists as part of their participation with the Interior Columbia Basin Ecosystem Management Project—be automatically rejected from consideration as Best Available Science for the Buckskin Saddle process, because it is inconsistent with the assumptions contained in the Scoping Notice?

The EIS must demonstrate consistency with all the applicable direction in the Forest Plan to comply with NEPA and NFMA.

The Forest Plan exhibits a relative absence of explicit reference to the 1982 planning rule. The Forest Plan is inconsistent with the regulations written to guide planning under NFMA.

Many Forest Plan Objectives are not linked with Forest Plan Goals, as required.

The use of the word "should" in Forest Plan Standards and Guidelines allows land managers to have too much or undefined levels of discretion.

"Short term" and "long term" are not adequately defined in the Forest Plan.

The Forest Plan relies upon static Desired Conditions (DCs) to direct active management on the IPNF. The philosophy driving the FS strategy to "move toward" and replicate historic vegetative conditions (basically, replace natural processes with logging and prescribed burning) is that emulation of the results of disturbance processes would conserve biological diversity. McRae et al. 2001 provide a scientific review summarizing empirical evidence that finds marked contrasts

between the results of logging and wildfire. A plethora of scientific evidence directs that DCs be more properly

stated in terms of desired future dynamics, in line with 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 much other support for such an approach in the scientific literature. Noss 2001, for example, believes "If the thoughtfully identified critical components and processes of an ecosystem are sustained, there is a high probability that the ecosystem as a whole is sustained." (Emphasis added.)

Noss 2001 describes basic ecosystem components:

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

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

Composition includes the kinds of species present in an ecosystem and their relative abundances, as well as the composition of plant associations, floras and faunas, and habitats at broader scales. We might describe the composition of a forest, from individual stands to watersheds and regions.

Structure is the architecture of the forest, which includes the vertical layering and shape of vegetation and its horizontal patchiness at several scales, from within stands (e.g., treefall gaps) to landscape patterns at coarser scales. Structure also includes the presence and abundance of such distinct structural elements as snags (standing dead trees) and downed logs in various size and decay classes.

Function refers to the ecological processes that characterize the ecosystem. These processes are both biotic and abiotic, and include decomposition, nutrient cycling, disturbance, succession, seed dispersal, herbivory, predation, parasitism, pollination, and many others. Evolutionary processes, including mutation, gene flow, and natural selection, are also in the functional category.

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

Fire is such an important creator of the ecological variety in Rocky Mountain landscapes that the conservation of biological diversity (required by NFMA) is likely to be accomplished only through the conservation of fire as a process[hellip]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. (Emphases 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. [hellip]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. [hellip] 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). (Emphases added.)

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

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

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

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

Typically, vegetation management proposals and their accompanying NEPA documents on the IPNF acknowledge that attempts to control or resist the natural process of fire have been a contributor to deviations from DCs. This Buckskin Saddle proposal is no exception. Often these same documents characterize fire as well as native insects and other natural pathogens as threats to the ecosystem rather than rejuvenating natural processes. They seem to need such an obsolete viewpoint in order to justify and prioritize the proposed vegetation manipulations, tacitly for replacing natural processes with "treatments" and "prescriptions." However the scientific support for assuming that large landscapes and ecosystems can be restored or continuously maintained by such manipulative actions is entirely lacking.

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. "[hellip]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 "[hellip]capacity for self-repair when perturbed is preserved, and minimal external support for management is needed."

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

The Forest Plan desired ranges for dominance groups are not supported by reliable historic data taken from IPNF surveys or scientific research. Also, the FS has not explained how the effects of climate change and white pine blister rust affect the attainability of those desired ranges.

The Forest Plan desired ranges for Size Class are not supported by reliable historic data taken from IPNF surveys or scientific research. And the FS has not explained how the effects of climate change and white pine blister rust affect the attainability of those desired ranges.

In FW-DC-VEG-03 the term "substantial amounts" is not defined. The desired "greater increase" related to the identified tree species is not supported by citation to specific reliable historic data taken from IPNF surveys or scientific research. The FS has not explained how the effects of climate change and white pine blister rust affect the attainability of those increases.

In FW-DC-VEG-04 the implication that trees are generally too dense on the IPNF is not supported by specific reliable historic data gathered from IPNF surveys or scientific research.

In FW-DC-VEG-05 the desired increase in size of forest patches in the seedling and sapling size classes and decreases in size of forest patches in the small and medium size classes is not supported by specific reliable historic data gathered from IPNF surveys or scientific research.

In FW-DC-VEG-06 the implied assertion that root fungi and forest insects are causing too much tree mortality on the IPNF is not supported by specific reliable historic data gathered from IPNF surveys or scientific research.

In FW-DC-VEG-07 the desired ranges for snags are not supported by reliable historic data taken from IPNF surveys or scientific research. The scientific basis for the delineation of snags into two diameter groups using 20" d.b.h. as the division point is not established.

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).

The implications are that managers know little about how many snags per acre are needed to sustain populations of cavity nesting species. Only the birds themselves have the ability to decide if a tree is suitable for excavating. The FS and Forest Plan fails to recognize this scientific finding.

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. The authors state:

"Many species of birds are dependent on snags for nest sites, including 85 species of cavity-nesting birds in North America (Scott et al. 1977). Therefore, information of how many and what types of snags are required by cavity-nesting bird species is critical for wildlife biologists, silviculturists, and forest managers."

"Researchers across many forest types have found that cavity-nesting birds utilize snags with large DBH and tall height for nest trees (Scott, 1978; Cunningham et al., 1980; Mannan et al., 1980; Raphael and White, 1984; Reynolds et al., 1985; Zarnowitz and Manuwal, 1985; Schreiber and deCalesta, 1992)."

Spiering and Knight (2005) found the following.

Larger DBH and greater snag height were positively associated with the presence of a cavity, and advanced stages of decay and the presence of a broken top were negatively associated with the presence of a cavity. Snags in larger DBH size classes had more evidence of foraging than expected based on abundance.

Percent bark cover had little influence on the presence of a cavity. Therefore, larger and taller snags that are not heavily decayed are the most likely locations for cavity-nesting birds to excavate cavities.

The association of larger DBH and greater height of snags with cavities is consistent with other studies (Scott,

1978; Cunningham et al., 1980; Mannan et al., 1980; Raphael and White, 1984; Reynolds et al., 1985; Zarnowitz and Manuwal, 1985; Schreiber and deCalesta, 1992).

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

size class increased and the significant goodness-of-fit test indicate that large snags are the most important for foraging."

Please disclose the cumulative snag loss in areas previously logged or subject to other causes of snag loss.

In FW-DC-VEG-11 the desired ranges for forest composition, structure, and pattern for each biophysical setting are not supported by reliable historic data taken from IPNF surveys or scientific research. The Forest Plan does not explained how the effects of climate change and white pine blister rust affect the attainability of those desired ranges.

Standard FW-STD-VEG-01 allows active mechanical treatments in old growth but ignores scientific information that such active management is the very antithesis of old growth. The Forest Plan cites no scientific research or monitoring results from the IPNF that demonstrate management manipulations will create net ecological benefit rather than harm old growth and old-growth associated wildlife.

The IPNF's recent Halfway Malin EA states, "there are currently an estimated 11.8 percent of forested lands allocated as old growth on the Idaho Panhandle National Forests[hellip]" Is the inventory of "allocated old growth" on the IPNF maintained for public review? Also, that statement refers to "allocated" old growth, but how much actually meets the IPNF's old-growth criteria?

Please provide an estimate of how much old growth in the project area has been destroyed by logging. What is the HRV for old growth forestwide?

How many FIA plots (locations in the project area) show the plot is old growth?

Please disclose the natural historic range vs. current conditions regarding patch size, edge effect, and amount of interior forest old growth in the project area and forestwide.

Has the FS compared all stands proposed for logging to old growth criteria? Did the FS consider retaining such stands to be as best-closest to old-growth conditions, recruitment to compensate for deficits compared to the historic range?

USDA Forest Service, 1990 uses an index of the "Number of potential nesting trees >30" dbh per acre" for the pileated woodpecker, and McClelland and McClelland (1999) found similar results in their study in northwest Montana, with the average nest tree being 73 cm. (almost 29") dbh." Given this highly specialized habitat need of the pileated woodpecker, how does the FS insure that species' viability without any quantitative direction in Forest Plan for trees of that size? Because the Forest Plan omitted adoption of old growth MIS, the FS has no viability strategy. The 1987 Kootenai National Forest Plan states that "(U)nits of 50-100 acres are the smallest acceptable size in view of the nesting needs of pileated woodpeckers[hellip] (McClelland, 1979)," and that "managing for a minimum size of 50 acres will preclude the existence of species which have larger territory requirements."

The Scoping Notice states, "The proposed vegetation treatments occur in some old growth stands and within some recruitment potential old growth" This is another erratic characteristic of the Forest Plan; although the Glossary mentions some "goal" of meeting the old growth definition in the future, the Forest Plan actually contains no such goal. Does the IPNF have an inventory of forestwide and project area "recruitment potential old growth?" If so, please display these areas on a map and provide links on the Forest website to the forestwide spreadsheet of stands which are designated or otherwise considered to be "recruitment potential old growth."

Please disclose the best available science the IPNF uses to manage recruitment potential old growth stands.

What exactly is accomplished by identifying forest stands suitable for future old growth? How does the IPNF maintain such a commitment to the future, if indeed such a commitment is being documented or followed at all? In other words, how can the public monitor the agency's commitment to these old-growth "goals" or desired conditions, or whatever?

Please disclose the wildlife species the IPNF considers to be strongly associated with old growth, which must be a meaningful relationship.

The IPNF's 1987 Forest Plan included standards for protection of old growth and associated wildlife (USDA Forest Service 1987c). 1987 Forest Plan Appendix 27 (USDA Forest Service, 1987d) provided other direction and biological information concerning old growth and old- growth associated wildlife species. Please explained what it is about the IPNF's 1987 Forest Plan's old growth standards, and its Appendix 27 which is inconsistent with the best available science.

Likewise the adjacent Kootenai National Forest's 1987 Forest Plan included standards for protection of old growth and associated wildlife, along with Appendix 17 (USDA Forest Service 1987a, USDA Forest Service 1987b). Please explain what it is about the KNF's 1987 Forest

Plan old growth standards and its Forest Plan Appendix 17 which is inconsistent with the best available science.

After forest plan revision the IPNF has greatly weakened protections for old growth, and in fact the Forest Plan provides direction for logging old growth that lacks scientific support. We incorporate USDA Forest Service, 1987a as well as USDA Forest Service, 1987b which contains a list of "species [hellip](which) find optimum habitat in the "old" successional stage[hellip]" We also incorporate the KNF document ("Old Growth validation") which 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 1987a, and USDA Forest Service 1987b also provides biological information concerning old growth and old-growth associated wildlife species.

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

The 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 an 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) Old growth is typically distinguished from younger growth by several of the following attributes:

1. Large trees for species and site.

2. Wide variation in tree sizes and spacing.
3. Accumulations of large-size dead standing and fallen trees that are high relative to earlier stages.
4. Decadence in the form of broken or deformed tops or bole and root decay.
5. Multiple canopy layers
6. Canopy gaps and understory patchiness.

Green et al., 1992 also recognize that "Rates of change in composition and structure are slow relative to younger forests."

In preparing and adopting Green et al. 1992 old-growth guidelines, the FS did not use an independent scientific peer review process, as discussed by Yanishevsky, 1994:

As a result of Washington Office directives, Region 1 established an Old-Growth Committee. In April 1992, Region 1 issued a document entitled "Old-Growth Forest Types of the Northern Region," which presented Old-Growth Screening Criteria for specific zones on Western Montana, Eastern Montana, and North Idaho (U.S.D.A. Forest Service 1992). This was an attempt to standardize criteria for classifying the variety of old-growth types across the Region. [hellip]The committee, however, executed this task without the benefit of outside scientific peer review or public input, either during or after the process (Yanishevsky 1990, Shultz 1992b). Moreover, the methodology used by the committee was unscientific and did not even include gathering field data to verify the characteristics of

old-growth stands as a basis for the definition (id.). A former member of the Region 1 Old- Growth Committee described a "definition process" that relied heavily upon the Committee members' pre-conceived notions of the quantifiable characteristics of old-growth forests (Schultz 1992b).

The old-growth definition in its present state, without field verification of assumptions, and without addressing the issue of quality, is inadequate to scientifically describe, define, delineate, or inventory old-growth ecosystems.

(id.) Not only did the Committee fail to obtain new field data on old-growth forest characteristics, it failed even to use existing field data on old-growth definition and classification previously collected for Region 1 (Pfister 1987). Quality of old growth was not addressed during the definition process. The Committee did not take into account the legacy of logging that has already destroyed much of the best old growth. This approach skewed the characteristics that describe old-growth forests toward poorer remaining examples. [hellip]It's premature for the Forest Service to base management decisions with long- term environmental effects on its Region 1 old-growth criteria, until these criteria are validated by the larger scientific community.

Yanishevsky (1994) also points out the scientific inadequacy of maintaining merely "minimum" amounts of old-growth habitat and its components such as snags.

It appears the agency wants to make the definition of old growth to be a simplistic numbers and database analysis game, devoid of biologically vital data gathered in the field which might document what is unique about old growth[mdash]not just a few large trees left over after logging, but decadence, rot, snags, down logs, patchy irregular canopy layers[mdash]things that can't be created by the agency's version of "restoration" and which would be depleted by such management actions.

Please disclose the natural historic range vs. current conditions regarding patch size, edge effect, and amount of interior forest old growth in the IPNF.

Please provide an analysis for the Forest Plan MIS "Landbird Assemblage." Please disclose the specific habitat needs of all of these bird species, and analyze cumulative impacts.

The FS is obligated to consider best available science. AWR's Objection to the Forest Plan notes that the scientific basis for its standards, guidelines, and other components/direction is not well established. Consequently if the Buckskin Saddle project is tiered to the Forest Plan, which is obviously must, then in order to consider best available science the FS must finally explain what

science it has considered for all forest plan components/direction. Also, please disclose how this consideration played out in Forest Plan structure and how does it play out in project design?

Western (boreal) toad

Please disclose the FS's strategy and best available science for insuring viable populations of the boreal toad. USDA Forest Service, 2003a states:

Little quantitative data are available regarding the boreal toad's use of upland and forested habitats. However, boreal toads are known to migrate between the aquatic breeding and terrestrial nonbreeding habitats (TNC Database 1999), and that juvenile and adult toads are capable of moving over 5 km between breeding sites (Corn et al. 1998). It is thought than juveniles and female boreal toads travel farther than the males (Ibid). A study on the Targhee National Forest (Bartelt and Peterson 1994) found female toads traveled up to 2.5 kilometers away from water after breeding, and in foraging areas, the movements of toads were significantly influenced by the distribution of shrub cover. Their data suggests that toads may have avoided macro-habitats with little or no canopy and shrub cover (such as clearcuts). Underground burrows in winter and debris were important components of toad selected micro-sites in a variety of macro-habitats. The boreal toad digs its own burrow in loose soil or uses those of small mammals, or shelters under logs or rocks, suggesting the importance of coarse woody debris on the forest floor. [hellip](T)imber harvest and prescribed burning activities could impact upland habitat by removing shrub cover, down woody material, and/or through compaction of soil.

Montana Fish, Wildlife & Parks, 2005 (a more recent version of the above cite "TNC Database, 1999") also discuss boreal toad habitat:

Habitats used by boreal toads in Montana are similar to those reported for other regions, and include low elevation beaver ponds, reservoirs, streams, marshes, lake shores, potholes, wet meadows, and marshes, to high elevation ponds, fens, and tarns at or near treeline (Rodgers and Jellison 1942, Brunson and Demaree 1951, Miller 1978, Marnell 1997, Werner et al. 1998, Boundy 2001). Forest cover in or near encounter sites is often unreported, but toads have been noted in open-canopy ponderosa pine woodlands and closed-canopy dry conifer forest in Sanders County (Boundy 2001), willow wetland thickets and aspen stands bordering Engelmann spruce stands in Beaverhead County (Jean et al. 2002), and mixed ponderosa pine/cottonwood/willow sites or Douglas-fir/ponderosa pine forest in Ravalli and Missoula counties (P. Hendricks personal observation).

Elsewhere the boreal toad is known to utilize a wide variety of habitats, including desert springs and streams, meadows and woodlands, mountain wetlands, beaver ponds, marshes, ditches, and backwater channels of rivers where they prefer shallow areas with mud bottoms (Nussbaum et al. 1983, Baxter and Stone 1985, Russell and Bauer 1993, Koch and Peterson 1995, Hammerson 1999). Forest cover around occupied montane wetlands may include aspen, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir; in local situations it may also be found in ponderosa pine forest. They also occur in urban settings, sometimes congregating under streetlights at night to feed on insects (Hammerson 1999, P. Hendricks personal observation). Normally they remain fairly close to ponds, lakes, reservoirs, and slow-moving rivers and streams during the day, but may range widely at night. Eggs and larvae develop in still, shallow areas of ponds, lakes, or reservoirs or in pools of slow-moving streams, often where there is sparse emergent vegetation. Adult and juvenile boreal toads dig burrows in loose soil or use burrows of small mammals, or occupy shallow shelters under logs or rocks. At least some toads hibernate in terrestrial burrows or cavities, apparently where conditions prevent freezing (Nussbaum et al. 1983, Koch and Peterson 1995, Hammerson 1999).

Maxell et al., 1998 state:

We believe that the status of the Boreal toad is largely uncertain in all Region 1 Forests.

[hellip]Briefly, factors which are a cause for concern over the viability of the species throughout Region 1 include: (1) a higher degree of genetic similarity within the range of Region 1 Forests relative to southern or coastal populations; (2) a general lack of both historical and current knowledge of status in the region; (3) indications of declines in areas which do have historical information; (4) low (5-10%) occupancy of seemingly suitable habitat as detected in recent surveys; (5) some evidence for recent restriction of breeding to low elevation sites and; (6) recent crashes in boreal toad populations in the southern part of its range which may indicate the species' sensitivity to a variety of anthropogenic impacts.

Fisher

Please disclose the FS's strategy and best available science for insuring viable populations of the fisher. Please conduct a scientifically-based analysis on the spatial and structural requirements for fisher survival and successful reproduction. There is no sound, scientifically-based analysis for the Forest Plan or entire IPNF comparing forestwide conditions with habitat metrics required to insure fisher viability. The analyses for other wildlife must address these same flaws.

Sauder (2014) suggests that five national forests (Clearwater, Nez Perce, Coeur d'Alene, Kaniksu, and Kootenai) hold the key to recovery of the species in the Northern Region. As with most of the Sensitive wildlife, fishers receive little habitat protection emphasis in the Forest Plan[mdash]mostly just move it (via logging) toward desired conditions. Please disclose the direct, indirect and cumulative impacts on important habitat components such as snags, logs, foraging habitat configuration, connectivity, cover, and impacts on predator and prey species.

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

[hellip]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 state:

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.

Forest Plan protections for the fisher revolve entirely around the rather random likelihood of a fisher den site

being detected, so that measures might be taken: "Management activities on NFS lands should avoid/minimize disturbance at known active nesting or denning sites for other sensitive, threatened, or endangered species not covered under other forestwide guidelines." (FW-GDL-WL-25.) The Forest Plan provides no further direction on how motorized activities would be avoided or minimized other than vaguely stating, "Use the best available information to set a timeframe and a distance buffer around active nests or dens." (Id.) Please disclose this best available science.

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 fisher populations at the Forest level, projects will continue to degrade fisher habitat across the IPNF over time. (Also see also Schultz 2012, who identified these problems in analyses for many wildlife species.)

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the fisher.

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).

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. 2014, 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).

Pine marten

Please disclose the FS's strategy and best available science for insuring viable populations of the pine marten, a species whose habitat is significantly altered by thinning and other active forest management (Moriarty et al., 2016; Bull and Blumton, 1999; Hargis et al., 1999 and Wasserman et al., 2012).

Northern goshawk

Please disclose the FS's strategy and best available science for insuring viable populations of the northern goshawk, a species whose habitat is significantly altered by logging and other active forest management.

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

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

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 post- fledging areas (PFA)s and foraging areas. Reynolds et al. 1992 calls for 100% in VSS classes 5 & 6 and 0% in VSS classes 1-4 in nest areas.

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

Crocker-Bedford (1990) noted:

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

Moser and Garton (2009) reported that all goshawk nests examined in their study area were found in stands whose average diameter of overstory trees was over 12.2 inches and all nest stands had > 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)[hellip]."

The FS's Samson (2006) reports says that 110 breeding individuals (i.e. 55 pairs) are necessary for a viable goshawk population in R1. USDA Forest Service, 2005e is a map showing the results from the 2005 R1 region-wide goshawk survey using the FS's Woodbridge and Hargis goshawk monitoring protocol. That 2005 detection map says there were 40 detections in 2005 in Region 1. So the results of this survey essentially show that the population in Region 1 has not been viable according to the agency's own science (only 40 instead of 55). And some of the detections may have been individuals using the same nest, so the number of nests (and therefore number of breeding pairs) could be even lower than 40.

White-headed woodpecker

Please disclose the FS's strategy and best available science for insuring viable populations of the white-headed woodpecker.

Flammulated owl

Please disclose the FS's strategy and best available science for insuring viable populations of the flammulated owl.

Wright, et al. (1997) point out that habitat restoration for the flammulated owl must be carefully targeted to the correct habitat types. The FS can't simply cut and/or burn forest land and expect flammulated owls to start or continue using it as habitat. Wright, et al. (1997) state:

(W)e never detected Flammulated Owls in mesic old-growth ponderosa pine stands with a *Vaccinium* understory. Thus, within suitable landscapes, it may be most effective to conserve and restore stand structural characteristics within suitable habitat types (e.g., xeric ponderosa pine/ Douglas-fir stands in our study area), rather than within any stand containing ponderosa pine trees.

Hayward and Verner, 1994 provide a conservation assessment for flammulated owls, and make management recommendations.

Great gray owl

Please disclose the FS's strategy and best available science for insuring viable populations of the great gray owl. Hayward and Verner, 1994 provide a conservation assessment for the great gray owl, and make management recommendations.

Pileated woodpecker

Please disclose the FS's strategy and best available science for insuring viable populations of the pileated woodpecker. Bull et al. 2007 represents over 30 years of investigation into the effects of logging on the pileated woodpecker and is the latest information on such effects.

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

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

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

This preferred diameter of nesting trees for the pileated woodpecker recognized by R-1 is notable. McClelland and McClelland (1999) found similar results in their study in northwest Montana, with the average nest tree being 73 cm. (almost 29") dbh. The pileated woodpecker's strong preference for trees of rather large diameter is not adequately considered in the Forest Plan. Effectively, the IPNF provides absolutely no commitments for leaving specific numbers and sizes of largest trees favored by so many wildlife species.

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

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

McClelland (1977), states:

(The Pileated Woodpecker) is the most sensitive hole nester since it requires old growth larch, ponderosa pine, or black cottonwood for successful nesting. The Pileated can be

considered as key to the welfare of most hole-nesting species. If suitable habitat for its perpetuation is provided, most other hole-nesting species will be accommodated.

Pileated Woodpeckers use nest trees with the largest dbh: mean 32.5 inches; Pileated Woodpeckers use the tallest nest trees: mean 94.6 feet;

The nest tree search image of the Pileated Woodpecker is a western larch, ponderosa pine, or black cottonwood snag with a broken top (status 2), greater than 24 inches dbh, taller than 60 feet (usually much taller), with bark missing on at least the upper half of the snag, heartwood substantially affected by *Fomes laracis* or *Fomes pini* decay, and within an old- growth stand with a basal area of at least 100 sq feet/acre, composed of large dbh classes.

A cluster analysis based on a nine-dimensional ordination of nest tree traits and habitat traits revealed close association between Yellow-bellied Sapsuckers, Mountain Chickadees, and Red-breasted Nuthatches. These three species plus the Pileated Woodpecker and Hairy Woodpecker are relatively grouped by coincident occurrence in old growth. Tree Swallows, Black-capped Chickadees, and Common Flickers are separated from the above five species by their preference for more open areas and their frequent use of small dbh nest trees.

(Most) species found optimum nesting habitat in stands with a major component of old growth, particularly larch. Mean basal area for pileated woodpecker nest sites was 150 square feet per acre. (McClelland. B.R. and others, 1979)

Many large snags are being cut for firewood. Forest managers should limit firewood cutting to snags less than 15 inches in d.b.h. and discourage use of larch, ponderosa pine, and black cottonwood. Closure of logging roads may be necessary to save high-value snags. Logging slash can be made available for wood gatherers.

Wolverine

Please disclose the FS's strategy and best available science for insuring viable populations of the wolverine. Wolverines use habitats 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/mi² (1.7 km/km²) (Carroll et al. 2001b).

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

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

Wisdom et al. (2000) state:

Carnivorous mammals such as marten, fisher, lynx, and wolverine are vulnerable to over-trapping (Bailey and others 1986, Banci 1994, Coulter 1966, Fortin and Cantin 1994, Hodgman and others 1994, Hornocker and Hash 1981, Jones 1991, Parker and others 1983, Thompson 1994, Witmer and others 1998), and over-trapping can be facilitated by road access (Bailey and others 1986, Hodgman and others 1994, Terra-Berns and others 1997, Witmer and others 1998).

[hellip] 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).

[hellip] (T)he present distribution of the wolverine, like that of the grizzly bear, may be more related to regions that escaped human settlement than to vegetation structure.

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

[middot] 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.

[middot] Manage wolverine and lynx in a metapopulation context, and provide adequate links among existing populations.

[middot] Reduce human disturbances, particularly in areas with known or high potential for wolverine natal den sites (subalpine talus cirques).

The Forest Plan includes no coherent viability strategy for wolverine protection. Forest Plan protections for the wolverine revolve entirely around the rather random likelihood of a wolverine den site being detected, so that measures might be taken: "Management activities on NFS lands should avoid/minimize disturbance at known active nesting or denning sites for other sensitive, threatened, or endangered species not covered under other forestwide guidelines." (FW-GDL- WL-25.) The Forest Plan provides no further direction on how motorized activities would be avoided or minimized other than vaguely stating, "Use the best available information to set a timeframe and a distance buffer around active nests or dens." (Id.) What is this best available science?

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the wolverine.

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)[hellip]

[hellip]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.

In regards to the 2013 memo from the Regional Office (2013_0305_USDAWolverine Guidance), why are district-level specialists not allowed to arrive at effects conclusions based upon their own expertise and judgment?

Black-backed woodpecker

Please disclose the FS's strategy and best available science for insuring viable populations of the black-backed woodpecker. 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[hellip]

[hellip]Several bird species seem to be relatively restricted in distribution to early post-fire conditions[hellip] I believe it would be difficult to find a forest-bird species more restricted to a single vegetation cover type in the northern Rockies than the Black-backed Woodpecker is to early [first 6 years] post-fire conditions. (Emphasis added).

USDA Forest Service 2011c states:

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

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

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

Cherry (1997) states:

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

once was, and continued fire suppression and insect eradication is likely to cause further decline. (Emphasis added.)

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

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

Woodpeckers play critical roles in the forest ecosystem. Woodpeckers are primary cavity nesters that excavate at least one cavity per year, thus making these sites available to secondary cavity nesters (which include many species of both birds and mammals). Black-backed and three-toed woodpeckers can play a large role in potential insect control. The functional roles of these two woodpecker species could easily place them in the 'keystone' species category—a species on which other species depend for their existence.

Wickman (1965) calculated that woodpeckers may eat up to 50 larvae per day that were each about 50 mm in length. The predation on these larvae is significant. It has been estimated that individual three-toed woodpeckers may consume thousands of beetle larvae per day, and insect outbreaks may attract a many-fold increase in woodpecker densities (Steeger et al. 1996). The ability of woodpeckers in to help control insect outbreaks may have previously been underestimated.

Cherry (1997) also notes:

Black-backed woodpeckers preferred foraging in trees of 34 cm (16.5 in) diameters breast height and (63 ft) 19 m height (Bull et al. 1986). Goggans et al. (1987) found the mean dbh of trees used for foraging was 37.5 cm (15 in) and the mean dbh of trees in the lodgepole pine stands used for foraging was 35 cm (14 in). Steeger et al. (1996) found that both

(black-backed and three-toed) woodpecker species fed in trees from 20-50 cm (8-20 in) dbh.

Black-backed woodpeckers excavate their own cavities in trees for nesting. Therefore, they are referred to as primary cavity nesters, and they play a critical role in excavating cavities that are later used by many other species of birds and mammals that do not excavate their own cavity (secondary cavity nesters). Black-backed woodpeckers peel bark away from the entrance hole and excavate a new cavity every year. Other woodpeckers sometimes take over their cavities (Goggans et al. 1987).

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

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

however, are decades of successful fire suppression and salvage logging targeted at recent bark beetle outbreaks." Hillis et al., 2002 also state:

Black-backed woodpeckers occupy forested habitats that contain high densities of recently dead or dying trees that have been colonized by bark beetles and woodborer beetles (Buprestidae, Cerambycidae, and Scolytidae). These beetles and their larvae are most abundant within burned forests. In unburned forests, bark beetle and woodborer infested trees are found primarily in areas that have undergone natural disturbances, such as wind-throw, and within structurally diverse old-growth forests (Steeger and Dulisse in press, Bull et al. 1986, Goggans et al. 1987, Villard 1994, Hoffman 1997, Weinhausen 1998).

The viability of black-backed woodpeckers is threatened by the FS's fire suppression and other "forest health" policies such as that promoted in the Buckskin Saddle Scoping Notice, 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 Buckskin Saddle project is to negate the natural occurrence 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. This emphasis also occurs on a large portion of the IPNF. Viability of a species cannot be assured, if habitat suppression is a forestwide policy.

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the black-backed woodpecker.

Canada lynx

The USFWS listed the Canada lynx as a threatened species under the Endangered Species Act in 2000 due to "lack of guidance for conservation of lynx and snowshoe hare habitat..." and subsequent authorization of actions that may cumulatively adversely affect the lynx. Relatively little is known about lynx in the contiguous United States. Historically, lynx inhabited states spanning from Maine to Washington, but it is unknown how many lynx remain.

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

Lynx subsist primarily on a prey base of snowshoe hare, and survival is highly dependent upon snowshoe hare habitat, forest habitat where young trees and shrubs grow densely. In North America, the distribution and range of lynx is nearly "coincident" with that of snowshoe hares, and protection of snowshoe hares and their habitat is critical in lynx conservation strategies.

Please disclose if the FS conducted surveys of all the lynx suitable habitat in the LAUs. More often than not, when the FS conducts logging projects in Lynx Analysis Units (LAUs), surveys of stands for lynx habitat result in less suitable habitat than previously assumed. The FS needs to take a few steps backward and consider that its range-wide Canada lynx suitable habitat estimations were too high.

Please disclose if surveys target snowshoe hare occurrence data in these stands newly considered unsuitable for lynx. Please disclose if the FS conducted surveys of Canada lynx "unsuitable" habitat in the project area to find out if such habitat might in fact be suitable after all.

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

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

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

2006a.)

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

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

Squires et al., 2010 reported that lynx winter habitat should be "abundant and spatially well- distributed across

the landscape." Those authors also noted that in heavily managed landscapes, retention and recruitment of lynx habitat should be a priority.

The LCAS (Ruediger et al. 2000) recommends, until conclusive information is developed concerning lynx management, the agencies retain future options; that is, choose to err on the side of maintaining and restoring habitat for lynx and their prey. To err on the side of caution, the IPNF would retain all remaining stem exclusion forests for recruitment into lynx winter habitat, so that this key habitat would more closely resemble historic conditions.

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

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

Kosterman, 2014 finds that 50% of lynx habitat must be mature undisturbed forest for it to be optimal lynx habitat where lynx can have reproductive success and no more than 15% of lynx habitat should be young clearcuts, i.e. trees under 4 inches dbh. This renders inadequate the agency's assumption in the NRLMD that 30% of lynx habitat can be clearcut, and that no specific amount of mature forest needs to be conserved. Kosterman, 2014 demonstrates that the NRLMD standards are not adequate for lynx viability and recovery, as is assumed by the FS.

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the Canada lynx.

Grizzly bear

Please disclose if adverse project or cumulative impacts are consistent with the requirement to prioritize the needs of the grizzly bear for the applicable Management Situation(s).

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. Please disclose existing road

densities located outside of and between Bear Management Units (BMUs), both at present and during project implementation.

Please disclose the FS strategy and best available science to provide habitat protections outside Recovery Zones (RZs) that would allow for a larger protected zone and/or natural augmentation from outside the RZs. The FS has no effective strategy to provide scientifically defensible habitat protections inside the RZ that would facilitate functional connectivity between and among BMUs.

The Forest Service is aware of the best Plan direction it has adopted to date, established in Flathead Forest Plan Amendment 19.2 It established Open Motorized Route Density (OMRD)/Total Motorized Route Density (TMRD)/Security Core indices. These are based upon the scientific information concerning security from roads and road density requirements for grizzly bears as found in Mace and Manley, 1993 and Mace et al., 1996.

Please disclose the impacts of late-season snowmobile use on grizzly bear spring range.

Please analyze and disclose cumulative impacts on grizzly bears from human activities and habitat alternations on land of other ownerships.

Elk

2 Although that Forest Plan has been revised and the Amendment 19 direction dropped and/or weakened, AWR has objected to the Flathead NF's revised forest plan and filed notice of intent to sue on this issue.

Christensen, et al. (1993) is a Region One publication on elk habitat effectiveness. Meeting a minimum of 70% translates to about 0.75 miles/sq. mi. in key elk habitat, as shown in their graph:

Please provide a map of the entire road system in the watersheds affected by the proposal, including all national forest system roads, the nonsystem roads, all existing road templates, and all existing unauthorized roads[mdash]not just those the FS plans to use for this timber sale.

To address its unsustainable and deteriorating road system, the FS promulgated the

Roads Rule (referred to as "subpart A") in 2001. The rule directs each national forest to conduct "a science-based roads analysis," generally referred to as the "travel analysis process." The 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:

- [bull] A TAP must analyze all roads (maintenance levels 1 through 5);
- [bull] The Travel Analysis Report must include a map displaying roads that will inform the Minimum Road System pursuant to 36 C.F.R. [sect] 212.5(b), and an explanation of the underlying analysis;
- [bull] 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:

- [bull] Produce a Travel Analysis Report summarizing the travel analysis;
- [bull] Produce a list of roads likely not needed for future use; and
- [bull] Synthesize the results in a map displaying roads that are likely needed and likely not needed in the future that conforms to the provided template.

The Subpart A analysis is intended to account for benefits and risks of each road, and especially to account for affordability. The TAP must account for the cost of maintaining roads to standard, including costs required to comply with Best Management Practices related to road maintenance.

The Travel Management Regulations at 36 CFR [sect] 212.5 state:

(b) Road system[mdash](1) Identification of road system. For each national forest, national grassland, experimental forest, and any other units of the National Forest System ([sect] 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.

Please disclose if the project area is being managed in compliance with the Travel Management Regulations at 36 CFR 212 (Subparts, A, B, and C) and the Executive Orders related to Subpart

B. Subpart A requires the FS to involve the public in a scientifically based process which designates the Minimum Road System both in the analysis area and forestwide, so that unnecessary or ecologically damaging roads are targeted for decommissioning and the economic liabilities of roads are minimized.

Please disclose compliance with motorized route restrictions, and if violations exist, perform an analysis of the resultant harm to wildlife habitat, soil, and water.

Please analyze how proposed management actions would be affected by likely climate change scenarios. Please quantify all human-caused CO₂ emissions for all project activities. Please quantify carbon sequestration for each alternative. Please disclose how climate change has affected ecological conditions in the project area, and include an analysis of these conditions under climate change scenarios.

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[mdash]like those politicians and profiteers[mdash]ignores and distracts from the causes of climate change they enable.

Global climate change is a massive, unprecedented threat to humanity and forests. Climate change is caused by excess CO₂ and other greenhouse gases transferred to the atmosphere from other pools. All temperate and tropical forests, including those in this project area, are an

important part of the global carbon cycle. There is significant new information reinforcing the need to conserve all existing large stores of carbon in forests, in order to keep carbon out of the atmosphere and mitigate climate change. The agency must do its part by managing forests to maintain and increase carbon storage. Logging would add to cumulative total carbon emissions so is clearly part of the problem, so it must be minimized and mitigated. Logging would not only transfer carbon from storage to the atmosphere but future regrowth is unlikely to ever make up for the effects of logging, because carbon storage in logged forests lags far behind carbon storage in unlogged forests for decades or centuries. And before recovery, the agency plans even more activities causing greenhouse gas emissions.

Clearly, the management of the planet's forests is a nexus for addressing the largest crisis ever facing humanity. This is an issue as serious as nuclear annihilation (although at least with the latter we're not already pressing the button).

Where is the cumulative effects analysis of IPNF carbon sequestration over time?

Respected experts say that the atmosphere might be able to safely hold 350 ppm of CO₂.³ So when the atmosphere was at pre-industrial levels of about 280 ppm, there was a cushion of about 70 ppm which represents millions of tons of greenhouse gas emissions. Well, now that cushion is completely gone. The atmosphere is now over 400 ppm CO₂ and rising. Therefore the safe level of additional emissions (from logging or any other activity) is negative. There is no safe level of additional emissions that our earth systems can tolerate. We need to be removing carbon from the atmosphere—not adding to it.⁴ How? By allowing forest to grow. Logging moves us away from our objective while conservation moves us toward our objective.

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. [hellip] 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.

³ <http://www.350.org/about/science>.

⁴ "To get back to 350 ppm, we'll have to run the whole carbon-spewing machine backwards, sucking carbon out of the atmosphere and storing it somewhere safely. [hellip] By growing more forests, growing more trees, and better managing all our forests[hellip]"

(<http://blog.cleanenergy.org/2013/11/26/exploringbiocarbon-tools/comment-page-1/#comment-375371>)

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.

From a report by the Union of Concerned Scientists & Rocky Mountain Climate Organization (Funk et al., 2014):

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

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

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

Global climate change is caused by excess CO₂ 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 CO₂, 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 IPNF is an important part of the global carbon cycle. Clear scientific information reinforces the critical need to conserve all existing stores of carbon in forests to keep it out of the atmosphere. Given that forest policies in other countries and on private lands are politically more difficult to influence, the FS must take a leadership role to maintain and increase carbon storage on publicly owned forests, in order to help mitigate climate change effects.

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

Robust statistical associations between wildfire and hydro-climate in western forests indicate that increased wildfire activity over recent decades reflects sub-regional responses to changes in climate. Historical wildfire observations exhibit an abrupt transition in the mid-1980s from a regime of infrequent large wildfires of short (average of one week) duration to one with much more frequent and longer-burning (five weeks) fires. This transition was marked by a shift toward unusually warm springs, longer summer dry seasons, drier vegetation (which provoked more and longer-burning large wildfires), and longer fire seasons. Reduced winter precipitation and an early spring snowmelt played a role in this shift. Increases in wildfire were particularly strong in mid-elevation forests.

[hellip]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[deg] to 5[deg]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[deg]C would be roughly three times the spring-summer temperature increase that Westerling et al. have linked to the current trends. Wildfire burn areas in Canada are expected to increase by 74 to 118% in the next century

(12), and similar increases seem likely for the western United States.

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

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

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

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

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

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

The IPNF Forest Plan draft EIS defines carbon sequestration: "[hellip]the process by which atmospheric carbon dioxide is taken up by vegetation through photosynthesis and stored as carbon in biomass (trunks, branches, foliage, and roots) and soils."

The FS also ignores CO₂ and other greenhouse gas emissions from other common human activities related to forest management and recreational uses. These include emissions associated with machines used for logging and associated activities, vehicle use for administrative actions, recreational motor vehicles, and emissions associated with livestock grazing. The FS is simply ignoring the climate impacts of these management and other authorized or allowed activities.

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

Off-road vehicles in California currently emit more than 230,000 metric tons [mdash] or

5000 million pounds [mdash] 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 CO₂ per year into the atmosphere.

Can we really afford this?

The FS distracts from the emerging scientific consensus that removing wood or any biomass from the forest only worsens the climate change problem. Law and Harmon, 2011 conducted a literature review and concluded [hellip]

Thinning forests to reduce potential carbon losses due to wildfire is in direct conflict with carbon sequestration goals, and, if implemented, would result in a net emission of CO₂ to

the atmosphere because the amount of carbon removed to change fire behavior is often far larger than that saved by changing fire behavior, and more area has to be harvested than will ultimately burn over the period of effectiveness of the thinning treatment.

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

Kutsch et al., 2010 provide an integrated view of the current and emerging methods and concepts applied in soil carbon research. They use a standardized protocol for measuring soil CO₂ efflux, designed to improve future assessments of regional and global patterns of soil carbon dynamics:

Excluding carbonate rocks, soils represent the largest terrestrial stock of carbon, holding approximately 1,500 Pg (10¹⁵ g) C in the top metre. This is approximately twice the amount held in the atmosphere and thrice the amount held in terrestrial vegetation. Soils, and soil organic carbon in particular, currently receive much attention in terms of the role they can play in mitigating the effects of elevated atmospheric carbon dioxide (CO₂) 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.)

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."

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.

In 2016, Professors Mark Harmon and Bev Law of Oregon State University 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.

Van der Werf, et al. 2009 discuss the effects of land-management practices and state: (T)he maximum reduction in CO₂ 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 CO₂ 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.

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

Our forests are functioning as carbon sinks (net sequestration) where logging has been reduced or halted, and wildland fire helps maintain high productivity and carbon storage.

Even large, intense fires consume less than 3% of the biomass in live trees, and carbon emissions from forest fires is only tiny fraction of the amount resulting from fossil fuel consumption (even these emissions are balanced by carbon uptake from forest growth and regeneration).

"Thinning" operations for lumber or biofuels do not increase carbon storage but, rather, reduce it, and thinning designed to curb fires further threatens imperiled wildlife species that depend upon post-fire habitat.

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

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

Although fuel-reduction treatments may be necessary to restore historical functionality to fire-suppressed ecosystems, we found little credible evidence that such efforts have the added benefit of increasing terrestrial C stocks.

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

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

In 2012 Forest Service scientists reported, "Climate change will alter ecosystem services, perceptions of value,

and decisions regarding land uses." (Vose et al. 2012.)

The 2014 National Climate Assessment chapter for the Northwest is prefaced by four "key messages" including this one: "The combined impacts of increasing wildfire, insect outbreaks, and tree diseases are already causing widespread tree die-off and are virtually certain to cause additional forest mortality by the 2040s and long-term transformation of forest landscapes.

Under higher emissions scenarios, extensive conversion of subalpine forests to other forest types is projected by the 2080s." (Mote et al. 2014.)

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

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

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

Heat, a long-established topic of physics, plays an equally important role at the level of plant and animal physiology—every organism only survives and thrives within thermal limits. For example, Pörtner et al. (2008) point out, "All organisms live within a limited range of body temperatures[hellip] Direct effects of climatic warming can be understood through fatal decrements in an organism's performance in growth, reproduction, foraging, immune competence, behaviors and competitiveness." The authors further explain, "Performance in animals is supported by aerobic scope, the increase in oxygen consumption rate from resting to maximal." In other words, rising heat has the same effect on animals as reducing the oxygen supply, and creates the same difficulties in breathing. But breathing difficulties brought on by heat can have important consequences even at sub-lethal levels. In the case of grizzly bears, increased demand for oxygen under increasing heat has implications for vigorous (aerobically demanding) activity including digging, running in pursuit of prey, mating, and the play of cubs.

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

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

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

Forests are changing in ways they've never experienced before because today's growing conditions are different from anything in the past. The climate is changing at an unprecedented rate, exotic diseases and pests are present, and landscapes are fragmented by human activity often occurring at the same time and place.

The current drought in California serves as a reminder and example that forests of the 21st century may not resemble those from the 20th century. "When replanting a forest after disturbances, does it make sense to try to reestablish what was there before? Or, should we

find re-plant material that might be more appropriate to current and future conditions of a changing environment?

"Restoration efforts on U.S. Forest Service managed lands call for the use of locally adapted and appropriate native seed sources. The science-based process for selecting these seeds varies, but in the past, managers based decisions on the assumption that present site conditions are similar to those of the past.

"This may no longer be the case."

This raises the important issue: are our forests really "suitable" for timber production if the likely impacts of climate change mean that regeneration following this massive clearcutting operation may not be feasible.

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[mdash]and community economic planning[mdash]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[mdash]hotter drought", an emerging characteristic of the Anthropocene[mdash]are the focus of rapidly expanding literature.

[hellip](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.

[hellip]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.

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 [hellip]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.

[hellip]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.

Please consider that the "desired" vegetation conditions may not be achievable or sustainable. Please conduct an analysis as to how realistic and achievable Forest Plan desired conditions are in the context of a rapidly changing climate, along an unpredictable but changing trajectory.

Global warming and its consequences are effectively irreversible which implicates certain legal consequences under NEPA and NFMA and ESA (e.g., 40 CFR [sect] 1502.16; 16 USC [sect]1604(g); 36 CFR [sect]219.12; ESA Section 7; 50 CFR [sect][sect]402.9, 402.14). All net carbon emissions from logging represent "irretrievable and irreversible commitments of resources."

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[hellip]"

Harmon, 2009 is the written record of "Testimony Before the Subcommittee on National Parks, Forests, and Public Lands of the Committee of Natural Resources for an oversight hearing on The Role of Federal Lands in Combating Climate Change." The author "reviews, in terms as simple as possible, how the forest system stores carbon, the issues that need to be addressed when assessing any proposed action, and some common misconceptions that need to be avoided." His testimony begins, "I am here to [hellip]offer my expertise to the subcommittee. I am a professional scientist, having worked in the area of forest carbon for nearly three decades.

During that time I have conducted numerous studies on many aspects of this problem, have published extensively, and provided instruction to numerous students, forest managers, and the general public."

The NEPA document must disclose that most wildland fire ignitions are human-caused, and occur near roads.

Where may we find an analysis of the Forestwide cumulative effects of your fire management policies, including fire suppression policies? The Forest Plan and its EIS did not include a programmatic analysis of the cumulative effects of fire suppression. Part of the agency's mantra for more management includes mitigating the impacts of fire suppression. So to comply with NEPA, the FS must conduct a programmatic analysis of the cumulative effects of its fire suppression policies. Until it does so, the FS cannot assure viability of the black-backed woodpecker, a species that depends upon the direct effects of natural wildland fire.

The FS'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."

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

Mixed-severity fires, and in particular patches of high-severity fire, benefit grizzly bears by increasing cover of berry producing shrubs (such as huckleberry) that the bears rely upon to get fat before winter, and promoting regeneration of whitebark pine—the seeds of which are an important food source for the bears (DellaSala and Hanson, 2015, Ch. 4, pp. 89, 101).

Finally, ecological resilience, which the FS implies they are creating through this project, 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 here is the human control of the forest ecosystem through mechanical means in order to maintain unnatural stasis by eliminating, suppressing or altering natural disturbances such as 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).

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. Six et al., 2014 documented that logging to prevent or contain insect and disease has not been empirically proven to work, and because of lack of monitoring the FS can't content this method is viable for containing insect outbreaks.

How much will it cost U.S. taxpayers have the FS implement the project?

What is the best available science for sustaining viable populations of ESA-listed, management indicator species and all sensitive species on the Forest? Past timber harvest activities, roads, mining and related activities (OHV use, including closed roads and trails illegally accessed) must be analyzed in the context of the importance of habitat capability and suitability, as well as connectivity.

Please disclose ongoing soil and water impacts from roads not being adequately maintained. Please disclose the impacts of roads that are not maintained because they are unauthorized or non-system.

The Scoping Notice states, "Fifty-seven percent of the National Forest System lands within the project area have been determined to be suitable for timber production." Please cite the documentation which determined that the specific areas proposed for logging in this proposal are suitable for timber production.

An accurate ecological analysis of the IPNF and project area would reveal too much forest and habitat fragmentation. In describing any landscape departures from the historical range of variability (HRV), please provide a spatial analysis, comparing true reference conditions to current project area conditions.

Please disclose an accurate comparison of baseline (pre-management) species composition in the project area vs. present-day project area species composition. Likewise, please disclose an accurate analysis of baseline (pre-management) vs present-day regarding structural diversity, patch size, and age class.

Please disclose the impacts of past and ongoing livestock grazing on forest composition, "fuels" arrangement, and all other measurable aspects of vegetation in the project area. Please disclose the impacts of livestock grazing on soil conditions in the project area. Please analyze the interactions between livestock grazing and noxious weeds in the project area.

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.

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

Why can't the FS sacrifice some of its timber goals and set diameter limits to compensate for the deficiency compared to the historic range of large diameter trees (regardless of species) to serve wildlife habitat needs? How will the FS emphasize retention of the largest snags and live trees if you don't provide details on how this is to be accomplished?

The Forest Plan FEIS includes a "Large/Very Large" size class (20"+ dbh). Please disclose how many stands in the project area fall within that Large/Very Large size class, and how many acres of those would be logged. Please estimate how many total trees > 20" dbh would be cut in each unit.

The Forest Plan contains no minimum acreage or distribution requirements for maintaining old growth, ignoring 36 CFR 219.19 viability provisions that would prevent large areas of the IPNF becoming devoid of old growth or old-growth associated wildlife. The FS has not analyzed the wildlife viability implications of managing the IPNF well outside the HRV for old growth, based upon the best available scientific information.

Please compare patch size of the old-growth areas to scientific information on minimum size needed for utilization by old-growth associated wildlife.

The Forest Plan does not cite the scientific basis for the minimum amounts of coarse woody debris to be retained under Guideline FW-GDL-VEG-03.

The Forest Plan does not cite the scientific basis for the minimum amounts of snags to be retained under Guideline FW-GDL-VEG-04. Also the scientific basis for the delineation of snags into two diameter groups using 15" d.b.h. as the division point is not disclosed.

In FW-GDL-VEG-05 it is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the Forest Plan, or if it is intended to render the entire Guideline to be discretionary. Also, the "fire salvage" provision for using untreated areas to meet snag requirement would lead to insufficient retention in logged areas.

Hutto, 2006 addresses the latter subject; from the Abstract:

The bird species in western North America that are most restricted to, and therefore most dependent on, severely burned conifer forests during the first years following a fire event depend heavily on the abundant standing snags for perch sites, nest sites, and food resources. Thus, it is critical to develop and apply appropriate snag-management guidelines to implement postfire timber harvest operations in the same locations. Unfortunately, existing guidelines designed for green-tree forests cannot be applied to postfire salvage sales because the snag needs of snag-dependent species in burned forests are not at all similar to the snag needs of snag-dependent species in green-tree forests. Birds in burned forests have very different snag-retention needs from those cavity-nesting bird species that have served as the focus for the development of existing snag-management guidelines.

Specifically, many postfire specialists use standing dead trees not only for nesting purposes but for feeding purposes as well. Woodpeckers, in particular, specialize on wood-boring beetle larvae that are superabundant in fire-killed trees for several years following severe fire. Species such as the Black-backed Woodpecker (*Picoides arcticus*) are nearly restricted in their habitat distribution to severely burned forests. Moreover, existing postfire salvage- logging studies reveal that most postfire specialist species are completely absent from burned forests that have been (even partially) salvage logged. I call for the long-overdue development and use of more meaningful snag-retention guidelines for postfire specialists, and I note that the biology of the most fire-dependent bird species suggests that even a cursory attempt to meet their snag needs would preclude postfire salvage logging in those severely burned conifer forests wherein the maintenance of biological diversity is deemed important.

In FW-GDL-VEG-06 it is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the Forest Plan, or if it is intended to render the entire Guideline to be discretionary.

The first sentence of FW-GDL-VEG-08 along with the consistency requirement on page 4 of the Forest Plan suggest that any silvicultural system may be used in any proposed treatment unit, regardless of its appropriateness.

Essentially, FW-DC-FIRE-02 and Guideline MA6-GDL-FIRE-01 can be used to justify treatments regardless if they result in forest conditions that would not likely occur naturally, or if the biophysical setting would require frequent, intensive fuel treatments to maintain the desired fuel conditions. Regardless of natural fire regime, "Fire behavior is characterized by low- intensity surface fires with limited crown fire potential." Also, they prioritize fuel reduction over natural processes that create important wildlife habitat components and maintain soil productivity.

Nothing in the Scoping Notice 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 Scoping Notice primarily discusses fuel conditions only in the areas proposed for treatment, yet wildland fire operates beyond artificial ownership or other boundaries. In regards to the proper cumulative effects analysis area for fire risk, Finney and Cohen (2003) discuss the concept of a "fireshed involving a wide area around the community (for many miles that include areas that fires can come from)." In other words, for any given entity that would apparently have its risk of fire reduced by the proposed project (or affected cumulatively from past, ongoing, or foreseeable actions on land of all ownerships within this "fireshed")—just how effective would fuel reduction be? The Scoping Notice fails to include a thorough discussion and detailed disclosure of the current fuel situation within the fireshed within and outside the proposed treatment units, making it impossible to make scientifically supportable and reasonable conclusions about the manner and degree to which fire behavior would be changed by the project.

The Scoping Notice also fails to deal with the fuels issue on the appropriate temporal scale. How landscape-level fire behavior at any period except for very shortly after treatment would be changed or improved is ignored.

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.) And Rhodes also points out that using 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.)

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.)

In support of focusing on manipulating limited areas near homes, Finney and Cohen, 2003, state: Research findings indicate that a home's characteristics and the characteristics of a home's immediate surroundings within

30 meters principally determine the potential for wildland-urban fire destruction. This area, which includes the home and its immediate surroundings, is termed the home ignition zone. The home ignition zone implies that activities to reduce

the potential for wildland-urban fire destruction can address the necessary factors that determine ignitions and can be done sufficiently to reduce the likelihood of ignition. Wildland fuel reduction outside and adjacent to a home ignition zone might reduce the potential flame and firebrand exposure to the home ignition zone (i.e., within 30 m of the home). However, the factors contributing to home ignition within this zone have not been mitigated. Given a wildfire, wildland fuel management alone (i.e., outside the home ignition zone) is not sufficient nor does it substitute for mitigations within the home ignition zone. It is questionable whether wildland fuel reduction activities are necessary and sufficient for mitigating structure loss in wildland-urban fires.

Wildland fuel management changes the probability of a fire reaching a given location. It also changes the distribution of fire behaviors and ecological effects experienced at each location because of the way fuel treatments alter local and spatial fire behaviors (Finney 2001). The probability that a structure burns, however, has been shown to depend exclusively on the properties of the structure and its immediate surroundings (Cohen 2000a).

(Emphasis added.) Our take from Finney and Cohen (2003) is that there is much uncertainty over effects of fuel reduction. The authors point out:

Although the conceptual basis of fuel management is well supported by ecological and fire behavior research in some vegetation types, the promise of fuel management has lately become loaded with the expectation of a diffuse array of benefits. Presumed benefits range from restoring forest structure and function, bringing fire behavior closer to ecological precedents, reducing suppression costs and acres burned, and preventing losses of ecological and urban values. For any of these benefits to be realized from fuel management, a supporting analysis must be developed to physically relate cause and effect, essentially evaluating how the benefit is physically derived from the management action (i.e. fuel management). Without such an analysis, the results of fuel management can fail to yield the expected return, potentially leading to recriminations and abandonment of a legitimate and generally useful approach to wildland fire management.

In their conclusion, Graham, et al., 1999a state:

Depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fire-adapted species. Such intermediate treatments can reduce the severity and intensity of wildfires for a given set of physical and weather variables. But crown and selection thinnings would not reduce crown fire potential. (Emphasis added.)

Please disclose the project logging impacts on the rate of fire spread. Graham, et al., 1999a point out that fire modeling indicates:

For example, the 20-foot wind speed⁵ must exceed 50 miles per hour for midflame wind speeds to reach 5 miles per hour within a dense stand (0.1 adjustment factor). In contrast, in an open stand (0.3 adjustment factor), the same midflame wind speeds would occur at only a 16-mile-per-hour wind at 20 feet.

5 Velocity of the wind 20 feet above the vegetation, in this case tree tops.

Please disclose the implications of how the fire regime is changing due to climate change.

The FS alleges a need to reduce forest fuels in the wildland-urban interface (WUI). What is it about past projects that left the project area WUI in such a needy condition? Again, the FS must provide a cumulative effects analysis that compares current project area "needs" to accomplishments (or failures) of past projects.

Aside from urging landowners to adopt firewise measures on their own land, there's little that "management" can accomplish in the way of reducing wildland fire risk. When weather conditions arise that are favorable to high intensity fires, which happens more and more these days due to the effects of climate change, those fires will burn regardless of suppression efforts. Please disclose the relative contribution of weather factors to fire spread, intensity, and severity.

The forest plan Glossary definition of WUI under (A) has allowed entities other than the general public to set WUI boundaries outside of NEPA and NFMA processes, and under (B) defines it so vaguely as to expand the delineation of the WUI greatly—again outside NFMA and NEPA processes.

The vague language of Desired Condition FW-DC-FIRE-03 essentially nullifies its intent that recognizes the desirability of wildland fire.

We want the FS and the public to be comfortable with unplanned wildland fires under some weather conditions in sensible locations, so that the ecosystem benefits can be realized. Simply stated, at the time that response to any given fire is contemplated, we want decision makers to have publicly vetted documentation—for that specific fire area—of the benefits of the process that helps create habitat conditions for wildlife, restores forest composition, recycles soil nutrients, creates large dead logs that fall into streams forming native fish habitat, as well as many others. That will provide the public, the news media, and politicians with a fully vetted set of justifications for managing with—rather than against—the native ecosystem process of fire. We believe that such planning can and must be undertaken for sustainable forest management to evolve away from the unacceptable present situation. If the FS is unwilling to perform such an analysis for projects such as

Buckskin Saddle, then it must undergo programmatic analysis of its fire suppression policies, disclosing the impacts and ecological harm that the agency will subsequently claim must be later addressed by vegetation management and fuel treatment projects across the landscape. Not to mention the enormous financial costs[mdash]also never analyzed or disclosed at any planning level.

Rather than fire starts, FW-OBJ-FIRE-02 should specify a number of acres set by best available science and analysis. The Forest Plan needs much stronger direction and certainty for use of wildland fire for resource benefits.

The Forest Plan FEIS analysis of fire suppression fails to address the constrained budget scenario which implies the FS will not be allocated enough funding to address the problems it states are perpetuated by fire suppression.

MON-VEG-01-01 is part of the circular logic in the Forest Plan's construction, which is that vegetation manipulation is the only way areas of the Forest would be resilient, resistant, meeting Desired Conditions, etc.

The Scoping Notice includes a project objective/need to "Improve the resiliency and resistance of the forest vegetation to disturbances such as wildfire, drought, insects and diseases." It makes no sense, ecologically speaking to "increase resilience" to the identified natural processes. An ecosystem that is fully functioning is naturally resilient. When an ecosystem is disturbed, succession according to natural processes occurs. If previous management has led to restoration needs, then the course of action should be to work with natural processes, removing human- caused impediments as necessary.

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

A significant body of our concerns about the Forest Plan surround its over-reliance on "Desired Conditions" (DCs) as directing management, and too few standards that refrain management. As we pointed out, this results in an overall lack of accountability for the FS to ever accomplish anything positive expressed in the Forest Plan's timeless, aspirational DCs, as well as there being far too few restraints that serve the conservation of biological diversity and promotion of ecological sustainability.

The Forest Plan has so much discretion as to render the aquatic standards arbitrary. The standards pertaining to watersheds and water quality, riparian, aquatic species and habitat are limited, narrowly focused, and contain

language that could subvert the intent of the standard. No matter how badly degraded a drainage might be, no aquatic standards or thresholds would properly limit timber sales.

The IPNF now uses the Water Erosion Prediction Project (WEPP) model to assess potential impacts of surface disturbance on aquatic resources in the IPNF. Please provide project area information validating the use of the WEPP model.

Please take a hard look at the condition of all streams and water bodies in the affected watersheds, and explain how those conditions contribute to fish population and trends. Please disclose populations of fish species in the project area, and compare those numbers to minimum viable populations.

Please explain how the timber sale would comply with the Clean Water Act and all state water quality laws and regulations. Designating BMPs is not sufficient for compliance with CWA and NFMA. Please disclose the actual effectiveness of proposed BMPs in preventing sediment from reaching streams in or near the analysis area. What BMP failures have been noted for past projects with similar landtypes? Also, please disclose which segments of roads in the watersheds to be affected by this proposal would not meet BMPs following project activities.

Please disclose the intensity or thoroughness of the alleged surveys for inventorying sediment sources in the project area. See Fly et al. 2011, which describes a thorough survey in the Boise National Forest. Please disclose the metrics you are using to estimate elevated, unnatural sources of sediment yield into streams.

Log hauling itself adds sediment to streams. From an investigation of the Bitterroot Burned Area Recovery Project, hydrologist Rhodes (2002) notes, "On all haul roads evaluated, haul traffic has created a copious amounts of mobile, non-cohesive sediment on the road surfaces that will elevate erosion and consequent sedimentation, during rain and snowmelt events." USDA Forest Service, 2001a also presents an analysis of increased sedimentation because of log hauling, reporting "Increased traffic over these roads would be expected to increase sediment delivery from a predicted 6.30 tons per year to 7.96 tons per year."

Objective FW-OBJ-WTR-01 prioritizes management (logging, fuel reduction) in the watersheds in best condition on the Forest, because of use of vague language "toward a better condition" and "risk factors."

Objective FW-OBJ-WTR-02 prioritize managements (logging, fuel reduction) because of its language "improve[hellip] across acres of subwatersheds[hellip]"

Guideline FW-GDL-WTR-01 offers little to no protection to the impaired waters on the IPNF. Even with an approved TMDL, there is no legal authority to enforce a violation of the TMDL.

In Guideline FW-GDL-WTR-02 the meaning of "hydrologic stability" is unclear.

Please disclose the existing conditions of site specific stream reaches and project effects on water quality, fish and other aquatic resources. Please disclose information regarding the existence and effects of bedload and accumulated sediment. Please analyze and disclose channel stability for specific stream reaches. Please disclose the amount of existing accumulated fine and bedload sediment that remains from the previous logging and road construction.

Kappesser, 2002 discusses an assessment procedure used on the IPNF:

The RSI [Riffle Stability Index] addresses situations in which increases in gravel bedload from headwaters activities is depositing material on riffles and filling pools, and it reflects qualitative differences between reference and managed watersheds[hellip]it can be used as an indicator of stream reach and watershed condition and also of aquatic habitat quality.

Peak flows can be altered by forest harvest activities after removal of canopy through less interception, which results in more snow accumulation and snowmelt available for runoff (Troendle and King 1985). Please disclose the potential for the project to damage channel morphology and aquatic habitat.

Please conduct an analysis of water flow alteration effects on stream bank erosion and channel scouring during spring runoff and/or rain-on-snow (ROS) events. Most segment altering and channel forming events occur during instantaneous flows.

Openings accumulate much more snow than in a forested areas that are not as "open," thus provide a significant contribution to water yield especially during ROS and spring runoff events. The number, mileage and proximity of the roads to the proposed logging units and streams are important because they will also have a significant effect on peak flows and the resultant impact on fish, stream channels and possible flooding.

According to Kappesser, 1992:

The stability condition of a watershed may be broadly determined by evaluating the level of harvest activity (ECA), its spatial distribution with regard to headwater harvest and rain on snow risk and the density of roading in the watershed with consideration of road location relative to geology and slope. Each of these four factors may [be] evaluated against "threshold" levels of activity characteristic of watersheds on the IPNF that are known to be

stable, unstable, or on a threshold of stability.

ROS events can be the most channel changing, sediment producing events and can have a significant adverse effect on fish and their habitat (Kappesser, 1991b):

Filling of pools by bedload sediment is seen as a significant factor in the reduction of rearing and overwintering habitat for fish such as West Slope Cutthroat Trout (Rieman and Apperson, 1989). Bedload increases have traditionally been interpreted as the result of channel scour in response to increased peak flows created by timber harvest.

(Also see Kappesser, 1991a.) The Inland Northwest frequently gets at least one mid-winter chinook which is often accompanied by windy and rainy conditions. The warm wind blowing across the snow, especially in relatively open areas on south and southwestern facing slopes between 2,500 to 4,500 feet elevation results in rapid snow melt and high levels of instantaneous water flows.

King, 1994 explains that small headwaters areas are particularly sensitive to the increased water yields due to removal of tree canopy:

Timber removal on 25-37% of the area of small headwater watersheds increased annual water yield by an average of 14.1 inches, prorated to the area in harvest units and roads. Increases in streamflow occurred during the spring snowmelt period, especially during the rising portion of the snowmelt hydrograph. These forest practices also resulted in large increases in short duration peakflows, greatly increasing the sediment transport capacity of these small streams. The cumulative effects of these activities on streamflow in the Main Fork, with only 6.3% of its area in roads and harvest units, were not detectable.

Ziemer, 1998 observed the same phenomenon in his study on flooding and stormflows. Also, King, 1989 observed that "Current procedures for estimating the hydrologic responses to timber removal of third to fifth order streams often ignore what may be hydrologically important modifications in the low-order streams."

USDA Forest Service 1994b states:

It is important to recognize that the Equivalent Clearcut Area model uses tree growth (canopy density) to estimate Spring peak flows and that channels do not recover immediately in response to tree growth. There is a lag time between hilltop recovery (growth) and channel recovery. The length of the lag time is difficult to predict and is likely to be influenced by factors other than simply canopy density (e.g. the role of culvert failures, in-stream activities, geology, etc.).

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

professional judgement." (III-77.) Harr, 1987 states:

Perhaps the most basic of the erroneous beliefs is the idea that simplicity can be willed on the forest hydrologic system. This belief encourages the implementation of simplistic guidelines, the adoption of arbitrary thresholds of concern, and the search for all-encompassing methodologies to predict consequences of forest activities on water resources. These actions occur sometimes with the blessings of hydrologists or soil scientists but other times over their objections. The belief in simplicity has been nurtured by the rapid increase in the use of computer simulation models in forest planning and the desire to accept the output from such models. Another reason for pursuit of simplicity is the current emphasis on planning called for by NFMA; such planning is often conducted under strict time and budgetary constraints.

I must point out that, on the average, the simplistic methodologies may have resulted in fairly prudent forest management. But rather than being viewed as merely a first attempt at solving a problem, they often seem to inhibit further investigation and development. Also, they tend to lead forest managers and some specialists to believe that hydrologic systems really do function in the manner described by the simplistic methodologies.

Forest hydrologic systems are more complex than one would believe after reading some of the methodologies and procedures that have been proposed to predict cumulative effects of logging on water resources. For example, many of these procedures state that a threshold of harvest activity or intensity will be determined, without specifying how it will be determined or whether it really exists or can be measured. Similarly, implementing a methodology for estimating cumulative effects of harvest operations on water resources does not mean that such cumulative effects either exist or can be measured.

(I)n our desire to simplify, to create a methodology that will predict consequences of harvest activities everywhere or in the average situation, we usually expend considerable energy creating a methodology that predicts reasonably accurately virtually nowhere. We may implement procedures without providing for testing or monitoring the results to see whether the procedures are, in fact, working. In the process, we may even develop a false sense of security that our methodology can really protect soil and water resources.

Please conduct an analysis of forest plan Riparian Management Objectives (RMOs), including trends toward or away from meeting those RMOs.

Please disclose the results of surveys for native fish occurrence and abundance in project area streams.

The 1998 Bull Trout Biological Opinion (BO) indicates that bull trout are absent when road densities exceed 1.71 mi./mi²., depressed when the road density = 1.36 mi./mi². and strong when road density equals or is less than .45 mi./mi². (P. 67.)

The Watershed Disturbance Rating strongly suggests forestwide direction to attain watershed restoration. Yet, there are no forestwide standards for those parameters, which is needed to provide much stronger prioritization towards meeting forestwide Watershed and Water Quality Desired Conditions.

Please provide an analysis of soil conditions in the analysis area, noting any detrimental soil disturbance and its consequences for diminishing soil and land productivity. Please disclose the extent of soils in the analysis area that are already hydrologically impacted, and analyze and disclose their watershed impacts.

In FW-DC-SOIL-01 the meaning of "Areas with sensitive and highly erodible soils or land types with mass failure potential are not detrimentally impacted or destabilized as a result of management activities" is unclear.

In FW-DC-SOIL-02 the meaning of the term "Managed areas" is unclear. The areal extent could be delineated as a few square feet, a logging unit, a timber sale contract area, an entire watershed, or even a Ranger District.

Forest Plan soil Objective FW-OBJ-SOIL-01 would accomplish little soil restoration. The meaning of "not meeting soil quality criteria" is unclear.

The Forest Plan includes no soil quality standards. By adopting FSM-2500-99-1 the Forest Service does not avoid irreversible soil damage on the IPNF.

There is no Forest Plan requirement to quantify, minimize, or even consider the total amount of detrimentally disturbed soils on the IPNF or in a watershed.

The Forest Plan adopts a proxy[mdash]detrimental soil disturbance[mdash]rather than more direct measures of management-induced losses or reductions of soil productivity. We are aware of no scientific information based upon IPNF data that correlates the proxy (areal extent of detrimental soil disturbance 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[mdash]even though it may cumulatively affect the productivity of the soil.

FW-GDL-SOIL-01, 02, 03, and 04: It is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the Forest Plan, or if it is intended to render these entire Guidelines to be discretionary.

Guideline FW-GDL-SOIL-04 leaves too much discretion allowing activities on landslide-prone areas.

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.

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[mdash]including, at the broadest level, water, air, and vegetation[mdash]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.

[hellip] 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 Region 1 Soil Quality Standards (SQS) are the only directives limiting damage to soil during industrial extraction on the IPNF, and even they are 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.⁶

Please disclose soil conditions in the project area that are outside the project treatment units. The cumulative amount of existing soil damage over the entire project area 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 in this project area.

The FS generally provides no idea of the degree of soil impacts in a project area[mdash]except for an estimate of a limited category (detrimental soil disturbance or "DSD")[mdash]but only if a site happens to occur in a unit proposed for logging or burning under the project. Such a narrow view of the cumulative impacts on soils contradicts other FS policy and best available science.

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

Booth, 1991 explains how soil quality conditions translate to watershed hydrology and thus, water quality and quantity:

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.

[hellip]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.

[hellip]Flooding, channel erosion, landsliding, and destruction of aquatic habitat are some of the unanticipated changes that [hellip]result from these alterations.

[hellip]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. [hellip]These changes produce measurable effects in the hydrologic response of a drainage basin.

Elsewhere the FS recognizes that amounts of soil compaction and other measures of DSD 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[hellip] 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.

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.) The IPNF (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.)

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.

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.

[hellip]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.)

Please provide an analysis of the hydrological implications of the cumulative soil damage caused by past management added to timber sale-induced damage in project area 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 are effects to be analyzed in a watershed analysis.

Harr, 1987 rejects absolute thresholds for making determinations of significant vs nonsignificant levels of soil compaction in watersheds, but nevertheless he does refer to his experience as noted above by Johnson, 1995. Harr, 1987 states:

[hellip]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. [hellip]The 12 percent figure is arbitrary. Flow changes at lesser amounts of compaction may also cause adverse impacts. [hellip]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 DSD 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. [hellip] 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.

[hellip]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 IPNF 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 DSD with very mixed results (e.g., Reeves et al., 2011). The point is[mdash]as weak as the standards are[mdash]FS pledges to meet the standards must be taken with a grain of salt.

There is also an issue of reliability and validity of the FS's soil survey methods. 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.

[hellip]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 (DSD7) 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.) USDA Forest Service, 2012a admits that DSD estimates are "not absolute."

One set of cumulative soil impacts ignored by the SQS is associated with permanent, or "system" roads. Although every square foot of road is, of course compacted, this compaction is in no way limited by the application of the SQS. The same goes for existing or ongoing erosion—no amount of soil erosion on these road templates would violate the SQS. 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.

7 Detrimental Soil Disturbance (DSD) is equivalent to exceeding soil property thresholds

Another cumulative impact the SQS 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 and/or had organic layers displaced to use as temporary log storage and log truck loading and often 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 SQS. Much like system roads, there are no limits to total DSD from landings set by the SQS, and there is no requirement that their extent in a project area be disclosed. Roads and log landings might be limited by other resource considerations such as road densities in sensitive wildlife habitat, but they are not limited by the SQS.

Still more cumulative soil damages the SQS ignore involve existing DSD on areas the FS maintains as part of the "suitable" or productive land base such as timber stands, grazing allotments and riparian zones that are not within the boundaries of any current project activity areas. The SQS do not limit or require disclosure of the existing/prior DSD 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, SQS do not compel the FS to take actions that might restore the soil productivity in such areas because their existing DSD does not matter for determining consistency with the SQS —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, 2016a explains another major cumulative effect ignored by the SQS, which is the indirect effect of soil damage, or DSD, on sustained yield. It states that the SQS "created the concept of 'Detrimental Soil Disturbance' (DSD) for National Forests in Region One as a measure to be used in assessing potential loss of soil productivity resulting from management activities." USDA Forest Service, 2016a further explains (emphases added):

Without maintaining land productivity, neither multiple use nor sustained (yield) can be supported by our National Forests. Direct references to maintaining productivity are made in the Sustained Yield Act "[hellip]coordinated management of resources without impairment of the productivity of the land" and in the Forest and Rangeland Renewable Resources Act "[hellip]substantial and permanent impairment of productivity must be avoided".

Soil quality is a more recent addition to Forest Service Standards. The Forest and Rangeland Renewable Resources Act (1974) appears to be the first legal reference made to protecting the "quality of the soil" in Forest Service directives. Although the fundamental laws that directly govern policies of the U.S. Forest Service clearly indicate that land productivity must be preserved, increasingly references to land or soil productivity in Forest Service directives were being replaced by references to soil quality as though soil quality was a surrogate for maintaining land productivity. This was unfortunate, since although the two concepts are certainly related, they are not synonymous.

Our understanding of the relationship between soil productivity and soil quality has continued to evolve since 1974. Amendments to the Forest Service Manual, Chapter 2550 - Soil Management in 2009 and again to 2010 have helped provide some degree of clarity on

this issue and acknowledged that the relationship is not as simple as originally thought. The 2009 (2500-2009-1) amendment to Chapter 2550 of the Forest Service Manual states in section 2550.43-5, directs the Washington Office Director of Watershed, Fish, Wildlife, Air and Rare plants to "Coordinate validation studies of soil quality criteria and indicators with Forest Service Research and Development staff to ensure soil quality measurements are appropriate to protect soil productivity" (USFS-FSM 2009). Inadvertently this directive concedes that the relationship between soil productivity and soil quality is 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.)

Please provide a map showing the locations of all past logging units, including the intensity of the logging activities.

The IPNF (USDA Forest Service, 2009c) admits, in regards to project area sites where DSD soils were not to be restored by active management: "For the [hellip]severely disturbed sites,[hellip] "no action"

[hellip]would create indirect negative impacts by missing an opportunity to actively restore damaged soils. (Emphasis added.)

In order to meet NFMA and NFMA regulations' mandates to protect soil productivity, the IPNF adopted the SQS. Again, the SQS requires the FS to delineate specific geographic areas called "activity areas" for the purpose of predicting, measuring, monitoring, and analyzing impacts on soil productivity from management activities. FSM 2500-99-1 includes a mandate to maintain 85% of an activity area in a satisfactory, non-DSD soil condition.

Please explain how your methodology for determining DSD produces statistically reliable data. This also raises questions of the validity of DSD estimation and other analysis methodology, and therefore compliance with the FS's proxy for soil productivity. Please explain how the FS arrives at current DSD estimates, and provide sufficient detail to indicate the intensity of soil surveys or monitoring of past projects.

Please disclose that the SQS methodology for "activity areas" inherently encourages gerrymandering areas not previously logged into project "activity areas", helping to artificially dilute the amount of effective DSD from previously logged units by creating a more favorable average.

Please disclose that DSD percent limit is based upon the amount of damage that is operationally feasible, not scientific data that measures land and soil productivity losses caused by DSD. The SQS were developed internally by the FS without the use of any public process such as Forest Planning, NEPA, or independent scientific peer review.

DSD 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 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[hellip] (A)pplying the 15% areal limit for detrimental damage is not correct... (T)hat was never the intent of the 15% limit[hellip] 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 stated, "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 limit is based largely on what is physically possible, while achieving other resource management objectives" (emphasis added). So the SQS limits are based on feasibility of timber sale implementation rather than concerns over soil productivity; and additionally we have the bulk density increase limit is based upon the limitations of detection by FS bulk density measuring methods[mdash]again, not concerns over soil productivity.

The FS's soil proxy[mdash]its SQS assumption that up to 15% of an activity area having long-term damage is consistent with NMFA and regulations[mdash]is arbitrary. The FS does not cite any scientific basis for adopting its numerical limits. 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. [hellip]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. (Emphasis added.)

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

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[hellip] some sites showed that maximum compaction occurred at a depth of 8 inches[hellip] 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 in the IPNF, 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 SQS standard is the same arbitrary 15%.

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.)

However the SQS definition of DSD considers only alterations to physical properties, but not chemical or biological properties. The SQS is not consistent with best available science.

One of these biological properties is represented by naturally occurring organic debris from dead trees. The SQS recognize the importance of limiting the ecological damage that logging causes due to retaining inadequate amounts of large woody debris, but set no quantitative limits on such losses caused by logging and slash burning. Please disclose the levels of large woody debris in the project area following past management activities, in addressing your obligations to consider cumulative effects.

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.)

"(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.

"The big trees were subsidizing the young ones through the fungal networks. Without this helping hand, most of the seedlings wouldn't make it." (Suzanne Simard: <http://www.ecology.com/2012/10/08/trees-communicate/>) "Disrupting network links by reducing diversity of mycorrhizal fungi[hellip] can reduce tree seedling survivorship or growth (Simard et al, 1997a; Teste et al., 2009), ultimately affecting recruitment of old-growth trees that provide habitat for cavity nesting birds and mammals and thus dispersed seed for future generations of trees." (Simard et al., 2013.) (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>).

Gorzalak et al., 2015:

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

The scientists involved in research on ectomycorrhizal networks have discovered connectedness, communication, and cooperation between what we traditionally consider to be separate

organisms. Such a phenomenon is usually studied within single organisms, such as the interconnections in humans among neurons, sense organs, glands, muscles, other organs, etc. so necessary for individual survival. The FS must consider the ecosystem impacts from industrial management activities on this mycorrhizal network. The industrial forestry management paradigm is unfortunately destroying what it fails to recognize.

Please disclose if and how the IPNF has determined if management activities have reduced the diversity of mycorrhizal fungi in any treatment area.

USDA Forest Service, 2007 states:

Sustained yield was defined in the [hellip]Forest Plan [hellip]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 capacity of the lands ability to produce resources.

That statement is on point: Since the FS has no idea how much soil has been permanently impaired either within the project area or forestwide, "sustained yield" is an empty promise. There continues to be a lack of adequate regulatory mechanisms for protecting soil productivity on the IPNF and Northern Region, as advocated for by Lacy (2001). Since the FS has no idea how much soil has been permanently impaired either within the project area or forestwide, the agency's "sustained yield" is an empty promise. The FS lacks adequate measures for protecting soil productivity on the Forest.

NEPA requires that the FS specify the effectiveness of its mitigations. (40 C.F.R. 1502.16.) Please disclose the effectiveness of DSD mitigation. There is no quantitative monitoring data that demonstrates DSD remediation activities have taken an activity area with DSD amounts over the 15% 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. (Emphases added.)

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

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

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.)

Please provide an analysis of the noxious weeds situation in the analysis area. Please disclose the degree to which the productivity of the land and soil has been affected in the project area and forestwide due to noxious weed infestations, and how that situation is expected to change in the coming years and decades. The IPNF's noxious weed treatment program is mitigation for

management activities which exacerbate the spread of noxious weeds. Please disclose the effectiveness of this mitigation.

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.

So the project will worsen the noxious weed spread in the project area, and even if post- disturbance treatments are implemented, their uncertain efficacy means that the project will significantly increase noxious weed occurrence.

The FS often proposes winter logging as mitigation. Evidence that 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 IPNF 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 SQS 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." (Emphases 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.

In FW-STD-RIP-01 and FW-STD-RIP-02, the meaning of "intact and [hellip]functioning at desired conditions" is unclear. There is no reference to any established objective criteria.

In FW-STD-RIP-02, the last sentence ("Large-scale restoration plans or projects that address other cumulative effects within the same watershed may be considered as compensatory components and shall be described during site specific project analyses") allows this standard to be ignored in project development as long as the FS makes any claim that the project has some vague "large scale" restoration component.

In FW-GDL-RIP-01, 02, 03, 04, and 05 it is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the LMP, or if it is intended to render these entire Guidelines to be discretionary.

The Forest Plan fails to acknowledge the known limitations of the INFISH direction. INFISH deals primarily with riparian zone protection, and does not consider instream and stream bank erosion and sediment deposition during high water yield events, such as spring runoff and rain- on-snow events.

The FS sets an inadequate Aquatic Habitat restoration Objective (FW-OBJ-AQH-01) for the next 15 years, hardly addressing the Forest Plan Goal for this topic.

The Forest Plan does not contain direction that explicitly limits the amount of sediment that would be allowed to enter water bodies from management activities in compliance with NFMA regulations at 36 CFR 219.27(e).

Due to the inability of the FS to receive funding for or perform routine maintenance, a very substantial portion of the IPNF road system is not up to BMP standards, meaning that sediment and other pollution that result are violations of state water quality standards and the Clean Water Act.

The Forest Plan is not responsive to NFMA at 36 CFR 219.27(e) which concerns management practices that cause blockages of water courses.

The Forest Plan does not address the lack locally calibrated coefficients of the Equivalent Clearcut Area (ECA) component of the WATSED model, nor validate the model.

The Forest Plan's aquatic Macroinvertebrate Assemblage Management Indicator Species does not comply with 36 CFR 219.19(a)(1), because the FS does not explain how it assures well- distributed, viable populations of other aquatic species such as bull trout, westslope cutthroat trout, inland redband trout, and western pearlshell mussel.

Please disclose the results of monitoring the Macroinvertebrate Assemblage Management Indicator Species.

The Scoping Notice states:

The landscape architect working on this project will analyze treatment areas to predict what they would look like from various viewpoints. This will help determine if additional changes to the proposed action are necessary to ensure consistency with forest plan direction for scenery.

This, and several other statements in the Scoping Notice illustrate a fatal flaw: the FS is forging ahead with a process that doesn't allow the public to review necessary FS analyses. Another example is that there is nothing in the Scoping Notice for the public to review about wildlife and their habitat needs, despite Forest Plan direction.

Please disclose the funding or other meaningful distinctions between "road maintenance" and "road reconstruction" (Scoping Notice at 29-30) to explain why the FS is saying major actions such as replacing culverts and installing rolling dips are not "reconstruction."

We ask the Forest Service disclose the following information concerning the project area:

- [middot] The deferred road maintenance backlog
- [middot] The annual road maintenance funding needs
- [middot] The annual road maintenance budget
- [middot] The capital improvement needs for existing roads
- [middot] The road density in the project area
- [middot] The number of miles of project area roads that fail to meet BMP standards or design standards

Please disclose the itemized costs for each of the following: new temporary roads, project-related road maintenance, road decommissioning, all other road-related work, sale preparation and administration, project-related weed treatment, other project mitigation, post-project monitoring, environmental analyses and reports, public meetings and field trips, publicity, consultation with other government agencies, responding to comments.

The Forest Plan FEIS concludes that implementation of the Forest Plan "may impact individuals or habitat, but is not likely to result in a trend towards federal listing or loss of viability" for each species. However, it does not disclose the minimum viable population of any of the Sensitive species (plant, wildlife, or aquatic), nor does it describe the quantity and quality of habitat needed to maintain viable populations of any of the Sensitive species. The Forest Plan lacks science-based habitat Standards based upon the needs of Sensitive species. The Forest Plan does not even include criteria for measuring a viable population in its Glossary.

The FS must address the case law requirement that the FS insure that there exists the quantity and quality of habitat necessary to insure viability of aquatic species of concern. The Ninth Circuit Court of Appeals ruled that the FS "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. The Forest Plan is not based upon scientific research regarding the forestwide amount and distribution of habitat needed to insure viability of vertebrate species of concern. Furthermore, the FS maintains an inaccurate old-growth inventory. What is the FS's way of describing the quantity and quality of habitat that is necessary to sustain the viability of the species in question on the IPNF? Also, please "explain (the) methodology for measuring this habitat."

That Sensitive species are administratively designated by the regional forester highlights a weakness of the

biodiversity provisions of the Forest Plan. At any time, the Regional Forester may change or even eliminate the Sensitive species list for the IPNF, without any public process.

The Forest Plan omits old-growth Management Indicator Species, which means there would be no monitoring of wildlife whose special habitat needs are best found in old growth. The Forest Plan's failure to designate management indicator species according to the requirements of the 1982 planning regulations violates NFMA.

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

The proposal is that the Forest Service monitor those species whose status allows inference to the status of other species, are indicative of the soundness of key ecological processes, or provide insights to the integrity of the overall ecosystem. This procedure is a necessary shortcut because monitoring and managing for all aspects of biodiversity is impossible.

No single species is adequate to assess compliance to biological sustainability at the scale of the national forests. Thus, several species will need to be monitored. The goal is to select a small number of focal species whose individual status and trends will collectively allow an assessment of ecological integrity. That is, the individual species are chosen to provide complementary information and to be responsive to specific conservation issues. Thus, the Committee proposed for consideration a broad list of species categories reflecting the diversity of ecosystems and management issues within the NFS.

The Forest Plan and FEIS do not include scientific justification for the adoption of the landbird assemblage (olive-sided flycatcher, hairy woodpecker, chipping sparrow, Hammond's flycatcher and dusky flycatcher) as MIS representing other wildlife (including old-growth associated wildlife species) on the IPNF. In fact the EIS contains an explicit assumption that its implementation cannot possibly affect viability of its chosen indicator species: "These MIS, elk and insectivores, were not selected because of a viability concern."

The use of vegetation habitat proxy is invalid for insuring viable populations of wildlife.

Please disclose statistically robust estimates of population trends of each Sensitive species. Please disclose the intensity of surveys for Sensitive species that have been conducted in the project area. Please provide a sound scientifically-based explanation for any species' apparent absence from the project area.

Traill et al., 2010 and Reed et al., 2003 are published, peer-reviewed scientific articles addressing what a true

"minimum viable population" would be, and how that number is typically drastically underestimated. The FS has not identified the best available science that provides scientifically sound, minimum viable populations of any Sensitive species or MIS on the IPNF.

Please disclose the cumulative effects of recreational activities and motorized/mechanic access on wildlife populations.

The use of VMap base data causes unacceptable inaccuracy in the Forest Plan EIS wildlife analysis.

There is no accuracy assessment including confidence intervals in the Forest Plan EIS wildlife analysis.

IN FW-DC-WL-06, the provision directing management to promote large-diameter trees in eagle nesting territories is not based upon any information source from the IPNF that demonstrates it is needed, or on recommendations of any scientific research on managing for bald eagles.

Desired Condition FW-DC-WL-07 encourages occupancy of woodland caribou only within the currently designated Recovery Zone, far less than its historic range. The Recovery Zone is also not a FS established geographic area, which means the DC could be changed without public process.

It is unclear if the word "should" in Forestwide Wildlife Guidelines is intended to render these entire Guidelines to be discretionary.

In FW-GDL-WL-01, 03, 04, 05, 11, 14, 19, 20, 21, 22, 23, 24, and 25 the words "or minimize" are not objectively defined and basically nullify these guidelines.

In order to meet Forest Plan requirements in the Elk Management Unit, the project "should maintain existing levels of elk security" (Forest Plan guideline FW-GDL-WL-13).

Guideline FW-GDL-WL-08 can be read to provide direction to log areas that scientific consensus recognizes as some of the worst places to do so, because of the ecological sensitivity and often rarity of intact post-fire habitats.

Desired Condition FW-GDL-WL-20 states, "(Raptors) that establish nests near pre-existing human activities are assumed to be tolerant of that level of activity." There is no scientific research that validates the inclusion of this

assumption for all raptors.

Desired Condition FW-GDL-WL-25 states, "Individual animals that establish nests and den sites near areas of pre-existing human use[hellip] are assumed to be accepting[hellip]" There is no scientific research that validates this assumption for the remaining species "not covered under other forestwide guidelines."

In the absence of meaningful thresholds of habitat loss and no monitoring of wildlife populations at the Forest level, projects will continue to degrade wildlife habitat across the IPNF over time. (See also Schultz 2012.). The FS would never be able to detect the likelihood of complete extirpation of any wildlife species from the IPNF, using such methodology.

The FS must conduct surveys for wildlife, or their dens or nests, in the project area.

Hutto, 2008 cautions against the common practice of landscape scale thinning to "restore" forests to a condition thought to be more congruent with historical conditions:

Black-backed Woodpeckers [hellip]require burned forests that are densely stocked and have an abundance of large, thick-barked trees favored by wood-boring beetles (Hutto 1995, Saab and Dudley 1998, Saab et al. 2002, Russell et al. 2007, Vierling et al. 2008). Indeed, data collected from within a wide variety of burned forest types show that the probability of Black-backed Woodpecker occurrence decreases dramatically and incrementally as the intensity of traditional (pre-fire) harvest methods increases. (Emphases added.)

The Hutto, 2008 Abstract states:

I use data on the pattern of distribution of one bird species (Black-backed Woodpecker, *Picoides arcticus*) as derived from 16,465 sample locations to show that, in western Montana, this bird species is extremely specialized on severely burned forests. Such specialization has profound implications because it suggests that the severe fires we see burning in many forests in the Intermountain West are not entirely "unnatural" or "unhealthy." Instead, 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.

Please evaluate impacts on species that are affected by human activity including the fisher, pine marten, wolverine, Canada lynx, native trout and other fish, elk, woodpeckers, pygmy nuthatches, northern goshawks, flammulated owls and other raptors, fringed myotis, Townsend's big-eared bats, amphibians (such as western toad and Coeur d'Alene salamander), and reptiles.

Please disclose data and the best available science concerning biological relationships and population trends of

these species on the IPNF.

The FS relies upon unpublished reports by Samson alleged to prove viability is being maintained for various wildlife species of concern on the IPNF. However, those reports have not been subject to scientific peer review and thus fail to meet the best available science standard. The Samson reports rely upon the databases of outdated, unreliable information as its quantitative source.

The preference for large diameter of nesting trees for the pileated woodpecker is known (McClelland and McClelland, 1999) but because the Forest Plan omitted adoption of old growth MIS, the FS has no viability strategy.

GA-DC-WL-PR-02 allows "low levels of human disturbance" in grizzly and caribou habitat, but this is too vague to be based upon best available science.

The Forest Plan lacks meaningful direction maintaining Landscape Connectivity for wildlife. 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.)

The FS has still not sufficiently dealt with the issue of fragmentation, road effects, and past logging on old-growth species' habitat.

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 IPNF is a major ongoing concern. It is documented that edge effects occur 10-30 meters into a forest tract (Wilcove et al., 1986). The size of blocks of interior forest that existed historically before management (including fire suppression) was initiated must be compared to the present condition. USDA Forest Service, 2004a states:

Forested connections between old growth patches [hellip](widths) are important because effective corridors should be wide enough to "contain a band of habitat unscathed by edge effects" relevant to species that rarely venture out of their preferred habitats (Lidicker and Koenig 1996 and Exhibit Q-17).

Timber harvest patterns across the Interior Columbia River basin of eastern Washington and Oregon, Idaho, and western Montana have caused an increase in fragmentation of forested lands and a loss of connectivity within and between blocks of habitat. This has isolated some wildlife habitats and reduced the ability of some wildlife populations to move across the landscape, resulting in long-term loss of genetic interchange (Lesica 1996,

U.S. Forest Service and Bureau of Land Management 1996 and 1997).

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

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

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

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

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

Connectivity objectives should be set for each landscape unit. [hellip]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. [hellip] 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. [hellip]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. [hellip](l)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. [hellip]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. [hellip](A) way to moderate both the demands for and the stresses placed

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

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

Habitat alone cannot be used to predict wildlife populations[hellip]The presence of suitable habitat does not ensure that any particular species will be present or will reproduce.

Therefore, populations of species must also be assessed and continually monitored.

(Emphasis added.)

The Forest Plan includes inadequate direction to designate the minimum road system. The Forest Plan is inconsistent with the Travel Management Regulations.

How does the FS propose to afford maintaining the road system in this project area when the funding doesn't exist, and as a result watershed conditions will continue to deteriorate from naturally increasing erosion?

The main ecological (as well as budgetary) problem facing the IPNF is the existing excessive network of roads.

Although the main focus of the Travel Management Rule Subpart A was to be this excessive road network, the FS sidesteps the issue at every juncture—in the design of the Forest Plan, in the design of projects implementing the Forest Plan, and in the systematic avoidance of fully performing its duties under Subpart A, which requires the agency to minimize the ecological and economic liabilities of the excessive road network by significantly downsizing it.

Early in the forest plan revision process, the FS recognized the opportunity the process provided for addressing the excessive road system on the Forest. This was indicated in statements made in the AMS:

The revised Forest Plans need to be in compliance with new laws, regulations, and management direction. Forest Plans also need to incorporate new research and science that has been developed. The new strategies have been developed to aid in the sustainability of all native and desired non-native species.

In January of 2001, a new Forest Roads Rule and Policy was issued which revised regulations concerning the management, use, and maintenance of the National Forest Transportation System. Forest Plan Revision provides the opportunity to incorporate this direction into the Forest Plans (USDA 2001b).

Possible Strategies in Revising Management Direction for Access and Recreation:

[bull] Provide management direction for Access and Travel Management Planning, including criteria for developing access strategies by appropriate modes and season of use.

On the verge of taking bold, necessary strides towards reforming its roads and access management into something ecologically sustainable, the FS issued the revised Forest Plan and FEIS which failed to analyze or address the problem, and then followed that up with a sham

Region 1-directed Travel Analysis Process that failed to follow the Travel Management Rule Subpart A requirements for involving the public in a science-based effort to identify the forestwide minimum road system. The FS is obligated to disclose the project area road system's long-term financial liabilities, and the associated ecological impacts due to inadequate maintenance funding.

Huge bibliographies 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. That there are no road density standards in the forest plan suggests the biased and arbitrary manner of the FS's use of its own "best available science." From the Wisdom et al. (2000) Abstract:

Our assessment was designed to provide technical support for the ICBEMP and was done in five steps. [hellip] 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 make a very strong scientific rationale for including ecologically- based road density standards:

Roads have well-documented, significant and widespread ecological impacts across multiple scales, often far beyond the area of the road "footprint". Such impacts often create large and extensive departures from the natural conditions to which organisms are adapted, which increase with the extent and/or density of the road network. Road density is a useful metric or indicator of human impact at all scales broader than a single local site because it integrates impacts of human disturbance from activities that are associated with roads and their use (e.g., timber harvest, mining, human wildfire ignitions, invasive species introduction and spread, etc.) with direct road impacts. Multiple, convergent lines of empirical evidence summarized herein support two robust conclusions: 1) no truly "safe" threshold road density exists, but rather negative impacts begin to accrue and be expressed with incursion of the very first road segment; and 2) highly significant impacts (e.g., threat of extirpation of sensitive species) are already apparent at road densities on the order of 0.6 km per square km (1 mile per square mile) or less. Therefore, restoration strategies prioritized to reduce road densities in areas of high aquatic resource value from low-to-moderately-low levels to zero-to-low densities (e.g., <1 mile per square mile, lower if attainable) are likely to be most efficient and effective in terms of both economic cost and ecological benefit. By strong inference from these empirical studies of systems and species sensitive to humans' environmental impact, with limited exceptions, investments that only reduce high road density to moderate road density are unlikely to produce any but small incremental improvements in abundance, and will not result in robust populations of sensitive species.

(Emphases added.) Wisdom et al., 2000, which was cited heavily in the forest plan FEIS and is thus considered to be "Best Available Science" by the FS, state in their Abstract:

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.

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.

(Emphases added.) And from the article's Major Findings and Implications:

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.

(Emphasis added.) The heavy bias toward identifying habitat manipulation options (i.e., logging and other active management activities) in the forest plan—which lacks Wisdom et al. (2000) implications for road management—has led to a forest plan that is a recipe for failure.

Desired Condition FW-DC-AR-04 is a Forest Plan Decision prioritizing vast but unspecified acreage of the IPNF for motorized recreation, in the absence of the travel planning required by the Travel Management Regulations.

Objectives FW-OBJ-AR-04, and 05 are Forest Plan Decisions designating unspecified mileages of the IPNF for motorized recreation, in the absence of the travel planning required by Travel Management Regulations and completed by 2015. In addition, because of the existing degraded condition of many motorized travel routes this Desired Condition conflicts with FW-DC-AR-07 and 08.

The Forest Plan is not consistent with best available science on road density in grizzly bear habitat outside of Bear Management Units.

The Forest Plan lacks direction to update roadless area boundaries utilizing a transparent public procedures in order to evaluate unroaded areas contiguous with IRAs and Wilderness.

In FW-DC-TBR-01, including the sentence that begins with "Salvage[hellip]" perpetuates the longstanding conflict between timber production and natural processes which create wildlife habitat. The Desired Condition phrase, "associated desired conditions" is too vague. And FW- DC-TBR-01 fails to recognize that market demand has no regard for ecological sustainability. Since the Forest Service fails to acknowledge the scientific and public controversy of the "salvage" issue, such statements should be excluded from the Forest Plan.

The wording of FW-DC-TBR-03 essentially nullifies any meaningful distinction between suitable and unsuitable land, and together FW-OBJ-TBR-01, MA6-STD-TBR-01, and the ASQ (FW-DC-TBR-04), encourages logging in unsuitable land. One or more of the "purposes" of logging it allows in land that is "unsuitable" appear in every timber sale NEPA document.

FW-DC-TBR-04. The Allowable Sale Quantity (ASQ) of 120 million board feet annually is not based upon scientifically sound modeling that adequately considers ecological and economic constraints. It is simply not ecologically sustainable. It creates a sense of false expectations for forest products industries.

FW-OBJ-TBR-01. This timber target provides incentives which conflict with ecological sustainability. The annual target of offering 45 million board feet is not based upon scientifically sound modeling that adequately considers ecological and economic constraints. It creates a sense of false expectations for forest products industries

FW-STD-TBR-02 perpetuates the fiction that there is a category of natural processes that are some sort of "catastrophe." This effectively translates to dead trees not being logged (not maximizing timber volume produced) as the catastrophe rather than there really being something truly ecologically harmful.

Desired Condition FW-DC-SES-04 perpetuates the Smoky Bear myth that protection from fire is a promise that the government can and should make. Unlike the direction provided in the Forest Plan Fire section, there is no recognized balance with ecological considerations. This Desired Condition does not provide any further increment of public safety.

The FS refused to consider scientific research and opinion that recognizes the critical challenge posed by climate change to global ecosystems and the IPNF. The statement in the 2010 KIPZ Climate Change Report, "Harvested wood products increase the net sequestration on these forests by an undetermined amount" is unsubstantiated by cited scientific research or information.

Climate change science suggests that logging for sequestration of carbon, logging to reduce wild fire, and other manipulation of forest stands does not offer benefits to climate. Rather, increases in carbon emissions from soil disturbance and drying out of forest floors are the result. Managers of national forest lands can best address climate change through minimizing development of forest stands, especially stands that have not been previously logged, by allowing natural processes to function. Furthermore, any supposedly carbon sequestration from logging are usually more than offset by carbon release from ground disturbing activities and from the burning of fossil fuels to accomplish the timber sale, even when couched in the language of restoration. Reducing fossil fuel use is vital. Please analyze, disclose, and consider the full range of scientific information on carbon storage, vegetation management, and wildfire.

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. [hellip]Impending changes in regional climates [hellip]have the capacity for causing great shifts in composition of ecological communities.

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

Please disclose the body of science that implicates logging activities as a contributor to reduced carbon stocks in forests and increases in greenhouse gas emissions.

The LMP's Monitoring Program is inadequate for informing the agency and the public within any valid adaptive management framework.

Indicator MON-VEG-01-02 merely reports on acres burned, and lacks a necessary qualitative component.

Indicator MON-VEG-01-05, the annual measure of old growth and recruitment potential old growth, does not require that the old-growth definition as specified in the LMP Glossary be the measurement criteria utilized to determine if any acre is old growth.

The logic behind Indicator MON-VEG-01-06 is lacking, since annually determining old-growth acres "treated" would reveal nothing about the outcome[mdash]positive or negative[mdash]of those treatments.

The Indicator MON-VEG-01-08 lacks relevance since it would merely measure the "Number of acres influenced by insects and disease."

Indicator MON-VEG-02-01 is inadequate since annually determining acres of noxious weeds "treated" doesn't reveal the effectiveness of those treatments.

Indicator MON-VEG-02-02 is inadequate since the definition of a "site of new non-native invasive plant species" is not given.

Indicator MON-FIRE-01-01. Effectiveness of fuel treatments is not evaluated.

Indicator MON-WTR-01-01. "Number of Best Management Practices[hellip]" This Indicator is too vague to answer the Monitoring Question, "Are soil, water quality, and riparian and aquatic habitats protected and moving towards desired conditions?"

Indicators MON-WTR-02-01, MON-WTR-02-02: Measuring watersheds by "miles of restoration activities" would not be informative. It is also unclear how measuring watersheds by "acres of restoration activities" would be useful since the Forest Service definition of restoration is so lax that every acre treated would be considered

restoration.

Indicator MON-WTR-02-03: The meaning of "trended toward" is too subjective. Use of these three indicators would not answer the Monitoring Question.

The Forest Plan fails to include Monitoring Plan Questions and Indicators to validate Watershed Condition Ratings and Watershed Disturbance Ratings with other measures, such as the condition or status of aquatic habitat such as attainment of INFISH RMOs, and with measures of hydrological equilibrium/streambank stability in assessed subwatersheds, and with data gathered for the 1987 Forest Plan monitoring items.

Indicator MON-AQH-01-01 lacks a baseline of unconnected stream habitat for subsequent comparison.

The monitoring program lacks Monitoring Questions and Indicators for the Sensitive westslope cutthroat trout, inland redband trout, and western pearlshell mussel.

The Monitoring Program lacks a measure for determining significant reductions in soil productivity due to land management activities in any timeframe short of forever. There is a lack of any measure of the areal extent of soil damage within any geographic scale.

There is no direction in the Forest Plan for monitoring soil restoration accomplishment.

Monitoring Question MON-FLS-01 is worded too vaguely to provide meaningful answers. The overarching goal of ESA listing is population recovery, which is omitted. A measure of population numbers of grizzly bears is essential for determining attainment of recovery, as is mortality information.

Indicator MON-FLS-01-02. Measuring population numbers of Canada lynx is essential for determining attainment of recovery, as is information on trapping mortality.

Indicator MON-FLS-01-03. Specific to the INFISH monitoring requirements that this Indicator adopts; the IPNF must use monitoring data to determine if project implementation results in attainment of riparian goals and objectives—deemed to be "critical" monitoring by the Forest Service in Forest Plan Appendix B.

The bull trout redd count data must be supplemented by fish survey data for numbers of bull trout in bull trout

streams. It is also important to measure population trends of brook trout in bull trout streams for hybridization reasons.

Monitoring Question MON-MIS-01 lacks a requirement to estimate baseline elk population numbers, and measure elk population trends in response to management actions.

Indicator MON-MIS-01-02 is useless as a biological indicator because nothing is required specific to any bird species.

Indicator MON-MIS-01-03 relies upon a measurement system that is not explained anywhere in the Forest Plan, merely commits to monitoring vague "changes" measured somewhere every five years.

Indicator MON-WL-01-01 is useless as a biological indicator because nothing is required specific to any wildlife species.

The FS has failed to monitor populations of wildlife, in favor of striving towards DCs for habitat (actually, vegetation) in project planning. The Committee of Scientists (1999) state:

Habitat alone cannot be used to predict wildlife populations[hellip]The presence of suitable habitat does not ensure that any particular species will be present or will reproduce.

Therefore, populations of species must also be assessed and continually monitored.

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

(Emphasis added.) The Committee of Scientists (1999) provide still more emphases on the importance of monitoring:

The proposal is that the Forest Service monitor those species whose status allows inference to the status of other species, are indicative of the soundness of key ecological processes, or provide insights to the integrity of the overall ecosystem. This procedure is a necessary shortcut because monitoring and managing for all aspects of biodiversity is impossible.

No single species is adequate to assess compliance to biological sustainability at the scale of the national forests. Thus, several species will need to be monitored. The goal is to select a small number of focal species whose individual status and trends will collectively allow an assessment of ecological integrity. That is, the individual species are chosen to provide complementary information and to be responsive to specific conservation issues. Thus, the Committee proposed for consideration a broad list of species categories reflecting

the diversity of ecosystems and management issues within the NFS.

Please address this scientific opinion (Committee of Scientists, 1999) which disagrees with Forest Plan assumptions about wildlife habitat management.

Monitoring Question MON-AR-01. With the wide variety of recreation impacts on the wide variety of recreation sites throughout the Forest, this leaves unfulfilled the need for more specific monitoring and reporting.

Monitoring Question MON-AR-02: Identification of the minimum transportation system necessary is a regulatory requirement, so the IPNF must complete forestwide travel planning.

Monitoring Question MON-AR-03: Specific to motorized recreation, identification of the minimum transportation system necessary is a regulatory requirement, and the IPNF must complete its forestwide travel planning.

Monitoring Question MON-WLDN-01. The IPNF has so many acres of roadless areas deserving protection as Wilderness, so the public would be well-served with a Monitoring Question and Indicators that assess wilderness conditions and trends in roadless areas.

Indicator MON-MIN-01-01: The baseline number of unreclaimed abandoned mine sites must be disclosed. Additionally, including monitoring items for water quality and soil productivity in abandoned mine sites is important for biological resources including human health and safety.

Monitoring Question MON-SOC-01: Data on the contribution to the economy from those gathering non-timber products, hunters, anglers, and recreationists would lead to a more balanced understanding by the agency of how the IPNF sustains local and regional economies.

Many FS analyses rely upon the use of models. The reliability of all the data used as input for these models is not disclosed. Also, the validity of the models was not established for how the FS utilizes them. Please cite the best available scientific information which establishes model validity.

Please disclose the limitations of all models the FS relies upon for the NEPA analyses.

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

The next level of scientific integrity is the notion of "validity." So even if FS data input to its models are reliable, a question remains of the models' validity. In other words, are the models scientifically appropriate for the uses for which the FS is utilizing them? As Huck, (2000) explains, the degree of "content validity," or accuracy of the model or methodology is established by utilizing other experts. This, in turn, demonstrates the necessity for utilizing the peer review process.

Ruggiero, 2007 (a scientist from the research branch of the FS) recognizes a fundamental need to demonstrate the proper use of scientific information, in order to overcome issues of decisionmaking integrity that arise from bureaucratic inertia and political influence. Ruggiero, 2007 and Sullivan et al., 2006 provide a commentary on the scientific integrity and agency use and misuse of science. And the Committee of Scientists (1999) recommend "independent scientific review of proposed conservation strategies[hellip]"

Roger Sedjo, member of the Committee of Scientists, expresses his concerns in Appendix A of their 1999 Report about the discrepancy between forest plans and Congressional allocations, leading to issues not considered in forest plans such as the IPNF's:

(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.

A Science Consistency Review is long overdue for the revised Forest Plan. The FS prepared Guldin et al. (2003) which:

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

The Committee of Scientists (1999) state:

To ensure the development of scientifically credible conservation strategies, the Committee recommends a process that includes (1) scientific involvement in the selection of focal species, in the development of measures of species viability and ecological integrity, and in the definition of key elements of conservation strategies; (2) independent scientific review of proposed conservation strategies before plans are published; (3) scientific involvement in designing monitoring protocols and adaptive management; and

(4) a national scientific committee to advise the Chief of the Forest Service on scientific issues in assessment and planning.

Please analyze and disclose the cumulative effects of past, ongoing, and proposed management actions, within a logically defined cumulative effects analysis area, on land of all ownerships. Please disclose if the FS has performed all of the monitoring and mitigation required or recommended in those NEPA documents, and the results of the monitoring. The FS would be unable to properly analyze and disclose cumulative effects of management plan implementation if it is not adequately informed by past project monitoring and plan-mandated monitoring.

The Montana Forest Restoration Committee adopted 13 Principles, written collaboratively by a diverse set of stakeholders which included two Region 1 forest supervisors along with representatives from timber and forest products industries, conservation groups, recreation interests, and others. Principle #3 states:

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

Consistent with this principle, the agency would publicize a landscape assessment of the project area so a

genuine scoping process could help determine the project Purpose and Need. Instead, the FS has apparently prioritized the project Purpose and Need based on appropriated funds and Congress's ill-informed priorities for this project area, and promoted them via "collaboration" to subsidize narrow financial interests.

Since the FS has gone out of its way to please a narrow segment of the public in the design of the project before ever notifying the public at large, the agency is also obligated to be open to this wider pool of national forest owners for suggestions concerning alternative development. We support some of the actions proposed, specifically those reducing road related impacts and restoring aquatic habitat and watersheds. However, we request the FS take a more comprehensive approach to restoring aquatic habitat and watersheds than is included in the proposal. Please design an alternative that results in a road system which is fully affordable to maintain on an annual basis, within all of the watersheds affected by the proposal. Please use expected appropriations as the yardstick to measure "affordable", based on recent years' funding levels.

Such an alternative would reduce road densities to meet science-based ecological conditions for wildlife and fisheries. Wisdom et al. (2000) state:

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.

The actions needed to reduce the road system to this affordable level need not themselves be within expected budgets. Indeed, few restoration projects proposed or implemented by the FS are fully funded by appropriated dollars. Figuring out a way to fund road decommissioning would follow from a Decision to implement it. That would be a way to truly collaborate.

In analyzing such an alternative, it may turn out that some of the actions mentioned in the Scoping Notice would be unnecessary or would be modified. For example, some roads proposed for maintenance or upgrading may not be affordable to maintain, or may be located where chronic sedimentation into streams persists. In such cases consideration of highest restoration priorities would require full road obliteration.

Such an alternative would reduce the road network in the project area watersheds consistent with the forest plan and with best available science for maintaining robust populations of native fish.

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

Such an alternative would be in compliance with the Travel Management Rule Subpart A, which requires the FS to identify the forestwide minimum road system—itself necessarily being maintainable using expected annual appropriations. This alternative would be consistent with Montana Forest Restoration Committee Principle

#13, which is to "Establish and maintain a safe road and trail system that is ecologically sustainable."

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

Such an alternative would not construct any new roads, including temporary roads because, as the Forest Service is aware, construction of temporary roads potentially creates much of the same impact as system roads.

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

In conclusion, please keep both organizations on the list to receive all communications concerning the Buckskin Saddle timber sale. It is our intention that the project ID Team reviews and includes in the Project Record the literature and other documents we've cited herein. Please contact us if you have problems locating any of them.

Sincerely,

/s/

Michael Garrity

Alliance for the Wild Rockies

P.O. Box 505

Helena, Montana 59624

406-459-5936

References cited

Adams, P.W and H.A. Froehlich. 1981. Compaction of forest soils. Extension Publication PNW

217. 13 pp.

Allen, Craig D., David D. Breshears, Nate G. McDowell 2015. On underestimation of global vulnerability to tree mortality and forest die-off from hotter drought in the Anthropocene ECOSPHERE ESA Centennial Paper published 7 August 2015.

Angermeier, P. L., and J. R. Karr. 1994. Protecting biotic resources: Biological integrity versus biological diversity as policy directives. *BioScience* Vol. 44, No. 10, November 1994.

Aubry, Keith B. Kevin S. McKelvey, and Jeffrey P. Copeland, 2007. Distribution and Broad-scale Habitat Relations of the Wolverine in the Contiguous United States. *Journal of Wildlife Management* 71(7):2147-2158; 2007

Aubry, K.B., C.M. Raley, S.W. Buskirk, W.J. Zielinski, M.K. Schwartz, R.T. Golightly, K.L. Purcell, Richard D. Weir, J. Scott Yaeger, 2013. Meta-Analyses of Habitat Selection by Fishers at Resting Sites in the Pacific Coastal Region. *The Journal of Wildlife Management* 77(5):965- 974; 2013; DOI: 10.1002/jwmg.563

Bart RR, Tague CL, Moritz MA (2016). Effect of Tree-to-Shrub Type Conversion in Lower Montane Forests of the Sierra Nevada (USA) on Streamflow. *PLoS ONE* 11(8): e0161805. doi:10.1371/journal.pone.0161805

Booth, Derek B.; 1991. Urbanization and the Natural Drainage System—Impacts, Solutions, and Prognoses. *Northwest Environmental Journal*, v. 7, p. 93-118, 1991.

Brais, S. and C. Camire. 1997. Soil compaction induced by careful logging in the claybelt region of northwestern Quebec (Canada). *Can. J. Soil Sci.* 78:197-206.

Breshears, David D., Neil S. Cobb, Paul M. Rich, Kevin P. Price, Craig D. Allen, Randy G. Balice, William H. Romme, Jude H. Kastens, M. Lisa Floyd, Jayne Belnap, Jesse J. Anderson, Orrin B. Myers, and Clifton W. Meyer; 2005. Regional vegetation die-off in response to global- change-type drought. *Proceedings of the National Academy of Sciences of the United States of America*, October 10, 2005.

Bull, Evelyn L. and Richard S. Holthausen, 1993. Habitat use and management of pileated woodpeckers in northeastern Oregon. *Journal of Wildlife Management* 57(2): 1993. Pp. 335-345.

Bull, E. L., N. Nielsen-Pincus, B.C. Wales, J.L. Hayes. 2007. The influence of disturbance events on pileated woodpeckers in Northeastern Oregon. *Forest Ecology and Management* 243:320-329.

Bull, Evelyn L. and Arlene K. Blumton, 1999. Effect of Fuels Reduction on American Martens and Their Prey. USDA Forest Service Department of Agriculture, Pacific Northwest Research Station, Research Note PNW-RN-539, March 1999.

Bull, Evelyn L. Richard S. Holthausen and Mark G. Henjum; 1992. Roost Trees Used by Pileated Woodpeckers in Northeastern Oregon. *The Journal of Wildlife Management*, Vol. 56, No. 4 (Oct., 1992), pp. 786-793.

Bull, Evelyn L., Catherine G. Parks, and Torolf R. Torgersen, 1997. Trees and Logs Important to Wildlife in the Interior Columbia River Basin. Gen. Tech. Rep. PNW-GTR-391. Portland, OR:

U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 55p.

Campbell, John L, Mark E Harmon, and Stephen R Mitchell, 2011. Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions? *Front Ecol Environ* 2011; doi:10.1890/110057

Carnefix, Gary and Chris Frissell, 2009. Aquatic and Other Environmental Impacts of Roads: The Case for Road Density as Indicator of Human Disturbance and Road-Density Reduction as Restoration Target; A Concise Review. Pacific Rivers Council Science Publication 09-001.

Pacific Rivers Council; PMB 219, 48901 Highway 93, Suite A, Polson, MT 59860)

Carroll, Carlos, Paul C. Paquet, and Reed F. Noss, 2001b. Carnivores as Focal Species for Conservation Planning in the Rocky Mountain Region. *Ecological Applications*, August, 2001, Vol. 11, No. 4 : 961-980.

Castello, J.D., D.J. Leopold, and P.J. Smallidge; 1995. Pathogens, patterns, and processes in forest ecosystems. *Bioscience* 45(1):16_24.

Cherry, M.B. 1997. The Black-Backed And Threetoed Woodpeckers: Life History, Habitat Use, And Monitoring Plan. Unpublished Report. On File With: U.S. Department Of Agriculture, Lewis And Clark National Forest, P.O. Box 869, Great Falls, Mt 59403. 19 P.

Christensen, Alan G.; L. Jack Lyon and James W. Unsworth, 1993. Elk Management in the Northern Region: Considerations in Forest Plan Updates or Revisions. United States Department of Agriculture, Forest Service Intermountain Research Station, General Technical Report INT- 303 November 1993.

Clough, Lorraine T. 2000. Nesting Habitat Selection and Productivity of Northern Goshawks in West-Central Montana. M.S. Thesis, University of Montana, 87 pp.

Cohen, Jack 1999a. Reducing the Wildland Fire Threat to Homes: Where and How Much? Pp. 189-195 In Proceedings of the symposium on fire economics, planning, and policy: bottom lines. April 5-9, 1999, San Diego, CA. USDA Forest Service Gen. Tech. Rep. PSW-GTR-173.

Cohen, Jack and Bret Butler, 2005. Wildlife Threat Analysis in the Boulder River Canyon: Revisited. Fire Sciences Laboratory, USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana. July 26-27, 2005.

Cohen, Warren B., Zhiqiang Yang, Stephen V. Stehman, Todd A. Schroeder, David M. Bell, Jeffrey G. Masek, Chengquan Huang, Garrett W. Meigs. 2016. Forest disturbance across the conterminous United States from 1985-2012: The emerging dominance of forest decline. *Forest Ecology and Management*. 360 (2016) 242-252

Collins, Brandon M and Scott L Stephens, 2007. Managing natural wildfires in Sierra Nevada wilderness areas. *Frontiers in Ecology and the Environment* 2007; 5, doi:10.1890/070007[copy] The Ecological Society of America. www.frontiersinecology.org

Committee of Scientists, 1999. Sustaining the People's Lands. Recommendations for Stewardship of the National Forests and Grasslands into the Next Century. March 15, 1999

Copeland, Jeffrey P., James M. Peek, Craig R. Groves, Wayne E. Melquist, Kevin S. Mckelvey, Gregory W. Mcdaniel, Clinton D. Long, Charles E. Harris, 2007. Seasonal Habitat Associations of the Wolverine in Central Idaho. *Journal of Wildlife Management* 71(7):2201-2212; 2007.

Crocker-Bedford, D.C. 1990. Goshawk reproduction and forest management. Wildlife Society Bulletin; v. 18, no. 3, pp. 262-269.

Cullen, S.J., C. Montagne, and H Ferguson, 1991. Timber Harvest Trafficking and Soil Compaction in Western Montana. Soil Sci. Soc. Am. J., Vol. 55 (1416-1421), September- October 1991.

DellaSala, Dominick A. and Chad T. Hanson, 2015. The Ecological Importance of Mixed- Severity Fires: Nature's Phoenix. Published by Elsevier Inc.

Depro, Brooks M., Brian C. Murray, Ralph J. Alig, and Alyssa Shanks. 2008. Public land, timber harvests, and climate mitigation: quantifying carbon sequestration potential on U.S. Public timberlands. Forest Ecology and Management 255: 1122-1134.

Environmental Protection Agency, 1999. Considering Ecological Processes in Environmental Impact Assessments. U.S. Environmental Protection Agency, Office of Federal Activities. July 1999

Everett, Richard L., comp. 1994. Restoration of stressed sites, and processes. Gen. Tech. Rep. PNWGTR- 330. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 123 p. (Everett, Richard L., assessment team leader; Eastside forest ecosystem health assessment; volume IV.)

Finney and Cohen, 2003. Expectation and Evaluation of Fuel Management Objectives. USDA Forest Service Proceedings RMRS-P-29.

Fire Science Brief, 2009. Listening to the Message of the Black-backed Woodpecker, a Hot Fire Specialist. Fire Science Brief Issue 39 February 2009. www.firescience.gov/projects/briefs/04-2-1-106_FSBrief39.pdf

Flatten, Brad, 2003. Determining Appropriate Winter Logging Conditions for Protection of the Soil Resource. Okanogan & Wenatchee National Forests, December 2003 Draft.

Fly, Chase; Scott Bergendorf; John Thornton; Tom Black and Charlie Luce; 2011. Scriver Creek Road Inventory (GRAIP) Report In Support of the Scriver Creek Integrated Restoration Project USDA Forest Service, Boise

National Forest. September 14, 2011.

Funk, J., S. Saunders, T. Sanford, T. Easley, and A. Markham. 2014. Rocky Mountain forests at risk: Confronting climate-driven impacts from insects, wildfires, heat, and drought. Report from the Union of Concerned Scientists and the Rocky Mountain Climate Organization. Cambridge, MA: Union of Concerned Scientists.

Goggans, Rebecca, Rita. D. Dixon, and L. Claire S. Seminara, 1989. Habitat Use by Three-toed and Black-backed Woodpeckers, Deschutes National Forest, Oregon. Oregon Department of Fish and Wildlife Nongame Wildlife Program, USDA Deschutes National Forest, Technical Report #87-3-02.

Gorzelak MA, Asay AK, Pickles BJ, Simard SW. 2015. Inter-plant communication through mycorrhizal networks mediates complex adaptive behaviour in plant communities. *AoB PLANTS* 7: plv050; doi:10.1093/aobpla/plv050

Graham, R., et al. 1999a. The Effects of Thinning and Similar Stand Treatments on FireBehavior in Western Forests. U.S. Forest Service, Pacific Northwest Research Station. General Tech. Rpt PNW-GTR-463. Sept. 1999.

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann, 1992. Old-growth forest types of the northern region. Northern Region, R-1 SES 4/92. Missoula, MT.

Grier, C. C., K. M. Lee, N. M. Nadkarni, G. O. Klock, & P. J. Edgerton, 1989 Productivity of Forests of the United States and Its Relation to Soil and Site Factors and Management Practices: A Literature Review. USDA Forest Service General Technical Report PNW-GTR-222, March 1989.

Guldin, James M., David Cawrse, Russell Graham, Miles Hemstrom, Linda Joyce, Steve Kessler, Ranotta McNair, George Peterson, Charles G. Shaw, Peter Stine, Mark Twery, Jeffrey Walte. 2003. The Science Consistency Review: A Tool to Evaluate the Use of Scientific Information in Land Management Decisionmaking. United States Department of Agriculture Forest Service FS-772, September 2003.

Hargis Christina D., John A. Bissonette, and David L. Turner, 1999. The influence of forest fragmentation and landscape pattern on American martens. *Journal of Applied Ecology*, 1999, 36 Pp. 157-172.

Harmon, Mark E, William K. Ferrell, and Jerry F. Franklin. 1990. Effects on carbon storage of conversion of old-

growth forest to young forests. *Science* 247: 4943: 699-702

Harmon, Mark E. & Barbara Marks, 2002. Effects of silvicultural practices on carbon stores in Douglas-fir - western hemlock forests in the Pacific Northwest, U.S.A.: results from a simulation model, 32 *Canadian Journal of Forest Research* 863, 871 Table 3 (2002).

Harmon, Mark E. 2001. Carbon Sequestration in Forests: Addressing the Scale Question, 99:4 *Journal of Forestry* 24, 24-25, 29 (2001) (citing C.F. Cooper, Carbon Storage in Managed Forests, 13:1 *Canadian Journal of Forest Research* 155-66 (1983); Harmon et al., *infra* n. 34, at 699-702; R.C. Dewar, Analytical model of carbon storage in trees, soils and wood products of managed forests, 8:3 *Tree Physiology* 239-58 (1991); and E.D. Schulze et al., Managing Forests after Kyoto, 289 *Science* 2058-59 (2000)).

Harmon, Mark E. 2009. Testimony Before the Subcommittee on National Parks, Forests, and Public Lands of the Committee of Natural Resources for an oversight hearing on "The Role of Federal Lands in Combating Climate Change", March 3, 2009. Mark E. Harmon, PhD, Richardson Endowed Chair and Professor in Forest Science, Department of Forest Ecosystems and Society, Oregon State University.

Harr, R. Dennis 1987. Myths and misconceptions about forest hydrologic systems and cumulative effects. Proceedings of the California Watershed Management Conference, November 18-20, 1986, West Sacramento, California. Wildland Resources Center, Division of Agriculture and Natural Resources, University of California, 145 Mulford Hall, Berkeley, California 94720. Report No. 11, February, 1987.

Harris, Larry D. 1984. *The Fragmented Forest : Island Biogeography Theory and the Preservation of Biotic Diversity*. Chicago Press, Chicago, Ill. 211pp.

Harrison S and Voller J. 1998. Connectivity. Voller J and Harrison S, eds. *Conservation Biology Principles for Forested Landscapes*. Ch3:76-97. Vancouver: UBC Press.

Harvey, A.E., J.M. Geist, G.I. McDonald, M.F. Jurgensen, P.H. Cochran, D. Zabowski, and R.T. Meurisse, 1994. Biotic and Abiotic Processes in Eastside Ecosystems: The Effects of Management on Soil Properties, Processes, and Productivity. *GTR-323* 93-204 (1994)

Hayward, G. D., and R. E. Escano. 1989. Goshawk nest-site characteristics in western Montana and northern Idaho. *Condor*: v. 91, no. 2, pp. 476-479.

Hayward, Gregory D., and Jon Verner, 1994. Flammulated, Boreal, and Great Gray Owls in the United States: A Technical Conservation Assessment. USDA Forest Service General Technical Report RM-253

He, Yujie, Susan E. Trumbore, Margaret S. Torn, Jennifer W. Harden, Lydia J. S. Vaughn, Steven D. Allison, James T. Randerson 2016. Radiocarbon constraints imply reduced carbon uptake by soils during the 21st century. Science 23 Sep 2016: Vol. 353, Issue 6306, pp. 1419- 1424 DOI: 10.1126/science.aad4273

Heinemeyer, KS and JL Jones. 1994. Fisher biology and management: a literature review and adaptive management strategy. USDA Forest Service Northern Region, Missoula, MT. 108 pp.

Hessburg Paul F. and James K. Agee; 2003. An environmental narrative of Inland Northwest United States forests, 1800-2000. Forest Ecology and Management 178 (2000) 23-59.

Hillis, Mike; Amy Jacobs, and Vita Wright, 2002. Black-Backed Woodpecker Assessment. U.S. Forest Service Region One.

Homann, Peter S., Mark Harmon, Suzanne Remillard, & Erica A.H. Smithwick, 2005. What the soil reveals: Potential total ecosystem C stores of the Pacific Northwest region, USA, 220 Forest Ecology and Management. 270, 281 (2005).

Huck, Schuyler W., 2000. Reading Statistics and Research (3rd Edition). New York: Longman, 2000.

Hutto, Richard L., 2006. Toward Meaningful Snag-Management Guidelines for Postfire Salvage Logging in North American Conifer Forests. Conservation Biology Volume 20, No. 4, 984-993, 2006.

Hutto, Richard L. 2008. The Ecological Importance of Severe Wildfires: Some Like it Hot. Ecological Applications, 18(8), 2008, pp. 1827-1834.

Hutto, R.L. 1995. The composition of bird communities following stand-replacement fires in northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology 9:1041-1058.

Johnson, Randy 2016. Looking to the Future and Learning from the Past in our National Forests. USDA Blog. <http://blogs.usda.gov/2016/11/01/looking-to-the-future-and-learning-from-the-past-in-our-national-forests/>

Johnson, Steve, 1995. Factors Supporting Road Removal and/or Obliteration, Memo from Kootenai Forest Hydrologist, February 6, 1995

Jones, Jeff, (undated) A Fisher Management Strategy for the Northern Rocky Mountains (draft). USFS Northern Region.

Kappesser, 1991a. A procedure for evaluating risk of increasing peak flows from Rain On Snow events by creating openings in the forest canopy. Gary Kappesser, Forest Hydrologist, Idaho Panhandle National Forests, March, 1991

Kappesser, Gary, 1991b. The Use of a Riffle Armor Stability Index to Define Channel Stability of Gravel and Cobble Bed Streams. Gary Kappesser, Forest Hydrologist, Idaho Panhandle National Forests, January 1991.

Kappesser, Gary, 1992. Alternative Procedures for Watershed Analysis to Determine Timber Harvest Opportunities and Evaluate the Need for a Forest Plan Revision for the Idaho Panhandle

National Forests. Gary Kappesser, Forest Hydrologist, Idaho Panhandle National Forests, January 1992.

Kappesser, Gary B., 2002. A Riffle Stability Index to Evaluate Sediment Loading to Streams. Journal of the American Water Resources Association Vol. 38, No. 4, August 2002.

Karr, J.R. 1991. Biological integrity: A long-neglected aspect of water resource management. Ecological Applications 1:66-84.

Kauffman, J. Boone, 2004. Death Rides the Forest: Perceptions of Fire Land Use, and Ecological Restoration of Western Forests. Conservation Biology, Vol. 18 No. 4, August 2004, Pp 878-882.

Keith, Heather; Brendan G. Mackey and David B. Lindenmayer. 2009. Re-evaluation of forest biomass carbon stocks and lessons from the world's most carbon-dense forests PNAS July 14, 2009 vol. 106 no. 28 11635-11640

King, J.G. 1989. Streamflow responses to road building and harvesting: a comparison with the equivalent clearcut area procedure. Res. Pap. INT-401. Ogden, UT: USDA-FS, Intermountain Research Station. 13 pp.

King, John G., 1994. Streamflow and sediment yield responses to forest practices in north Idaho. Proceedings from symposium: Interior Cedar-Hemlock-White Pine Forests: Ecology and Management, Spokane WA, March 2-4, 1993. Department of Natural Resource Sciences, Washington State University.

Kirilenko, Andrei P. and Roger A. Sedjo, 2007. Climate change impacts on forestry. Proceedings of the National Academy of Sciences [copy] 2007 by The National Academy of Sciences of the USA.

Kormos, Patrick R., Charles H. Luce, Seth J. Wenger, and Wouter R. Berghuijs 2016. Trends and sensitivities of low streamflow extremes to discharge timing and magnitude in Pacific Northwest mountain streams. Water Resources Research. Published online 2 JUL 2016

Kosterman, Megan K., 2014. Correlates of Canada Lynx Reproductive Success in Northwestern Montana. Thesis presented in partial fulfillment of the requirements for the degree of Master of Science in Wildlife Biology, The University of Montana, Missoula, December 2014. Theses, Dissertations, Professional Papers. Paper 4363.

Krebs John, Eric C. Lofroth, Ian Parfitt, 2007. Multiscale Habitat Use by Wolverines in British Columbia, Canada. Journal of Wildlife Management 71(7):2180-2192; 2007

Kuennen, L., G. Edson & T. Tolle, 1979. Soil Compaction Due To Timber Harvest Activities. Northern Region, May 1979

Kuennen, Lou; Henry Shovic, Bill Basko, Ken McBride, Jerry Niehoff, and John Nesser, 2000. Soil Quality Monitoring: A Review of Methods and Trends in the Northern Region. May 2000.

Kutsch, Werner L. Michael Bahn and Andreas Heinemeyer, Editors, 2010. Soil Carbon Dynamics: An Integrated Methodology. Cambridge University Press 978-0-521-86561-6 -

Lacy, Peter M., 2001. Our Sedimentation Boxes Runneth Over: Public Lands Soil Law As The Missing Link In Holistic Natural Resource Protection. *Environmental Law*; 31 *Envtl. L.* 433 (2001).

Law, B. & M.E. Harmon 2011. Forest sector carbon management, measurement and verification, and discussion of policy related to mitigation and adaptation of forests to climate change. *Carbon Management* 2011 2(1). <http://terraweb.forestry.oregonstate.edu/pubs/lawharmon2011.pdf>.

Law, Beverly E. 2014. Role of Forest Ecosystems in Climate Change Mitigation. Presentation by Beverly E. Law, Professor of Global Change Biology & Terrestrial Systems Science, Oregon State University. Feb. 2014. terraweb.forestry.oregonstate.edu

Lehmkuhl, John F., Leonard F. Ruggiero, and Patricia A. Hall; 1991. Landscape-level patterns of forest fragmentation and wildlife richness and abundance in the southern Washington Cascades. IN: Ruggiero, Leonard F., Keith B. Aubry, Andrew B. Carey, and Mark H. Huff, technical editors, 1991. *Wildlife and vegetation of unmanaged Douglas-fir forests*. USDA Forest Service PNW Gen. Tech. Report. 285 Olympia, WA 474 pp. plus appendix.

Lofroth, E.C., 1997. Northern wolverine project: wolverine ecology in logged and unlogged plateau and foothill landscapes. Wildlife Branch, Victoria, British Columbia, May 7, 1997.

Lorenz, T.J.; Vierling, K.T.; Johnson, T.R.; Fischer, P.C. 2015. The role of wood hardness in limiting nest site selection in avian cavity excavators. *Ecological Applications*. 25: 1 016-1033. <https://www.treearch.fs.fed.us/pubs/49102>

Mace, R. and T. Manley. 1993. The Effects of Roads on Grizzly Bears: Scientific Supplement. South Fork Flathead River Grizzly Bear Project: Project Report For 1992. Montana Department of Fish, Wildlife and Parks.

Mace, Richard D, John S. Waller, Timothy L. Manley, L. Jack Lyon and Hans Zuuring, 1996. Relationships Among Grizzly Bears, Roads and Habitat in the Swan Mountains, Montana.

Journal of Applied Ecology 1996, 33, 1395-1404.

Malmsheimer Robert W., Patrick Heffernan, Steve Brink, Douglas Crandall, Fred Deneke, Christopher Galik, Edmund Gee, John A. Helms, Nathan McClure, Michael Mortimer, Steve Ruddell, Matthew Smith, and John Stewart 2008. Forest Management Solutions for Mitigating Climate Change in the United States. Journal of Forestry. April/May 2008.

Maxell, Bryce; Steve Corn; Paul Hendricks; Ted Koch; Charles Peterson; and Kirwin Werner; 1998. Unpublished letter to USFS Region 1 Species at Risk Task Group: Subject - Inclusion of the Boreal toad (*Bufo boreas boreas*) on the Sensitive SpeciesList for all Region 1 Forests. 8pp.

May, R., Landa, A., vanDijk, J., Linnell, J.D.C. and Andersen, R. 2006. Impact of infrastructure on habitat selection of wolverines *Gulo gulo*. *Wildl. Biol.* 12:285-295. doi:10.2981/0909-6396 (2006) 12[285:IOIOHS] 2.0. CO;2.

McClelland, B. Riley, 1977. Relationships Between Hole-Nesting Birds, Forest Snags, And Decay In Western Larch-Douglas-Fir Forests Of The Northern Rocky Mountains. Presented in partial fulfillment of the requirements for the degree of Doctor of Philosophy, University Of Montana, 1977.

McClelland, B. Riley, 1985. Letter to Flathead National Forest Supervisor Edgar B. Brannon regarding old-growth management in draft forest plan. March 12, 1985.

McClelland BR and McClelland PT. 1999. Pileated woodpecker nest and roost trees in Montana: links with old-growth and forest "health." *Wildlife Society Bulletin* 1999, 27(3): 846- 857.

McRae D.J., L.C. Duchesne, B. Freedman, T.J. Lynham, and S. Woodley 2001. Comparisons between wildfire and forest harvesting and their implications in forest management. *Environ. Rev.* 9: 223-260 (2001) DOI: 10.1139/er-9-4-223 [copy] 2001 NRC Canada

Mitchell, Stephen R., Mark E. Harmon, and Kari E. B. O'Connell. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems.

Ecological Applications 19:643-655. <http://dx.doi.org/10.1890/08-0501.1>

Montana Fish, Wildlife & Parks, 2005. Animal Field Guide: Boreal Toad.
<http://nhp.nris.state.mt.us/animalguide/speciesDetail.aspx?elcode=AAABB01030>

Montana Forest Restoration Committee, 2007. Restoring Montana's National Forest Lands. Guiding Principles and Recommended Implementation. September, 2007. Authored by and the work product of the Montana Forest Restoration Committee. <http://www.montanarestoration.org/restoration/principles>

Moomaw, Bill and Janna Smith, 2017. The Great American Stand: US Forests and the Climate Emergency. Why the United States needs an aggressive forest protection agenda focused in its own backyard. March 2017. Dogwood Alliance, PO Box 7645 Asheville, NC 28802. info@dogwoodalliance.org

Moriarty Katie M., Clinton W. Epps, and William J. Zielinski, 2016. Forest Thinning Changes Movement Patterns and Habitat Use by Pacific Marten. The Journal of Wildlife Management 80(4):621-633; 2016; DOI: 10.1002/jwmg.1060

Moser, Brian W. and Edward O. Garton 2009. Short-Term Effects of Timber Harvest and Weather on Northern Goshawk Reproduction in Northern Idaho. J. Raptor Res. 43(1):1-10

Mote et al. 2014. Ch. 21: Northwest. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds.,

U.S. Global Change Research Program, 487-513. doi:10.7930/J04Q7RWX.
<http://nca2014.globalchange.gov/highlights/regions/northwest>

Nesser, John A., 2002. Notes from the National Soil Program Managers meeting in Reno as related to soil quality issues. John A. Nesser, Regional Soil Scientist, USDA Forest Service, Northern Region. May 23, 2002.

Noss, Reed F. 2001. Biocentric Ecological Sustainability: A Citizen's Guide. Louisville, CO: Biodiversity Legal Foundation. 12pp. Noss, Reed F., and Allen Y. Cooperrider. 1994. Saving Nature's Legacy: Protecting and Restoring Biodiversity. Island Press.

Noss, Reed F., and Allen Y. Cooperrider. 1994. Saving Nature's Legacy: Protecting and Restoring Biodiversity. Island Press.

Olson, Lucretia E. Joel D. Sauder, Nathan M. Albrecht, Ray S. Vinkey, Samuel A. Cushman, Michael K. Schwartz; 2014. Modeling the effects of dispersal and patch size on predicted fisher (*Pekania [Martes] pennanti*) distribution in the U.S. Rocky Mountains. *Biological Conservation* 169 (2014) 89-98.

Pacific Northwest Research Station, 2004. Western Forests, Fire Risk, and Climate Change, Pacific Northwest Research Station, Issue 6 January 2004. <http://www.fs.fed.us/pnw>.

Page-Dumroese, D.; Jurgensen, M.; Elliot, W.; Rice, T.; Nesser, J.; Collins, T.; Meurisse, R., 2000. Soil quality standards and guidelines for forest sustainability in northwestern North America. *Forest Ecology and Management* 138 (2000) 445-462.

Page-Dumroese, Deborah, 1993. Susceptibility of Volcanic Ash-Influenced Soil in Northern Idaho to Mechanical Compaction. USDA Forest Service Intermountain Research Station, Research Note INT-409. February, 1993.

Pederson, Gregory T., Lisa J. Graumlich, Daniel B. Fagre, Todd Kipfer, and Clint C. Muhlfeld 2009. A Century of Climate and Ecosystem Change in Western Montana: What do temperature trends portend? *Climatic Change* DOI 10.1007/s10584-009-9642-y 2009

Poehner, Hans O. and Anthony P. Farrell; 2008. Physiology and Climate Change. *Science*. 31 OCTOBER 2008

Powell, R. A., and W. J. Zielinski. 1994. Fisher. Pages 38-73 in L. F. Ruggiero, K. B. Aubry,

S.W. Buskirk, and W. J. Zielinski, editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine. USDA Forest Service, Rocky Mountain Forest and Range Experimental Station, Fort Collins, Colorado, USA.

Raley, C. M., E. C. Lofroth, R. L. Truex, J. S. Yaeger, and J. M. Higley. 2012. Habitat ecology of fishers in western North America: a new synthesis. Pages 231-254 in Aubry, K.B., W.J. Zielinski, M.G. Raphael, G. Proulx, and S.W. Buskirk, editors. *Biology and conservation of martens, sables, and fishers: a new synthesis*. Cornell University Press, Ithaca, NY, USA.

Reed, David H., , Julian J. O'Grady, Barry W. Brook, Jonathan D. Ballou, and Richard Frankham; 2003.

Estimates of minimum viable population sizes for vertebrates and factors influencing those estimates. *Biological Conservation* 113 (2003) 23-34

Reeves, Derrick; Page-Dumroese, Deborah; Coleman, Mark. 2011. Detrimental soil disturbance associated with timber harvest systems on National Forests in the Northern Region. Res. Pap.

RMRS-RP-89 Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 12 p.

Reynolds, R. T., R. T. Graham, M. H. Reiser, R. L. Bassett, P. L. Kennedy, D. A. Boyce, Jr., G. Goodwin, R. Smith, and E. L. Fischer. 1992. Management recommendations for the Northern goshawk in the southwestern United States. Rocky Mountain Forest and range Experiment Station and Southwest Region Forest Service. US Dept. of Agriculture, Gen. Tech. Rpt. RM-217.

Rhodes, Jonathan 2007. The Watershed Impacts Of Forest Treatments To Reduce Fuels And Modify Fire Behavior. Prepared for Pacific Rivers Council, P.O. Box 10798, Eugene, OR 97440. 541-345-0119. www.pacrivers.org. February, 2007.

Rhodes, Jon 2002. Bitterroot National Forest Burned Area Recovery Project Post-fire salvage logging field review: 8/20-22/2002. Jon Rhodes, Hydrologist, Center for Biological Diversity.

Ruediger, B., J. Claar, S. Gnaidek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehye, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada lynx conservation assessment and strategy. USDA Forest Service, USDI Fish and Wildlife Service, and USDI National Park Service. Forest Service Publication #R1-00-53. Missoula, MT. 142 pp.

Ruggiero LF, Hayward, G.D. and Squires, J.R., 1994a. Viability Analysis in Biological Evaluations: Concepts of Population Viability Analysis, Biological Population, and Ecological Scale. *Conservation Biology*, Vol. 8, No. 2, June 1994, pp. 364-372

Ruggiero, Leonard F.; 2007. Scientific Independence: A Key to Credibility. From ECO-Report 2007: Bitterroot Ecosystem Management Research Project, Rocky Mountain Research Station, 800 E. Beckwith St., Missoula, MT 59801.

Ruggiero, L.F., K.S. McKelvey, K.B. Aubry, J.P. Copeland, D.H. Pletscher, M.G. Hornocker. 2007. Wolverine

Conservation and Management. *Journal of Wildlife Management*, 71(7):2145- 2146.

Ruggiero, Leonard F., Keith B. Aubry, Steven W. Buskirk, L. Jack Lyon, and William J. Zielinski. 1994b. The Scientific Basis for Conserving Forest Carnivores in the Western United States: American Marten, Fisher, Lynx, and Wolverine. Pacific Southwest Research Station, USDA Forest Service. General Technical Report RM-254 September 1994.

Running, Steven W. 2006. Is Global Warming Causing More, Larger Wildfires? *Science Express*, 6 July 2006 (www.scienceexpress.org).

Sallabanks, R.; Bruce G. Marcot, Robert A. Riggs, Carolyn A. Mehl, & Edward B. Arnett, 2001. Wildlife of Eastside (Interior) Forests and Woodlands. Chapter 8 in *Wildlife-Habitat Relationships in Oregon and Washington*, 2001 by David H. Johnson and Thomas A. O'Neil (Managing Editors); Oregon State University Press, Corvallis, OR.

Sauder Joel D. and Janet L. Rachlow, 2014. Both forest composition and configuration influence landscape-scale habitat selection by fishers (*Pekania pennanti*) in mixed coniferous forests of the Northern Rocky Mountains. *Forest Ecology and Management* 314 (2014) 75-84

Sauder, Joel D. 2014. Landscape Ecology of Fishers (*Pekania Pennanti*) in North-Central Idaho. Ph.D Dissertation, University of Idaho.

Schultz, C. 2010. Challenges in connecting cumulative effects analysis to effective wildlife conservation planning. *BioScience* 60:545-551.

Schultz, C. A. 2012. The U.S. Forest Service's analysis of cumulative effects to wildlife: a study of legal standards, current practice, and ongoing challenges on a National Forest. *Environmental Impact Assessment Review* 32:74-81.

Schwartz, Charles C., Mark A. Haroldson, and Gary C. White, 2010. Hazards Affecting Grizzly Bear Survival in the Greater Yellowstone Ecosystem. *Journal of Wildlife Management* 74(4):654-667; 2010; DOI: 10.2193/2009-206.

Schwartz, Michael K., Nicholas J. DeCesare, Benjamin S. Jimenez, Jeffrey P. Copeland, Wayne

E. Melquist; 2013. Stand- and landscape-scale selection of large trees by fishers in the Rocky Mountains of Montana and Idaho. *Forest Ecology and Management* 305 (2013) 103-111

Sexton, Timothy O., 1998. Ecological Effects of Post-Wildfire Management Activities (Salvage- Logging and Grass-Seeding) on Vegetation Composition, Diversity, Biomass, and Growth and Survival of *Pinus ponderosa* and *Purshia tridentata*. Master's Thesis, Oregon State University, 1998.

Simard SW, Asay AK, Beiler KJ, Bingham MA, Deslippe JR, Xinhua H, Philip LJ, Song Y, Teste FP. 2015. Resource transfer between plants through ectomycorrhizal fungal networks. In: Horton TR, ed. *Mycorrhizal networks*. Berlin: Springer.

Simard SW, Martin K, Vyse A, Larson B. 2013. Meta-networks of fungi, fauna and flora as agents of complex adaptive systems. In: Puettmann K, Messier C, Coates K, eds. *Managing forests as complex adaptive systems: building resilience to the challenge of global change*. New York: Routledge, 133-164.

Six, Diana L., Eric Biber, and Elisabeth Long 2014. Management for Mountain Pine Beetle Outbreak Suppression: Does Relevant Science Support Current Policy?" *Forests* 2014, 5, 103- 133.

Solomon, S.D. et al., 2007: Technical Summary, in *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* 24, (Feb. 2, 2007).

Spiering, David J. and Richard L. Knight. 2005. Snag density and use by cavity-nesting birds in managed stands of the Black Hills National Forest. *Forest Ecology and Management* 214 (2005) 40-52.

Squires John R., Jeffrey P. Copeland, Todd J. Ulizio, Michael K. Schwartz, Leonard F. Ruggiero, 2007. Sources and Patterns of Wolverine Mortality in Western Montana. *Journal of Wildlife Management* 71(7):2213-2220; 2007.

Squires John R., 2009. Letter to Carly Walker of Missoula County Rural Initiatives. John R. Squires, Research Wildlife Biologist, USDA Forest Service Rocky Mountain Research Station, Forestry Sciences Laboratory, 800 E. Beckwith, Missoula, Montana 59801.

Squires John R., Nicholas J. Decesare, Jay A. Kolbe and Leonard F. Ruggiero 2010. Seasonal Resource Selection of Canada Lynx in Managed Forests of the Northern Rocky Mountains. *The Journal of Wildlife Management* Vol. 74, No. 8 (November 2010), pp. 1648-1660

Squires, J., L. Ruggiero, J. Kolbe, and N. DeCesare. 2006a. Lynx ecology in the Intermountain West: research program summary, summer 2006. USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana.

Squires, J., N. DeCesare, L. Olson, J. Kolbe, M. Hebblewhite, and S. Parks. 2013. Combining resource selection and movement behavior to predict corridors for Canada lynx at their southern range periphery. *Biological Conservation* 157:187-195.

Stephenson, N. L., A. J. Das, R. Condit, S. E. Russo, P. J. Baker, N. G. Beckman, D. A. Coomes,

E. R. Lines, W. K. Morris, N. Ruger, E. Alvarez, C. Blundo, S. Bunyavejchewin, G. Chuyong, S.

J. Davies, A. Duque, C. N. Ewango, O. Flores, J. F. Franklin, H. R. Grau, Z. Hao, M. E. Harmon,

S. P. Hubbell, D. Kenfack, Y. Lin, J.-R. Makana, A. Malizia, L. R. Malizia, R. J. Pabst, N. Pongpattananurak, S.-H. Su, I-F. Sun, S. Tan, D. Thomas, P. J. van Mantgem, X. Wang, S. K. Wiser & M. A. Zavala; 2014. Rate of tree carbon accumulation increases continuously with tree size. *Nature*. 2014.

Sullivan, Patrick J.; James M. Acheson; Paul L. Angermeier; Tony Faast; Jean Flemma; Cynthia

M. Jones; E. Eric Knudsen; Thomas J. Minello; David H. Secor; Robert Wunderlich; Brooke A. Zanetell; 2006. Defining and Implementing Best Available Science for Fisheries and Environmental Policy, and Management. American Fisheries Society, Bethesda, Maryland; Estuarine Research Federation, Port Republic, Maryland. September 2006

Sun, Ge and James M. Vose. 2016. Forest Management Challenges for Sustaining Water Resources in the Anthropocene. *Forests* 2016, 7, 68; doi:10.3390/f7030068

Suzanne Simard "Trees Communicate" webpage. <https://www.youtube.com/watch?v=-8SORM4dYG8&feature=youtu.be>

Thompson, Jonathan R. and Thomas A. Spies 2009. Vegetation and weather explain variation in crown damage within a large mixed-severity wildfire. *Forest Ecology and Management* 258 (2009) 1684-1694.

Traill, Lochran W., Barry W. Brook, Richard R. Frankham, Corey J.A. Bradshaw, 2010. Pragmatic population viability targets in a rapidly changing world. *Biological Conservation* 143 (2010) 28-34.

Troendle, C.A. and R.M. King. 1985. The effect of timber harvest on the fool creek watershed, 30 years later. *Water Resources Research*. 21(12):915-922.

Turner, David P., William K. Ferrell & Mark E. Harmon, 1997. Letter to the Editor, The Carbon Crop: Continued, 277 *Sci.* 1591, 1592 (Sept. 1997).

Turner, David P.; Greg J. Koerper; Mark E. Harmon; Jeffrey J. Lee; 1995. A Carbon Budget for the Forests of the Conterminous United States, 5:2 *Ecological Applications* 421 (1995).

US Fish and Wildlife Service, 1998. Consultation on effects to bull trout from continued implementation of USFS LRMPs and BLM RMPs, as amended by PACFISH and INFISH. USDI Fish and Wildlife Service, Regions 1 and 6.

USDA Forest Service, 1987a. Old Growth Habitat Characteristics and Management Guidelines. Kootenai National Forest, Forest Plan Appendix 17. USDA Forest Service Region One.

USDA Forest Service, 1987b. Appendix to "Old Growth Habitat Characteristics and Management Guidelines." Kootenai National Forest, Forest Plan Appendix 17. USDA Forest Service Region One.

USDA Forest Service, 1987c. Forest Plan Old-Growth Habitat Management Standards, Idaho Panhandle National Forests, USDA Forest Service Region One.

USDA Forest Service, 1987d. Old Growth Management, Idaho Panhandle National Forests, Forest Plan Appendix 27, USDA Forest Service Region One.

USDA Forest Service, 1990. Old-Growth Habitat and Associated Wildlife Species in the Northern Rocky Mountains. Warren, Nancy M. (ed.) USDA Northern Region.

USDA Forest Service, 1993. Wolverine habitat guidelines for the Malheur National Forest. Prepared by Richard Haines, Malheur National Forest; Reviewed by Robert Naney, USFS Region 6, June 1993.

USDA Forest Service 1994b. Savant Sage Final Environmental Impact Statement, Idaho Panhandle National Forests.

USDA Forest Service, 2000a. Environmental Effects of Postfire Logging: Literature Review and Annotated Bibliography. Gen. Tech. Rep. PNW-GTR-486. Wenatchee, WA: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

USDA Forest Service, 2000b. Expert interview summary for the Black Hills National Forest Land and Resource Management Plan Amendment. USDA Forest Service, Black Hills National Forest, Hwy 385 North - R.R. 2, Box 200 Custer, South Dakota 57730 (605-673-9200). October,

2000.

USDA Forest Service, 2001a. Silverbird Post-Fire Harvest Environmental Analysis. Salmon- Cobalt Ranger District, Salmon-Challis National Forest, May 2001.

USDA Forest Service, 2003a. Bristow Area Restoration Project Environmental Assessment, Kootenai National Forest.

USDA Forest Service, 2004a. Logan Creek Ecosystem Restoration Project Final Environmental Impact Statement. Flathead National Forest.

USDA Forest Service, 2005b. Middle East Fork Hazardous Fuel Reduction Draft Environmental Impact Statement. Bitterroot National Forest.

USDA Forest Service, 2005d. American and Crooked River Project Final Environmental Impact Statement, Nez Perce National Forest.

USDA Forest Service, 2007. Trego DN, Responses to Comments, Fortine Ranger District, Kootenai National

Forest, February 2007.

USDA Forest Service, 2007c. Myrtle Creek Healthy Forests Restoration Act Project Final Environmental Impact Statement. Soil Resources. March 2007. Bonners Ferry Ranger District, Idaho Panhandle National Forests

USDA Forest Service, 2008a. Young Dodge Draft Environmental Impact Statement, Rexford Ranger District, USDA Forest Service, Kootenai National Forest, February 2008

USDA Forest Service, 2008b. Young Dodge FEIS/ Responses to Comments-Soils. Rexford Ranger District, USDA Forest Service, Kootenai National Forest, April 2008

USDA Forest Service, 2008f. Gold Crown Fuels Reduction Project Soil Specialists' Report: Past Disturbance and Probable Impacts. Prepared by: Mark Vander Meer & Tricia Burgoyne, Soil Scientists, USDA Forest Service.

USDA Forest Service, 2009a. Lakeview-Reeder Fuels Reduction Project Draft Environmental Impact Statement, Priest Lake Ranger District, Idaho Panhandle National Forests.

USDA Forest Service, 2009c. Excerpt from Lakeview-Reeder Fuels Reduction Project Draft Environmental Impact Statement. Priest Lake Ranger District, Idaho Panhandle National Forests. January 2009.

USDA Forest Service, 2011c. Griffin Creek Resource Management Project Environmental Assessment. Tally Lake Ranger District, Flathead National Forest, December 2011.

USDA Forest Service, 2012a. Doc Denny Vegetation Management Project Environmental Assessment, Salmon River Ranger District, Nez Perce National Forest, August 2012

USDA Forest Service, 2012d. Travel Management, Implementation of 36 CFR, Part 202, Subpart A (36 CFR 212.5(b)). Memorandum to Regional Foresters, Station Directors, Area Director, IITF Director, Deputy Chiefs and WO Directors. March 29, 2012

USDA Forest Service, 2013a. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Reports 2010 and 2011. March 2013.

USDA Forest Service, 2013b. Travel Management Implementation. Memorandum to Regional Foresters, Station Directors, Area Director, IITF Director, Deputy Chiefs and WO Directors.

December 17, 2013.

USDA Forest Service, 2014a. Como Forest Health Project Draft Environmental Impact Statement, Darby Ranger District, Bitterroot National Forest, August 2014.

USDA Forest Service, 2015a. Deer Creek Soil Resource Report. Prepared by: Chandra Neils, Forest Soil Scientist for: Bonners Ferry Ranger District, Idaho Panhandle National Forests, August 2015.

USDA Forest Service, 2016a. Categorical Exclusion Worksheet: Resource Considerations-Soils. Smith Shields Forest Health Project, Yellowstone Ranger District, Custer Gallatin National Forest.

Van der Werf, G. R.; D. C. Morton, R. S. DeFries, J. G. J. Olivier, P. S. Kasibhatla, R. B. Jackson, G. J. Collatz and J. T. Randerson; 2009. CO₂ emissions from forest loss. *Nature Geoscience* vol. 2, November 2009.

Vizcarra, Natasha 2017. Woodpecker Woes: The Right Tree Can Be Hard to Find. *Science Findings*, USDA Forest Service, Pacific Northwest Research Station, Issue 199, August 2017.

Vose, James M. David L. Peterson, and Toral Patel-Weynand (Eds.), 2012. *Effects of Climatic Variability and Change on Forest Ecosystems: A Comprehensive Science Synthesis for the U.S. Forest Sector*. United States Department of Agriculture, Forest Service Pacific Northwest Research Station General Technical Report PNW-GTR-870, December 2012.

Wasserman, Tzeidle N.; Cushman, Samuel A.; Wallin, David O.; Hayden, Jim. 2012. Multi scale habitat relationships of *Martes americana* in northern Idaho, U.S.A. Res. Pap. RMRS-RP-

94. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 21 p.

Weir, Richard D. and Fraser B. Corbould 2010. Factors Affecting Landscape Occupancy by Fishers in North-Central British Columbia. *The Journal of Wildlife Management*, Vol. 74, No. 3 (April 2010), pp. 405-410

Westerling, A. L., H. G. Hidalgo, D. R. Cayan, T. W. Swetnam; 2006. Warming and Earlier Spring Increases Western U.S. Forest Wildfire Activity. *Science Express*, Research Article, July 6, 2006, www.sciencexpress.org.

Williams, A. Park, Craig D. Allen, Alison K. Macalady, Daniel Griffin, Connie A. Woodhouse, David M. Meko, Thomas W. Swetnam, Sara A. Rauscher, Richard Seager, Henri D. Grissino- Mayer, Jeffrey S. Dean, Edward R. Cook, Chandana Gangodagamage, Michael Cai and Nate G. McDowell; 2012. Temperature as a potent driver of regional forest drought stress and tree mortality. *Nature Climate Change*, PUBLISHED ONLINE: 30 SEPTEMBER 2012 | DOI: 10.1038/NCLIMATE1693

Williamson, J.R. and W.A. Neilsen. 2000. The influence of forest site and rate and extent of soil compaction and profile disturbance of skid trails during ground-based harvesting. *Can. J. For. Res.* 30:119

Wisdom, Michael J.; Richard S. Holthausen; Barbara C. Wales; Christina D. Hargis; Victoria A. Saab; Danny C. Lee; Wendel J. Hann; Terrell D. Rich; Mary M. Rowland; Wally J. Murphy; and Michelle R. Eames. 2000. Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-Scale Trends and Management Implications. General Technical Report PNW-GTR-485 United States Department of Agriculture Forest Service Pacific Northwest Research Station United States Department of the Interior Bureau of Land Management General Technical Report PNW-GTR-485. May 2000

Witmer, Gary W.; Martin, Sandra K.; Sayler, Rodney D. 1998. Forest Carnivore Conservation and Management in the Interior Columbia Basin: Issues and Environmental Correlates. Gen. Tech. Rep. PNW-GTR-420. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p. (Quigley, Thomas M., ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

Woodbridge, B. and C.D. Hargis, 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

Woodbury, Peter B., James E. Smith & Linda S. Heath, 2007. Carbon sequestration in the U.S. forest sector from 1990 to 2010, 241 *Forest Ecology and Management* 14, 24 (2007).

Wright, Vita, Sallie J. Hejl, and Richard L. Hutto, 1997. Conservation Implications of a Multi- scale Study of Flammulated Owl (*Otus flammeolus*) Habitat Use in the Northern Rocky Mountains, USA. From Duncan, J.R., Johnson, D.H., Nicholls, T.H. Eds. 1997. Biology and conservation of owls of the Northern Hemisphere: 2d International symposium; 1997 February 5-9; Winnipeg, Manitoba Gen. Tech. Rep. NC-190. St. Paul, MN: USDA Forest Service, North Central Research Station 635 p.

Yanishevsky, Rosalind M., 1994. Old-Growth Overview: Fragmented Management of Fragmented Habitat. Pp. 7-36 in Rocky Mountain Challenge: Fulfilling a New Mission in the

U.S. Forest Service. Association of Forest Service Employees For Environmental Ethics, P.O. Box 11615, Eugene, Oregon 97440, February, 1994.

September 9, 2019

Sandpoint Ranger Station

Attn: Michelle Norton

1602 Ontario Street

Sandpoint, ID 83864

Comments transmitted via email to: michelle.norton@usda.gov. Please acknowledge timely receipt.

Ms. Norton;

These are comments on the Scoping Notice for the Buckskin Saddle Integrated Restoration Project proposal, on behalf of Alliance for the Wild Rockies (AWR).

Several aspects of the Buckskin Saddle Integrated Restoration Project (Buckskin Saddle) proposal raise questions of significant and cumulative effects, necessitating the preparation of an Environmental Impact Statement under the National Environmental Policy Act (NEPA). The massive logging and road construction proposed, including thousands of acres of clearcut-type logging would not be "insignificant" under any definition, nor without cumulative effects. The proposal would also adversely affect the roadless characteristics and wilderness potential of roadless area. And there are so many "purposes" claimed for the project, and serving them all will create significant conflicts.

The Buckskin Saddle project would implement the 2015 revised Forest Plan. In carrying out its mission, AWR has participated in the public processes concerning management of the Idaho Panhandle National Forests (IPNF) since the early days of original 1987 Forest Plan implementation, and has taken legal action a few times to force the Forest Service (FS) to manage in conformance with environmental laws such as the Endangered Species Act (ESA), the National Forest Management Act (NFMA), and the National Environmental Policy Act (NEPA). AWR also participated fully in the public process as the FS developed its revised Forest Plan, including commenting at every stage and submitting a formal objection. And because the FS provided essentially no relief in response to the formal objection, AWR incorporates the documentation of public participation in the revised Forest Plan public process within these comments on the Buckskin Saddle proposal. By implementing the revised Forest Plan with this project, the FS would be operating outside of environmental laws and regulations.

AWR participated in the public process during the development of the Access Amendments, and we incorporate AWR's comments and appeal of that Decision within these comments. AWR also participated during the public process as the Northern Rockies Lynx Management Direction (NRLMD) was developed, and continues to believe that the Forest Plan/NRLMD does not consider the best available science. AWR incorporates the documentation of its participation in the NRLMD public process within this comment on the Buckskin Saddle proposal.

Necessary Elements for Project analysis:

[middot] Disclose all IPNF Forest Plan direction for logging/burning projects and explain how the project complies with them;

[middot] Explain how the project will comply with forest plan big game hiding cover requirements;

[middot] Disclose the location and acreages of past, current, and reasonably foreseeable logging, grazing, and roadbuilding activities within the project area;

[middot] Solicit and disclose comments from the Idaho Department of Fish and Game regarding the impact of the project on wildlife habitat;

[middot] Solicit and disclose comments from the Idaho Department of Environmental Quality regarding the impact of the project on water quality;

[middot] Disclose the biological assessment for the candidate, threatened, or endangered species with potential and/or actual habitat in the project area;

[middot] Disclose the biological evaluation for the sensitive and management indicator species (MIS) with potential and/or actual habitat in the project area;

[middot] Disclose the snag densities in the project area, and the method used to determine those densities;

[middot] Disclose the current, during-project, and post-project road densities in the project area;

[middot] Disclose the IPNF's record of compliance with state best management practices regarding stream sedimentation from ground-disturbing management activities;

[middot] Disclose the IPNF's record of compliance with its monitoring requirements as set forth in its 1987 and revised forest plans;

[middot] Disclose the IPNF's record of compliance with the additional monitoring requirements set forth in previous DN/FONSIs and RODs on the IPNF;

[middot] Disclose the results of the field surveys for threatened, endangered, sensitive, and rare plants in each of the proposed units;

[middot] Formally consult with the U.S. Fish and Wildlife Service (USFWS) on the impacts of this project on candidate, threatened, or endangered wildlife, fish, and plant species;

Also please address the following questions and issues:

[middot] Will this project exacerbate existing noxious weed infestations and start new infestations?

[middot] Do unlogged old growth forest store more carbon than the wood products that would be removed from the same forest in a logging operation?

[middot] What is the cumulative effect of national forest logging on U.S. carbon stores? How many acres of national forest lands are logged every year? How much carbon is lost by that logging?

[middot] Please list each visual quality standard that applies to each unit and disclose whether each unit meets its respective visual quality standard. A failure to comply with visual quality Forest Plan standards violates NFMA.

[middot] For the visual quality standard analysis please define "ground vegetation," i.e. what age are the trees, "re-establishes," "short-term," "longer term," and "revegetate."

[middot] Please disclose whether you have conducted surveys in the project area for this project for all threatened, endangered, sensitive and management indicator species (MIS).

[middot] Please disclose how often the project area has been surveyed for all MIS, sensitive, threatened, and endangered species suspected to inhabit the project area.

[middot] Would the habitat be better for all MIS, sensitive, threatened, and endangered species if roads were removed in the project area?

[middot] What is the USFWS position on the impacts of this project on all candidate, threatened, and endangered species?

[middot] Have you conducted ESA consultation?

[middot] Please provide us with the full Biological Evaluations/Assessments for the all threatened, endangered, sensitive, and MIS species.

[middot] What is wrong with uniform forest conditions?

[middot] Have insects and tree diseases contributed to a diverse landscape?

[middot] Disclose the level of current noxious weed infestations in the project area and the cause of those infestations;

[middot] Disclose the impact of the project on noxious weed infestations and native plant communities;

[middot] Disclose the amount of detrimental soil disturbance that currently exists in each proposed unit from previous logging and livestock grazing activities;

[middot] Disclose the expected amount of detrimental soil disturbance in each unit after ground disturbance and prior to any proposed mitigation/remediation;

[middot] Disclose the expected amount of detrimental soil disturbance in each unit after proposed mitigation/remediation;

[middot] Disclose the analytical data that supports proposed soil mitigation/remediation measures;

[middot] Disclose the timeline for implementation;

[middot] How do you define a healthy forest¹?

[middot] Disclose the funding source for non-commercial activities proposed.

[middot] Disclose the current level of old growth forest in each third order drainage in the project area;

[middot] Disclose the method used to quantify old growth forest acreages and its rate of error based upon field review of its predictions;

[middot] Disclose the historic levels of mature and old growth forest in the project area;

[middot] Disclose the level of mature and old growth forest necessary to sustain viable populations of old-growth associated wildlife species in the area;

[middot] Disclose the amount of mature and old growth forest that will remain after implementation;

1 The Scoping Notice states, "The area is experiencing declining forest health, based on annual forest health surveys[hellip]"

[middot] Disclose the amount of current habitat for old growth and mature forest dependent species in the project area;

[middot] Disclose the amount of habitat for old growth and mature forest dependent species that will remain after project implementation;

[middot] Disclose the method used to model old growth and mature forest dependent wildlife habitat acreages and its rate of error based upon field review of its predictions;

[middot] Disclose the amount of big game (moose and elk) hiding cover, winter range, and security currently available in the area;

[middot] Disclose the amount of big game (moose and elk) hiding cover, winter range, and security during project implementation;

[middot] Disclose the amount of big game (moose and elk) hiding cover, winter range, and security after project implementation;

[middot] Disclose the method used to determine big game hiding cover, winter range, and security, and its rate of error as determined by field review;

[middot] Disclose and address the concerns expressed by the Planning Team in the draft Five-Year Review of the Forest Plan regarding the failure to monitor population trends of MIS, the inadequacy of the Forest Plan old growth standard, and the failure to compile data to establish a reliable inventory of sensitive species on the Forest;

[middot] Disclose the actions being taken to reduce fuels on private lands adjacent to the project area and how those activities/or lack thereof will impact the efficacy of the activities proposed for this project;

[middot] Disclose the efficacy of the proposed activities at reducing wildfire risk and severity in the project area in the future, including a two-year, five-year, ten-year, and 20-year projection;

[middot] Disclose when and how the IPNF made the decision to suppress natural wildfire in the project area and replace natural fire with logging and prescribed burning;

[middot] Disclose the cumulative impacts on the Forest-wide level of the IPNF policy decision to replace natural fire with logging and prescribed burning;

[middot] Disclose how Project complies with the Idaho Roadless Rule;

[middot] Disclose the impact of climate change on the efficacy of the proposed treatments;

[middot] Disclose the impact of the proposed project on the carbon storage potential of the area;

[middot] Disclose the baseline condition, and expected sedimentation during and after activities, for all streams in the area;

[middot] Disclose maps of the area that show the following elements:

1. Past, current, and reasonably foreseeable logging units in the project area;
2. Past, current, and reasonably foreseeable livestock grazing allotments in the project area;
3. Density of human residences within 1.5 miles from the project unit boundaries;
4. Hiding cover in the project area according to the Forest Plan definition;
5. Old growth forest in the project area;
6. Big game security areas;
7. Moose winter range.

The Scoping Notice makes a preliminary determination that the impacts of this proposal will be documented in an

Environmental Assessment. We believe that use of an EA is only appropriate in the context of a national forest being managed in accordance to its forest plan, NFMA, and best available science, and also in the context of a detailed narrative of the project area evaluating management performance of past FS actions. Please disclose the best available science the FS is relying upon to support the Buckskin Saddle proposed action.

Using the EA process means the FS would not be required to provide written responses to public comments, rendering the notion of public involvement rather meaningless. We believe the FS is obligated to prepare an EIS, and provide written responses to all comments at every stage.

Project activities and their environmental impacts will extend beyond the mapped project area boundary shown on the map, and the FS is obligated to acknowledge and disclose those impacts. The FS should utilize an analysis area formed by the watershed boundaries encompassing all the logging and any other proposed active management.

It is vital that the results of past monitoring be incorporated into this project analysis and planning. We request the following be disclosed:

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

Please provide an analysis of how well those past FS projects met the goals, objectives, desired conditions, etc. stated in the corresponding NEPA documents, and how well the projects conformed to forest plan standards and guidelines.

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

The Forest Plan revision process itself violated NEPA and NFMA and failed to utilize the best available science. Implementing actions under the Forest Plan would be significant. Therefore these comments identify legal deficiencies of the Forest Plan as well as the project proposal.

Please provide an analysis to determine if implementation of past management activities contributed to the claimed deficiency in resiliency.

The FS's "desired conditions" rationale is inconsistent with a more holistic ecosystem management approach, which acknowledges the forest's capability of operating in a self-regulatory manner. For example, 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.

[hellip]Pests are a part of even the healthiest eastside ecosystems. Pest roles[mdash]such as the removal of poorly adapted individuals, accelerated decomposition, and reduced stand density[mdash]may be critical to rapid ecosystem adjustment.

[hellip]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. (Emphasis added.)

Would the above statement[mdash]made by government scientists as part of their participation with the Interior Columbia Basin Ecosystem Management Project[mdash]be automatically rejected from consideration as Best Available Science for the Buckskin Saddle process, because it is inconsistent with the assumptions contained in the Scoping Notice?

The EIS must demonstrate consistency with all the applicable direction in the Forest Plan to comply with NEPA and NFMA.

The Forest Plan exhibits a relative absence of explicit reference to the 1982 planning rule. The Forest Plan is inconsistent with the regulations written to guide planning under NFMA.

Many Forest Plan Objectives are not linked with Forest Plan Goals, as required.

The use of the word "should" in Forest Plan Standards and Guidelines allows land managers to have too much or undefined levels of discretion.

"Short term" and "long term" are not adequately defined in the Forest Plan.

The Forest Plan relies upon static Desired Conditions (DCs) to direct active management on the IPNF. The philosophy driving the FS strategy to "move toward" and replicate historic vegetative conditions (basically, replace natural processes with logging and prescribed burning) is that emulation of the results of disturbance processes would conserve biological diversity. McRae et al. 2001 provide a scientific review summarizing empirical evidence that finds marked contrasts

between the results of logging and wildfire. A plethora of scientific evidence directs that DCs be more properly stated in terms of desired future dynamics, in line with 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 much other support for such an approach in the scientific literature. Noss 2001, for example, believes "If the thoughtfully identified critical components and processes of an ecosystem are sustained, there is a high probability that the ecosystem as a whole is sustained." (Emphasis added.)

Noss 2001 describes basic ecosystem components:

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

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

Composition includes the kinds of species present in an ecosystem and their relative abundances, as well as the composition of plant associations, floras and faunas, and habitats at broader scales. We might describe the

composition of a forest, from individual stands to watersheds and regions.

Structure is the architecture of the forest, which includes the vertical layering and shape of vegetation and its horizontal patchiness at several scales, from within stands (e.g., treefall gaps) to landscape patterns at coarser scales. Structure also includes the presence and abundance of such distinct structural elements as snags (standing dead trees) and downed logs in various size and decay classes.

Function refers to the ecological processes that characterize the ecosystem. These processes are both biotic and abiotic, and include decomposition, nutrient cycling, disturbance, succession, seed dispersal, herbivory, predation, parasitism, pollination, and many others. Evolutionary processes, including mutation, gene flow, and natural selection, are also in the functional category.

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

Fire is such an important creator of the ecological variety in Rocky Mountain landscapes that the conservation of biological diversity (required by NFMA) is likely to be accomplished only through the conservation of fire as a process[hellip]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. (Emphases 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. [hellip]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. [hellip] 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). (Emphases added.)

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

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

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

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

Typically, vegetation management proposals and their accompanying NEPA documents on the IPNF acknowledge that attempts to control or resist the natural process of fire have been a contributor to deviations from DCs. This Buckskin Saddle proposal is no exception. Often these same documents characterize fire as well as native insects and other natural pathogens as threats to the ecosystem rather than rejuvenating natural processes. They seem to need such an obsolete viewpoint in order to justify and prioritize the proposed vegetation manipulations, tacitly for replacing natural processes with "treatments" and "prescriptions." However the scientific support for assuming that large landscapes and ecosystems can be restored or continuously maintained by such manipulative actions is entirely lacking.

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. "[hellip]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 "[hellip]capacity for self-repair when perturbed is preserved, and minimal external support for management is needed."

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

The Forest Plan desired ranges for dominance groups are not supported by reliable historic data taken from IPNF surveys or scientific research. Also, the FS has not explained how the effects of climate change and white pine blister rust affect the attainability of those desired ranges.

The Forest Plan desired ranges for Size Class are not supported by reliable historic data taken from IPNF surveys or scientific research. And the FS has not explained how the effects of climate change and white pine blister rust affect the attainability of those desired ranges.

In FW-DC-VEG-03 the term "substantial amounts" is not defined. The desired "greater increase" related to the identified tree species is not supported by citation to specific reliable historic data taken from IPNF surveys or scientific research. The FS has not explained how the effects of climate change and white pine blister rust affect the attainability of those increases.

In FW-DC-VEG-04 the implication that trees are generally too dense on the IPNF is not supported by specific reliable historic data gathered from IPNF surveys or scientific research.

In FW-DC-VEG-05 the desired increase in size of forest patches in the seedling and sapling size classes and decreases in size of forest patches in the small and medium size classes is not supported by specific reliable historic data gathered from IPNF surveys or scientific research.

In FW-DC-VEG-06 the implied assertion that root fungi and forest insects are causing too much tree mortality on the IPNF is not supported by specific reliable historic data gathered from IPNF surveys or scientific research.

In FW-DC-VEG-07 the desired ranges for snags are not supported by reliable historic data taken from IPNF surveys or scientific research. The scientific basis for the delineation of snags into two diameter groups using 20" d.b.h. as the division point is not established.

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).

The implications are that managers know little about how many snags per acre are needed to sustain populations of cavity nesting species. Only the birds themselves have the ability to decide if a tree is suitable for excavating. The FS and Forest Plan fails to recognize this scientific finding.

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. The authors state:

"Many species of birds are dependent on snags for nest sites, including 85 species of cavity-nesting birds in North America (Scott et al. 1977). Therefore, information of how many and what types of snags are required by cavity-nesting bird species is critical for wildlife biologists, silviculturists, and forest managers."

"Researchers across many forest types have found that cavity-nesting birds utilize snags with large DBH and tall height for nest trees (Scott, 1978; Cunningham et al., 1980; Mannan et al., 1980; Raphael and White, 1984; Reynolds et al., 1985; Zarnowitz and Manuwal, 1985; Schreiber and deCalesta, 1992)."

Spiering and Knight (2005) found the following.

Larger DBH and greater snag height were positively associated with the presence of a cavity, and advanced

stages of decay and the presence of a broken top were negatively associated with the presence of a cavity. Snags in larger DBH size classes had more evidence of foraging than expected based on abundance.

Percent bark cover had little influence on the presence of a cavity. Therefore, larger and taller snags that are not heavily decayed are the most likely locations for cavity-nesting birds to excavate cavities.

The association of larger DBH and greater height of snags with cavities is consistent with other studies (Scott, 1978; Cunningham et al., 1980; Mannan et al., 1980; Raphael and White, 1984; Reynolds et al., 1985; Zarnowitz and Manuwal, 1985; Schreiber and deCalesta, 1992).

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

size class increased and the significant goodness-of-fit test indicate that large snags are the most important for foraging."

Please disclose the cumulative snag loss in areas previously logged or subject to other causes of snag loss.

In FW-DC-VEG-11 the desired ranges for forest composition, structure, and pattern for each biophysical setting are not supported by reliable historic data taken from IPNF surveys or scientific research. The Forest Plan does not explained how the effects of climate change and white pine blister rust affect the attainability of those desired ranges.

Standard FW-STD-VEG-01 allows active mechanical treatments in old growth but ignores scientific information that such active management is the very antithesis of old growth. The Forest Plan cites no scientific research or monitoring results from the IPNF that demonstrate management manipulations will create net ecological benefit rather than harm old growth and old-growth associated wildlife.

The IPNF's recent Halfway Malin EA states, "there are currently an estimated 11.8 percent of forested lands allocated as old growth on the Idaho Panhandle National Forests[hellip]" Is the inventory of "allocated old growth" on the IPNF maintained for public review? Also, that statement refers to "allocated" old growth, but how much actually meets the IPNF's old-growth criteria?

Please provide an estimate of how much old growth in the project area has been destroyed by logging. What is the HRV for old growth forestwide?

How many FIA plots (locations in the project area) show the plot is old growth?

Please disclose the natural historic range vs. current conditions regarding patch size, edge effect, and amount of interior forest old growth in the project area and forestwide.

Has the FS compared all stands proposed for logging to old growth criteria? Did the FS consider retaining such stands to be as best-closest to old-growth conditions, recruitment to compensate for deficits compared to the historic range?

USDA Forest Service, 1990 uses an index of the "Number of potential nesting trees >30" dbh per acre" for the pileated woodpecker, and McClelland and McClelland (1999) found similar results in their study in northwest Montana, with the average nest tree being 73 cm. (almost 29") dbh." Given this highly specialized habitat need of the pileated woodpecker, how does the FS insure that species' viability without any quantitative direction in Forest Plan for trees of that size? Because the Forest Plan omitted adoption of old growth MIS, the FS has no viability strategy. The 1987 Kootenai National Forest Plan states that "(U)nits of 50-100 acres are the smallest acceptable size in view of the nesting needs of pileated woodpeckers[hellip] (McClelland, 1979)," and that "managing for a minimum size of 50 acres will preclude the existence of species which have larger territory requirements."

The Scoping Notice states, "The proposed vegetation treatments occur in some old growth stands and within some recruitment potential old growth" This is another erratic characteristic of the Forest Plan; although the Glossary mentions some "goal" of meeting the old growth definition in the future, the Forest Plan actually contains no such goal. Does the IPNF have an inventory of forestwide and project area "recruitment potential old growth?" If so, please display these areas on a map and provide links on the Forest website to the forestwide spreadsheet of stands which are designated or otherwise considered to be "recruitment potential old growth."

Please disclose the best available science the IPNF uses to manage recruitment potential old growth stands.

What exactly is accomplished by identifying forest stands suitable for future old growth? How does the IPNF maintain such a commitment to the future, if indeed such a commitment is being documented or followed at all? In other words, how can the public monitor the agency's commitment to these old-growth "goals" or desired conditions, or whatever?

Please disclose the wildlife species the IPNF considers to be strongly associated with old growth, which must be a meaningful relationship.

The IPNF's 1987 Forest Plan included standards for protection of old growth and associated wildlife (USDA Forest Service 1987c). 1987 Forest Plan Appendix 27 (USDA Forest Service, 1987d) provided other direction and biological information concerning old growth and old-growth associated wildlife species. Please explained what it is about the IPNF's 1987 Forest Plan's old growth standards, and its Appendix 27 which is inconsistent with the best available science.

Likewise the adjacent Kootenai National Forest's 1987 Forest Plan included standards for protection of old growth and associated wildlife, along with Appendix 17 (USDA Forest Service 1987a, USDA Forest Service 1987b). Please explained what it is about the KNF's 1987 Forest

Plan old growth standards and its Forest Plan Appendix 17 which is inconsistent with the best available science.

After forest plan revision the IPNF has greatly weakened protections for old growth, and in fact the Forest Plan provides direction for logging old growth that lacks scientific support. We incorporate USDA Forest Service, 1987a as well as USDA Forest Service, 1987b which contains a list of "species [hellip](which) find optimum habitat in the "old" successional stage[hellip]" We also incorporate the KNF document ("Old Growth validation") which 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 1987a, and USDA Forest Service 1987b also provides biological information concerning old growth and old-growth associated wildlife species.

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

The 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) Old growth is typically distinguished from younger growth by several of the following attributes:

1. Large trees for species and site.
2. Wide variation in tree sizes and spacing.
3. Accumulations of large-size dead standing and fallen trees that are high relative to earlier stages.
4. Decadence in the form of broken or deformed tops or bole and root decay.
5. Multiple canopy layers
6. Canopy gaps and understory patchiness.

Green et al., 1992 also recognize that "Rates of change in composition and structure are slow relative to younger forests."

In preparing and adopting Green et al. 1992 old-growth guidelines, the FS did not use an independent scientific peer review process, as discussed by Yanishevsky, 1994:

As a result of Washington Office directives, Region 1 established an Old-Growth Committee. In April 1992, Region 1 issued a document entitled "Old-Growth Forest Types of the Northern Region," which presented Old-Growth Screening Criteria for specific zones on Western Montana, Eastern Montana, and North Idaho (U.S.D.A. Forest Service 1992). This was an attempt to standardize criteria for classifying the variety of old-growth types across the Region. [hellip]The committee, however, executed this task without the benefit of outside scientific peer review or public input, either during or after the process (Yanishevsky 1990, Shultz 1992b). Moreover, the methodology used by the committee was unscientific and did not even include gathering field data to verify the characteristics of

old-growth stands as a basis for the definition (id.). A former member of the Region 1 Old-Growth Committee described a "definition process" that relied heavily upon the Committee members' pre-conceived notions of the quantifiable characteristics of old-growth forests (Schultz 1992b).

The old-growth definition in its present state, without field verification of assumptions, and without addressing the issue of quality, is inadequate to scientifically describe, define, delineate, or inventory old-growth ecosystems.

(id.) Not only did the Committee fail to obtain new field data on old-growth forest characteristics, it failed even to use existing field data on old-growth definition and classification previously collected for Region 1 (Pfister 1987). Quality of old growth was not addressed during the definition process. The Committee did not take into account the legacy of logging that has already destroyed much of the best old growth. This approach skewed the characteristics that describe old-growth forests toward poorer remaining examples. [hellip]It's premature for the Forest Service to base management decisions with long- term environmental effects on its Region 1 old-growth criteria, until these criteria are validated by the larger scientific community.

Yanishevsky (1994) also points out the scientific inadequacy of maintaining merely "minimum" amounts of old-growth habitat and its components such as snags.

It appears the agency wants to make the definition of old growth to be a simplistic numbers and database analysis game, devoid of biologically vital data gathered in the field which might document what is unique about old growth[mdash]not just a few large trees left over after logging, but decadence, rot, snags, down logs, patchy irregular canopy layers[mdash]things that can't be created by the agency's version of "restoration" and which would be depleted by such management actions.

Please disclose the natural historic range vs. current conditions regarding patch size, edge effect, and amount of interior forest old growth in the IPNF.

Please provide an analysis for the Forest Plan MIS "Landbird Assemblage." Please disclose the specific habitat needs of all of these bird species, and analyze cumulative impacts.

The FS is obligated to consider best available science. AWR's Objection to the Forest Plan notes that the scientific basis for its standards, guidelines, and other components/direction is not well established. Consequently if the Buckskin Saddle project is tiered to the Forest Plan, which is obviously must, then in order to consider best available science the FS must finally explain what

science it has considered for all forest plan components/direction. Also, please disclose how this consideration played out in Forest Plan structure and how does it play out in project design?

Western (boreal) toad

Please disclose the FS's strategy and best available science for insuring viable populations of the boreal toad. USDA Forest Service, 2003a states:

Little quantitative data are available regarding the boreal toad's use of upland and forested habitats. However, boreal toads are known to migrate between the aquatic breeding and terrestrial nonbreeding habitats (TNC Database 1999), and that juvenile and adult toads are capable of moving over 5 km between breeding sites (Corn et al. 1998). It is thought than juveniles and female boreal toads travel farther than the males (Ibid). A study

on the Targhee National Forest (Bartelt and Peterson 1994) found female toads traveled up to 2.5 kilometers away from water after breeding, and in foraging areas, the movements of toads were significantly influenced by the distribution of shrub cover. Their data suggests that toads may have avoided macro-habitats with little or no canopy and shrub cover (such as clearcuts). Underground burrows in winter and debris were important components of toad selected micro-sites in a variety of macro-habitats. The boreal toad digs its own burrow in loose soil or uses those of small mammals, or shelters under logs or rocks, suggesting the importance of coarse woody debris on the forest floor. [hellip](T)imber harvest and prescribed burning activities could impact upland habitat by removing shrub cover, down woody material, and/or through compaction of soil.

Montana Fish, Wildlife & Parks, 2005 (a more recent version of the above cite "TNC Database, 1999") also discuss boreal toad habitat:

Habitats used by boreal toads in Montana are similar to those reported for other regions, and include low elevation beaver ponds, reservoirs, streams, marshes, lake shores, potholes, wet meadows, and marshes, to high elevation ponds, fens, and tarns at or near treeline (Rodgers and Jellison 1942, Brunson and Demaree 1951, Miller 1978, Marnell 1997, Werner et al. 1998, Boundy 2001). Forest cover in or near encounter sites is often unreported, but toads have been noted in open-canopy ponderosa pine woodlands and closed-canopy dry conifer forest in Sanders County (Boundy 2001), willow wetland thickets and aspen stands bordering Engelmann spruce stands in Beaverhead County (Jean et al. 2002), and mixed ponderosa pine/cottonwood/willow sites or Douglas-fir/ponderosa pine forest in Ravalli and Missoula counties (P. Hendricks personal observation).

Elsewhere the boreal toad is known to utilize a wide variety of habitats, including desert springs and streams, meadows and woodlands, mountain wetlands, beaver ponds, marshes, ditches, and backwater channels of rivers where they prefer shallow areas with mud bottoms (Nussbaum et al. 1983, Baxter and Stone 1985, Russell and Bauer 1993, Koch and Peterson 1995, Hammerson 1999). Forest cover around occupied montane wetlands may include aspen, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir; in local situations it may also be found in ponderosa pine forest. They also occur in urban settings, sometimes congregating under streetlights at night to feed on insects (Hammerson 1999, P. Hendricks personal observation). Normally they remain fairly close to ponds, lakes, reservoirs, and slow-moving rivers and streams during the day, but may range widely at night. Eggs and larvae develop in still, shallow areas of ponds, lakes, or reservoirs or in pools of slow-moving streams, often where there is sparse emergent vegetation. Adult and juvenile boreal toads dig burrows in loose soil or use burrows of small mammals, or occupy shallow shelters under logs or rocks. At least some toads hibernate in terrestrial burrows or cavities, apparently where conditions prevent freezing (Nussbaum et al. 1983, Koch and Peterson 1995, Hammerson 1999).

Maxell et al., 1998 state:

We believe that the status of the Boreal toad is largely uncertain in all Region 1 Forests.

[hellip]Briefly, factors which are a cause for concern over the viability of the species throughout Region 1 include: (1) a higher degree of genetic similarity within the range of Region 1 Forests relative to southern or coastal populations; (2) a general lack of both historical and current knowledge of status in the region; (3) indications of declines in areas which do have historical information; (4) low (5-10%) occupancy of seemingly suitable habitat as detected in recent surveys; (5) some evidence for recent restriction of breeding to low elevation sites and; (6) recent crashes in boreal toad populations in the southern part of its range which may indicate the species'

sensitivity to a variety of anthropogenic impacts.

Fisher

Please disclose the FS's strategy and best available science for insuring viable populations of the fisher. Please conduct a scientifically-based analysis on the spatial and structural requirements for fisher survival and successful reproduction. There is no sound, scientifically-based analysis for the Forest Plan or entire IPNF comparing forestwide conditions with habitat metrics required to insure fisher viability. The analyses for other wildlife must address these same flaws.

Sauder (2014) suggests that five national forests (Clearwater, Nez Perce, Coeur d'Alene, Kaniksu, and Kootenai) hold the key to recovery of the species in the Northern Region. As with most of the Sensitive wildlife, fishers receive little habitat protection emphasis in the Forest Plan[mdash]mostly just move it (via logging) toward desired conditions. Please disclose the direct, indirect and cumulative impacts on important habitat components such as snags, logs, foraging habitat configuration, connectivity, cover, and impacts on predator and prey species.

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

[hellip]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 state:

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.

Forest Plan protections for the fisher revolve entirely around the rather random likelihood of a fisher den site being detected, so that measures might be taken: "Management activities on NFS lands should avoid/minimize disturbance at known active nesting or denning sites for other sensitive, threatened, or endangered species not covered under other forestwide guidelines." (FW-GDL-WL-25.) The Forest Plan provides no further direction on how motorized activities would be avoided or minimized other than vaguely stating, "Use the best available information to set a timeframe and a distance buffer around active nests or dens." (Id.) Please disclose this best available science.

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 fisher populations at the Forest level, projects will continue to degrade fisher habitat across the IPNF over time. (Also see also Schultz 2012, who identified these problems in analyses for many wildlife species.)

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the fisher.

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).

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. 2014, 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).

Pine marten

Please disclose the FS's strategy and best available science for insuring viable populations of the pine marten, a species whose habitat is significantly altered by thinning and other active forest management (Moriarty et al., 2016; Bull and Blumton, 1999; Hargis et al., 1999 and Wasserman et al., 2012).

Northern goshawk

Please disclose the FS's strategy and best available science for insuring viable populations of the northern goshawk, a species whose habitat is significantly altered by logging and other active forest management.

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

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

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 post- fledging areas (PFA)s and foraging areas. Reynolds et al. 1992 calls for 100% in VSS classes 5 & 6 and 0% in VSS classes 1-4 in nest areas.

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

Crocker-Bedford (1990) noted:

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

Moser and Garton (2009) reported that all goshawk nests examined in their study area were found in stands whose average diameter of overstory trees was over 12.2 inches and all nest stands had > 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)[hellip]."

The FS's Samson (2006) reports says that 110 breeding individuals (i.e. 55 pairs) are necessary for a viable goshawk population in R1. USDA Forest Service, 2005e is a map showing the results from the 2005 R1 region-wide goshawk survey using the FS's Woodbridge and Hargis goshawk monitoring protocol. That 2005 detection map says there were 40 detections in 2005 in Region 1. So the results of this survey essentially show that the population in Region 1 has not been viable according to the agency's own science (only 40 instead of 55). And some of the detections may have been individuals using the same nest, so the number of nests (and therefore number of breeding pairs) could be even lower than 40.

White-headed woodpecker

Please disclose the FS's strategy and best available science for insuring viable populations of the white-headed woodpecker.

Flammulated owl

Please disclose the FS's strategy and best available science for insuring viable populations of the flammulated owl.

Wright, et al. (1997) point out that habitat restoration for the flammulated owl must be carefully targeted to the correct habitat types. The FS can't simply cut and/or burn forest land and expect flammulated owls to start or continue using it as habitat. Wright, et al. (1997) state:

(W)e never detected Flammulated Owls in mesic old-growth ponderosa pine stands with a *Vaccinium* understory. Thus, within suitable landscapes, it may be most effective to conserve and restore stand structural characteristics within suitable habitat types (e.g., xeric ponderosa pine/ Douglas-fir stands in our study area), rather than within any stand containing ponderosa pine trees.

Hayward and Verner, 1994 provide a conservation assessment for flammulated owls, and make management recommendations.

Great gray owl

Please disclose the FS's strategy and best available science for insuring viable populations of the great gray owl. Hayward and Verner, 1994 provide a conservation assessment for the great gray owl, and make management recommendations.

Pileated woodpecker

Please disclose the FS's strategy and best available science for insuring viable populations of the pileated woodpecker. Bull et al. 2007 represents over 30 years of investigation into the effects of logging on the pileated woodpecker and is the latest information on such effects.

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

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

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

This preferred diameter of nesting trees for the pileated woodpecker recognized by R-1 is notable. McClelland and McClelland (1999) found similar results in their study in northwest Montana, with the average nest tree being 73 cm. (almost 29") dbh. The pileated woodpecker's strong preference for trees of rather large diameter is not adequately considered in the Forest Plan. Effectively, the IPNF provides absolutely no commitments for leaving specific numbers and sizes of largest trees favored by so many wildlife species.

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

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

McClelland (1977), states:

(The Pileated Woodpecker) is the most sensitive hole nester since it requires old growth larch, ponderosa pine, or black cottonwood for successful nesting. The Pileated can be

considered as key to the welfare of most hole-nesting species. If suitable habitat for its perpetuation is provided, most other hole-nesting species will be accommodated.

Pileated Woodpeckers use nest trees with the largest dbh: mean 32.5 inches; Pileated Woodpeckers use the tallest nest trees: mean 94.6 feet;

The nest tree search image of the Pileated Woodpecker is a western larch, ponderosa pine, or black cottonwood snag with a broken top (status 2), greater than 24 inches dbh, taller than 60 feet (usually much taller), with bark missing on at least the upper half of the snag, heartwood substantially affected by *Fomes laracis* or *Fomes pini* decay, and within an old- growth stand with a basal area of at least 100 sq feet/acre, composed of large dbh classes.

A cluster analysis based on a nine-dimensional ordination of nest tree traits and habitat traits revealed close association between Yellow-bellied Sapsuckers, Mountain Chickadees, and Red-breasted Nuthatches. These three species plus the Pileated Woodpecker and Hairy Woodpecker are relatively grouped by coincident occurrence in old growth. Tree Swallows, Black-capped Chickadees, and Common Flickers are separated from the above five species by their preference for more open areas and their frequent use of small dbh nest trees.

(Most) species found optimum nesting habitat in stands with a major component of old growth, particularly larch. Mean basal area for pileated woodpecker nest sites was 150 square feet per acre. (McClelland. B.R. and others, 1979)

Many large snags are being cut for firewood. Forest managers should limit firewood cutting to snags less than 15 inches in d.b.h. and discourage use of larch, ponderosa pine, and black cottonwood. Closure of logging roads

may be necessary to save high-value snags. Logging slash can be made available for wood gatherers.

Wolverine

Please disclose the FS's strategy and best available science for insuring viable populations of the wolverine. Wolverines use habitats 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/mi² (1.7 km/km²) (Carroll et al. 2001b).

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

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

Wisdom et al. (2000) state:

Carnivorous mammals such as marten, fisher, lynx, and wolverine are vulnerable to over- trapping (Bailey and others 1986, Banci 1994, Coulter 1966, Fortin and Cantin 1994, Hodgman and others 1994, Hornocker and Hash 1981, Jones 1991, Parker and others 1983, Thompson 1994, Witmer and others 1998), and over-trapping can be facilitated by road access (Bailey and others 1986, Hodgman and others 1994, Terra-Berns and others 1997, Witmer and others 1998).

[hellip]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).

[hellip] (T)he present distribution of the wolverine, like that of the grizzly bear, may be more related to regions that escaped human settlement than to vegetation structure.

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

[middot] 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.

[middot] Manage wolverine and lynx in a metapopulation context, and provide adequate links among existing populations.

[middot] Reduce human disturbances, particularly in areas with known or high potential for wolverine natal den sites (subalpine talus cirques).

The Forest Plan includes no coherent viability strategy for wolverine protection. Forest Plan protections for the wolverine revolve entirely around the rather random likelihood of a wolverine den site being detected, so that measures might be taken: "Management activities on NFS lands should avoid/minimize disturbance at known active nesting or denning sites for other sensitive, threatened, or endangered species not covered under other forestwide guidelines." (FW-GDL- WL-25.) The Forest Plan provides no further direction on how motorized activities would be avoided or minimized other than vaguely stating, "Use the best available information to set a timeframe and a distance buffer around active nests or dens." (Id.) What is this best available science?

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the wolverine.

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)[hellip]

[hellip]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.

In regards to the 2013 memo from the Regional Office (2013_0305_USDAWolverine Guidance), why are district-level specialists not allowed to arrive at effects conclusions based upon their own expertise and judgment?

Black-backed woodpecker

Please disclose the FS's strategy and best available science for insuring viable populations of the black-backed woodpecker. 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[hellip]

[hellip]Several bird species seem to be relatively restricted in distribution to early post-fire conditions[hellip] I believe it would be difficult to find a forest-bird species more restricted to a single vegetation cover type in the northern Rockies than the Black-backed Woodpecker is to early [first 6 years] post-fire conditions. (Emphasis added).

USDA Forest Service 2011c states:

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

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

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

Cherry (1997) states:

The black-backed woodpecker appears to fill a niche that describes everything that foresters and fire fighters have attempted to eradicate. For about the last 50 years, disease and fire have been considered enemies of the 'healthy' forest and have been combated relatively successfully. We have recently (within the last 0 to 15 years)

realized that disease and fire have their place on the landscape, but the landscape is badly out of balance with the fire suppression and insect and disease reduction activities (i.e. salvage logging) of the last 50 years. Therefore, the black-backed woodpecker is likely not to be abundant as it

once was, and continued fire suppression and insect eradication is likely to cause further decline. (Emphasis added.)

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

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

Woodpeckers play critical roles in the forest ecosystem. Woodpeckers are primary cavity nesters that excavate at least one cavity per year, thus making these sites available to secondary cavity nesters (which include many species of both birds and mammals). Black-backed and three-toed woodpeckers can play a large role in potential insect control. The functional roles of these two woodpecker species could easily place them in the 'keystone' species category—a species on which other species depend for their existence.

Wickman (1965) calculated that woodpeckers may eat up to 50 larvae per day that were each about 50 mm in length. The predation on these larvae is significant. It has been estimated that individual three-toed woodpeckers may consume thousands of beetle larvae per day, and insect outbreaks may attract a many-fold increase in woodpecker densities (Steeger et al. 1996). The ability of woodpeckers in to help control insect outbreaks may have previously been underestimated.

Cherry (1997) also notes:

Black-backed woodpeckers preferred foraging in trees of 34 cm (16.5 in) diameters breast height and (63 ft) 19 m height (Bull et al. 1986). Goggans et al. (1987) found the mean dbh of trees used for foraging was 37.5 cm (15 in) and the mean dbh of trees in the lodgepole pine stands used for foraging was 35 cm (14 in). Steeger et al. (1996) found that both

(black-backed and three-toed) woodpecker species fed in trees from 20-50 cm (8-20 in) dbh.

Black-backed woodpeckers excavate their own cavities in trees for nesting. Therefore, they are referred to as primary cavity nesters, and they play a critical role in excavating cavities that are later used by many other species of birds and mammals that do not excavate their own cavity (secondary cavity nesters). Black-backed woodpeckers peel bark away from the entrance hole and excavate a new cavity every year. Other woodpeckers sometimes take over their cavities (Goggans et al. 1987).

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

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

Black-backed woodpeckers occupy forested habitats that contain high densities of recently dead or dying trees that have been colonized by bark beetles and woodborer beetles (Buprestidae, Cerambycidae, and Scolytidae). These beetles and their larvae are most abundant within burned forests. In unburned forests, bark beetle and woodborer infested trees are found primarily in areas that have undergone natural disturbances, such as wind-throw, and within structurally diverse old-growth forests (Steege and Dulisse in press, Bull et al. 1986, Goggans et al. 1987, Villard 1994, Hoffman 1997, Weinhausen 1998).

The viability of black-backed woodpeckers is threatened by the FS's fire suppression and other "forest health" policies such as that promoted in the Buckskin Saddle Scoping Notice, 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 Buckskin Saddle project is to negate the natural occurrence 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. This emphasis also occurs on a large portion of the IPNF. Viability of a species cannot be assured, if habitat suppression is a forestwide policy.

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the black-backed woodpecker.

Canada lynx

The USFWS listed the Canada lynx as a threatened species under the Endangered Species Act in 2000 due to "lack of guidance for conservation of lynx and snowshoe hare habitat..." and subsequent authorization of actions that may cumulatively adversely affect the lynx. Relatively little is known about lynx in the contiguous United States. Historically, lynx inhabited states spanning from Maine to Washington, but it is unknown how many lynx remain.

Lynx are highly mobile and generally move long distances [greater than 60 mi. (100 km.)]; they disperse primarily when snowshoe hare populations decline; subadult lynx disperse even when prey is abundant, presumably to

establish new home ranges; and lynx also make exploratory movements outside their home ranges. 74 Peg. Reg. at 8617. The contiguous United States is at the southern edge of the boreal forest range, resulting in limited and patchy forests that can support snowshoe hare and lynx populations.

Lynx subsist primarily on a prey base of snowshoe hare, and survival is highly dependent upon snowshoe hare habitat, forest habitat where young trees and shrubs grow densely. In North America, the distribution and range of lynx is nearly "coincident" with that of snowshoe hares, and protection of snowshoe hares and their habitat is critical in lynx conservation strategies.

Please disclose if the FS conducted surveys of all the lynx suitable habitat in the LAUs. More often than not, when the FS conducts logging projects in Lynx Analysis Units (LAUs), surveys of stands for lynx habitat result in less suitable habitat than previously assumed. The FS needs to take a few steps backward and consider that its range-wide Canada lynx suitable habitat estimations were too high.

Please disclose if surveys target snowshoe hare occurrence data in these stands newly considered unsuitable for lynx. Please disclose if the FS conducted surveys of Canada lynx "unsuitable" habitat in the project area to find out if such habitat might in fact be suitable after all.

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

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

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

2006a.)

Lynx winter habitat, provided only in older, multi-storied forests, is critical for lynx preservation. (Squires et al. 2010.) Winter is the most constraining season for lynx in terms of resource use; starvation mortality has been

found to be the most common during winter and early spring. (Squires et al. 2010.) Prey availability for lynx is highest in the summer. (Squires et al. 2013.)

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

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

The LCAS (Ruediger et al. 2000) recommends, until conclusive information is developed concerning lynx management, the agencies retain future options; that is, choose to err on the side of maintaining and restoring habitat for lynx and their prey. To err on the side of caution, the IPNF would retain all remaining stem exclusion forests for recruitment into lynx winter habitat, so that this key habitat would more closely resemble historic conditions.

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

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

Kosterman, 2014 finds that 50% of lynx habitat must be mature undisturbed forest for it to be optimal lynx habitat where lynx can have reproductive success and no more than 15% of lynx habitat should be young clearcuts, i.e. trees under 4 inches dbh. This renders inadequate the agency's assumption in the NRLMD that 30% of lynx habitat can be clearcut, and that no specific amount of mature forest needs to be conserved. Kosterman, 2014 demonstrates that the NRLMD standards are not adequate for lynx viability and recovery, as is assumed by the FS.

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the Canada lynx.

Grizzly bear

Please disclose if adverse project or cumulative impacts are consistent with the requirement to prioritize the needs of the grizzly bear for the applicable Management Situation(s).

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. Please disclose existing road densities located outside of and between Bear Management Units (BMUs), both at present and during project implementation.

Please disclose the FS strategy and best available science to provide habitat protections outside Recovery Zones (RZs) that would allow for a larger protected zone and/or natural augmentation from outside the RZs. The FS has no effective strategy to provide scientifically defensible habitat protections inside the RZ that would facilitate functional connectivity between and among BMUs.

The Forest Service is aware of the best Plan direction it has adopted to date, established in Flathead Forest Plan Amendment 19.2 It established Open Motorized Route Density (OMRD)/Total Motorized Route Density (TMRD)/Security Core indices. These are based upon the scientific information concerning security from roads and road density requirements for grizzly bears as found in Mace and Manley, 1993 and Mace et al., 1996.

Please disclose the impacts of late-season snowmobile use on grizzly bear spring range.

Please analyze and disclose cumulative impacts on grizzly bears from human activities and habitat alternations on land of other ownerships.

Elk

2 Although that Forest Plan has been revised and the Amendment 19 direction dropped and/or weakened, AWR has objected to the Flathead NF's revised forest plan and filed notice of intent to sue on this issue.

Christensen, et al. (1993) is a Region One publication on elk habitat effectiveness. Meeting a minimum of 70% translates to about 0.75 miles/sq. mi. in key elk habitat, as shown in their graph:

Please provide a map of the entire road system in the watersheds affected by the proposal, including all national forest system roads, the nonsystem roads, all existing road templates, and all existing unauthorized roads[mdash]not just those the FS plans to use for this timber sale.

To address its unsustainable and deteriorating road system, the FS promulgated the

Roads Rule (referred to as "subpart A") in 2001. The rule directs each national forest to conduct "a science-based roads analysis," generally referred to as the "travel analysis process." The 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:

- [bull] A TAP must analyze all roads (maintenance levels 1 through 5);
- [bull] The Travel Analysis Report must include a map displaying roads that will inform the Minimum Road System pursuant to 36 C.F.R. [sect] 212.5(b), and an explanation of the underlying analysis;
- [bull] 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:

- [bull] Produce a Travel Analysis Report summarizing the travel analysis;
- [bull] Produce a list of roads likely not needed for future use; and
- [bull] Synthesize the results in a map displaying roads that are likely needed and likely not needed in the future that conforms to the provided template.

The Subpart A analysis is intended to account for benefits and risks of each road, and especially to account for affordability. The TAP must account for the cost of maintaining roads to standard, including costs required to comply with Best Management Practices related to road maintenance.

The Travel Management Regulations at 36 CFR [sect] 212.5 state:

- (b) Road system[mdash](1) Identification of road system. For each national forest, national grassland, experimental forest, and any other units of the National Forest System ([sect] 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.

Please disclose if the project area is being managed in compliance with the Travel Management Regulations at 36 CFR 212 (Subparts, A, B, and C) and the Executive Orders related to Subpart

B. Subpart A requires the FS to involve the public in a scientifically based process which designates the Minimum Road System both in the analysis area and forestwide, so that unnecessary or ecologically damaging roads are targeted for decommissioning and the economic liabilities of roads are minimized.

Please disclose compliance with motorized route restrictions, and if violations exist, perform an analysis of the resultant harm to wildlife habitat, soil, and water.

Please analyze how proposed management actions would be affected by likely climate change scenarios. Please quantify all human-caused CO₂ emissions for all project activities. Please quantify carbon sequestration for each alternative. Please disclose how climate change has affected ecological conditions in the project area, and include an analysis of these conditions under climate change scenarios.

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.

Global climate change is a massive, unprecedented threat to humanity and forests. Climate change is caused by excess CO₂ and other greenhouse gases transferred to the atmosphere from other pools. All temperate and tropical forests, including those in this project area, are an

important part of the global carbon cycle. There is significant new information reinforcing the need to conserve all existing large stores of carbon in forests, in order to keep carbon out of the atmosphere and mitigate climate change. The agency must do its part by managing forests to maintain and increase carbon storage. Logging would add to cumulative total carbon emissions so is clearly part of the problem, so it must be minimized and mitigated. Logging would not only transfer carbon from storage to the atmosphere but future regrowth is unlikely to ever make up for the effects of logging, because carbon storage in logged forests lags far behind carbon

storage in unlogged forests for decades or centuries. And before recovery, the agency plans even more activities causing greenhouse gas emissions.

Clearly, the management of the planet's forests is a nexus for addressing the largest crisis ever facing humanity. This is an issue as serious as nuclear annihilation (although at least with the latter we're not already pressing the button).

Where is the cumulative effects analysis of IPNF carbon sequestration over time?

Respected experts say that the atmosphere might be able to safely hold 350 ppm of CO₂.³ So when the atmosphere was at pre-industrial levels of about 280 ppm, there was a cushion of about 70 ppm which represents millions of tons of greenhouse gas emissions. Well, now that cushion is completely gone. The atmosphere is now over 400 ppm CO₂ and rising. Therefore the safe level of additional emissions (from logging or any other activity) is negative. There is no safe level of additional emissions that our earth systems can tolerate. We need to be removing carbon from the atmosphere[mdash]not adding to it.⁴ How? By allowing forest to grow. Logging moves us away from our objective while conservation moves us toward our objective.

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. [hellip] 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.

³ <http://www.350.org/about/science>.

⁴ "To get back to 350 ppm, we'll have to run the whole carbon-spewing machine backwards, sucking carbon out of the atmosphere and storing it somewhere safely. [hellip] By growing more forests, growing more trees, and better managing all our forests[hellip]"

(<http://blog.cleanenergy.org/2013/11/26/exploringbiocarbon-tools/comment-page-1/#comment-375371>)

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.

From a report by the Union of Concerned Scientists & Rocky Mountain Climate Organization (Funk et al., 2014):

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

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

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

Global climate change is caused by excess CO₂ 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 CO₂, 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 IPNF is an important part of the global carbon cycle. Clear scientific information reinforces the critical need to conserve all existing stores of carbon in forests to keep it out of the atmosphere. Given that forest policies in other countries and on private lands are politically more difficult to influence, the FS must take a leadership role to maintain and increase carbon storage on publicly owned forests, in order to help mitigate climate change effects.

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

Robust statistical associations between wildfire and hydro-climate in western forests indicate that increased wildfire activity over recent decades reflects sub-regional responses to changes in climate. Historical wildfire observations exhibit an abrupt transition in the mid-1980s from a regime of infrequent large wildfires of short (average of one week) duration to one with much more frequent and longer-burning (five weeks) fires. This transition was marked by a shift toward unusually warm springs, longer summer dry seasons, drier vegetation (which provoked more and longer-burning large wildfires), and longer fire seasons. Reduced winter precipitation and an early spring snowmelt played a role in this shift. Increases in wildfire were particularly strong in mid-elevation forests.

[hellip]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[deg] to 5[deg]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[deg]C would be roughly three times the spring-summer temperature increase that Westerling et al. have linked to the current trends. Wildfire burn areas in Canada are expected to increase by 74 to 118% in the next century (12), and similar increases seem likely for the western United States.

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

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

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

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

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

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

The IPNF Forest Plan draft EIS defines carbon sequestration: "[hellip]the process by which atmospheric carbon

dioxide is taken up by vegetation through photosynthesis and stored as carbon in biomass (trunks, branches, foliage, and roots) and soils."

The FS also ignores CO₂ and other greenhouse gas emissions from other common human activities related to forest management and recreational uses. These include emissions associated with machines used for logging and associated activities, vehicle use for administrative actions, recreational motor vehicles, and emissions associated with livestock grazing. The FS is simply ignoring the climate impacts of these management and other authorized or allowed activities.

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

Off-road vehicles in California currently emit more than 230,000 metric tons [mdash] or

5000 million pounds [mdash] 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 CO₂ per year into the atmosphere.

Can we really afford this?

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

[hellip]

Thinning forests to reduce potential carbon losses due to wildfire is in direct conflict with carbon sequestration goals, and, if implemented, would result in a net emission of CO₂ to

the atmosphere because the amount of carbon removed to change fire behavior is often far larger than that saved by changing fire behavior, and more area has to be harvested than will ultimately burn over the period of effectiveness of the thinning treatment.

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

Kutsch et al., 2010 provide an integrated view of the current and emerging methods and concepts applied in soil carbon research. They use a standardized protocol for measuring soil CO₂ efflux, designed to improve future assessments of regional and global patterns of soil carbon dynamics:

Excluding carbonate rocks, soils represent the largest terrestrial stock of carbon, holding approximately 1,500 Pg (10¹⁵ g) C in the top metre. This is approximately twice the amount held in the atmosphere and thrice the amount held in terrestrial vegetation. Soils, and soil organic carbon in particular, currently receive much attention in terms of the role they can play in mitigating the effects of elevated atmospheric carbon dioxide (CO₂) 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.)

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."

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.

In 2016, Professors Mark Harmon and Bev Law of Oregon State University 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.

Van der Werf, et al. 2009 discuss the effects of land-management practices and state: (T)he maximum reduction in CO₂ 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 CO₂ 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.

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

Our forests are functioning as carbon sinks (net sequestration) where logging has been reduced or halted, and wildland fire helps maintain high productivity and carbon storage.

Even large, intense fires consume less than 3% of the biomass in live trees, and carbon emissions from forest fires is only tiny fraction of the amount resulting from fossil fuel consumption (even these emissions are balanced by carbon uptake from forest growth and regeneration).

"Thinning" operations for lumber or biofuels do not increase carbon storage but, rather, reduce it, and thinning designed to curb fires further threatens imperiled wildlife species that depend upon post-fire habitat.

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

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

Although fuel-reduction treatments may be necessary to restore historical functionality to fire-suppressed ecosystems, we found little credible evidence that such efforts have the added benefit of increasing terrestrial C stocks.

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

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

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

The 2014 National Climate Assessment chapter for the Northwest is prefaced by four "key messages" including this one: "The combined impacts of increasing wildfire, insect outbreaks, and tree diseases are already causing widespread tree die-off and are virtually certain to cause additional forest mortality by the 2040s and long-term transformation of forest landscapes.

Under higher emissions scenarios, extensive conversion of subalpine forests to other forest types is projected by the 2080s." (Mote et al. 2014.)

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

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

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

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

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

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

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

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

Forests are changing in ways they've never experienced before because today's growing conditions are different from anything in the past. The climate is changing at an unprecedented rate, exotic diseases and pests are present, and landscapes are fragmented by human activity often occurring at the same time and place.

The current drought in California serves as a reminder and example that forests of the 21st century may not resemble those from the 20th century. "When replanting a forest after disturbances, does it make sense to try to reestablish what was there before? Or, should we

find re-plant material that might be more appropriate to current and future conditions of a changing environment?

"Restoration efforts on U.S. Forest Service managed lands call for the use of locally adapted and appropriate native seed sources. The science-based process for selecting these seeds varies, but in the past, managers based decisions on the assumption that present site conditions are similar to those of the past.

"This may no longer be the case."

This raises the important issue: are our forests really "suitable" for timber production if the likely impacts of climate change mean that regeneration following this massive clearcutting operation may not be feasible.

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[mdash]and community economic planning[mdash]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[mdash]hotter drought", an emerging characteristic of the Anthropocene[mdash]are the focus of rapidly expanding literature.

[hellip](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.

[hellip]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.

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 [hellip]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.

[hellip]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.

Please consider that the "desired" vegetation conditions may not be achievable or sustainable. Please conduct an analysis as to how realistic and achievable Forest Plan desired conditions are in the context of a rapidly changing climate, along an unpredictable but changing trajectory.

Global warming and its consequences are effectively irreversible which implicates certain legal consequences under NEPA and NFMA and ESA (e.g., 40 CFR [sect] 1502.16; 16 USC [sect]1604(g); 36 CFR [sect]219.12; ESA Section 7; 50 CFR [sect][sect]402.9, 402.14). All net carbon emissions from logging represent "irretrievable and irreversible commitments of resources."

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[hellip]"

Harmon, 2009 is the written record of "Testimony Before the Subcommittee on National Parks, Forests, and Public Lands of the Committee of Natural Resources for an oversight hearing on The Role of Federal Lands in

Combating Climate Change." The author "reviews, in terms as simple as possible, how the forest system stores carbon, the issues that need to be addressed when assessing any proposed action, and some common misconceptions that need to be avoided." His testimony begins, "I am here to [hellip]offer my expertise to the subcommittee. I am a professional scientist, having worked in the area of forest carbon for nearly three decades.

During that time I have conducted numerous studies on many aspects of this problem, have published extensively, and provided instruction to numerous students, forest managers, and the general public."

The NEPA document must disclose that most wildland fire ignitions are human-caused, and occur near roads.

Where may we find an analysis of the Forestwide cumulative effects of your fire management policies, including fire suppression policies? The Forest Plan and its EIS did not include a programmatic analysis of the cumulative effects of fire suppression. Part of the agency's mantra for more management includes mitigating the impacts of fire suppression. So to comply with NEPA, the FS must conduct a programmatic analysis of the cumulative effects of its fire suppression policies. Until it does so, the FS cannot assure viability of the black-backed woodpecker, a species that depends upon the direct effects of natural wildland fire.

The FS'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."

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

Mixed-severity fires, and in particular patches of high-severity fire, benefit grizzly bears by increasing cover of berry producing shrubs (such as huckleberry) that the bears rely upon to get fat before winter, and promoting regeneration of whitebark pine[mdash] the seeds of which are an important food source for the bears (DellaSala and Hanson, 2015, Ch. 4, pp. 89, 101).

Finally, ecological resilience, which the FS implies they are creating through this project, 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 here is the human control of the forest ecosystem through mechanical

means in order to maintain unnatural stasis by eliminating, suppressing or altering natural disturbances such as 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).

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. Six et al., 2014 documented that logging to prevent or contain insect and disease has not been empirically proven to work, and because of lack of monitoring the FS can't content this method is viable for containing insect outbreaks.

How much will it cost U.S. taxpayers have the FS implement the project?

What is the best available science for sustaining viable populations of ESA-listed, management indicator species and all sensitive species on the Forest? Past timber harvest activities, roads, mining and related activities (OHV use, including closed roads and trails illegally accessed) must be analyzed in the context of the importance of habitat capability and suitability, as well as connectivity.

Please disclose ongoing soil and water impacts from roads not being adequately maintained. Please disclose the impacts of roads that are not maintained because they are unauthorized or non-system.

The Scoping Notice states, "Fifty-seven percent of the National Forest System lands within the project area have been determined to be suitable for timber production." Please cite the documentation which determined that the specific areas proposed for logging in this proposal are suitable for timber production.

An accurate ecological analysis of the IPNF and project area would reveal too much forest and habitat fragmentation. In describing any landscape departures from the historical range of variability (HRV), please provide a spatial analysis, comparing true reference conditions to current project area conditions.

Please disclose an accurate comparison of baseline (pre-management) species composition in the project area vs. present-day project area species composition. Likewise, please disclose an accurate analysis of baseline (pre-management) vs present-day regarding structural diversity, patch size, and age class.

Please disclose the impacts of past and ongoing livestock grazing on forest composition, "fuels" arrangement, and all other measurable aspects of vegetation in the project area. Please disclose the impacts of livestock grazing on soil conditions in the project area. Please analyze the interactions between livestock grazing and noxious weeds in the project area.

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.

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

Why can't the FS sacrifice some of its timber goals and set diameter limits to compensate for the deficiency compared to the historic range of large diameter trees (regardless of species) to serve wildlife habitat needs? How will the FS emphasize retention of the largest snags and live trees if you don't provide details on how this is to be accomplished?

The Forest Plan FEIS includes a "Large/Very Large" size class (20"+ dbh). Please disclose how many stands in the project area fall within that Large/Very Large size class, and how many acres of those would be logged. Please estimate how many total trees > 20" dbh would be cut in each unit.

The Forest Plan contains no minimum acreage or distribution requirements for maintaining old growth, ignoring 36 CFR 219.19 viability provisions that would prevent large areas of the IPNF becoming devoid of old growth or old-growth associated wildlife. The FS has not analyzed the wildlife viability implications of managing the IPNF well outside the HRV for old growth, based upon the best available scientific information.

Please compare patch size of the old-growth areas to scientific information on minimum size needed for utilization by old-growth associated wildlife.

The Forest Plan does not cite the scientific basis for the minimum amounts of coarse woody debris to be retained under Guideline FW-GDL-VEG-03.

The Forest Plan does not cite the scientific basis for the minimum amounts of snags to be retained under Guideline FW-GDL-VEG-04. Also the scientific basis for the delineation of snags into two diameter groups using 15" d.b.h. as the division point is not disclosed.

In FW-GDL-VEG-05 it is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the Forest Plan, or if it is intended to render the entire Guideline to be discretionary. Also, the "fire salvage" provision for using untreated areas to meet snag requirement would lead to insufficient retention in logged areas.

Hutto, 2006 addresses the latter subject; from the Abstract:

The bird species in western North America that are most restricted to, and therefore most dependent on, severely burned conifer forests during the first years following a fire event depend heavily on the abundant standing snags for perch sites, nest sites, and food resources. Thus, it is critical to develop and apply appropriate snag-management guidelines to implement postfire timber harvest operations in the same locations. Unfortunately, existing guidelines designed for green-tree forests cannot be applied to postfire salvage sales because the snag needs of snag-dependent species in burned forests are not at all similar to the snag needs of snag-dependent species in green-tree forests. Birds in burned forests have very different snag-retention needs from those cavity-nesting bird species that have served as the focus for the development of existing snag-management guidelines.

Specifically, many postfire specialists use standing dead trees not only for nesting purposes but for feeding purposes as well. Woodpeckers, in particular, specialize on wood-boring beetle larvae that are superabundant in fire-killed trees for several years following severe fire. Species such as the Black-backed Woodpecker (*Picoides arcticus*) are nearly restricted in their habitat distribution to severely burned forests. Moreover, existing postfire salvage- logging studies reveal that most postfire specialist species are completely absent from burned forests that have been (even partially) salvage logged. I call for the long-overdue development and use of more meaningful snag-retention guidelines for postfire specialists, and I note that the biology of the most fire-dependent bird species suggests that even a cursory attempt to meet their snag needs would preclude postfire salvage logging in those severely burned conifer forests wherein the maintenance of biological diversity is deemed important.

In FW-GDL-VEG-06 it is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the Forest Plan, or if it is intended to render the entire Guideline to be discretionary.

The first sentence of FW-GDL-VEG-08 along with the consistency requirement on page 4 of the Forest Plan suggest that any silvicultural system may be used in any proposed treatment unit, regardless of its appropriateness.

Essentially, FW-DC-FIRE-02 and Guideline MA6-GDL-FIRE-01 can be used to justify treatments regardless if they result in forest conditions that would not likely occur naturally, or if the biophysical setting would require

frequent, intensive fuel treatments to maintain the desired fuel conditions. Regardless of natural fire regime, "Fire behavior is characterized by low- intensity surface fires with limited crown fire potential." Also, they prioritize fuel reduction over natural processes that create important wildlife habitat components and maintain soil productivity.

Nothing in the Scoping Notice 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 Scoping Notice primarily discusses fuel conditions only in the areas proposed for treatment, yet wildland fire operates beyond artificial ownership or other boundaries. In regards to the proper cumulative effects analysis area for fire risk, Finney and Cohen (2003) discuss the concept of a "fireshed involving a wide area around the community (for many miles that include areas that fires can come from)." In other words, for any given entity that would apparently have its risk of fire reduced by the proposed project (or affected cumulatively from past, ongoing, or foreseeable actions on land of all ownerships within this "fireshed")—just how effective would fuel reduction be? The Scoping Notice fails to include a thorough discussion and detailed disclosure of the current fuel situation within the fireshed within and outside the proposed treatment units, making it impossible to make scientifically supportable and reasonable conclusions about the manner and degree to which fire behavior would be changed by the project.

The Scoping Notice also fails to deal with the fuels issue on the appropriate temporal scale. How landscape-level fire behavior at any period except for very shortly after treatment would be changed or improved is ignored.

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.) And Rhodes also points out that using 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.)

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.)

In support of focusing on manipulating limited areas near homes, Finney and Cohen, 2003, state: Research findings indicate that a home's characteristics and the characteristics of a home's immediate surroundings within 30 meters principally determine the potential for wildland-urban fire destruction. This area, which includes the home and its immediate surroundings, is termed the home ignition zone. The home ignition zone implies that activities to reduce

the potential for wildland-urban fire destruction can address the necessary factors that determine ignitions and can be done sufficiently to reduce the likelihood of ignition. Wildland fuel reduction outside and adjacent to a home ignition zone might reduce the potential flame and firebrand exposure to the home ignition zone (i.e., within 30 m of the home). However, the factors contributing to home ignition within this zone have not been mitigated. Given a wildfire, wildland fuel management alone (i.e., outside the home ignition zone) is not sufficient nor does it substitute for mitigations within the home ignition zone. It is questionable whether wildland fuel reduction activities are necessary and sufficient for mitigating structure loss in wildland urban fires.

Wildland fuel management changes the probability of a fire reaching a given location. It also changes the distribution of fire behaviors and ecological effects experienced at each location because of the way fuel treatments alter local and spatial fire behaviors (Finney 2001). The probability that a structure burns, however, has been shown to depend exclusively on the properties of the structure and its immediate surroundings (Cohen 2000a).

(Emphasis added.) Our take from Finney and Cohen (2003) is that there is much uncertainty over effects of fuel reduction. The authors point out:

Although the conceptual basis of fuel management is well supported by ecological and fire behavior research in some vegetation types, the promise of fuel management has lately become loaded with the expectation of a diffuse array of benefits. Presumed benefits range from restoring forest structure and function, bringing fire behavior closer to ecological precedents, reducing suppression costs and acres burned, and preventing losses of ecological and urban values. For any of these benefits to be realized from fuel management, a supporting analysis must be developed to physically relate cause and effect, essentially evaluating how the benefit is physically derived from the management action (i.e. fuel management). Without such an analysis, the results of fuel management can fail to yield the expected return, potentially leading to recriminations and abandonment of a legitimate and generally useful approach to wildland fire management.

In their conclusion, Graham, et al., 1999a state:

Depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fire-adapted species. Such intermediate treatments can reduce the severity and intensity of wildfires for a given set of physical and weather variables. But crown and selection thinnings would not reduce crown fire potential. (Emphasis added.)

Please disclose the project logging impacts on the rate of fire spread. Graham, et al., 1999a point out that fire modeling indicates:

For example, the 20-foot wind speed⁵ must exceed 50 miles per hour for midflame wind speeds to reach 5 miles per hour within a dense Stand (0.1 adjustment factor). In contrast, in an open stand (0.3 adjustment factor), the same midflame wind speeds would occur at only a 16-mile-per-hour wind at 20 feet.

⁵ Velocity of the wind 20 feet above the vegetation, in this case tree tops.

Please disclose the implications of how the fire regime is changing due to climate change.

The FS alleges a need to reduce forest fuels in the wildland-urban interface (WUI). What is it about past projects that left the project area WUI in such a needy condition? Again, the FS must provide a cumulative effects analysis that compares current project area "needs" to accomplishments (or failures) of past projects.

Aside from urging landowners to adopt firewise measures on their own land, there's little that "management" can accomplish in the way of reducing wildland fire risk. When weather conditions arise that are favorable to high intensity fires, which happens more and more these days due to the effects of climate change, those fires will burn regardless of suppression efforts. Please disclose the relative contribution of weather factors to fire spread, intensity, and severity.

The forest plan Glossary definition of WUI under (A) has allowed entities other than the general public to set WUI boundaries outside of NEPA and NFMA processes, and under (B) defines it so vaguely as to expand the delineation of the WUI greatly[mdash]again outside NFMA and NEPA processes.

The vague language of Desired Condition FW-DC-FIRE-03 essentially nullifies its intent that recognizes the desirability of wildland fire.

We want the FS and the public to be comfortable with unplanned wildland fires under some weather conditions in sensible locations, so that the ecosystem benefits can be realized. Simply stated, at the time that response to any given fire is contemplated, we want decision makers to have publicly vetted documentation[mdash]for that specific fire area[mdash]of the benefits of the process that helps create habitat conditions for wildlife, restores forest composition, recycles soil nutrients, creates large dead logs that fall into streams forming native fish habitat, as well as many others. That will provide the public, the news media, and politicians with a fully vetted set of justifications for managing with[mdash]rather than against[mdash]the native ecosystem process of fire. We believe that such planning can and must be undertaken for sustainable forest management to evolve away from the unacceptable present situation. If the FS is unwilling to perform such an analysis for projects such as Buckskin Saddle, then it must undergo programmatic analysis of its fire suppression policies, disclosing the impacts and ecological harm that the agency will subsequently claim must be later addressed by vegetation management and fuel treatment projects across the landscape. Not to mention the enormous financial costs[mdash]also never analyzed or disclosed at any planning level.

Rather than fire starts, FW-OBJ-FIRE-02 should specify a number of acres set by best available science and analysis. The Forest Plan needs much stronger direction and certainty for use of wildland fire for resource benefits.

The Forest Plan FEIS analysis of fire suppression fails to address the constrained budget scenario which implies the FS will not be allocated enough funding to address the problems it states are perpetuated by fire suppression.

MON-VEG-01-01 is part of the circular logic in the Forest Plan's construction, which is that vegetation manipulation is the only way areas of the Forest would be resilient, resistant, meeting Desired Conditions, etc.

The Scoping Notice includes a project objective/need to "Improve the resiliency and resistance of the forest vegetation to disturbances such as wildfire, drought, insects and diseases." It makes no sense, ecologically speaking to "increase resilience" to the identified natural processes. An ecosystem that is fully functioning is naturally resilient. When an ecosystem is disturbed, succession according to natural processes occurs. If previous management has led to restoration needs, then the course of action should be to work with natural processes, removing human- caused impediments as necessary.

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

A significant body of our concerns about the Forest Plan surround its over-reliance on "Desired Conditions" (DCs) as directing management, and too few standards that refrain management. As we pointed out, this results in an overall lack of accountability for the FS to ever accomplish anything positive expressed in the Forest Plan's timeless, aspirational DCs, as well as there being far too few restraints that serve the conservation of biological diversity and promotion of ecological sustainability.

The Forest Plan has so much discretion as to render the aquatic standards arbitrary. The standards pertaining to watersheds and water quality, riparian, aquatic species and habitat are limited, narrowly focused, and contain language that could subvert the intent of the standard. No matter how badly degraded a drainage might be, no aquatic standards or thresholds would properly limit timber sales.

The IPNF now uses the Water Erosion Prediction Project (WEPP) model to assess potential impacts of surface disturbance on aquatic resources in the IPNF. Please provide project area information validating the use of the WEPP model.

Please take a hard look at the condition of all streams and water bodies in the affected watersheds, and explain how those conditions contribute to fish population and trends. Please disclose populations of fish species in the project area, and compare those numbers to minimum viable populations.

Please explain how the timber sale would comply with the Clean Water Act and all state water quality laws and regulations. Designating BMPs is not sufficient for compliance with CWA and NFMA. Please disclose the actual effectiveness of proposed BMPs in preventing sediment from reaching streams in or near the analysis area. What BMP failures have been noted for past projects with similar landtypes? Also, please disclose which segments of roads in the watersheds to be affected by this proposal would not meet BMPs following project activities.

Please disclose the intensity or thoroughness of the alleged surveys for inventorying sediment sources in the project area. See Fly et al. 2011, which describes a thorough survey in the Boise National Forest. Please disclose the metrics you are using to estimate elevated, unnatural sources of sediment yield into streams.

Log hauling itself adds sediment to streams. From an investigation of the Bitterroot Burned Area Recovery Project, hydrologist Rhodes (2002) notes, "On all haul roads evaluated, haul traffic has created a copious amounts of mobile, non-cohesive sediment on the road surfaces that will elevate erosion and consequent sedimentation, during rain and snowmelt events." USDA Forest Service, 2001a also presents an analysis of increased sedimentation because of log hauling, reporting "Increased traffic over these roads would be expected to increase sediment delivery from a predicted 6.30 tons per year to 7.96 tons per year."

Objective FW-OBJ-WTR-01 prioritizes management (logging, fuel reduction) in the watersheds in best condition on the Forest, because of use of vague language "toward a better condition" and "risk factors."

Objective FW-OBJ-WTR-02 prioritize managements (logging, fuel reduction) because of its language "improve[hellip] across acres of subwatersheds[hellip]"

Guideline FW-GDL-WTR-01 offers little to no protection to the impaired waters on the IPNF. Even with an approved TMDL, there is no legal authority to enforce a violation of the TMDL.

In Guideline FW-GDL-WTR-02 the meaning of "hydrologic stability" is unclear.

Please disclose the existing conditions of site specific stream reaches and project effects on water quality, fish and other aquatic resources. Please disclose information regarding the existence and effects of bedload and accumulated sediment. Please analyze and disclose channel stability for specific stream reaches. Please disclose the amount of existing accumulated fine and bedload sediment that remains from the previous logging and road construction.

Kappesser, 2002 discusses an assessment procedure used on the IPNF:

The RSI [Riffle Stability Index] addresses situations in which increases in gravel bedload from headwaters activities is depositing material on riffles and filling pools, and it reflects qualitative differences between reference and managed watersheds[hellip]it can be used as an indicator of stream reach and watershed condition and also of aquatic habitat quality.

Peak flows can be altered by forest harvest activities after removal of canopy through less interception, which results in more snow accumulation and snowmelt available for runoff (Troendle and King 1985). Please disclose the potential for the project to damage channel morphology and aquatic habitat.

Please conduct an analysis of water flow alteration effects on stream bank erosion and channel scouring during spring runoff and/or rain-on-snow (ROS) events. Most segment altering and channel forming events occur during instantaneous flows.

Openings accumulate much more snow than in a forested areas that are not as "open," thus provide a significant contribution to water yield especially during ROS and spring runoff events. The number, mileage and proximity of

the roads to the proposed logging units and streams are important because they will also have a significant effect on peak flows and the resultant impact on fish, stream channels and possible flooding.

According to Kappesser, 1992:

The stability condition of a watershed may be broadly determined by evaluating the level of harvest activity (ECA), its spatial distribution with regard to headwater harvest and rain on snow risk and the density of roading in the watershed with consideration of road location relative to geology and slope. Each of these four factors may [be] evaluated against "threshold" levels of activity characteristic of watersheds on the IPNF that are known to be stable, unstable, or on a threshold of stability.

ROS events can be the most channel changing, sediment producing events and can have a significant adverse effect on fish and their habitat (Kappesser, 1991b):

Filling of pools by bedload sediment is seen as a significant factor in the reduction of rearing and overwintering habitat for fish such as West Slope Cutthroat Trout (Rieman and Apperson, 1989). Bedload increases have traditionally been interpreted as the result of channel scour in response to increased peak flows created by timber harvest.

(Also see Kappesser, 1991a.) The Inland Northwest frequently gets at least one mid-winter chinook which is often accompanied by windy and rainy conditions. The warm wind blowing across the snow, especially in relatively open areas on south and southwestern facing slopes between 2,500 to 4,500 feet elevation results in rapid snow melt and high levels of instantaneous water flows.

King, 1994 explains that small headwaters areas are particularly sensitive to the increased water yields due to removal of tree canopy:

Timber removal on 25-37% of the area of small headwater watersheds increased annual water yield by an average of 14.1 inches, prorated to the area in harvest units and roads. Increases in streamflow occurred during the spring snowmelt period, especially during the rising portion of the snowmelt hydrograph. These forest practices also resulted in large increases in short duration peakflows, greatly increasing the sediment transport capacity of these small streams. The cumulative effects of these activities on streamflow in the Main Fork, with only 6.3% of its area in roads and harvest units, were not detectable.

Ziemer, 1998 observed the same phenomenon in his study on flooding and stormflows. Also, King, 1989 observed that "Current procedures for estimating the hydrologic responses to timber removal of third to fifth order streams often ignore what may be hydrologically important modifications in the low-order streams."

USDA Forest Service 1994b states:

It is important to recognize that the Equivalent Clearcut Area model uses tree growth (canopy density) to estimate Spring peak flows and that channels do not recover immediately in response to tree growth. There is a lag time between hilltop recovery (growth) and channel recovery. The length of the lag time is difficult to predict and is likely to be influenced by factors other than simply canopy density (e.g. the role of culvert failures, in-stream activities, geology, etc.).

USDA Forest Service 1994b states "It is important to realize that all models greatly simplify complex processes and that the numbers generated by these models should be interpreted in light of field observations and professional judgement." (III-77.) Harr, 1987 states:

Perhaps the most basic of the erroneous beliefs is the idea that simplicity can be willed on the forest hydrologic system. This belief encourages the implementation of simplistic guidelines, the adoption of arbitrary thresholds of concern, and the search for all-encompassing methodologies to predict consequences of forest activities on water resources. These actions occur sometimes with the blessings of hydrologists or soil scientists but other times over their objections. The belief in simplicity has been nurtured by the rapid increase in the use of computer simulation models in forest planning and the desire to accept the output from such models. Another reason for pursuit of simplicity is the current emphasis on planning called for by NFMA; such planning is often conducted under strict time and budgetary constraints.

I must point out that, on the average, the simplistic methodologies may have resulted in fairly prudent forest management. But rather than being viewed as merely a first attempt at solving a problem, they often seem to inhibit further investigation and development. Also, they tend to lead forest managers and some specialists to believe that hydrologic systems really do function in the manner described by the simplistic methodologies.

Forest hydrologic systems are more complex than one would believe after reading some of the methodologies and procedures that have been proposed to predict cumulative effects of logging on water resources. For example, many of these procedures state that a threshold of harvest activity or intensity will be determined, without specifying how it will be determined or whether it really exists or can be measured. Similarly, implementing a methodology for estimating cumulative effects of harvest operations on water resources does not mean that such cumulative effects either exist or can be measured.

(I)n our desire to simplify, to create a methodology that will predict consequences of harvest activities everywhere or in the average situation, we usually expend considerable energy creating a methodology that predicts reasonably accurately virtually nowhere. We may implement procedures without providing for testing or monitoring the results to see whether the procedures are, in fact, working. In the process, we may even develop a false sense of security that our methodology can really protect soil and water resources.

Please conduct an analysis of forest plan Riparian Management Objectives (RMOs), including trends toward or away from meeting those RMOs.

Please disclose the results of surveys for native fish occurrence and abundance in project area streams.

The 1998 Bull Trout Biological Opinion (BO) indicates that bull trout are absent when road densities exceed 1.71 mi./mi²., depressed when the road density = 1.36 mi./mi². and strong when road density equals or is less than .45 mi./mi². (P. 67.)

The Watershed Disturbance Rating strongly suggests forestwide direction to attain watershed restoration. Yet, there are no forestwide standards for those parameters, which is needed to provide much stronger prioritization towards meeting forestwide Watershed and Water Quality Desired Conditions.

Please provide an analysis of soil conditions in the analysis area, noting any detrimental soil disturbance and its consequences for diminishing soil and land productivity. Please disclose the extent of soils in the analysis area that are already hydrologically impacted, and analyze and disclose their watershed impacts.

In FW-DC-SOIL-01 the meaning of "Areas with sensitive and highly erodible soils or land types with mass failure potential are not detrimentally impacted or destabilized as a result of management activities" is unclear.

In FW-DC-SOIL-02 the meaning of the term "Managed areas" is unclear. The areal extent could be delineated as a few square feet, a logging unit, a timber sale contract area, an entire watershed, or even a Ranger District.

Forest Plan soil Objective FW-OBJ-SOIL-01 would accomplish little soil restoration. The meaning of "not meeting soil quality criteria" is unclear.

The Forest Plan includes no soil quality standards. By adopting FSM-2500-99-1 the Forest Service does not avoid irreversible soil damage on the IPNF.

There is no Forest Plan requirement to quantify, minimize, or even consider the total amount of detrimentally disturbed soils on the IPNF or in a watershed.

The Forest Plan adopts a proxy[mdash]detrimental soil disturbance[mdash]rather than more direct measures of management-induced losses or reductions of soil productivity. We are aware of no scientific information based

upon IPNF data that correlates the proxy (areal extent of detrimental soil disturbance 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.

FW-GDL-SOIL-01, 02, 03, and 04: It is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the Forest Plan, or if it is intended to render these entire Guidelines to be discretionary.

Guideline FW-GDL-SOIL-04 leaves too much discretion allowing activities on landslide-prone areas.

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.

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.

[hellip] 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 Region 1 Soil Quality Standards (SQS) are the only directives limiting damage to soil during industrial extraction on the IPNF, and even they are 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.⁶

Please disclose soil conditions in the project area that are outside the project treatment units. The cumulative amount of existing soil damage over the entire project area 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 in this project area.

The FS generally provides no idea of the degree of soil impacts in a project area[mdash]except for an estimate of a limited category (detrimental soil disturbance or "DSD")[mdash]but only if a site happens to occur in a unit proposed for logging or burning under the project. Such a narrow view of the cumulative impacts on soils contradicts other FS policy and best available science.

The Soil and Water Conservation Practices Handbook (FSH 2509.22) states: Practice 11.01 - Determination of Cumulative Watershed Effects

Jam Cracker Environmental Assessment, Lolo National Forest, 2016

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.

Booth, 1991 explains how soil quality conditions translate to watershed hydrology and thus, water quality and quantity:

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.

[hellip]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.

[hellip]Flooding, channel erosion, landsliding, and destruction of aquatic habitat are some of the unanticipated changes that [hellip]result from these alterations.

[hellip]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. [hellip]These changes produce measurable effects in the hydrologic response of a drainage basin.

Elsewhere the FS recognizes that amounts of soil compaction and other measures of DSD 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[hellip] 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.

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.) The IPNF (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.)

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.

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.

[hellip]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.)

Please provide an analysis of the hydrological implications of the cumulative soil damage caused by past management added to timber sale-induced damage in project area 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 are effects to be analyzed in a watershed analysis.

Harr, 1987 rejects absolute thresholds for making determinations of significant vs nonsignificant levels of soil compaction in watersheds, but nevertheless he does refer to his experience as noted above by Johnson, 1995. Harr, 1987 states:

[hellip]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. [hellip]The 12 percent figure is arbitrary. Flow changes at lesser amounts of compaction may also cause adverse impacts. [hellip]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 DSD 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. [hellip] 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.

[hellip]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 IPNF 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 DSD with very mixed results (e.g., Reeves et al., 2011). The point is[mdash]as weak as the standards are[mdash]FS pledges to meet the standards must be taken with a grain of salt.

There is also an issue of reliability and validity of the FS's soil survey methods. 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.

[hellip]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 (DSD7) 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.) USDA Forest Service, 2012a admits that DSD estimates are "not absolute."

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

7 Detrimental Soil Disturbance (DSD) is equivalent to exceeding soil property thresholds

Another cumulative impact the SQS 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 and/or had organic layers displaced to use as temporary log storage and log truck loading and often 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 SQS. Much like system roads, there are no limits to total DSD from landings set by the SQS, and there is no requirement that their extent in a project area be disclosed. Roads and log landings might be limited by other resource considerations such as road densities in sensitive wildlife habitat, but they are not limited by the SQS.

Still more cumulative soil damages the SQS ignore involve existing DSD on areas the FS maintains as part of the "suitable" or productive land base such as timber stands, grazing allotments and riparian zones that are not within the boundaries of any current project activity areas. The SQS do not limit or require disclosure of the existing/prior DSD 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, SQS do not compel the FS to take actions that might restore the soil productivity in such areas because their existing DSD does not matter for determining consistency with the SQS [mdash]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, 2016a explains another major cumulative effect ignored by the SQS, which is the indirect effect of soil damage, or DSD, on sustained yield. It states that the SQS "created the concept of 'Detrimental Soil Disturbance' (DSD) for National Forests in Region One as a measure to be used in assessing potential loss of soil productivity resulting from management activities." USDA Forest Service, 2016a further explains (emphases added):

Without maintaining land productivity, neither multiple use nor sustained (yield) can be supported by our National Forests. Direct references to maintaining productivity are made in the Sustained Yield Act "[hellip]coordinated management of resources without impairment of the productivity of the land" and in the Forest and Rangeland Renewable Resources Act "[hellip]substantial and permanent impairment of productivity must be avoided".

Soil quality is a more recent addition to Forest Service Standards. The Forest and Rangeland Renewable Resources Act (1974) appears to be the first legal reference made to protecting the "quality of the soil" in Forest Service directives. Although the fundamental laws that directly govern policies of the U.S. Forest Service clearly indicate that land productivity must be preserved, increasingly references to land or soil productivity in Forest Service directives were being replaced by references to soil quality as though soil quality was a surrogate for maintaining land productivity. This was unfortunate, since although the two concepts are certainly related, they are not synonymous.

Our understanding of the relationship between soil productivity and soil quality has continued to evolve since 1974. Amendments to the Forest Service Manual, Chapter 2550 - Soil Management in 2009 and again to 2010 have helped provide some degree of clarity on

this issue and acknowledged that the relationship is not as simple as originally thought. The 2009 (2500-2009-1) amendment to Chapter 2550 of the Forest Service Manual states in section 2550.43-5, directs the Washington Office Director of Watershed, Fish, Wildlife, Air and Rare plants to "Coordinate validation studies of soil quality criteria and indicators with Forest Service Research and Development staff to ensure soil quality measurements are appropriate to protect soil productivity" (USFS-FSM 2009). Inadvertently this directive concedes that the relationship between soil productivity and soil quality is 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.)

Please provide a map showing the locations of all past logging units, including the intensity of the logging activities.

The IPNF (USDA Forest Service, 2009c) admits, in regards to project area sites where DSD soils were not to be

restored by active management: "For the [hellip]severely disturbed sites,[hellip] "no action"

[hellip]would create indirect negative impacts by missing an opportunity to actively restore damaged soils.
(Emphasis added.)

In order to meet NFMA and NFMA regulations' mandates to protect soil productivity, the IPNF adopted the SQS. Again, the SQS requires the FS to delineate specific geographic areas called "activity areas" for the purpose of predicting, measuring, monitoring, and analyzing impacts on soil productivity from management activities. FSM 2500-99-1 includes a mandate to maintain 85% of an activity area in a satisfactory, non-DSD soil condition.

Please explain how your methodology for determining DSD produces statistically reliable data. This also raises questions of the validity of DSD estimation and other analysis methodology, and therefore compliance with the FS's proxy for soil productivity. Please explain how the FS arrives at current DSD estimates, and provide sufficient detail to indicate the intensity of soil surveys or monitoring of past projects.

Please disclose that the SQS methodology for "activity areas" inherently encourages gerrymandering areas not previously logged into project "activity areas", helping to artificially dilute the amount of effective DSD from previously logged units by creating a more favorable average.

Please disclose that DSD percent limit is based upon the amount of damage that is operationally feasible, not scientific data that measures land and soil productivity losses caused by DSD. The SQS were developed internally by the FS without the use of any public process such as Forest Planning, NEPA, or independent scientific peer review.

DSD 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 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[hellip] (A)ppling the 15% areal limit for detrimental damage is not correct... (T)hat was never the intent of the 15% limit[hellip] 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 stated, "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 limit is based largely on what is physically possible, while achieving other resource management objectives" (emphasis added). So the SQS limits are based on feasibility of timber sale implementation rather than concerns over soil productivity; and additionally we have the bulk density increase limit is based upon the limitations of detection by FS bulk density measuring methods[mdash]again, not concerns over soil productivity.

The FS's soil proxy[mdash]its SQS assumption that up to 15% of an activity area having long-term damage is consistent with NMFA and regulations[mdash]is arbitrary. The FS does not cite any scientific basis for adopting its numerical limits. 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. [hellip]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. (Emphasis added.)

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

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[hellip] some sites showed that maximum compaction occurred at a depth of 8 inches[hellip] 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 in the IPNF, 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 SQS standard is the same arbitrary 15%.

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.)

However the SQS definition of DSD considers only alterations to physical properties, but not chemical or biological properties. The SQS is not consistent with best available science.

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

burning. Please disclose the levels of large woody debris in the project area following past management activities, in addressing your obligations to consider cumulative effects.

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.)

"(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.

"The big trees were subsidizing the young ones through the fungal networks. Without this helping hand, most of the seedlings wouldn't make it." (Suzanne Simard: <http://www.ecology.com/2012/10/08/trees-communicate/>) "Disrupting network links by reducing diversity of mycorrhizal fungi[hellip] can reduce tree seedling survivorship or growth (Simard et al, 1997a; Teste et al., 2009), ultimately affecting recruitment of old-growth trees that provide habitat for cavity nesting birds and mammals and thus dispersed seed for future generations of trees." (Simard et al., 2013.) (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>).

Gorzalak et al., 2015:

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

The scientists involved in research on ectomycorrhizal networks have discovered connectedness, communication, and cooperation between what we traditionally consider to be separate

organisms. Such a phenomenon is usually studied within single organisms, such as the interconnections in

humans among neurons, sense organs, glands, muscles, other organs, etc. so necessary for individual survival. The FS must consider the ecosystem impacts from industrial management activities on this mycorrhizal network. The industrial forestry management paradigm is unfortunately destroying what it fails to recognize.

Please disclose if and how the IPNF has determined if management activities have reduced the diversity of mycorrhizal fungi in any treatment area.

USDA Forest Service, 2007 states:

Sustained yield was defined in the [hellip]Forest Plan [hellip]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 capacity of the lands ability to produce resources.

That statement is on point: Since the FS has no idea how much soil has been permanently impaired either within the project area or forestwide, "sustained yield" is an empty promise. There continues to be a lack of adequate regulatory mechanisms for protecting soil productivity on the IPNF and Northern Region, as advocated for by Lacy (2001). Since the FS has no idea how much soil has been permanently impaired either within the project area or forestwide, the agency's "sustained yield" is an empty promise. The FS lacks adequate measures for protecting soil productivity on the Forest.

NEPA requires that the FS specify the effectiveness of its mitigations. (40 C.F.R. 1502.16.) Please disclose the effectiveness of DSD mitigation. There is no quantitative monitoring data that demonstrates DSD remediation activities have taken an activity area with DSD amounts over the 15% 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. (Emphases added.)

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

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

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.)

Please provide an analysis of the noxious weeds situation in the analysis area. Please disclose the degree to which the productivity of the land and soil has been affected in the project area and forestwide due to noxious weed infestations, and how that situation is expected to change in the coming years and decades. The IPNF's noxious weed treatment program is mitigation for

management activities which exacerbate the spread of noxious weeds. Please disclose the effectiveness of this mitigation.

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.

So the project will worsen the noxious weed spread in the project area, and even if post- disturbance treatments are implemented, their uncertain efficacy means that the project will significantly increase noxious weed occurrence.

The FS often proposes winter logging as mitigation. Evidence that 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 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 IPNF 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 SQS 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." (Emphases 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.

In FW-STD-RIP-01 and FW-STD-RIP-02, the meaning of "intact and [hellip]functioning at desired conditions" is unclear. There is no reference to any established objective criteria.

In FW-STD-RIP-02, the last sentence ("Large-scale restoration plans or projects that address other cumulative effects within the same watershed may be considered as compensatory components and shall be described during site specific project analyses") allows this standard to be ignored in project development as long as the FS makes any claim that the project has some vague "large scale" restoration component.

In FW-GDL-RIP-01, 02, 03, 04, and 05 it is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the LMP, or if it is intended to render these entire Guidelines to be discretionary.

The Forest Plan fails to acknowledge the known limitations of the INFISH direction. INFISH deals primarily with riparian zone protection, and does not consider instream and stream bank erosion and sediment deposition during high water yield events, such as spring runoff and rain- on-snow events.

The FS sets an inadequate Aquatic Habitat restoration Objective (FW-OBJ-AQH-01) for the next 15 years, hardly addressing the Forest Plan Goal for this topic.

The Forest Plan does not contain direction that explicitly limits the amount of sediment that would be allowed to enter water bodies from management activities in compliance with NFMA regulations at 36 CFR 219.27(e).

Due to the inability of the FS to receive funding for or perform routine maintenance, a very substantial portion of the IPNF road system is not up to BMP standards, meaning that sediment and other pollution that result are violations of state water quality standards and the Clean Water Act.

The Forest Plan is not responsive to NFMA at 36 CFR 219.27(e) which concerns management practices that cause blockages of water courses.

The Forest Plan does not address the lack locally calibrated coefficients of the Equivalent Clearcut Area (ECA) component of the WATSED model, nor validate the model.

The Forest Plan's aquatic Macroinvertebrate Assemblage Management Indicator Species does not comply with 36 CFR 219.19(a)(1), because the FS does not explain how it assures well- distributed, viable populations of other aquatic species such as bull trout, westslope cutthroat trout, inland redband trout, and western pearlshell mussel.

Please disclose the results of monitoring the Macroinvertebrate Assemblage Management Indicator Species.

The Scoping Notice states:

The landscape architect working on this project will analyze treatment areas to predict what they would look like

from various viewpoints. This will help determine if additional changes to the proposed action are necessary to ensure consistency with forest plan direction for scenery.

This, and several other statements in the Scoping Notice illustrate a fatal flaw: the FS is forging ahead with a process that doesn't allow the public to review necessary FS analyses. Another example is that there is nothing in the Scoping Notice for the public to review about wildlife and their habitat needs, despite Forest Plan direction.

Please disclose the funding or other meaningful distinctions between "road maintenance" and "road reconstruction" (Scoping Notice at 29-30) to explain why the FS is saying major actions such as replacing culverts and installing rolling dips are not "reconstruction."

We ask the Forest Service disclose the following information concerning the project area:

- [middot] The deferred road maintenance backlog
- [middot] The annual road maintenance funding needs
- [middot] The annual road maintenance budget
- [middot] The capital improvement needs for existing roads
- [middot] The road density in the project area
- [middot] The number of miles of project area roads that fail to meet BMP standards or design standards

Please disclose the itemized costs for each of the following: new temporary roads, project-related road maintenance, road decommissioning, all other road-related work, sale preparation and administration, project-related weed treatment, other project mitigation, post-project monitoring, environmental analyses and reports, public meetings and field trips, publicity, consultation with other government agencies, responding to comments.

The Forest Plan FEIS concludes that implementation of the Forest Plan "may impact individuals or habitat, but is not likely to result in a trend towards federal listing or loss of viability" for each species. However, it does not disclose the minimum viable population of any of the Sensitive species (plant, wildlife, or aquatic), nor does it describe the quantity and quality of habitat needed to maintain viable populations of any of the Sensitive species. The Forest Plan lacks science-based habitat Standards based upon the needs of Sensitive species. The Forest Plan does not even include criteria for measuring a viable population in its Glossary.

The FS must address the case law requirement that the FS insure that there exists the quantity and quality of habitat necessary to insure viability of aquatic species of concern. The Ninth Circuit Court of Appeals ruled that

the FS "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. The Forest Plan is not based upon scientific research regarding the forestwide amount and distribution of habitat needed to insure viability of vertebrate species of concern. Furthermore, the FS maintains an inaccurate old-growth inventory. What is the FS's way of describing the quantity and quality of habitat that is necessary to sustain the viability of the species in question on the IPNF? Also, please "explain (the) methodology for measuring this habitat."

That Sensitive species are administratively designated by the regional forester highlights a weakness of the biodiversity provisions of the Forest Plan. At any time, the Regional Forester may change or even eliminate the Sensitive species list for the IPNF, without any public process.

The Forest Plan omits old-growth Management Indicator Species, which means there would be no monitoring of wildlife whose special habitat needs are best found in old growth. The Forest Plan's failure to designate management indicator species according to the requirements of the 1982 planning regulations violates NFMA.

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

The proposal is that the Forest Service monitor those species whose status allows inference to the status of other species, are indicative of the soundness of key ecological processes, or provide insights to the integrity of the overall ecosystem. This procedure is a necessary shortcut because monitoring and managing for all aspects of biodiversity is impossible.

No single species is adequate to assess compliance to biological sustainability at the scale of the national forests. Thus, several species will need to be monitored. The goal is to select a small number of focal species whose individual status and trends will collectively allow an assessment of ecological integrity. That is, the individual species are chosen to provide complementary information and to be responsive to specific conservation issues. Thus, the Committee proposed for consideration a broad list of species categories reflecting the diversity of ecosystems and management issues within the NFS.

The Forest Plan and FEIS do not include scientific justification for the adoption of the landbird assemblage (olive-sided flycatcher, hairy woodpecker, chipping sparrow, Hammond's flycatcher and dusky flycatcher) as MIS representing other wildlife (including old-growth associated wildlife species) on the IPNF. In fact the EIS contains an explicit assumption that its implementation cannot possibly affect viability of its chosen indicator species: "These MIS, elk and insectivores, were not selected because of a viability concern."

The use of vegetation habitat proxy is invalid for insuring viable populations of wildlife.

Please disclose statistically robust estimates of population trends of each Sensitive species. Please disclose the intensity of surveys for Sensitive species that have been conducted in the project area. Please provide a sound scientifically-based explanation for any species' apparent absence from the project area.

Traill et al., 2010 and Reed et al., 2003 are published, peer-reviewed scientific articles addressing what a true "minimum viable population" would be, and how that number is typically drastically underestimated. The FS has not identified the best available science that provides scientifically sound, minimum viable populations of any Sensitive species or MIS on the IPNF.

Please disclose the cumulative effects of recreational activities and motorized/mechanic access on wildlife populations.

The use of VMap base data causes unacceptable inaccuracy in the Forest Plan EIS wildlife analysis.

There is no accuracy assessment including confidence intervals in the Forest Plan EIS wildlife analysis.

IN FW-DC-WL-06, the provision directing management to promote large-diameter trees in eagle nesting territories is not based upon any information source from the IPNF that demonstrates it is needed, or on recommendations of any scientific research on managing for bald eagles.

Desired Condition FW-DC-WL-07 encourages occupancy of woodland caribou only within the currently designated Recovery Zone, far less than its historic range. The Recovery Zone is also not a FS established geographic area, which means the DC could be changed without public process.

It is unclear if the word "should" in Forestwide Wildlife Guidelines is intended to render these entire Guidelines to be discretionary.

In FW-GDL-WL-01, 03, 04, 05, 11, 14, 19, 20, 21, 22, 23, 24, and 25 the words "or minimize" are not objectively defined and basically nullify these guidelines.

In order to meet Forest Plan requirements in the Elk Management Unit, the project "should maintain existing levels of elk security" (Forest Plan guideline FW-GDL-WL-13).

Guideline FW-GDL-WL-08 can be read to provide direction to log areas that scientific consensus recognizes as some of the worst places to do so, because of the ecological sensitivity and often rarity of intact post-fire habitats.

Desired Condition FW-GDL-WL-20 states, "(Raptors) that establish nests near pre-existing human activities are assumed to be tolerant of that level of activity." There is no scientific research that validates the inclusion of this assumption for all raptors.

Desired Condition FW-GDL-WL-25 states, "Individual animals that establish nests and den sites near areas of pre-existing human use[hellip] are assumed to be accepting[hellip]" There is no scientific research that validates this assumption for the remaining species "not covered under other forestwide guidelines."

In the absence of meaningful thresholds of habitat loss and no monitoring of wildlife populations at the Forest level, projects will continue to degrade wildlife habitat across the IPNF over time. (See also Schultz 2012.). The FS would never be able to detect the likelihood of complete extirpation of any wildlife species from the IPNF, using such methodology.

The FS must conduct surveys for wildlife, or their dens or nests, in the project area.

Hutto, 2008 cautions against the common practice of landscape scale thinning to "restore" forests to a condition thought to be more congruent with historical conditions:

Black-backed Woodpeckers [hellip]require burned forests that are densely stocked and have an abundance of large, thick-barked trees favored by wood-boring beetles (Hutto 1995, Saab and Dudley 1998, Saab et al. 2002, Russell et al. 2007, Vierling et al. 2008). Indeed, data collected from within a wide variety of burned forest types show that the probability of Black-backed Woodpecker occurrence decreases dramatically and incrementally as the intensity of traditional (pre-fire) harvest methods increases. (Emphases added.)

The Hutto, 2008 Abstract states:

I use data on the pattern of distribution of one bird species (Black-backed Woodpecker, *Picoides arcticus*) as derived from 16,465 sample locations to show that, in western Montana, this bird species is extremely specialized on severely burned forests. Such specialization has profound implications because it suggests that the severe fires we see burning in many forests in the Intermountain West are not entirely "unnatural" or "unhealthy." Instead, 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.

Please evaluate impacts on species that are affected by human activity including the fisher, pine marten, wolverine, Canada lynx, native trout and other fish, elk, woodpeckers, pygmy nuthatches, northern goshawks, flammulated owls and other raptors, fringed myotis, Townsend's big-eared bats, amphibians (such as western toad and Coeur d'Alene salamander), and reptiles.

Please disclose data and the best available science concerning biological relationships and population trends of these species on the IPNF.

The FS relies upon unpublished reports by Samson alleged to prove viability is being maintained for various wildlife species of concern on the IPNF. However, those reports have not been subject to scientific peer review and thus fail to meet the best available science standard. The Samson reports rely upon the databases of outdated, unreliable information as its quantitative source.

The preference for large diameter of nesting trees for the pileated woodpecker is known (McClelland and McClelland, 1999) but because the Forest Plan omitted adoption of old growth MIS, the FS has no viability strategy.

GA-DC-WL-PR-02 allows "low levels of human disturbance" in grizzly and caribou habitat, but this is too vague to be based upon best available science.

The Forest Plan lacks meaningful direction maintaining Landscape Connectivity for wildlife. 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.)

The FS has still not sufficiently dealt with the issue of fragmentation, road effects, and past logging on old-growth species' habitat.

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 IPNF is a major ongoing concern. It is documented that edge effects occur 10-30 meters into a forest tract (Wilcove et al., 1986). The size of blocks of interior forest that existed historically before management (including fire suppression) was initiated must be compared to the present condition. USDA Forest Service, 2004a states:

Forested connections between old growth patches [hellip](widths) are important because effective corridors should be wide enough to "contain a band of habitat unscathed by edge effects" relevant to species that rarely venture out of their preferred habitats (Lidicker and Koenig 1996 and Exhibit Q-17).

Timber harvest patterns across the Interior Columbia River basin of eastern Washington and Oregon, Idaho, and western Montana have caused an increase in fragmentation of forested lands and a loss of connectivity within and between blocks of habitat. This has isolated some wildlife habitats and reduced the ability of some wildlife populations to move across the landscape, resulting in long-term loss of genetic interchange (Lesica 1996,

U.S. Forest Service and Bureau of Land Management 1996 and 1997).

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

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

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

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

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

Connectivity objectives should be set for each landscape unit. [hellip]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. [hellip] 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. [hellip]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. [hellip](l)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. [hellip]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. [hellip](A) way to moderate both the demands for and the stresses placed

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

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

Habitat alone cannot be used to predict wildlife populations[hellip]The presence of suitable habitat does not ensure that any particular species will be present or will reproduce.

Therefore, populations of species must also be assessed and continually monitored.

(Emphasis added.)

The Forest Plan includes inadequate direction to designate the minimum road system. The Forest Plan is inconsistent with the Travel Management Regulations.

How does the FS propose to afford maintaining the road system in this project area when the funding doesn't exist, and as a result watershed conditions will continue to deteriorate from naturally increasing erosion?

The main ecological (as well as budgetary) problem facing the IPNF is the existing excessive network of roads. Although the main focus of the Travel Management Rule Subpart A was to be this excessive road network, the FS sidesteps the issue at every juncture[mdash]in the design of the Forest Plan, in the design of projects implementing the Forest Plan, and in the systematic avoidance of fully performing its duties under Subpart A, which requires the agency to minimize the ecological and economic liabilities of the excessive road network by significantly downsizing it.

Early in the forest plan revision process, the FS recognized the opportunity the process provided for addressing the excessive road system on the Forest. This was indicated in statements made in the AMS:

The revised Forest Plans need to be in compliance with new laws, regulations, and management direction. Forest Plans also need to incorporate new research and science that has been developed. The new strategies have been developed to aid in the sustainability of all native and desired non-native species.

In January of 2001, a new Forest Roads Rule and Policy was issued which revised regulations concerning the management, use, and maintenance of the National Forest Transportation System. Forest Plan Revision provides the opportunity to incorporate this direction into the Forest Plans (USDA 2001b).

Possible Strategies in Revising Management Direction for Access and Recreation:

[bull] Provide management direction for Access and Travel Management Planning, including criteria for developing access strategies by appropriate modes and season of use.

On the verge of taking bold, necessary strides towards reforming its roads and access management into something ecologically sustainable, the FS issued the revised Forest Plan and FEIS which failed to analyzed or address the problem, and then followed that up with a sham

Region 1-directed Travel Analysis Process that failed to follow the Travel Management Rule Subpart A requirements for involving the public in a science-based effort to identify the forestwide minimum road system. The FS is obligated to disclose the project area road system's long-term financial liabilities, and the associated ecological impacts due to inadequate maintenance funding.

Huge bibliographies 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. That there are no road density standards in the forest plan suggests the biased and arbitrary manner of the FS's use of its own "best available science." From the Wisdom et al. (2000) Abstract:

Our assessment was designed to provide technical support for the ICBEMP and was done in five steps. [hellip] 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 make a very strong scientific rationale for including ecologically- based road density standards:

Roads have well-documented, significant and widespread ecological impacts across multiple scales, often far beyond the area of the road "footprint". Such impacts often create large and extensive departures from the natural conditions to which organisms are adapted, which increase with the extent and/or density of the road network. Road density is a useful metric or indicator of human impact at all scales broader than a single local site because it integrates impacts of human disturbance from activities that are associated with roads and their use (e.g., timber harvest, mining, human wildfire ignitions, invasive species introduction and spread, etc.) with direct road impacts. Multiple, convergent lines of empirical evidence summarized herein support two robust conclusions: 1) no truly "safe" threshold road density exists, but rather negative impacts begin to accrue and be expressed with incursion of the very first road segment; and 2) highly significant impacts (e.g., threat of extirpation of sensitive species) are already apparent at road densities on the order of 0.6 km per square km (1 mile per square mile) or less. Therefore, restoration strategies prioritized to reduce road densities in areas of high aquatic resource value from low-to-moderately-low levels to zero-to-low densities (e.g., <1 mile per square mile, lower if attainable) are likely to be most efficient and effective in terms of both economic cost and ecological benefit. By strong inference from these empirical studies of systems and species sensitive to humans' environmental impact, with limited exceptions, investments that only reduce high road density to moderate road density are unlikely to produce any but small incremental improvements in abundance, and will not result in robust populations of sensitive species.

(Emphases added.) Wisdom et al., 2000, which was cited heavily in the forest plan FEIS and is thus considered to be "Best Available Science" by the FS, state in their Abstract:

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.

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.

(Emphases added.) And from the article's Major Findings and Implications:

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.

(Emphasis added.) The heavy bias toward identifying habitat manipulation options (i.e., logging and other active management activities) in the forest plan[mdash]which lacks Wisdom et al. (2000) implications for road management[mdash]has led to a forest plan that is a recipe for failure.

Desired Condition FW-DC-AR-04 is a Forest Plan Decision prioritizing vast but unspecified acreage of the IPNF for motorized recreation, in the absence of the travel planning required by the Travel Management Regulations.

Objectives FW-OBJ-AR-04, and 05 are Forest Plan Decisions designating unspecified mileages of the IPNF for motorized recreation, in the absence of the travel planning required by Travel Management Regulations and completed by 2015. In addition, because of the existing degraded condition of many motorized travel routes this Desired Condition conflicts with FW-DC-AR-07 and 08.

The Forest Plan is not consistent with best available science on road density in grizzly bear habitat outside of Bear Management Units.

The Forest Plan lacks direction to update roadless area boundaries utilizing a transparent public procedures in order to evaluate unroaded areas contiguous with IRAs and Wilderness.

In FW-DC-TBR-01, including the sentence that begins with "Salvage[hellip]" perpetuates the longstanding conflict between timber production and natural processes which create wildlife habitat. The Desired Condition phrase, "associated desired conditions" is too vague. And FW- DC-TBR-01 fails to recognize that market demand has no regard for ecological sustainability. Since the Forest Service fails to acknowledge the scientific and public controversy of the "salvage" issue, such statements should be excluded from the Forest Plan.

The wording of FW-DC-TBR-03 essentially nullifies any meaningful distinction between suitable and unsuitable land, and together FW-OBJ-TBR-01, MA6-STD-TBR-01, and the ASQ (FW-DC-TBR-04), encourages logging in unsuitable land. One or more of the "purposes" of logging it allows in land that is "unsuitable" appear in every timber sale NEPA document.

FW-DC-TBR-04. The Allowable Sale Quantity (ASQ) of 120 million board feet annually is not based upon scientifically sound modeling that adequately considers ecological and economic constraints. It is simply not ecologically sustainable. It creates a sense of false expectations for forest products industries.

FW-OBJ-TBR-01. This timber target provides incentives which conflict with ecological sustainability. The annual target of offering 45 million board feet is not based upon scientifically sound modeling that adequately considers ecological and economic constraints. It creates a sense of false expectations for forest products industries

FW-STD-TBR-02 perpetuates the fiction that there is a category of natural processes that are some sort of "catastrophe." This effectively translates to dead trees not being logged (not maximizing timber volume produced) as the catastrophe rather than there really being something truly ecologically harmful.

Desired Condition FW-DC-SES-04 perpetuates the Smoky Bear myth that protection from fire is a promise that the government can and should make. Unlike the direction provided in the Forest Plan Fire section, there is no recognized balance with ecological considerations. This Desired Condition does not provide any further increment of public safety.

The FS refused to consider scientific research and opinion that recognizes the critical challenge posed by climate change to global ecosystems and the IPNF. The statement in the 2010 KIPZ Climate Change Report, "Harvested wood products increase the net sequestration on these forests by an undetermined amount" is unsubstantiated by cited scientific research or information.

Climate change science suggests that logging for sequestration of carbon, logging to reduce wild fire, and other manipulation of forest stands does not offer benefits to climate. Rather, increases in carbon emissions from soil disturbance and drying out of forest floors are the result. Managers of national forest lands can best address climate change through minimizing development of forest stands, especially stands that have not been previously logged, by allowing natural processes to function. Furthermore, any supposedly carbon sequestration from logging are usually more than offset by carbon release from ground disturbing activities and from the burning of fossil fuels to accomplish the timber sale, even when couched in the language of restoration. Reducing fossil fuel use is vital. Please analyze, disclose, and consider the full range of scientific information on carbon storage, vegetation management, and wildfire.

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. [hellip]Impending changes in regional climates [hellip]have the capacity for causing great shifts in composition of

ecological communities.

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

Please disclose the body of science that implicates logging activities as a contributor to reduced carbon stocks in forests and increases in greenhouse gas emissions.

The LMP's Monitoring Program is inadequate for informing the agency and the public within any valid adaptive management framework.

Indicator MON-VEG-01-02 merely reports on acres burned, and lacks a necessary qualitative component.

Indicator MON-VEG-01-05, the annual measure of old growth and recruitment potential old growth, does not require that the old-growth definition as specified in the LMP Glossary be the measurement criteria utilized to determine if any acre is old growth.

The logic behind Indicator MON-VEG-01-06 is lacking, since annually determining old-growth acres "treated" would reveal nothing about the outcome[mdash]positive or negative[mdash]of those treatments.

The Indicator MON-VEG-01-08 lacks relevance since it would merely measure the "Number of acres influenced by insects and disease."

Indicator MON-VEG-02-01 is inadequate since annually determining acres of noxious weeds "treated" doesn't reveal the effectiveness of those treatments.

Indicator MON-VEG-02-02 is inadequate since the definition of a "site of new non-native invasive plant species" is not given.

Indicator MON-FIRE-01-01. Effectiveness of fuel treatments is not evaluated.

Indicator MON-WTR-01-01. "Number of Best Management Practices[hellip]" This Indicator is too vague to answer the Monitoring Question, "Are soil, water quality, and riparian and aquatic habitats protected and moving towards desired conditions?"

Indicators MON-WTR-02-01, MON-WTR-02-02: Measuring watersheds by "miles of restoration activities" would not be informative. It is also unclear how measuring watersheds by "acres of restoration activities" would be useful since the Forest Service definition of restoration is so lax that every acre treated would be considered restoration.

Indicator MON-WTR-02-03: The meaning of "trended toward" is too subjective. Use of these three indicators would not answer the Monitoring Question.

The Forest Plan fails to include Monitoring Plan Questions and Indicators to validate Watershed Condition Ratings and Watershed Disturbance Ratings with other measures, such as the condition or status of aquatic habitat such as attainment of INFISH RMOs, and with measures of hydrological equilibrium/streambank stability in assessed subwatersheds, and with data gathered for the 1987 Forest Plan monitoring items.

Indicator MON-AQH-01-01 lacks a baseline of unconnected stream habitat for subsequent comparison.

The monitoring program lacks Monitoring Questions and Indicators for the Sensitive westslope cutthroat trout, inland redband trout, and western pearlshell mussel.

The Monitoring Program lacks a measure for determining significant reductions in soil productivity due to land management activities in any timeframe short of forever. There is a lack of any measure of the areal extent of soil damage within any geographic scale.

There is no direction in the Forest Plan for monitoring soil restoration accomplishment.

Monitoring Question MON-FLS-01 is worded too vaguely to provide meaningful answers. The overarching goal of ESA listing is population recovery, which is omitted. A measure of population numbers of grizzly bears is essential for determining attainment of recovery, as is mortality information.

Indicator MON-FLS-01-02. Measuring population numbers of Canada lynx is essential for determining attainment

of recovery, as is information on trapping mortality.

Indicator MON-FLS-01-03. Specific to the INFISH monitoring requirements that this Indicator adopts; the IPNF must use monitoring data to determine if project implementation results in attainment of riparian goals and objectives—deemed to be "critical" monitoring by the Forest Service in Forest Plan Appendix B.

The bull trout redd count data must be supplemented by fish survey data for numbers of bull trout in bull trout streams. It is also important to measure population trends of brook trout in bull trout streams for hybridization reasons.

Monitoring Question MON-MIS-01 lacks a requirement to estimate baseline elk population numbers, and measure elk population trends in response to management actions.

Indicator MON-MIS-01-02 is useless as a biological indicator because nothing is required specific to any bird species.

Indicator MON-MIS-01-03 relies upon a measurement system that is not explained anywhere in the Forest Plan, merely commits to monitoring vague "changes" measured somewhere every five years.

Indicator MON-WL-01-01 is useless as a biological indicator because nothing is required specific to any wildlife species.

The FS has failed to monitor populations of wildlife, in favor of striving towards DCs for habitat (actually, vegetation) in project planning. The Committee of Scientists (1999) state:

Habitat alone cannot be used to predict wildlife populations. The presence of suitable habitat does not ensure that any particular species will be present or will reproduce.

Therefore, populations of species must also be assessed and continually monitored.

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

(Emphasis added.) The Committee of Scientists (1999) provide still more emphases on the importance of monitoring:

The proposal is that the Forest Service monitor those species whose status allows inference to the status of

other species, are indicative of the soundness of key ecological processes, or provide insights to the integrity of the overall ecosystem. This procedure is a necessary shortcut because monitoring and managing for all aspects of biodiversity is impossible.

No single species is adequate to assess compliance to biological sustainability at the scale of the national forests. Thus, several species will need to be monitored. The goal is to select a small number of focal species whose individual status and trends will collectively allow an assessment of ecological integrity. That is, the individual species are chosen to provide complementary information and to be responsive to specific conservation issues. Thus, the Committee proposed for consideration a broad list of species categories reflecting the diversity of ecosystems and management issues within the NFS.

Please address this scientific opinion (Committee of Scientists, 1999) which disagrees with Forest Plan assumptions about wildlife habitat management.

Monitoring Question MON-AR-01. With the wide variety of recreation impacts on the wide variety of recreation sites throughout the Forest, this leaves unfulfilled the need for more specific monitoring and reporting.

Monitoring Question MON-AR-02: Identification of the minimum transportation system necessary is a regulatory requirement, so the IPNF must complete forestwide travel planning.

Monitoring Question MON-AR-03: Specific to motorized recreation, identification of the minimum transportation system necessary is a regulatory requirement, and the IPNF must complete its forestwide travel planning.

Monitoring Question MON-WLDN-01. The IPNF has so many acres of roadless areas deserving protection as Wilderness, so the public would be well-served with a Monitoring Question and Indicators that assess wilderness conditions and trends in roadless areas.

Indicator MON-MIN-01-01: The baseline number of unreclaimed abandoned mine sites must be disclosed. Additionally, including monitoring items for water quality and soil productivity in abandoned mine sites is important for biological resources including human health and safety.

Monitoring Question MON-SOC-01: Data on the contribution to the economy from those gathering non-timber products, hunters, anglers, and recreationists would lead to a more balanced understanding by the agency of how the IPNF sustains local and regional economies.

Many FS analyses rely upon the use of models. The reliability of all the data used as input for these models is not disclosed. Also, the validity of the models was not established for how the FS utilizes them. Please cite the best available scientific information which establishes model validity.

Please disclose the limitations of all models the FS relies upon for the NEPA analyses.

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

The next level of scientific integrity is the notion of "validity." So even if FS data input to its models are reliable, a question remains of the models' validity. In other words, are the models scientifically appropriate for the uses for which the FS is utilizing them? As Huck, (2000) explains, the degree of "content validity," or accuracy of the model or methodology is established by utilizing other experts. This, in turn, demonstrates the necessity for utilizing the peer review process.

Ruggiero, 2007 (a scientist from the research branch of the FS) recognizes a fundamental need to demonstrate the proper use of scientific information, in order to overcome issues of decisionmaking integrity that arise from bureaucratic inertia and political influence. Ruggiero, 2007 and Sullivan et al., 2006 provide a commentary on the scientific integrity and agency use and misuse of science. And the Committee of Scientists (1999) recommend "independent scientific review of proposed conservation strategies[hellip]"

Roger Sedjo, member of the Committee of Scientists, expresses his concerns in Appendix A of their 1999 Report about the discrepancy between forest plans and Congressional allocations, leading to issues not considered in forest plans such as the IPNF's:

(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.

A Science Consistency Review is long overdue for the revised Forest Plan. The FS prepared Guldin et al. (2003) which:

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

The Committee of Scientists (1999) state:

To ensure the development of scientifically credible conservation strategies, the Committee recommends a process that includes (1) scientific involvement in the selection of focal species, in the development of measures of species viability and ecological integrity, and in the definition of key elements of conservation strategies; (2) independent scientific review of proposed conservation strategies before plans are published; (3) scientific involvement in designing monitoring protocols and adaptive management; and

(4) a national scientific committee to advise the Chief of the Forest Service on scientific issues in assessment and planning.

Please analyze and disclose the cumulative effects of past, ongoing, and proposed management actions, within a logically defined cumulative effects analysis area, on land of all ownerships. Please disclose if the FS has performed all of the monitoring and mitigation required or recommended in those NEPA documents, and the results of the monitoring. The FS would be unable to properly analyze and disclose cumulative effects of management plan implementation if it is not adequately informed by past project monitoring and plan-mandated monitoring.

The Montana Forest Restoration Committee adopted 13 Principles, written collaboratively by a diverse set of stakeholders which included two Region 1 forest supervisors along with representatives from timber and forest

products industries, conservation groups, recreation interests, and others. Principle #3 states:

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

Consistent with this principle, the agency would publicize a landscape assessment of the project area so a genuine scoping process could help determine the project Purpose and Need. Instead, the FS has apparently prioritized the project Purpose and Need based on appropriated funds and Congress's ill-informed priorities for this project area, and promoted them via "collaboration" to subsidize narrow financial interests.

Since the FS has gone out of its way to please a narrow segment of the public in the design of the project before ever notifying the public at large, the agency is also obligated to be open to this wider pool of national forest owners for suggestions concerning alternative development. We support some of the actions proposed, specifically those reducing road related impacts and restoring aquatic habitat and watersheds. However, we request the FS take a more comprehensive approach to restoring aquatic habitat and watersheds than is included in the proposal. Please design an alternative that results in a road system which is fully affordable to maintain on an annual basis, within all of the watersheds affected by the proposal. Please use expected appropriations as the yardstick to measure "affordable", based on recent years' funding levels.

Such an alternative would reduce road densities to meet science-based ecological conditions for wildlife and fisheries. Wisdom et al. (2000) state:

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.

The actions needed to reduce the road system to this affordable level need not themselves be within expected budgets. Indeed, few restoration projects proposed or implemented by the FS are fully funded by appropriated dollars. Figuring out a way to fund road decommissioning would follow from a Decision to implement it. That would be a way to truly collaborate.

In analyzing such an alternative, it may turn out that some of the actions mentioned in the Scoping Notice would be unnecessary or would be modified. For example, some roads proposed for maintenance or upgrading may not be affordable to maintain, or may be located where chronic sedimentation into streams persists. In such cases consideration of highest restoration priorities would require full road obliteration.

Such an alternative would reduce the road network in the project area watersheds consistent with the forest plan and with best available science for maintaining robust populations of native fish.

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

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

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

Such an alternative would not construct any new roads, including temporary roads because, as the Forest Service is aware, construction of temporary roads potentially creates much of the same impact as system roads.

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

In conclusion, please keep both organizations on the list to receive all communications concerning the Buckskin Saddle timber sale. It is our intention that the project ID Team reviews and includes in the Project Record the literature and other documents we've cited herein. Please contact us if you have problems locating any of them.

Sincerely,

/s/

Michael Garrity

Alliance for the Wild Rockies

Helena, Montana

References cited

Adams, P.W and H.A. Froehlich. 1981. Compaction of forest soils. Extension Publication PNW

217. 13 pp.

Allen, Craig D., David D. Breshears, Nate G. McDowell 2015. On underestimation of global vulnerability to tree mortality and forest die-off from hotter drought in the Anthropocene ECOSPHERE ESA Centennial Paper published 7 August 2015.

Angermeier, P. L., and J. R. Karr. 1994. Protecting biotic resources: Biological integrity versus biological diversity as policy directives. *BioScience* Vol. 44, No. 10, November 1994.

Aubry, Keith B. Kevin S. McKelvey, and Jeffrey P. Copeland, 2007. Distribution and Broad-scale Habitat Relations of the Wolverine in the Contiguous United States. *Journal of Wildlife Management* 71(7):2147-2158; 2007

Aubry, K.B., C.M. Raley, S.W. Buskirk, W.J. Zielinski, M.K. Schwartz, R.T. Golightly, K.L. Purcell, Richard D. Weir, J. Scott Yaeger, 2013. Meta-Analyses of Habitat Selection by Fishers at Resting Sites in the Pacific Coastal Region. *The Journal of Wildlife Management* 77(5):965- 974; 2013; DOI: 10.1002/jwmg.563

Bart RR, Tague CL, Moritz MA (2016). Effect of Tree-to-Shrub Type Conversion in Lower Montane Forests of the Sierra Nevada (USA) on Streamflow. *PLoS ONE* 11(8): e0161805. doi:10.1371/journal.pone.0161805

Booth, Derek B.; 1991. Urbanization and the Natural Drainage System—Impacts, Solutions, and Prognoses. *Northwest Environmental Journal*, v. 7, p. 93-118, 1991.

Brais, S. and C. Camire. 1997. Soil compaction induced by careful logging in the claybelt region of northwestern Quebec (Canada). *Can. J. Soil Sci.* 78:197-206.

Breshears, David D., Neil S. Cobb, Paul M. Rich, Kevin P. Price, Craig D. Allen, Randy G. Balice, William H. Rommei, Jude H. Kastens, M. Lisa Floyd, Jayne Belnap, Jesse J. Anderson, Orrin B. Myers, and Clifton W. Meyer; 2005. Regional vegetation die-off in response to global- change-type drought. Proceedings of the National Academy of Sciences of the United States of America, October 10, 2005.

Bull, Evelyn L. and Richard S. Holthausen, 1993. Habitat use and management of pileated woodpeckers in northeastern Oregon. *Journal of Wildlife Management* 57(2): 1993. Pp. 335-345.

Bull, E. L., N. Nielsen-Pincus, B.C. Wales, J.L. Hayes. 2007. The influence of disturbance events on pileated woodpeckers in Northeastern Oregon. *Forest Ecology and Management* 243:320-329.

Bull, Evelyn L. and Arlene K. Blumton, 1999. Effect of Fuels Reduction on American Martens and Their Prey. USDA Forest Service Department of Agriculture, Pacific Northwest Research Station, Research Note PNW-RN-539, March 1999.

Bull, Evelyn L. Richard S. Holthausen and Mark G. Henjum; 1992. Roost Trees Used by Pileated Woodpeckers in Northeastern Oregon. *The Journal of Wildlife Management*, Vol. 56, No. 4 (Oct., 1992), pp. 786-793.

Bull, Evelyn L., Catherine G. Parks, and Torolf R. Torgersen, 1997. Trees and Logs Important to Wildlife in the Interior Columbia River Basin. Gen. Tech. Rep. PNW-GTR-391. Portland, OR:

U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 55p.

Campbell, John L, Mark E Harmon, and Stephen R Mitchell, 2011. Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions? *Front Ecol Environ* 2011; doi:10.1890/110057

Carnefix, Gary and Chris Frissell, 2009. Aquatic and Other Environmental Impacts of Roads: The Case for Road Density as Indicator of Human Disturbance and Road-Density Reduction as Restoration Target; A Concise Review. Pacific Rivers Council Science Publication 09-001.

Pacific Rivers Council; PMB 219, 48901 Highway 93, Suite A, Polson, MT 59860)

Carroll, Carlos, Paul C. Paquet, and Reed F. Noss, 2001b. Carnivores as Focal Species for Conservation Planning in the Rocky Mountain Region. *Ecological Applications*, August, 2001, Vol. 11, No. 4 : 961-980.

Castello, J.D., D.J. Leopold, and P.J. Smallidge; 1995. Pathogens, patterns, and processes in forest ecosystems. *Bioscience* 45(1):16_24.

Cherry, M.B. 1997. The Black-Backed And Threetoed Woodpeckers: Life History, Habitat Use, And Monitoring Plan. Unpublished Report. On File With: U.S. Department Of Agriculture, Lewis And Clark National Forest, P.O. Box 869, Great Falls, Mt 59403. 19 P.

Christensen, Alan G.; L. Jack Lyon and James W. Unsworth, 1993. Elk Management in the Northern Region: Considerations in Forest Plan Updates or Revisions. United States Department of Agriculture, Forest Service Intermountain Research Station, General Technical Report INT- 303 November 1993.

Clough, Lorraine T. 2000. Nesting Habitat Selection and Productivity of Northern Goshawks in West-Central Montana. M.S. Thesis, University of Montana, 87 pp.

Cohen, Jack 1999a. Reducing the Wildland Fire Threat to Homes: Where and How Much? Pp. 189-195 In Proceedings of the symposium on fire economics, planning, and policy: bottom lines. April 5-9, 1999, San Diego, CA. USDA Forest Service Gen. Tech. Rep. PSW-GTR-173.

Cohen, Jack and Bret Butler, 2005. Wildlife Threat Analysis in the Boulder River Canyon: Revisited. Fire Sciences Laboratory, USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana. July 26-27, 2005.

Cohen, Warren B., Zhiqiang Yang, Stephen V. Stehman, Todd A. Schroeder, David M. Bell, Jeffrey G. Masek, Chengquan Huang, Garrett W. Meigs. 2016. Forest disturbance across the conterminous United States from 1985-2012: The emerging dominance of forest decline. *Forest Ecology and Management*. 360 (2016) 242-252

Collins, Brandon M and Scott L Stephens, 2007. Managing natural wildfires in Sierra Nevada wilderness areas. *Frontiers in Ecology and the Environment* 2007; 5, doi:10.1890/070007[copy] The Ecological Society of America. www.frontiersinecology.org

Committee of Scientists, 1999. Sustaining the People's Lands. Recommendations for Stewardship of the National Forests and Grasslands into the Next Century. March 15, 1999

Copeland, Jeffrey P., James M. Peek, Craig R. Groves, Wayne E. Melquist, Kevin S. Mckelvey, Gregory W. Mcdaniel, Clinton D. Long, Charles E. Harris, 2007. Seasonal Habitat Associations of the Wolverine in Central Idaho. *Journal of Wildlife Management* 71(7):2201-2212; 2007.

Crocker-Bedford, D.C. 1990. Goshawk reproduction and forest management. *Wildlife Society Bulletin*; v. 18, no. 3, pp. 262-269.

Cullen, S.J., C. Montagne, and H Ferguson, 1991. Timber Harvest Trafficking and Soil Compaction in Western Montana. *Soil Sci. Soc. Am. J.*, Vol. 55 (1416-1421), September- October 1991.

DellaSala, Dominick A. and Chad T. Hanson, 2015. *The Ecological Importance of Mixed- Severity Fires: Nature's Phoenix*. Published by Elsevier Inc.

Depro, Brooks M., Brian C. Murray, Ralph J. Alig, and Alyssa Shanks. 2008. Public land, timber harvests, and climate mitigation: quantifying carbon sequestration potential on U.S. Public timberlands. *Forest Ecology and Management* 255: 1122-1134.

Environmental Protection Agency, 1999. Considering Ecological Processes in Environmental Impact Assessments. U.S. Environmental Protection Agency, Office of Federal Activities. July 1999

Everett, Richard L., comp. 1994. Restoration of stressed sites, and processes. Gen. Tech. Rep. PNWGTR- 330. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 123 p. (Everett, Richard L., assessment team leader; Eastside forest ecosystem health assessment; volume IV.)

Finney and Cohen, 2003. Expectation and Evaluation of Fuel Management Objectives. USDA Forest Service Proceedings RMRS-P-29.

Fire Science Brief, 2009. Listening to the Message of the Black-backed Woodpecker, a Hot Fire Specialist. Fire

Flatten, Brad, 2003. Determining Appropriate Winter Logging Conditions for Protection of the Soil Resource. Okanogan & Wenatchee National Forests, December 2003 Draft.

Fly, Chase; Scott Bergendorf; John Thornton; Tom Black and Charlie Luce; 2011. Scriver Creek Road Inventory (GRAIP) Report In Support of the Scriver Creek Integrated Restoration Project USDA Forest Service, Boise National Forest. September 14, 2011.

Funk, J., S. Saunders, T. Sanford, T. Easley, and A. Markham. 2014. Rocky Mountain forests at risk: Confronting climate-driven impacts from insects, wildfires, heat, and drought. Report from the Union of Concerned Scientists and the Rocky Mountain Climate Organization. Cambridge, MA: Union of Concerned Scientists.

Goggans, Rebecca, Rita. D. Dixon, and L. Claire S. Seminara, 1989. Habitat Use by Three-toed and Black-backed Woodpeckers, Deschutes National Forest, Oregon. Oregon Department of Fish and Wildlife Nongame Wildlife Program, USDA Deschutes National Forest, Technical Report #87-3-02.

Gorzelak MA, Asay AK, Pickles BJ, Simard SW. 2015. Inter-plant communication through mycorrhizal networks mediates complex adaptive behaviour in plant communities. *AoB PLANTS* 7: plv050; doi:10.1093/aobpla/plv050

Graham, R., et al. 1999a. The Effects of Thinning and Similar Stand Treatments on Fire Behavior in Western Forests. U.S. Forest Service, Pacific Northwest Research Station. General Tech. Rpt PNW-GTR-463. Sept. 1999.

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann, 1992. Old-growth forest types of the northern region. Northern Region, R-1 SES 4/92. Missoula, MT.

Grier, C. C., K. M. Lee, N. M. Nadkarni, G. O. Klock, & P. J. Edgerton, 1989 Productivity of Forests of the United States and Its Relation to Soil and Site Factors and Management Practices: A Literature Review. USDA Forest Service General Technical Report PNW-GTR-222, March 1989.

Guldin, James M., David Cawse, Russell Graham, Miles Hemstrom, Linda Joyce, Steve Kessler, Ranotta McNair, George Peterson, Charles G. Shaw, Peter Stine, Mark Twery, Jeffrey Walte. 2003. The Science

Consistency Review: A Tool to Evaluate the Use of Scientific Information in Land Management Decisionmaking. United States Department of Agriculture Forest Service FS-772, September 2003.

Hargis Christina D., John A. Bissonette, and David L. Turner, 1999. The influence of forest fragmentation and landscape pattern on American martens. *Journal of Applied Ecology*, 1999, 36 Pp. 157-172.

Harmon, Mark E, William K. Ferrell, and Jerry F. Franklin. 1990. Effects on carbon storage of conversion of old-growth forest to young forests. *Science* 247: 4943: 699-702

Harmon, Mark E. & Barbara Marks, 2002. Effects of silvicultural practices on carbon stores in Douglas-fir - western hemlock forests in the Pacific Northwest, U.S.A.: results from a simulation model, 32 *Canadian Journal of Forest Research* 863, 871 Table 3 (2002).

Harmon, Mark E. 2001. Carbon Sequestration in Forests: Addressing the Scale Question, 99:4 *Journal of Forestry* 24, 24-25, 29 (2001) (citing C.F. Cooper, Carbon Storage in Managed Forests, 13:1 *Canadian Journal of Forest Research* 155-66 (1983); Harmon et al., *infra* n. 34, at 699-702; R.C. Dewar, Analytical model of carbon storage in trees, soils and wood products of managed forests, 8:3 *Tree Physiology* 239-58 (1991); and E.D. Schulze et al., Managing Forests after Kyoto, 289 *Science* 2058-59 (2000)).

Harmon, Mark E. 2009. Testimony Before the Subcommittee on National Parks, Forests, and Public Lands of the Committee of Natural Resources for an oversight hearing on "The Role of Federal Lands in Combating Climate Change", March 3, 2009. Mark E. Harmon, PhD, Richardson Endowed Chair and Professor in Forest Science, Department of Forest Ecosystems and Society, Oregon State University.

Harr, R. Dennis 1987. Myths and misconceptions about forest hydrologic systems and cumulative effects. Proceedings of the California Watershed Management Conference, November 18-20, 1986, West Sacramento, California. Wildland Resources Center, Division of Agriculture and Natural Resources, University of California, 145 Mulford Hall, Berkeley, California 94720. Report No. 11, February, 1987.

Harris, Larry D. 1984. *The Fragmented Forest : Island Biogeography Theory and the Preservation of Biotic Diversity*. Chicago Press, Chicago, Ill. 211pp.

Harrison S and Voller J. 1998. Connectivity. Voller J and Harrison S, eds. *Conservation Biology Principles for Forested Landscapes*. Ch3:76-97. Vancouver: UBC Press.

Harvey, A.E., J.M. Geist, G.I. McDonald, M.F. Jurgensen, P.H. Cochran, D. Zabowski, and R.T. Meurisse, 1994. Biotic and Abiotic Processes in Eastside Ecosystems: The Effects of Management on Soil Properties, Processes, and Productivity. GTR-323 93-204 (1994)

Hayward, G. D., and R. E. Escano. 1989. Goshawk nest-site characteristics in western Montana and northern Idaho. Condor: v. 91, no. 2, pp. 476-479.

Hayward, Gregory D., and Jon Verner, 1994. Flammulated, Boreal, and Great Gray Owls in the United States: A Technical Conservation Assessment. USDA Forest Service General Technical Report RM-253

He, Yujie, Susan E. Trumbore, Margaret S. Torn, Jennifer W. Harden, Lydia J. S. Vaughn, Steven D. Allison, James T. Randerson 2016. Radiocarbon constraints imply reduced carbon uptake by soils during the 21st century. Science 23 Sep 2016: Vol. 353, Issue 6306, pp. 1419- 1424 DOI: 10.1126/science.aad4273

Heinemeyer, KS and JL Jones. 1994. Fisher biology and management: a literature review and adaptive management strategy. USDA Forest Service Northern Region, Missoula, MT. 108 pp.

Hessburg Paul F. and James K. Agee; 2003. An environmental narrative of Inland Northwest United States forests, 1800-2000. Forest Ecology and Management 178 (2000) 23-59.

Hillis, Mike; Amy Jacobs, and Vita Wright, 2002. Black-Backed Woodpecker Assessment. U.S. Forest Service Region One.

Homann, Peter S., Mark Harmon, Suzanne Remillard, & Erica A.H. Smithwick, 2005. What the soil reveals: Potential total ecosystem C stores of the Pacific Northwest region, USA, 220 Forest Ecology and Management. 270, 281 (2005).

Huck, Schuyler W., 2000. Reading Statistics and Research (3rd Edition). New York: Longman, 2000.

Hutto, Richard L., 2006. Toward Meaningful Snag-Management Guidelines for Postfire Salvage Logging in North American Conifer Forests. Conservation Biology Volume 20, No. 4, 984-993, 2006.

Hutto, Richard L. 2008. The Ecological Importance of Severe Wildfires: Some Like it Hot. *Ecological Applications*, 18(8), 2008, pp. 1827-1834.

Hutto, R.L. 1995. The composition of bird communities following stand-replacement fires in northern Rocky Mountain (U.S.A.) conifer forests. *Conservation Biology* 9:1041-1058.

Johnson, Randy 2016. Looking to the Future and Learning from the Past in our National Forests. USDA Blog. <http://blogs.usda.gov/2016/11/01/looking-to-the-future-and-learning-from-the-past-in-our-national-forests/>

Johnson, Steve, 1995. Factors Supporting Road Removal and/or Obliteration, Memo from Kootenai Forest Hydrologist, February 6, 1995

Jones, Jeff, (undated) A Fisher Management Strategy for the Northern Rocky Mountains (draft). USFS Northern Region.

Kappesser, 1991a. A procedure for evaluating risk of increasing peak flows from Rain On Snow events by creating openings in the forest canopy. Gary Kappesser, Forest Hydrologist, Idaho Panhandle National Forests, March, 1991

Kappesser, Gary, 1991b. The Use of a Riffle Armor Stability Index to Define Channel Stability of Gravel and Cobble Bed Streams. Gary Kappesser, Forest Hydrologist, Idaho Panhandle National Forests, January 1991.

Kappesser, Gary, 1992. Alternative Procedures for Watershed Analysis to Determine Timber Harvest Opportunities and Evaluate the Need for a Forest Plan Revision for the Idaho Panhandle

National Forests. Gary Kappesser, Forest Hydrologist, Idaho Panhandle National Forests, January 1992.

Kappesser, Gary B., 2002. A Riffle Stability Index to Evaluate Sediment Loading to Streams. *Journal of the American Water Resources Association* Vol. 38, No. 4, August 2002.

Karr, J.R. 1991. Biological integrity: A long-neglected aspect of water resource management. *Ecological Applications* 1:66-84.

Kauffman, J. Boone, 2004. Death Rides the Forest: Perceptions of Fire Land Use, and Ecological Restoration of Western Forests. *Conservation Biology*, Vol. 18 No. 4, August 2004, Pp 878-882.

Keith, Heather; Brendan G. Mackey and David B. Lindenmayer. 2009. Re-evaluation of forest biomass carbon stocks and lessons from the world's most carbon-dense forests *PNAS* July 14, 2009 vol. 106 no. 28 11635-11640

King, J.G. 1989. Streamflow responses to road building and harvesting: a comparison with the equivalent clearcut area procedure. Res. Pap. INT-401. Ogden, UT: USDA-FS, Intermountain Research Station. 13 pp.

King, John G., 1994. Streamflow and sediment yield responses to forest practices in north Idaho. Proceedings from symposium: Interior Cedar-Hemlock-White Pine Forests: Ecology and Management, Spokane WA, March 2-4, 1993. Department of Natural Resource Sciences, Washington State University.

Kirilenko, Andrei P. and Roger A. Sedjo, 2007. Climate change impacts on forestry. Proceedings of the National Academy of Sciences [copy] 2007 by The National Academy of Sciences of the USA.

Kormos, Patrick R., Charles H. Luce, Seth J. Wenger, and Wouter R. Berghuijs 2016. Trends and sensitivities of low streamflow extremes to discharge timing and magnitude in Pacific Northwest mountain streams. *Water Resources Research*. Published online 2 JUL 2016

Kosterman, Megan K., 2014. Correlates of Canada Lynx Reproductive Success in Northwestern Montana. Thesis presented in partial fulfillment of the requirements for the degree of Master of Science in Wildlife Biology, The University of Montana, Missoula, December 2014. Theses, Dissertations, Professional Papers. Paper 4363.

Krebs John, Eric C. Lofroth, Ian Parfitt, 2007. Multiscale Habitat Use by Wolverines in British Columbia, Canada. *Journal of Wildlife Management* 71(7):2180-2192; 2007

Kuennen, L., G. Edson & T. Tolle, 1979. Soil Compaction Due To Timber Harvest Activities. *Northern*

Region, May 1979

Kuennen, Lou; Henry Shovic, Bill Basko, Ken McBride, Jerry Niehoff, and John Nesser, 2000. Soil Quality Monitoring: A Review of Methods and Trends in the Northern Region. May 2000.

Kutsch, Werner L. Michael Bahn and Andreas Heinemeyer, Editors, 2010. Soil Carbon Dynamics: An Integrated Methodology. Cambridge University Press 978-0-521-86561-6 -

Lacy, Peter M., 2001. Our Sedimentation Boxes Runneth Over: Public Lands Soil Law As The Missing Link In Holistic Natural Resource Protection. Environmental Law; 31 Env'tl. L. 433 (2001).

Law, B. & M.E. Harmon 2011. Forest sector carbon management, measurement and verification, and discussion of policy related to mitigation and adaptation of forests to climate change. Carbon Management 2011 2(1). <http://terraweb.forestry.oregonstate.edu/pubs/lawharmon2011.pdf>.

Law, Beverly E. 2014. Role of Forest Ecosystems in Climate Change Mitigation. Presentation by Beverly E. Law, Professor of Global Change Biology & Terrestrial Systems Science, Oregon State University. Feb. 2014. terraweb.forestry.oregonstate.edu

Lehmkuhl, John F., Leonard F. Ruggiero, and Patricia A. Hall; 1991. Landscape-level patterns of forest fragmentation and wildlife richness and abundance in the southern Washington Cascades. IN: Ruggiero, Leonard F., Keith B. Aubry, Andrew B. Carey, and Mark H. Huff, technical editors, 1991. Wildlife and vegetation of unmanaged Douglas-fir forests. USDA Forest Service PNW Gen. Tech. Report. 285 Olympia, WA 474 pp. plus appendix.

Lofroth, E.C., 1997. Northern wolverine project: wolverine ecology in logged and unlogged plateau and foothill landscapes. Wildlife Branch, Victoria, British Columbia, May 7, 1997.

Lorenz, T.J.; Vierling, K.T.; Johnson, T.R.; Fischer, P.C. 2015. The role of wood hardness in limiting nest site selection in avian cavity excavators. Ecological Applications. 25: 1 016-1033. <https://www.treearch.fs.fed.us/pubs/49102>

Mace, R. and T. Manley. 1993. The Effects of Roads on Grizzly Bears: Scientific Supplement. South Fork

Flathead River Grizzly Bear Project: Project Report For 1992. Montana Department of Fish, Wildlife and Parks.

Mace, Richard D, John S. Waller, Timothy L. Manley, L. Jack Lyon and Hans Zuuring, 1996. Relationships Among Grizzly Bears, Roads and Habitat in the Swan Mountains, Montana.

Journal of Applied Ecology 1996, 33, 1395-1404.

Malmsheimer Robert W., Patrick Heffernan, Steve Brink, Douglas Crandall, Fred Deneke, Christopher Galik, Edmund Gee, John A. Helms, Nathan McClure, Michael Mortimer, Steve Ruddell, Matthew Smith, and John Stewart 2008. Forest Management Solutions for Mitigating Climate Change in the United States. Journal of Forestry. April/May 2008.

Maxell, Bryce; Steve Corn; Paul Hendricks; Ted Koch; Charles Peterson; and Kirwin Werner; 1998. Unpublished letter to USFS Region 1 Species at Risk Task Group: Subject - Inclusion of the Boreal toad (*Bufo boreas boreas*) on the Sensitive SpeciesList for all Region 1 Forests. 8pp.

May, R., Landa, A., vanDijk, J., Linnell, J.D.C. and Andersen, R. 2006. Impact of infrastructure on habitat selection of wolverines *Gulo gulo*. *Wildl.Biol.*12:285-295. doi:10.2981/0909-6396 (2006) 12[285:IOIOHS] 2.0. CO;2.

McClelland, B. Riley, 1977. Relationships Between Hole-Nesting Birds, Forest Snags, And Decay In Western Larch-Douglas-Fir Forests Of The Northern Rocky Mountains. Presented in partial fulfillment of the requirements for the degree of Doctor of Philosophy, University Of Montana, 1977.

McClelland, B. Riley, 1985. Letter to Flathead National Forest Supervisor Edgar B. Brannon regarding old-growth management in draft forest plan. March 12, 1985.

McClelland BR and McClelland PT. 1999. Pileated woodpecker nest and roost trees in Montana: links with old-growth and forest "health." *Wildlife Society Bulletin* 1999, 27(3): 846- 857.

McRae D.J., L.C. Duchesne, B. Freedman, T.J. Lynham, and S. Woodley 2001. Comparisons between wildfire and forest harvesting and their implications in forest management. *Environ. Rev.* 9: 223-260 (2001) DOI: 10.1139/er-9-4-223 [copy] 2001 NRC Canada

Mitchell, Stephen R., Mark E. Harmon, and Kari E. B. O'Connell. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems.

Ecological Applications 19:643-655. <http://dx.doi.org/10.1890/08-0501.1>

Montana Fish, Wildlife & Parks, 2005. Animal Field Guide: Boreal Toad.
<http://nhp.nris.state.mt.us/animalguide/speciesDetail.aspx?elcode=AAABB01030>

Montana Forest Restoration Committee, 2007. Restoring Montana's National Forest Lands. Guiding Principles and Recommended Implementation. September, 2007. Authored by and the work product of the Montana Forest Restoration Committee. <http://www.montanarestoration.org/restoration/principles>

Moomaw, Bill and Janna Smith, 2017. The Great American Stand: US Forests and the Climate Emergency. Why the United States needs an aggressive forest protection agenda focused in its own backyard. March 2017. Dogwood Alliance, PO Box 7645 Asheville, NC 28802. info@dogwoodalliance.org

Moriarty Katie M., Clinton W. Epps, and William J. Zielinski, 2016. Forest Thinning Changes Movement Patterns and Habitat Use by Pacific Marten. The Journal of Wildlife Management 80(4):621-633; 2016; DOI: 10.1002/jwmg.1060

Moser, Brian W. and Edward O. Garton 2009. Short-Term Effects of Timber Harvest and Weather on Northern Goshawk Reproduction in Northern Idaho. J. Raptor Res. 43(1):1-10

Mote et al. 2014. Ch. 21: Northwest. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds.,

U.S. Global Change Research Program, 487-513. doi:10.7930/J04Q7RWX.
<http://nca2014.globalchange.gov/highlights/regions/northwest>

Nesser, John A., 2002. Notes from the National Soil Program Managers meeting in Reno as related to soil quality issues. John A. Nesser, Regional Soil Scientist, USDA Forest Service, Northern Region. May 23, 2002.

Noss, Reed F. 2001. Biocentric Ecological Sustainability: A Citizen's Guide. Louisville, CO: Biodiversity Legal Foundation. 12pp. Noss, Reed F., and Allen Y. Cooperrider. 1994. Saving Nature's Legacy: Protecting and Restoring Biodiversity. Island Press.

Noss, Reed F., and Allen Y. Cooperrider. 1994. Saving Nature's Legacy: Protecting and Restoring Biodiversity. Island Press.

Olson, Lucretia E. Joel D. Sauder, Nathan M. Albrecht, Ray S. Vinkey, Samuel A. Cushman, Michael K. Schwartz; 2014. Modeling the effects of dispersal and patch size on predicted fisher (*Pekania [Martes] pennanti*) distribution in the U.S. Rocky Mountains. *Biological Conservation* 169 (2014) 89-98.

Pacific Northwest Research Station, 2004. Western Forests, Fire Risk, and Climate Change, Pacific Northwest Research Station, Issue 6 January 2004. <http://www.fs.fed.us/pnw>.

Page-Dumroese, D.; Jurgensen, M.; Elliot, W.; Rice, T.; Nesser, J.; Collins, T.; Meurisse, R., 2000. Soil quality standards and guidelines for forest sustainability in northwestern North America. *Forest Ecology and Management* 138 (2000) 445-462.

Page-Dumroese, Deborah, 1993. Susceptibility of Volcanic Ash-Influenced Soil in Northern Idaho to Mechanical Compaction. USDA Forest Service Intermountain Research Station, Research Note INT-409. February, 1993.

Pederson, Gregory T., Lisa J. Graumlich, Daniel B. Fagre, Todd Kipfer, and Clint C. Muhlfeld 2009. A Century of Climate and Ecosystem Change in Western Montana: What do temperature trends portend? *Climatic Change* DOI 10.1007/s10584-009-9642-y 2009

P[ouml]rtner, Hans O. and Anthony P. Farrell; 2008. Physiology and Climate Change. *Science*. 31 OCTOBER 2008

Powell, R. A., and W. J. Zielinski. 1994. Fisher. Pages 38-73 in L. F. Ruggiero, K. B. Aubry,

S.W. Buskirk, and W. J. Zielinski, editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine. USDA Forest Service, Rocky Mountain Forest and Range Experimental Station, Fort Collins, Colorado, USA.

Raley, C. M., E. C. Lofroth, R. L. Truex, J. S. Yaeger, and J. M. Higley. 2012. Habitat ecology of fishers in western North America: a new synthesis. Pages 231-254 in Aubry, K.B., W.J. Zielinski, M.G. Raphael, G. Proulx, and S.W. Buskirk, editors. Biology and conservation of martens, sables, and fishers: a new synthesis. Cornell University Press, Ithaca, NY, USA.

Reed, David H., , Julian J. O'Grady, Barry W. Brook, Jonathan D. Ballou, and Richard Frankham; 2003. Estimates of minimum viable population sizes for vertebrates and factors influencing those estimates. Biological Conservation 113 (2003) 23-34

Reeves, Derrick; Page-Dumroese, Deborah; Coleman, Mark. 2011. Detrimental soil disturbance associated with timber harvest systems on National Forests in the Northern Region. Res. Pap.

RMRS-RP-89 Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 12 p.

Reynolds, R. T., R. T. Graham, M. H. Reiser, R. L. Bassett, P. L. Kennedy, D. A. Boyce, Jr., G. Goodwin, R. Smith, and E. L. Fischer. 1992. Management recommendations for the Northern goshawk in the southwestern United States. Rocky Mountain Forest and range Experiment Station and Southwest Region Forest Service. US Dept. of Agriculture, Gen. Tech. Rpt. RM-217.

Rhodes, Jonathan 2007. The Watershed Impacts Of Forest Treatments To Reduce Fuels And Modify Fire Behavior. Prepared for Pacific Rivers Council, P.O. Box 10798, Eugene, OR 97440. 541-345-0119. www.pacrivers.org. February, 2007.

Rhodes, Jon 2002. Bitterroot National Forest Burned Area Recovery Project Post-fire salvage logging field review: 8/20-22/2002. Jon Rhodes, Hydrologist, Center for Biological Diversity.

Ruediger, B., J. Claar, S. Gnaidek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehye, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada lynx conservation assessment and strategy. USDA Forest Service, USDI Fish and Wildlife Service, and USDI National Park Service. Forest Service Publication #R1-00-53. Missoula, MT. 142 pp.

Ruggiero LF, Hayward, G.D. and Squires, J.R., 1994a. Viability Analysis in Biological Evaluations: Concepts of Population Viability Analysis, Biological Population, and Ecological Scale. Conservation Biology, Vol. 8, No. 2,

June 1994, pp. 364-372

Ruggiero, Leonard F.; 2007. Scientific Independence: A Key to Credibility. From ECO-Report 2007: Bitterroot Ecosystem Management Research Project, Rocky Mountain Research Station, 800 E. Beckwith St., Missoula, MT 59801.

Ruggiero, L.F., K.S. McKelvey, K.B. Aubry, J.P. Copeland, D.H. Pletscher, M.G. Hornocker. 2007. Wolverine Conservation and Management. *Journal of Wildlife Management*, 71(7):2145- 2146.

Ruggiero, Leonard F., Keith B. Aubry, Steven W. Buskirk, L. Jack Lyon, and William J. Zielinski. 1994b. The Scientific Basis for Conserving Forest Carnivores in the Western United States: American Marten, Fisher, Lynx, and Wolverine. Pacific Southwest Research Station, USDA Forest Service. General Technical Report RM-254 September 1994.

Running, Steven W. 2006. Is Global Warming Causing More, Larger Wildfires? *Science Express*, 6 July 2006 (www.sciencexpress.org).

Sallabanks, R.; Bruce G. Marcot, Robert A. Riggs, Carolyn A. Mehl, & Edward B. Arnett, 2001. Wildlife of Eastside (Interior) Forests and Woodlands. Chapter 8 in *Wildlife-Habitat Relationships in Oregon and Washington, 2001* by David H. Johnson and Thomas A. O'Neil (Managing Editors); Oregon State University Press, Corvallis, OR.

Sauder Joel D. and Janet L. Rachlow, 2014. Both forest composition and configuration influence landscape-scale habitat selection by fishers (*Pekania pennanti*) in mixed coniferous forests of the Northern Rocky Mountains. *Forest Ecology and Management* 314 (2014) 75-84

Sauder, Joel D. 2014. Landscape Ecology of Fishers (*Pekania Pennanti*) in North-Central Idaho. Ph.D Dissertation, University of Idaho.

Schultz, C. 2010. Challenges in connecting cumulative effects analysis to effective wildlife conservation planning. *BioScience* 60:545-551.

Schultz, C. A. 2012. The U.S. Forest Service's analysis of cumulative effects to wildlife: a study of legal

standards, current practice, and ongoing challenges on a National Forest. *Environmental Impact Assessment Review* 32:74-81.

Schwartz, Charles C., Mark A. Haroldson, and Gary C. White, 2010. Hazards Affecting Grizzly Bear Survival in the Greater Yellowstone Ecosystem. *Journal of Wildlife Management* 74(4):654-667; 2010; DOI: 10.2193/2009-206.

Schwartz, Michael K., Nicholas J. DeCesare, Benjamin S. Jimenez, Jeffrey P. Copeland, Wayne

E. Melquist; 2013. Stand- and landscape-scale selection of large trees by fishers in the Rocky Mountains of Montana and Idaho. *Forest Ecology and Management* 305 (2013) 103-111

Sexton, Timothy O., 1998. Ecological Effects of Post-Wildfire Management Activities (Salvage- Logging and Grass-Seeding) on Vegetation Composition, Diversity, Biomass, and Growth and Survival of *Pinus ponderosa* and *Purshia tridentata*. Master's Thesis, Oregon State University, 1998.

Simard SW, Asay AK, Beiler KJ, Bingham MA, Deslippe JR, Xinhua H, Philip LJ, Song Y, Teste FP. 2015. Resource transfer between plants through ectomycorrhizal fungal networks. In: Horton TR, ed. *Mycorrhizal networks*. Berlin: Springer.

Simard SW, Martin K, Vyse A, Larson B. 2013. Meta-networks of fungi, fauna and flora as agents of complex adaptive systems. In: Puettmann K, Messier C, Coates K, eds. *Managing forests as complex adaptive systems: building resilience to the challenge of global change*. New York: Routledge, 133-164.

Six, Diana L., Eric Biber, and Elisabeth Long 2014. Management for Mountain Pine Beetle Outbreak Suppression: Does Relevant Science Support Current Policy?" *Forests* 2014, 5, 103- 133.

Solomon, S.D. et al., 2007: Technical Summary, in *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* 24, (Feb. 2, 2007).

Spiering, David J. and Richard L. Knight. 2005. Snag density and use by cavity-nesting birds in managed stands of the Black Hills National Forest. *Forest Ecology and Management* 214 (2005) 40-52.

Squires John R., Jeffrey P. Copeland, Todd J. Ulizio, Michael K. Schwartz, Leonard F. Ruggiero, 2007. Sources and Patterns of Wolverine Mortality in Western Montana. *Journal of Wildlife Management* 71(7):2213-2220; 2007.

Squires John R., 2009. Letter to Carly Walker of Missoula County Rural Initiatives. John R. Squires, Research Wildlife Biologist, USDA Forest Service Rocky Mountain Research Station, Forestry Sciences Laboratory, 800 E. Beckwith, Missoula, Montana 59801.

Squires John R., Nicholas J. Decesare, Jay A. Kolbe and Leonard F. Ruggiero 2010. Seasonal Resource Selection of Canada Lynx in Managed Forests of the Northern Rocky Mountains. *The Journal of Wildlife Management* Vol. 74, No. 8 (November 2010), pp. 1648-1660

Squires, J., L. Ruggiero, J. Kolbe, and N. DeCesare. 2006a. Lynx ecology in the Intermountain West: research program summary, summer 2006. USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana.

Squires, J., N. DeCesare, L. Olson, J. Kolbe, M. Hebblewhite, and S. Parks. 2013. Combining resource selection and movement behavior to predict corridors for Canada lynx at their southern range periphery. *Biological Conservation* 157:187-195.

Stephenson, N. L., A. J. Das, R. Condit, S. E. Russo, P. J. Baker, N. G. Beckman, D. A. Coomes,

E. R. Lines, W. K. Morris, N. Ruger, E. Alvarez, C. Blundo, S. Bunyavejchewin, G. Chuyong, S.

J. Davies, A. Duque, C. N. Ewango, O. Flores, J. F. Franklin, H. R. Grau, Z. Hao, M. E. Harmon,

S. P. Hubbell, D. Kenfack, Y. Lin, J.-R. Makana, A. Malizia, L. R. Malizia, R. J. Pabst, N. Pongpattananurak, S.-H. Su, I-F. Sun, S. Tan, D. Thomas, P. J. van Mantgem, X. Wang, S. K. Wiser & M. A. Zavala; 2014. Rate of tree carbon accumulation increases continuously with tree size. *Nature*. 2014.

Sullivan, Patrick J.; James M. Acheson; Paul L. Angermeier; Tony Faast; Jean Flemma; Cynthia

M. Jones; E. Eric Knudsen; Thomas J. Minello; David H. Secor; Robert Wunderlich; Brooke A. Zanetell; 2006. *Defining and Implementing Best Available Science for Fisheries and Environmental Policy, and Management*. American Fisheries Society, Bethesda, Maryland; Estuarine Research Federation, Port Republic, Maryland. September 2006

Sun, Ge and James M. Vose. 2016. Forest Management Challenges for Sustaining Water Resources in the

Anthropocene. *Forests* 2016, 7, 68; doi:10.3390/f7030068

Suzanne Simard "Trees Communicate" webpage. <https://www.youtube.com/watch?v=-8SORM4dYG8&feature=youtu.be>

Thompson, Jonathan R. and Thomas A. Spies 2009. Vegetation and weather explain variation in crown damage within a large mixed-severity wildfire. *Forest Ecology and Management* 258 (2009) 1684-1694.

Traill, Lochran W., Barry W. Brook, Richard R. Frankham, Corey J.A. Bradshaw, 2010. Pragmatic population viability targets in a rapidly changing world. *Biological Conservation* 143 (2010) 28-34.

Troendle, C.A. and R.M. King. 1985. The effect of timber harvest on the fool creek watershed, 30 years later. *Water Resources Research*. 21(12):915-922.

Turner, David P., William K. Ferrell & Mark E. Harmon, 1997. Letter to the Editor, The Carbon Crop: Continued, 277 *Sci.* 1591, 1592 (Sept. 1997).

Turner, David P.; Greg J. Koerper; Mark E. Harmon; Jeffrey J. Lee; 1995. A Carbon Budget for the Forests of the Coterminous United States, 5:2 *Ecological Applications* 421 (1995).

US Fish and Wildlife Service, 1998. Consultation on effects to bull trout from continued implementation of USFS LRMPs and BLM RMPs, as amended by PACFISH and INFISH. *USDI Fish and Wildlife Service, Regions 1 and 6*.

USDA Forest Service, 1987a. Old Growth Habitat Characteristics and Management Guidelines. Kootenai National Forest, Forest Plan Appendix 17. USDA Forest Service Region One.

USDA Forest Service, 1987b. Appendix to "Old Growth Habitat Characteristics and Management Guidelines." Kootenai National Forest, Forest Plan Appendix 17. USDA Forest Service Region One.

USDA Forest Service, 1987c. Forest Plan Old-Growth Habitat Management Standards, Idaho Panhandle

National Forests, USDA Forest Service Region One.

USDA Forest Service, 1987d. Old Growth Management, Idaho Panhandle National Forests, Forest Plan Appendix 27, USDA Forest Service Region One.

USDA Forest Service, 1990. Old-Growth Habitat and Associated Wildlife Species in the Northern Rocky Mountains. Warren, Nancy M. (ed.) USDA Northern Region.

USDA Forest Service, 1993. Wolverine habitat guidelines for the Malheur National Forest. Prepared by Richard Haines, Malheur National Forest; Reviewed by Robert Naney, USFS Region 6, June 1993.

USDA Forest Service 1994b. Savant Sage Final Environmental Impact Statement, Idaho Panhandle National Forests.

USDA Forest Service, 2000a. Environmental Effects of Postfire Logging: Literature Review and Annotated Bibliography. Gen. Tech. Rep. PNW-GTR-486. Wenatchee, WA: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

USDA Forest Service, 2000b. Expert interview summary for the Black Hills National Forest Land and Resource Management Plan Amendment. USDA Forest Service, Black Hills National Forest, Hwy 385 North - R.R. 2, Box 200 Custer, South Dakota 57730 (605-673-9200). October, 2000.

USDA Forest Service, 2001a. Silverbird Post-Fire Harvest Environmental Analysis. Salmon- Cobalt Ranger District, Salmon-Challis National Forest, May 2001.

USDA Forest Service, 2003a. Bristow Area Restoration Project Environmental Assessment, Kootenai National Forest.

USDA Forest Service, 2004a. Logan Creek Ecosystem Restoration Project Final Environmental Impact Statement. Flathead National Forest.

USDA Forest Service, 2005b. Middle East Fork Hazardous Fuel Reduction Draft Environmental Impact Statement. Bitterroot National Forest.

USDA Forest Service, 2005d. American and Crooked River Project Final Environmental Impact Statement, Nez Perce National Forest.

USDA Forest Service, 2007. Trego DN, Responses to Comments, Fortine Ranger District, Kootenai National Forest, February 2007.

USDA Forest Service, 2007c. Myrtle Creek Healthy Forests Restoration Act Project Final Environmental Impact Statement. Soil Resources. March 2007. Bonners Ferry Ranger District, Idaho Panhandle National Forests

USDA Forest Service, 2008a. Young Dodge Draft Environmental Impact Statement, Rexford Ranger District, USDA Forest Service, Kootenai National Forest, February 2008

USDA Forest Service, 2008b. Young Dodge FEIS/ Responses to Comments-Soils. Rexford Ranger District, USDA Forest Service, Kootenai National Forest, April 2008

USDA Forest Service, 2008f. Gold Crown Fuels Reduction Project Soil Specialists' Report: Past Disturbance and Probable Impacts. Prepared by: Mark Vander Meer & Tricia Burgoyne, Soil Scientists, USDA Forest Service.

USDA Forest Service, 2009a. Lakeview-Reeder Fuels Reduction Project Draft Environmental Impact Statement, Priest Lake Ranger District, Idaho Panhandle National Forests.

USDA Forest Service, 2009c. Excerpt from Lakeview-Reeder Fuels Reduction Project Draft Environmental Impact Statement. Priest Lake Ranger District, Idaho Panhandle National Forests. January 2009.

USDA Forest Service, 2011c. Griffin Creek Resource Management Project Environmental Assessment. Tally Lake Ranger District, Flathead National Forest, December 2011.

USDA Forest Service, 2012a. Doc Denny Vegetation Management Project Environmental Assessment, Salmon River Ranger District, Nez Perce National Forest, August 2012

USDA Forest Service, 2012d. Travel Management, Implementation of 36 CFR, Part 202, Subpart A (36 CFR 212.5(b)). Memorandum to Regional Foresters, Station Directors, Area Director, IITF Director, Deputy Chiefs and WO Directors. March 29, 2012

USDA Forest Service, 2013a. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Reports 2010 and 2011. March 2013.

USDA Forest Service, 2013b. Travel Management Implementation. Memorandum to Regional Foresters, Station Directors, Area Director, IITF Director, Deputy Chiefs and WO Directors.

December 17, 2013.

USDA Forest Service, 2014a. Como Forest Health Project Draft Environmental Impact Statement, Darby Ranger District, Bitterroot National Forest, August 2014.

USDA Forest Service, 2015a. Deer Creek Soil Resource Report. Prepared by: Chandra Neils, Forest Soil Scientist for: Bonners Ferry Ranger District, Idaho Panhandle National Forests, August 2015.

USDA Forest Service, 2016a. Categorical Exclusion Worksheet: Resource Considerations-Soils. Smith Shields Forest Health Project, Yellowstone Ranger District, Custer Gallatin National Forest.

Van der Werf, G. R.; D. C. Morton, R. S. DeFries, J. G. J. Olivier, P. S. Kasibhatla, R. B. Jackson, G. J. Collatz and J. T. Randerson; 2009. CO₂ emissions from forest loss. Nature Geoscience vol. 2, November 2009.

Vizcarra, Natasha 2017. Woodpecker Woes: The Right Tree Can Be Hard to Find. Science Findings, USDA Forest Service, Pacific Northwest Research Station, Issue 199, August 2017.

Vose, James M. David L. Peterson, and Toral Patel-Weynand (Eds.), 2012. Effects of Climatic Variability and Change on Forest Ecosystems: A Comprehensive Science Synthesis for the U.S. Forest Sector. United States Department of Agriculture, Forest Service Pacific Northwest Research Station General Technical Report PNW-

GTR-870, December 2012.

Wasserman, Tzeidle N.; Cushman, Samuel A.; Wallin, David O.; Hayden, Jim. 2012. Multi scale habitat relationships of *Martes americana* in northern Idaho, U.S.A. Res. Pap. RMRS-RP-

94. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 21 p.

Weir, Richard D. and Fraser B. Corbould 2010. Factors Affecting Landscape Occupancy by Fishers in North-Central British Columbia. *The Journal of Wildlife Management*, Vol. 74, No. 3 (April 2010), pp. 405-410

Westerling, A. L., H. G. Hidalgo, D. R. Cayan, T. W. Swetnam; 2006. Warming and Earlier Spring Increases Western U.S. Forest Wildfire Activity. *Science Express*, Research Article, July 6, 2006, www.sciencexpress.org.

Williams, A. Park, Craig D. Allen, Alison K. Macalady, Daniel Griffin, Connie A. Woodhouse, David M. Meko, Thomas W. Swetnam, Sara A. Rauscher, Richard Seager, Henri D. Grissino- Mayer, Jeffrey S. Dean, Edward R. Cook, Chandana Gangodagamage, Michael Cai and Nate G. McDowell; 2012. Temperature as a potent driver of regional forest drought stress and tree mortality. *Nature Climate Change*, PUBLISHED ONLINE: 30 SEPTEMBER 2012 | DOI: 10.1038/NCLIMATE1693

Williamson, J.R. and W.A. Neilsen. 2000. The influence of forest site and rate and extent of soil compaction and profile disturbance of skid trails during ground-based harvesting. *Can. J. For. Res.* 30:119

Wisdom, Michael J.; Richard S. Holthausen; Barbara C. Wales; Christina D. Hargis; Victoria A. Saab; Danny C. Lee; Wendel J. Hann; Terrell D. Rich; Mary M. Rowland; Wally J. Murphy; and Michelle R. Eames. 2000. Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-Scale Trends and Management Implications. General Technical Report PNW-GTR-485 United States Department of Agriculture Forest Service Pacific Northwest Research Station United States Department of the Interior Bureau of Land Management General Technical Report PNW-GTR-485. May 2000

Witmer, Gary W.; Martin, Sandra K.; Saylor, Rodney D. 1998. Forest Carnivore Conservation and Management in the Interior Columbia Basin: Issues and Environmental Correlates. Gen. Tech. Rep. PNW-GTR-420. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p. (Quigley, Thomas M., ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

Woodbridge, B. and C.D. Hargis, 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

Woodbury, Peter B., James E. Smith & Linda S. Heath, 2007. Carbon sequestration in the U.S. forest sector from 1990 to 2010, 241 Forest Ecology and Management 14, 24 (2007).

Wright, Vita, Sallie J. Hejl, and Richard L. Hutto, 1997. Conservation Implications of a Multi- scale Study of Flammulated Owl (*Otus flammeolus*) Habitat Use in the Northern Rocky Mountains, USA. From Duncan, J.R., Johnson, D.H., Nicholls, T.H. Eds. 1997. Biology and conservation of owls of the Northern Hemisphere: 2d International symposium; 1997 February 5-9; Winnipeg, Manitoba Gen. Tech. Rep. NC-190. St. Paul, MN: USDA Forest Service, North Central Research Station 635 p.

Yanishevsky, Rosalind M., 1994. Old-Growth Overview: Fragmented Management of Fragmented Habitat. Pp. 7-36 in Rocky Mountain Challenge: Fulfilling a New Mission in the

U.S. Forest Service. Association of Forest Service Employees For Environmental Ethics, P.O. Box 11615, Eugene, Oregon 97440, February, 1994.

September 9, 2019

Sandpoint Ranger Station

Attn: Michelle Norton

1602 Ontario Street

Sandpoint, ID 83864

Comments transmitted via email to: michelle.norton@usda.gov. Please acknowledge timely receipt.

Ms. Norton;

These are comments on the Scoping Notice for the Buckskin Saddle Integrated Restoration Project proposal, on behalf of Alliance for the Wild Rockies (AWR).

Several aspects of the Buckskin Saddle Integrated Restoration Project (Buckskin Saddle) proposal raise questions of significant and cumulative effects, necessitating the preparation of an Environmental Impact Statement under the National Environmental Policy Act (NEPA). The massive logging and road construction proposed, including thousands of acres of clearcut-type logging would not be "insignificant" under any definition, nor without cumulative effects. The proposal would also adversely affect the roadless characteristics and wilderness potential of roadless area. And there are so many "purposes" claimed for the project, and serving them all will create significant conflicts.

The Buckskin Saddle project would implement the 2015 revised Forest Plan. In carrying out its mission, AWR has participated in the public processes concerning management of the Idaho Panhandle National Forests (IPNF) since the early days of original 1987 Forest Plan implementation, and has taken legal action a few times to force the Forest Service (FS) to manage in conformance with environmental laws such as the Endangered Species Act (ESA), the National Forest Management Act (NFMA), and the National Environmental Policy Act (NEPA). AWR also participated fully in the public process as the FS developed its revised Forest Plan, including commenting at every stage and submitting a formal objection. And because the FS provided essentially no relief in response to the formal objection, AWR incorporates the documentation of public participation in the revised Forest Plan public process within these comments on the Buckskin Saddle proposal. By implementing the revised Forest Plan with this project, the FS would be operating outside of environmental laws and regulations.

AWR participated in the public process during the development of the Access Amendments, and we incorporate AWR's comments and appeal of that Decision within these comments. AWR also participated during the public process as the Northern Rockies Lynx Management Direction (NRLMD) was developed, and continues to believe that the Forest Plan/NRLMD does not consider the best available science. AWR incorporates the documentation of its participation in the NRLMD public process within this comment on the Buckskin Saddle proposal.

Necessary Elements for Project analysis:

[middot] Disclose all IPNF Forest Plan direction for logging/burning projects and explain how the project complies with them;

[middot] Explain how the project will comply with forest plan big game hiding cover requirements;

[middot] Disclose the location and acreages of past, current, and reasonably foreseeable logging, grazing, and roadbuilding activities within the project area;

[middot] Solicit and disclose comments from the Idaho Department of Fish and Game regarding the impact of the project on wildlife habitat;

[middot] Solicit and disclose comments from the Idaho Department of Environmental Quality regarding the impact of the project on water quality;

[middot] Disclose the biological assessment for the candidate, threatened, or endangered species with potential and/or actual habitat in the project area;

[middot] Disclose the biological evaluation for the sensitive and management indicator species (MIS) with potential and/or actual habitat in the project area;

[middot] Disclose the snag densities in the project area, and the method used to determine those densities;

[middot] Disclose the current, during-project, and post-project road densities in the project area;

[middot] Disclose the IPNF's record of compliance with state best management practices regarding stream sedimentation from ground-disturbing management activities;

[middot] Disclose the IPNF's record of compliance with its monitoring requirements as set forth in its 1987 and revised forest plans;

[middot] Disclose the IPNF's record of compliance with the additional monitoring requirements set forth in previous DN/FONSI and RODs on the IPNF;

[middot] Disclose the results of the field surveys for threatened, endangered, sensitive, and rare plants in each of the proposed units;

[middot] Formally consult with the U.S. Fish and Wildlife Service (USFWS) on the impacts of this project on candidate, threatened, or endangered wildlife, fish, and plant species;

Also please address the following questions and issues:

[middot] Will this project exacerbate existing noxious weed infestations and start new infestations?

[middot] Do unlogged old growth forest store more carbon than the wood products that would be removed from the same forest in a logging operation?

[middot] What is the cumulative effect of national forest logging on U.S. carbon stores? How many acres of national forest lands are logged every year? How much carbon is lost by that logging?

[middot] Please list each visual quality standard that applies to each unit and disclose whether each unit meets its respective visual quality standard. A failure to comply with visual quality Forest Plan standards violates NFMA.

[middot] For the visual quality standard analysis please define "ground vegetation," i.e. what age are the trees, "re-establishes," "short-term," "longer term," and "revegetate."

[middot] Please disclose whether you have conducted surveys in the project area for this project for all threatened, endangered, sensitive and management indicator species (MIS).

[middot] Please disclose how often the project area has been surveyed for all MIS, sensitive, threatened, and endangered species suspected to inhabit the project area.

[middot] Would the habitat be better for all MIS, sensitive, threatened, and endangered species if roads were removed in the project area?

[middot] What is the USFWS position on the impacts of this project on all candidate, threatened, and endangered species?

[middot] Have you conducted ESA consultation?

[middot] Please provide us with the full Biological Evaluations/Assessments for the all threatened, endangered, sensitive, and MIS species.

[middot] What is wrong with uniform forest conditions?

[middot] Have insects and tree diseases contributed to a diverse landscape?

[middot] Disclose the level of current noxious weed infestations in the project area and the cause of those infestations;

[middot] Disclose the impact of the project on noxious weed infestations and native plant communities;

[middot] Disclose the amount of detrimental soil disturbance that currently exists in each proposed unit from previous logging and livestock grazing activities;

[middot] Disclose the expected amount of detrimental soil disturbance in each unit after ground disturbance and prior to any proposed mitigation/remediation;

[middot] Disclose the expected amount of detrimental soil disturbance in each unit after proposed mitigation/remediation;

[middot] Disclose the analytical data that supports proposed soil mitigation/remediation measures;

[middot] Disclose the timeline for implementation;

[middot] How do you define a healthy forest¹?

[middot] Disclose the funding source for non-commercial activities proposed.

[middot] Disclose the current level of old growth forest in each third order drainage in the project area;

[middot] Disclose the method used to quantify old growth forest acreages and its rate of error based upon field review of its predictions;

[middot] Disclose the historic levels of mature and old growth forest in the project area;

[middot] Disclose the level of mature and old growth forest necessary to sustain viable populations of old-growth associated wildlife species in the area;

[middot] Disclose the amount of mature and old growth forest that will remain after implementation;

1 The Scoping Notice states, "The area is experiencing declining forest health, based on annual forest health surveys[hellip]"

[middot] Disclose the amount of current habitat for old growth and mature forest dependent species in the project area;

[middot] Disclose the amount of habitat for old growth and mature forest dependent species that will remain after project implementation;

[middot] Disclose the method used to model old growth and mature forest dependent wildlife habitat acreages and its rate of error based upon field review of its predictions;

[middot] Disclose the amount of big game (moose and elk) hiding cover, winter range, and security currently available in the area;

[middot] Disclose the amount of big game (moose and elk) hiding cover, winter range, and security during project implementation;

[middot] Disclose the amount of big game (moose and elk) hiding cover, winter range, and security after project implementation;

[middot] Disclose the method used to determine big game hiding cover, winter range, and security, and its rate of error as determined by field review;

[middot] Disclose and address the concerns expressed by the Planning Team in the draft Five-Year Review of the Forest Plan regarding the failure to monitor population trends of MIS, the inadequacy of the Forest Plan old growth standard, and the failure to compile data to establish a reliable inventory of sensitive species on the Forest;

[middot] Disclose the actions being taken to reduce fuels on private lands adjacent to the project area and how those activities/or lack thereof will impact the efficacy of the activities proposed for this project;

[middot] Disclose the efficacy of the proposed activities at reducing wildfire risk and severity in the project area in the future, including a two-year, five-year, ten-year, and 20-year projection;

[middot] Disclose when and how the IPNF made the decision to suppress natural wildfire in the project area and replace natural fire with logging and prescribed burning;

[middot] Disclose the cumulative impacts on the Forest-wide level of the IPNF policy decision to replace natural fire with logging and prescribed burning;

[middot] Disclose how Project complies with the Idaho Roadless Rule;

[middot] Disclose the impact of climate change on the efficacy of the proposed treatments;

[middot] Disclose the impact of the proposed project on the carbon storage potential of the area;

[middot] Disclose the baseline condition, and expected sedimentation during and after activities, for all streams in the area;

[middot] Disclose maps of the area that show the following elements:

1. Past, current, and reasonably foreseeable logging units in the project area;
2. Past, current, and reasonably foreseeable livestock grazing allotments in the project area;
3. Density of human residences within 1.5 miles from the project unit boundaries;
4. Hiding cover in the project area according to the Forest Plan definition;

5. Old growth forest in the project area;

6. Big game security areas;

7. Moose winter range.

The Scoping Notice makes a preliminary determination that the impacts of this proposal will be documented in an Environmental Assessment. We believe that use of an EA is only appropriate in the context of a national forest being managed in accordance to its forest plan, NFMA, and best available science, and also in the context of a detailed narrative of the project area evaluating management performance of past FS actions. Please disclose the best available science the FS is relying upon to support the Buckskin Saddle proposed action.

Using the EA process means the FS would not be required to provide written responses to public comments, rendering the notion of public involvement rather meaningless. We believe the FS is obligated to prepare an EIS, and provide written responses to all comments at every stage.

Project activities and their environmental impacts will extend beyond the mapped project area boundary shown on the map, and the FS is obligated to acknowledge and disclose those impacts. The FS should utilize an analysis area formed by the watershed boundaries encompassing all the logging and any other proposed active management.

It is vital that the results of past monitoring be incorporated into this project analysis and planning. We request the following be disclosed:

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

Please provide an analysis of how well those past FS projects met the goals, objectives, desired conditions, etc. stated in the corresponding NEPA documents, and how well the projects conformed to forest plan standards and guidelines.

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

The Forest Plan revision process itself violated NEPA and NFMA and failed to utilize the best available science. Implementing actions under the Forest Plan would be significant. Therefore these comments identify legal deficiencies of the Forest Plan as well as the project proposal.

Please provide an analysis to determine if implementation of past management activities contributed to the claimed deficiency in resiliency.

The FS's "desired conditions" rationale is inconsistent with a more holistic ecosystem management approach, which acknowledges the forest's capability of operating in a self-regulatory manner. For example, 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.

[hellip]Pests are a part of even the healthiest eastside ecosystems. Pest roles[mdash]such as the removal of poorly adapted individuals, accelerated decomposition, and reduced stand density[mdash]may be critical to rapid ecosystem adjustment.

[hellip]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. (Emphasis added.)

Would the above statement[mdash]made by government scientists as part of their participation with the Interior Columbia Basin Ecosystem Management Project[mdash]be automatically rejected from consideration as Best Available Science for the Buckskin Saddle process, because it is inconsistent with the assumptions contained in the Scoping Notice?

The EIS must demonstrate consistency with all the applicable direction in the Forest Plan to comply with NEPA and NFMA.

The Forest Plan exhibits a relative absence of explicit reference to the 1982 planning rule. The Forest Plan is inconsistent with the regulations written to guide planning under NFMA.

Many Forest Plan Objectives are not linked with Forest Plan Goals, as required.

The use of the word "should" in Forest Plan Standards and Guidelines allows land managers to have too much or undefined levels of discretion.

"Short term" and "long term" are not adequately defined in the Forest Plan.

The Forest Plan relies upon static Desired Conditions (DCs) to direct active management on the IPNF. The philosophy driving the FS strategy to "move toward" and replicate historic vegetative conditions (basically, replace natural processes with logging and prescribed burning) is that emulation of the results of disturbance processes would conserve biological diversity. McRae et al. 2001 provide a scientific review summarizing empirical evidence that finds marked contrasts

between the results of logging and wildfire. A plethora of scientific evidence directs that DCs be more properly stated in terms of desired future dynamics, in line with 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 much other support for such an approach in the scientific literature. Noss 2001, for example, believes "If the thoughtfully identified critical components and processes of an ecosystem are sustained, there is a high probability that the ecosystem as a whole is sustained." (Emphasis added.)

Noss 2001 describes basic ecosystem components:

Ecosystems have three basic components: composition, structure, and function. Together, they define

biodiversity and ecological integrity and provide the foundation on which standards for a sustainable human relationship with the earth might be crafted.

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

Composition includes the kinds of species present in an ecosystem and their relative abundances, as well as the composition of plant associations, floras and faunas, and habitats at broader scales. We might describe the composition of a forest, from individual stands to watersheds and regions.

Structure is the architecture of the forest, which includes the vertical layering and shape of vegetation and its horizontal patchiness at several scales, from within stands (e.g., treefall gaps) to landscape patterns at coarser scales. Structure also includes the presence and abundance of such distinct structural elements as snags (standing dead trees) and downed logs in various size and decay classes.

Function refers to the ecological processes that characterize the ecosystem. These processes are both biotic and abiotic, and include decomposition, nutrient cycling, disturbance, succession, seed dispersal, herbivory, predation, parasitism, pollination, and many others. Evolutionary processes, including mutation, gene flow, and natural selection, are also in the functional category.

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

Fire is such an important creator of the ecological variety in Rocky Mountain landscapes that the conservation of biological diversity (required by NFMA) is likely to be accomplished only through the conservation of fire as a process[hellip]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. (Emphases 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. [hellip]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. [hellip] 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). (Emphases added.)

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

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

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

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

Typically, vegetation management proposals and their accompanying NEPA documents on the IPNF acknowledge that attempts to control or resist the natural process of fire have been a contributor to deviations from DCs. This Buckskin Saddle proposal is no exception. Often these same documents characterize fire as well as native insects and other natural pathogens as threats to the ecosystem rather than rejuvenating natural

processes. They seem to need such an obsolete viewpoint in order to justify and prioritize the proposed vegetation manipulations, tacitly for replacing natural processes with "treatments" and "prescriptions." However the scientific support for assuming that large landscapes and ecosystems can be restored or continuously maintained by such manipulative actions is entirely lacking.

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. "[hellip]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 "[hellip]capacity for self-repair when perturbed is preserved, and minimal external support for management is needed."

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

The Forest Plan desired ranges for dominance groups are not supported by reliable historic data taken from IPNF surveys or scientific research. Also, the FS has not explained how the effects of climate change and white pine blister rust affect the attainability of those desired ranges.

The Forest Plan desired ranges for Size Class are not supported by reliable historic data taken from IPNF surveys or scientific research. And the FS has not explained how the effects of climate change and white pine blister rust affect the attainability of those desired ranges.

In FW-DC-VEG-03 the term "substantial amounts" is not defined. The desired "greater increase" related to the identified tree species is not supported by citation to specific reliable historic data taken from IPNF surveys or scientific research. The FS has not explained how the effects of climate change and white pine blister rust affect the attainability of those increases.

In FW-DC-VEG-04 the implication that trees are generally too dense on the IPNF is not supported by specific reliable historic data gathered from IPNF surveys or scientific research.

In FW-DC-VEG-05 the desired increase in size of forest patches in the seedling and sapling size classes and decreases in size of forest patches in the small and medium size classes is not supported by specific reliable

historic data gathered from IPNF surveys or scientific research.

In FW-DC-VEG-06 the implied assertion that root fungi and forest insects are causing too much tree mortality on the IPNF is not supported by specific reliable historic data gathered from IPNF surveys or scientific research.

In FW-DC-VEG-07 the desired ranges for snags are not supported by reliable historic data taken from IPNF surveys or scientific research. The scientific basis for the delineation of snags into two diameter groups using 20" d.b.h. as the division point is not established.

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).

The implications are that managers know little about how many snags per acre are needed to sustain populations of cavity nesting species. Only the birds themselves have the ability to decide if a tree is suitable for excavating. The FS and Forest Plan fails to recognize this scientific finding.

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. The authors state:

"Many species of birds are dependent on snags for nest sites, including 85 species of cavity-nesting birds in North America (Scott et al. 1977). Therefore, information of how many and what types of snags are required by cavity-nesting bird species is critical for wildlife biologists, silviculturists, and forest managers."

"Researchers across many forest types have found that cavity-nesting birds utilize snags with large DBH and tall height for nest trees (Scott, 1978; Cunningham et al., 1980; Mannan et al., 1980; Raphael and White, 1984; Reynolds et al., 1985; Zarnowitz and Manuwal, 1985; Schreiber and deCalesta, 1992)."

Spiering and Knight (2005) found the following.

Larger DBH and greater snag height were positively associated with the presence of a cavity, and advanced stages of decay and the presence of a broken top were negatively associated with the presence of a cavity. Snags in larger DBH size classes had more evidence of foraging than expected based on abundance.

Percent bark cover had little influence on the presence of a cavity. Therefore, larger and taller snags that are not heavily decayed are the most likely locations for cavity-nesting birds to excavate cavities.

The association of larger DBH and greater height of snags with cavities is consistent with other studies (Scott, 1978; Cunningham et al., 1980; Mannan et al., 1980; Raphael and White, 1984; Reynolds et al., 1985; Zarnowitz and Manuwal, 1985; Schreiber and deCalesta, 1992).

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

size class increased and the significant goodness-of-fit test indicate that large snags are the most important for foraging."

Please disclose the cumulative snag loss in areas previously logged or subject to other causes of snag loss.

In FW-DC-VEG-11 the desired ranges for forest composition, structure, and pattern for each biophysical setting are not supported by reliable historic data taken from IPNF surveys or scientific research. The Forest Plan does not explained how the effects of climate change and white pine blister rust affect the attainability of those desired ranges.

Standard FW-STD-VEG-01 allows active mechanical treatments in old growth but ignores scientific information that such active management is the very antithesis of old growth. The Forest Plan cites no scientific research or monitoring results from the IPNF that demonstrate management manipulations will create net ecological benefit rather than harm old growth and old-growth associated wildlife.

The IPNF's recent Halfway Malin EA states, "there are currently an estimated 11.8 percent of forested lands allocated as old growth on the Idaho Panhandle National Forests[hellip]" Is the inventory of "allocated old growth" on the IPNF maintained for public review? Also, that statement refers to "allocated" old growth, but how much actually meets the IPNF's old-growth criteria?

Please provide an estimate of how much old growth in the project area has been destroyed by logging. What is the HRV for old growth forestwide?

How many FIA plots (locations in the project area) show the plot is old growth?

Please disclose the natural historic range vs. current conditions regarding patch size, edge effect, and amount of interior forest old growth in the project area and forestwide.

Has the FS compared all stands proposed for logging to old growth criteria? Did the FS consider retaining such stands to be as best-closest to old-growth conditions, recruitment to compensate for deficits compared to the historic range?

USDA Forest Service, 1990 uses an index of the "Number of potential nesting trees >30" dbh per acre" for the pileated woodpecker, and McClelland and McClelland (1999) found similar results in their study in northwest Montana, with the average nest tree being 73 cm. (almost 29") dbh." Given this highly specialized habitat need of the pileated woodpecker, how does the FS insure that species' viability without any quantitative direction in Forest Plan for trees of that size? Because the Forest Plan omitted adoption of old growth MIS, the FS has no viability strategy. The 1987 Kootenai National Forest Plan states that "(U)nits of 50-100 acres are the smallest acceptable size in view of the nesting needs of pileated woodpeckers[hellip] (McClelland, 1979)," and that "managing for a minimum size of 50 acres will preclude the existence of species which have larger territory requirements."

The Scoping Notice states, "The proposed vegetation treatments occur in some old growth stands and within some recruitment potential old growth" This is another erratic characteristic of the Forest Plan; although the Glossary mentions some "goal" of meeting the old growth definition in the future, the Forest Plan actually contains no such goal. Does the IPNF have an inventory of forestwide and project area "recruitment potential old growth?" If so, please display these areas on a map and provide links on the Forest website to the forestwide spreadsheet of stands which are designated or otherwise considered to be "recruitment potential old growth."

Please disclose the best available science the IPNF uses to manage recruitment potential old growth stands.

What exactly is accomplished by identifying forest stands suitable for future old growth? How does the IPNF maintain such a commitment to the future, if indeed such a commitment is being documented or followed at all? In other words, how can the public monitor the agency's commitment to these old-growth "goals" or desired conditions, or whatever?

Please disclose the wildlife species the IPNF considers to be strongly associated with old growth, which must be a meaningful relationship.

The IPNF's 1987 Forest Plan included standards for protection of old growth and associated wildlife (USDA Forest Service 1987c). 1987 Forest Plan Appendix 27 (USDA Forest Service, 1987d) provided other direction and biological information concerning old growth and old-growth associated wildlife species. Please explained what it is about the IPNF's 1987 Forest Plan's old growth standards, and its Appendix 27 which is inconsistent with the best available science.

Likewise the adjacent Kootenai National Forest's 1987 Forest Plan included standards for protection of old growth and associated wildlife, along with Appendix 17 (USDA Forest Service 1987a, USDA Forest Service 1987b). Please explained what it is about the KNF's 1987 Forest

Plan old growth standards and its Forest Plan Appendix 17 which is inconsistent with the best available science.

After forest plan revision the IPNF has greatly weakened protections for old growth, and in fact the Forest Plan provides direction for logging old growth that lacks scientific support. We incorporate USDA Forest Service, 1987a as well as USDA Forest Service, 1987b which contains a list of "species [hellip](which) find optimum habitat in the "old" successional stage[hellip]" We also incorporate the KNF document ("Old Growth validation") which 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 1987a, and USDA Forest Service 1987b also provides biological information concerning old growth and old-growth associated wildlife species.

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

The 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 an 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) Old growth is typically distinguished from younger growth by several of the following attributes:

1. Large trees for species and site.
2. Wide variation in tree sizes and spacing.
3. Accumulations of large-size dead standing and fallen trees that are high relative to earlier stages.
4. Decadence in the form of broken or deformed tops or bole and root decay.
5. Multiple canopy layers
6. Canopy gaps and understory patchiness.

Green et al., 1992 also recognize that "Rates of change in composition and structure are slow relative to younger forests."

In preparing and adopting Green et al. 1992 old-growth guidelines, the FS did not use an independent scientific peer review process, as discussed by Yanishevsky, 1994:

As a result of Washington Office directives, Region 1 established an Old-Growth Committee. In April 1992, Region 1 issued a document entitled "Old-Growth Forest Types of the Northern Region," which presented Old-Growth Screening Criteria for specific zones on Western Montana, Eastern Montana, and North Idaho (U.S.D.A. Forest Service 1992). This was an attempt to standardize criteria for classifying the variety of old-growth types across the Region. [hellip]The committee, however, executed this task without the benefit of outside scientific peer review or public input, either during or after the process (Yanishevsky 1990, Shultz 1992b). Moreover, the methodology used by the committee was unscientific and did not even include gathering field data to verify the characteristics of

old-growth stands as a basis for the definition (id.). A former member of the Region 1 Old- Growth Committee described a "definition process" that relied heavily upon the Committee members' pre-conceived notions of the quantifiable characteristics of old-growth forests (Schultz 1992b).

The old-growth definition in its present state, without field verification of assumptions, and without addressing the issue of quality, is inadequate to scientifically describe, define, delineate, or inventory old-growth ecosystems.

(id.) Not only did the Committee fail to obtain new field data on old-growth forest characteristics, it failed even to use existing field data on old-growth definition and classification previously collected for Region 1 (Pfister 1987). Quality of old growth was not addressed during the definition process. The Committee did not take into account the legacy of logging that has already destroyed much of the best old growth. This approach skewed the characteristics that describe old-growth forests toward poorer remaining examples. [hellip]It's premature for the Forest Service to base management decisions with long- term environmental effects on its Region 1 old-growth criteria, until these criteria are validated by the larger scientific community.

Yanishevsky (1994) also points out the scientific inadequacy of maintaining merely "minimum" amounts of old-growth habitat and its components such as snags.

It appears the agency wants to make the definition of old growth to be a simplistic numbers and database analysis game, devoid of biologically vital data gathered in the field which might document what is unique about old growth[mdash]not just a few large trees left over after logging, but decadence, rot, snags, down logs, patchy irregular canopy layers[mdash]things that can't be created by the agency's version of "restoration" and which would be depleted by such management actions.

Please disclose the natural historic range vs. current conditions regarding patch size, edge effect, and amount of interior forest old growth in the IPNF.

Please provide an analysis for the Forest Plan MIS "Landbird Assemblage." Please disclose the specific habitat needs of all of these bird species, and analyze cumulative impacts.

The FS is obligated to consider best available science. AWR's Objection to the Forest Plan notes that the scientific basis for its standards, guidelines, and other components/direction is not well established. Consequently if the Buckskin Saddle project is tiered to the Forest Plan, which is obviously must, then in order to consider best available science the FS must finally explain what

science it has considered for all forest plan components/direction. Also, please disclose how this consideration played out in Forest Plan structure and how does it play out in project design?

Western (boreal) toad

Please disclose the FS's strategy and best available science for insuring viable populations of the boreal toad. USDA Forest Service, 2003a states:

Little quantitative data are available regarding the boreal toad's use of upland and forested habitats. However, boreal toads are known to migrate between the aquatic breeding and terrestrial nonbreeding habitats (TNC Database 1999), and that juvenile and adult toads are capable of moving over 5 km between breeding sites (Corn et al. 1998). It is thought that juveniles and female boreal toads travel farther than the males (Ibid). A study on the Targhee National Forest (Bartelt and Peterson 1994) found female toads traveled up to 2.5 kilometers away from water after breeding, and in foraging areas, the movements of toads were significantly influenced by the distribution of shrub cover. Their data suggests that toads may have avoided macro-habitats with little or no canopy and shrub cover (such as clearcuts). Underground burrows in winter and debris were important components of toad selected micro-sites in a variety of macro-habitats. The boreal toad digs its own burrow in loose soil or uses those of small mammals, or shelters under logs or rocks, suggesting the importance of coarse woody debris on the forest floor. [hellip](T)imber harvest and prescribed burning activities could impact upland habitat by removing shrub cover, down woody material, and/or through compaction of soil.

Montana Fish, Wildlife & Parks, 2005 (a more recent version of the above cite "TNC Database, 1999") also discuss boreal toad habitat:

Habitats used by boreal toads in Montana are similar to those reported for other regions, and include low elevation beaver ponds, reservoirs, streams, marshes, lake shores, potholes, wet meadows, and marshes, to high elevation ponds, fens, and tarns at or near treeline (Rodgers and Jellison 1942, Brunson and Demaree 1951, Miller 1978, Marnell 1997, Werner et al. 1998, Boundy 2001). Forest cover in or near encounter sites is often unreported, but toads have been noted in open-canopy ponderosa pine woodlands and closed-canopy dry conifer forest in Sanders County (Boundy 2001), willow wetland thickets and aspen stands bordering Engelmann spruce stands in Beaverhead County (Jean et al. 2002), and mixed ponderosa pine/cottonwood/willow sites or Douglas-fir/ponderosa pine forest in Ravalli and Missoula counties (P. Hendricks personal observation).

Elsewhere the boreal toad is known to utilize a wide variety of habitats, including desert springs and streams, meadows and woodlands, mountain wetlands, beaver ponds, marshes, ditches, and backwater channels of rivers where they prefer shallow areas with mud bottoms (Nussbaum et al. 1983, Baxter and Stone 1985, Russell and Bauer 1993, Koch and Peterson 1995, Hammerson 1999). Forest cover around occupied montane wetlands may include aspen, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir; in local situations it may also be found in ponderosa pine forest. They also occur in urban settings, sometimes congregating under streetlights at night to feed on insects (Hammerson 1999, P. Hendricks personal observation). Normally they remain fairly close to ponds, lakes, reservoirs, and slow-moving rivers and streams during the day, but may range widely at night. Eggs and larvae develop in still, shallow areas of ponds, lakes, or reservoirs or in pools of slow-moving streams, often where there is sparse emergent vegetation. Adult and juvenile boreal toads dig burrows in loose soil or use burrows of small mammals, or occupy shallow shelters under logs or rocks. At least some toads hibernate in terrestrial burrows or cavities, apparently where conditions prevent freezing (Nussbaum et al. 1983, Koch and Peterson 1995, Hammerson 1999).

Maxell et al., 1998 state:

We believe that the status of the Boreal toad is largely uncertain in all Region 1 Forests.

[hellip]Briefly, factors which are a cause for concern over the viability of the species throughout Region 1 include: (1) a higher degree of genetic similarity within the range of Region 1 Forests relative to southern or coastal populations; (2) a general lack of both historical and current knowledge of status in the region; (3) indications of declines in areas which do have historical information; (4) low (5-10%) occupancy of seemingly suitable habitat as detected in recent surveys; (5) some evidence for recent restriction of breeding to low elevation sites and; (6) recent crashes in boreal toad populations in the southern part of its range which may indicate the species' sensitivity to a variety of anthropogenic impacts.

Fisher

Please disclose the FS's strategy and best available science for insuring viable populations of the fisher. Please conduct a scientifically-based analysis on the spatial and structural requirements for fisher survival and successful reproduction. There is no sound, scientifically-based analysis for the Forest Plan or entire IPNF comparing forestwide conditions with habitat metrics required to insure fisher viability. The analyses for other wildlife must address these same flaws.

Sauder (2014) suggests that five national forests (Clearwater, Nez Perce, Coeur d'Alene, Kaniksu, and Kootenai) hold the key to recovery of the species in the Northern Region. As with most of the Sensitive wildlife, fishers receive little habitat protection emphasis in the Forest Plan[mdash]mostly just move it (via logging) toward desired conditions. Please disclose the direct, indirect and cumulative impacts on important habitat components such as snags, logs, foraging habitat configuration, connectivity, cover, and impacts on predator and prey species.

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

[hellip]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 state:

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.

Forest Plan protections for the fisher revolve entirely around the rather random likelihood of a fisher den site being detected, so that measures might be taken: "Management activities on NFS lands should avoid/minimize disturbance at known active nesting or denning sites for other sensitive, threatened, or endangered species not covered under other forestwide guidelines." (FW-GDL-WL-25.) The Forest Plan provides no further direction on how motorized activities would be avoided or minimized other than vaguely stating, "Use the best available information to set a timeframe and a distance buffer around active nests or dens." (Id.) Please disclose this best available science.

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 fisher populations at the Forest level, projects will continue to degrade fisher habitat across the IPNF over time. (Also see also Schultz 2012, who identified these problems in analyses for many wildlife species.)

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the fisher.

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).

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. 2014, 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).

Pine marten

Please disclose the FS's strategy and best available science for insuring viable populations of the pine marten, a species whose habitat is significantly altered by thinning and other active forest management (Moriarty et al., 2016; Bull and Blumton, 1999; Hargis et al., 1999 and Wasserman et al., 2012).

Northern goshawk

Please disclose the FS's strategy and best available science for insuring viable populations of the northern goshawk, a species whose habitat is significantly altered by logging and other active forest management.

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

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

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 post- fledging areas (PFA)s and foraging areas. Reynolds et al. 1992 calls for 100% in VSS classes 5 & 6 and 0% in VSS classes 1-4 in nest areas.

In addition, Reynolds et al. 1992 recommend logged openings of no more than 2 acres in size or less in the PFAs, depending on forest type, and logged openings of no more than 1-4 acres or less in size in the foraging

areas, depending on forest type. Clough (2000) noted that in the absence of long-term monitoring data, a very conservative approach to allowing logging activities near active goshawk nest stands should be taken to ensure that goshawk distribution is not greatly altered. This indicates that the full 180-acre nest area management scheme recommended by Reynolds et al. (1992) should be used around any active goshawk nest. Removal of any large trees in the 180-acre nesting area would contradict the Reynolds et al. (1992) guidelines.

Crocker-Bedford (1990) noted:

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

Moser and Garton (2009) reported that all goshawk nests examined in their study area were found in stands whose average diameter of overstory trees was over 12.2 inches and all nest stands had > 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)[hellip]."

The FS's Samson (2006) reports says that 110 breeding individuals (i.e. 55 pairs) are necessary for a viable goshawk population in R1. USDA Forest Service, 2005e is a map showing the results from the 2005 R1 region-wide goshawk survey using the FS's Woodbridge and Hargis goshawk monitoring protocol. That 2005 detection map says there were 40 detections in 2005 in Region 1. So the results of this survey essentially show that the population in Region 1 has not been viable according to the agency's own science (only 40 instead of 55). And some of the detections may have been individuals using the same nest, so the number of nests (and therefore number of breeding pairs) could be even lower than 40.

White-headed woodpecker

Please disclose the FS's strategy and best available science for insuring viable populations of the white-headed woodpecker.

Flammulated owl

Please disclose the FS's strategy and best available science for insuring viable populations of the flammulated owl.

Wright, et al. (1997) point out that habitat restoration for the flammulated owl must be carefully targeted to the correct habitat types. The FS can't simply cut and/or burn forest land and expect flammulated owls to start or continue using it as habitat. Wright, et al. (1997) state:

(W)e never detected Flammulated Owls in mesic old-growth ponderosa pine stands with a Vaccinium understory.

Thus, within suitable landscapes, it may be most effective to conserve and restore stand structural characteristics within suitable habitat types (e.g., xeric ponderosa pine/ Douglas-fir stands in our study area), rather than within any stand containing ponderosa pine trees.

Hayward and Verner, 1994 provide a conservation assessment for flammulated owls, and make management recommendations.

Great gray owl

Please disclose the FS's strategy and best available science for insuring viable populations of the great gray owl. Hayward and Verner, 1994 provide a conservation assessment for the great gray owl, and make management recommendations.

Pileated woodpecker

Please disclose the FS's strategy and best available science for insuring viable populations of the pileated woodpecker. Bull et al. 2007 represents over 30 years of investigation into the effects of logging on the pileated woodpecker and is the latest information on such effects.

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

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

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

This preferred diameter of nesting trees for the pileated woodpecker recognized by R-1 is notable. McClelland and McClelland (1999) found similar results in their study in northwest Montana, with the average nest tree being 73 cm. (almost 29") dbh. The pileated woodpecker's strong preference for trees of rather large diameter is not adequately considered in the Forest Plan. Effectively, the IPNF provides absolutely no commitments for leaving specific numbers and sizes of largest trees favored by so many wildlife species.

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

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

McClelland (1977), states:

(The Pileated Woodpecker) is the most sensitive hole nester since it requires old growth larch, ponderosa pine, or black cottonwood for successful nesting. The Pileated can be

considered as key to the welfare of most hole-nesting species. If suitable habitat for its perpetuation is provided, most other hole-nesting species will be accommodated.

Pileated Woodpeckers use nest trees with the largest dbh: mean 32.5 inches; Pileated Woodpeckers use the tallest nest trees: mean 94.6 feet;

The nest tree search image of the Pileated Woodpecker is a western larch, ponderosa pine, or black cottonwood snag with a broken top (status 2), greater than 24 inches dbh, taller than 60 feet (usually much taller), with bark missing on at least the upper half of the snag, heartwood substantially affected by *Fomes laracis* or *Fomes pini* decay, and within an old- growth stand with a basal area of at least 100 sq feet/acre, composed of large dbh classes.

A cluster analysis based on a nine-dimensional ordination of nest tree traits and habitat traits revealed close association between Yellow-bellied Sapsuckers, Mountain Chickadees, and Red-breasted Nuthatches. These three species plus the Pileated Woodpecker and Hairy Woodpecker are relatively grouped by coincident occurrence in old growth. Tree Swallows, Black-capped Chickadees, and Common Flickers are separated from the above five species by their preference for more open areas and their frequent use of small dbh nest trees.

(Most) species found optimum nesting habitat in stands with a major component of old growth, particularly larch. Mean basal area for pileated woodpecker nest sites was 150 square feet per acre. (McClelland. B.R. and others, 1979)

Many large snags are being cut for firewood. Forest managers should limit firewood cutting to snags less than 15 inches in d.b.h. and discourage use of larch, ponderosa pine, and black cottonwood. Closure of logging roads may be necessary to save high-value snags. Logging slash can be made available for wood gatherers.

Wolverine

Please disclose the FS's strategy and best available science for insuring viable populations of the wolverine. Wolverines use habitats 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/mi² (1.7 km/km²) (Carroll et al. 2001b).

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

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

Wisdom et al. (2000) state:

Carnivorous mammals such as marten, fisher, lynx, and wolverine are vulnerable to over- trapping (Bailey and others 1986, Banci 1994, Coulter 1966, Fortin and Cantin 1994, Hodgman and others 1994, Hornocker and Hash 1981, Jones 1991, Parker and others 1983, Thompson 1994, Witmer and others 1998), and over-trapping can be facilitated by road access (Bailey and others 1986, Hodgman and others 1994, Terra-Berns and others 1997, Witmer and others 1998).

[hellip]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).

[hellip] (T)he present distribution of the wolverine, like that of the grizzly bear, may be more related to regions that escaped human settlement than to vegetation structure.

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

[middot] 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.

[middot] Manage wolverine and lynx in a metapopulation context, and provide adequate links among existing populations.

[middot] Reduce human disturbances, particularly in areas with known or high potential for wolverine natal den sites (subalpine talus cirques).

The Forest Plan includes no coherent viability strategy for wolverine protection. Forest Plan protections for the wolverine revolve entirely around the rather random likelihood of a wolverine den site being detected, so that measures might be taken: "Management activities on NFS lands should avoid/minimize disturbance at known active nesting or denning sites for other sensitive, threatened, or endangered species not covered under other forestwide guidelines." (FW-GDL- WL-25.) The Forest Plan provides no further direction on how motorized activities would be avoided or minimized other than vaguely stating, "Use the best available information to set a timeframe and a distance buffer around active nests or dens." (Id.) What is this best available science?

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the wolverine.

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)[hellip]

[hellip]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.

In regards to the 2013 memo from the Regional Office (2013_0305_USDAWolverine Guidance), why are district-level specialists not allowed to arrive at effects conclusions based upon their own expertise and judgment?

Black-backed woodpecker

Please disclose the FS's strategy and best available science for insuring viable populations of the black-backed woodpecker. 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[hellip]

[hellip]Several bird species seem to be relatively restricted in distribution to early post-fire conditions[hellip] I believe it would be difficult to find a forest-bird species more restricted to a single vegetation cover type in the northern Rockies than the Black-backed Woodpecker is to early [first 6 years] post-fire conditions. (Emphasis added).

USDA Forest Service 2011c states:

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

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

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

fire may be much broader than commonly appreciated."

Cherry (1997) states:

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

once was, and continued fire suppression and insect eradication is likely to cause further decline. (Emphasis added.)

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

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

Woodpeckers play critical roles in the forest ecosystem. Woodpeckers are primary cavity nesters that excavate at least one cavity per year, thus making these sites available to secondary cavity nesters (which include many species of both birds and mammals). Black-backed and three-toed woodpeckers can play a large role in potential insect control. The functional roles of these two woodpecker species could easily place them in the 'keystone' species category[mdash]a species on which other species depend for their existence.

Wickman (1965) calculated that woodpeckers may eat up to 50 larvae per day that were each about 50 mm in length. The predation on these larvae is significant. It has been estimated that individual three-toed woodpeckers may consume thousands of beetle larvae per day, and insect outbreaks may attract a many-fold increase in woodpecker densities (Steeger et al. 1996). The ability of woodpeckers in to help control insect outbreaks may have previously been underestimated.

Cherry (1997) also notes:

Black-backed woodpeckers preferred foraging in trees of 34 cm (16.5 in) diameters breast height and (63 ft) 19 m height (Bull et al. 1986). Goggans et al. (1987) found the mean dbh of trees used for foraging was 37.5 cm (15 in) and the mean dbh of trees in the lodgepole pine stands used for foraging was 35 cm (14 in). Steeger et al. (1996) found that both

(black-backed and three-toed) woodpecker species fed in trees from 20-50 cm (8-20 in) dbh.

Black-backed woodpeckers excavate their own cavities in trees for nesting. Therefore, they are referred to as primary cavity nesters, and they play a critical role in excavating cavities that are later used by many other species of birds and mammals that do not excavate their own cavity (secondary cavity nesters). Black-backed woodpeckers peel bark away from the entrance hole and excavate a new cavity every year. Other woodpeckers sometimes take over their cavities (Goggans et al. 1987).

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

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

Black-backed woodpeckers occupy forested habitats that contain high densities of recently dead or dying trees that have been colonized by bark beetles and woodborer beetles (Buprestidae, Cerambycidae, and Scolytidae). These beetles and their larvae are most abundant within burned forests. In unburned forests, bark beetle and woodborer infested trees are found primarily in areas that have undergone natural disturbances, such as wind-throw, and within structurally diverse old-growth forests (Steege and Dulisse in press, Bull et al. 1986, Goggans et al. 1987, Villard 1994, Hoffman 1997, Weinhausen 1998).

The viability of black-backed woodpeckers is threatened by the FS's fire suppression and other "forest health" policies such as that promoted in the Buckskin Saddle Scoping Notice, 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 Buckskin Saddle project is to negate the natural occurrence 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. This emphasis also occurs on a large portion of the IPNF. Viability of a species cannot be assured, if habitat suppression is a forestwide policy.

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the black-backed woodpecker.

Canada lynx

The USFWS listed the Canada lynx as a threatened species under the Endangered Species Act in 2000 due to

"lack of guidance for conservation of lynx and snowshoe hare habitat..." and subsequent authorization of actions that may cumulatively adversely affect the lynx. Relatively little is known about lynx in the contiguous United States. Historically, lynx inhabited states spanning from Maine to Washington, but it is unknown how many lynx remain.

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

Lynx subsist primarily on a prey base of snowshoe hare, and survival is highly dependent upon snowshoe hare habitat, forest habitat where young trees and shrubs grow densely. In North America, the distribution and range of lynx is nearly "coincident" with that of snowshoe hares, and protection of snowshoe hares and their habitat is critical in lynx conservation strategies.

Please disclose if the FS conducted surveys of all the lynx suitable habitat in the LAUs. More often than not, when the FS conducts logging projects in Lynx Analysis Units (LAUs), surveys of stands for lynx habitat result in less suitable habitat than previously assumed. The FS needs to take a few steps backward and consider that its range-wide Canada lynx suitable habitat estimations were too high.

Please disclose if surveys target snowshoe hare occurrence data in these stands newly considered unsuitable for lynx. Please disclose if the FS conducted surveys of Canada lynx "unsuitable" habitat in the project area to find out if such habitat might in fact be suitable after all.

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

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

The current best science indicates that lynx winter foraging habitat is critical to lynx persistence (Squires et al. 2010), and that this habitat should be "abundant and well-distributed across lynx habitat." (Squires et al. 2010;

Squires 2009.) Existing openings such as clearcuts not yet recovered are likely to be avoided by lynx in the winter. (Squires et al. 2010; Squires et al.

2006a.)

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

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

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

The LCAS (Ruediger et al. 2000) recommends, until conclusive information is developed concerning lynx management, the agencies retain future options; that is, choose to err on the side of maintaining and restoring habitat for lynx and their prey. To err on the side of caution, the IPNF would retain all remaining stem exclusion forests for recruitment into lynx winter habitat, so that this key habitat would more closely resemble historic conditions.

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

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

Kosterman, 2014 finds that 50% of lynx habitat must be mature undisturbed forest for it to be optimal lynx habitat where lynx can have reproductive success and no more than 15% of lynx habitat should be young clearcuts, i.e.

trees under 4 inches dbh. This renders inadequate the agency's assumption in the NRLMD that 30% of lynx habitat can be clearcut, and that no specific amount of mature forest needs to be conserved. Kosterman, 2014 demonstrates that the NRLMD standards are not adequate for lynx viability and recovery, as is assumed by the FS.

The Forest Plan/FEIS fail to describe the quantity and quality of habitat that is necessary to sustain the viability of the Canada lynx.

Grizzly bear

Please disclose if adverse project or cumulative impacts are consistent with the requirement to prioritize the needs of the grizzly bear for the applicable Management Situation(s).

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. Please disclose existing road densities located outside of and between Bear Management Units (BMUs), both at present and during project implementation.

Please disclose the FS strategy and best available science to provide habitat protections outside Recovery Zones (RZs) that would allow for a larger protected zone and/or natural augmentation from outside the RZs. The FS has no effective strategy to provide scientifically defensible habitat protections inside the RZ that would facilitate functional connectivity between and among BMUs.

The Forest Service is aware of the best Plan direction it has adopted to date, established in Flathead Forest Plan Amendment 19.2 It established Open Motorized Route Density (OMRD)/Total Motorized Route Density (TMRD)/Security Core indices. These are based upon the scientific information concerning security from roads and road density requirements for grizzly bears as found in Mace and Manley, 1993 and Mace et al., 1996.

Please disclose the impacts of late-season snowmobile use on grizzly bear spring range.

Please analyze and disclose cumulative impacts on grizzly bears from human activities and habitat alternations on land of other ownerships.

Elk

2 Although that Forest Plan has been revised and the Amendment 19 direction dropped and/or weakened, AWR has objected to the Flathead NF's revised forest plan and filed notice of intent to sue on this issue.

Christensen, et al. (1993) is a Region One publication on elk habitat effectiveness. Meeting a minimum of 70% translates to about 0.75 miles/sq. mi. in key elk habitat, as shown in their graph:

Please provide a map of the entire road system in the watersheds affected by the proposal, including all national forest system roads, the nonsystem roads, all existing road templates, and all existing unauthorized roads[mdash]not just those the FS plans to use for this timber sale.

To address its unsustainable and deteriorating road system, the FS promulgated the

Roads Rule (referred to as "subpart A") in 2001. The rule directs each national forest to conduct "a science-based roads analysis," generally referred to as the "travel analysis process." The 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:

- [bull] A TAP must analyze all roads (maintenance levels 1 through 5);
- [bull] The Travel Analysis Report must include a map displaying roads that will inform the Minimum Road System pursuant to 36 C.F.R. [sect] 212.5(b), and an explanation of the underlying analysis;
- [bull] 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:

- [bull] Produce a Travel Analysis Report summarizing the travel analysis;
- [bull] Produce a list of roads likely not needed for future use; and
- [bull] Synthesize the results in a map displaying roads that are likely needed and likely not needed in the future that conforms to the provided template.

The Subpart A analysis is intended to account for benefits and risks of each road, and especially to account for affordability. The TAP must account for the cost of maintaining roads to standard, including costs required to

comply with Best Management Practices related to road maintenance.

The Travel Management Regulations at 36 CFR [sect] 212.5 state:

(b) Road system[mdash](1) Identification of road system. For each national forest, national grassland, experimental forest, and any other units of the National Forest System ([sect] 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.

Please disclose if the project area is being managed in compliance with the Travel Management Regulations at 36 CFR 212 (Subparts, A, B, and C) and the Executive Orders related to Subpart

B. Subpart A requires the FS to involve the public in a scientifically based process which designates the Minimum Road System both in the analysis area and forestwide, so that unnecessary or ecologically damaging roads are targeted for decommissioning and the economic liabilities of roads are minimized.

Please disclose compliance with motorized route restrictions, and if violations exist, perform an analysis of the resultant harm to wildlife habitat, soil, and water.

Please analyze how proposed management actions would be affected by likely climate change scenarios. Please quantify all human-caused CO2 emissions for all project activities. Please quantify carbon sequestration for each alternative. Please disclose how climate change has affected ecological conditions in the project area, and include an analysis of these conditions under climate change scenarios.

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[mdash]like those politicians and profiteers[mdash]ignores and distracts from the causes of climate change they enable.

Global climate change is a massive, unprecedented threat to humanity and forests. Climate change is caused by excess CO2 and other greenhouse gases transferred to the atmosphere from other pools. All temperate and tropical forests, including those in this project area, are an

important part of the global carbon cycle. There is significant new information reinforcing the need to conserve all existing large stores of carbon in forests, in order to keep carbon out of the atmosphere and mitigate climate change. The agency must do its part by managing forests to maintain and increase carbon storage. Logging would add to cumulative total carbon emissions so is clearly part of the problem, so it must be minimized and mitigated. Logging would not only transfer carbon from storage to the atmosphere but future regrowth is unlikely to ever make up for the effects of logging, because carbon storage in logged forests lags far behind carbon storage in unlogged forests for decades or centuries. And before recovery, the agency plans even more activities causing greenhouse gas emissions.

Clearly, the management of the planet's forests is a nexus for addressing the largest crisis ever facing humanity. This is an issue as serious as nuclear annihilation (although at least with the latter we're not already pressing the button).

Where is the cumulative effects analysis of IPNF carbon sequestration over time?

Respected experts say that the atmosphere might be able to safely hold 350 ppm of CO₂.³ So when the atmosphere was at pre-industrial levels of about 280 ppm, there was a cushion of about 70 ppm which represents millions of tons of greenhouse gas emissions. Well, now that cushion is completely gone. The atmosphere is now over 400 ppm CO₂ and rising. Therefore the safe level of additional emissions (from logging or any other activity) is negative. There is no safe level of additional emissions that our earth systems can tolerate. We need to be removing carbon from the atmosphere—not adding to it.⁴ How? By allowing forest to grow. Logging moves us away from our objective while conservation moves us toward our objective.

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. [hellip] 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.

3 <http://www.350.org/about/science>.

4 "To get back to 350 ppm, we'll have to run the whole carbon-spewing machine backwards, sucking carbon out of the atmosphere and storing it somewhere safely. [hellip] By growing more forests, growing more trees, and better managing all our forests[hellip]"

(<http://blog.cleanenergy.org/2013/11/26/exploringbiocarbon-tools/comment-page-1/#comment-375371>)

Enhanced awareness, supported by appropriate governance, will provide the best chance of minimizing negative consequences while maximizing opportunities arising from species movements[mdash]movements that, with or without effective emission reduction, will continue for the foreseeable future, owing to the inertia in the climate system.

From a report by the Union of Concerned Scientists & Rocky Mountain Climate Organization (Funk et al., 2014):

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

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

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

Global climate change is caused by excess CO₂ 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 CO₂, 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 IPNF is an important part of the global carbon cycle. Clear scientific information reinforces the critical need to conserve all existing stores of carbon in forests to keep it out of the atmosphere. Given that forest policies in other countries and on private lands are politically more difficult to influence, the FS must take a leadership role to maintain and increase carbon storage on publicly owned forests, in order to help mitigate climate change effects.

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

Robust statistical associations between wildfire and hydro-climate in western forests indicate that increased wildfire activity over recent decades reflects sub-regional responses to changes in climate. Historical wildfire observations exhibit an abrupt transition in the mid-1980s from a regime of infrequent large wildfires of short (average of one week) duration to one with much more frequent and longer-burning (five weeks) fires. This transition was marked by a shift toward unusually warm springs, longer summer dry seasons, drier vegetation (which provoked more and longer-burning large wildfires), and longer fire seasons. Reduced winter precipitation

and an early spring snowmelt played a role in this shift. Increases in wildfire were particularly strong in mid-elevation forests.

[hellip]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[deg] to 5[deg]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[deg]C would be roughly three times the spring-summer temperature increase that Westerling et al. have linked to the current trends. Wildfire burn areas in Canada are expected to increase by 74 to 118% in the next century (12), and similar increases seem likely for the western United States.

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

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

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

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

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

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

The IPNF Forest Plan draft EIS defines carbon sequestration: "[hellip]the process by which atmospheric carbon dioxide is taken up by vegetation through photosynthesis and stored as carbon in biomass (trunks, branches, foliage, and roots) and soils."

The FS also ignores CO₂ and other greenhouse gas emissions from other common human activities related to forest management and recreational uses. These include emissions associated with machines used for logging and associated activities, vehicle use for administrative actions, recreational motor vehicles, and emissions associated with livestock grazing. The FS is simply ignoring the climate impacts of these management and other authorized or allowed activities.

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

Off-road vehicles in California currently emit more than 230,000 metric tons [mdash] or

5000 million pounds [mdash] 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 CO₂ per year into the atmosphere.

Can we really afford this?

The FS distracts from the emerging scientific consensus that removing wood or any biomass from the forest only worsens the climate change problem. Law and Harmon, 2011 conducted a literature review and concluded [hellip]

Thinning forests to reduce potential carbon losses due to wildfire is in direct conflict with carbon sequestration goals, and, if implemented, would result in a net emission of CO₂ to

the atmosphere because the amount of carbon removed to change fire behavior is often far larger than that saved by changing fire behavior, and more area has to be harvested than will ultimately burn over the period of effectiveness of the thinning treatment.

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

Kutsch et al., 2010 provide an integrated view of the current and emerging methods and concepts applied in soil carbon research. They use a standardized protocol for measuring soil CO₂ efflux, designed to improve future assessments of regional and global patterns of soil carbon dynamics:

Excluding carbonate rocks, soils represent the largest terrestrial stock of carbon, holding approximately 1,500 Pg (1015 g) C in the top metre. This is approximately twice the amount held in the atmosphere and thrice the amount held in terrestrial vegetation. Soils, and soil organic carbon in particular, currently receive much attention in terms of the role they can play in mitigating the effects of elevated atmospheric carbon dioxide (CO₂) 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.)

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."

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.

In 2016, Professors Mark Harmon and Bev Law of Oregon State University 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.

Van der Werf, et al. 2009 discuss the effects of land-management practices and state: (T)he maximum reduction in CO₂ 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 CO₂ 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.

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

Our forests are functioning as carbon sinks (net sequestration) where logging has been reduced or halted, and wildland fire helps maintain high productivity and carbon storage.

Even large, intense fires consume less than 3% of the biomass in live trees, and carbon emissions from forest fires is only tiny fraction of the amount resulting from fossil fuel consumption (even these emissions are balanced by carbon uptake from forest growth and regeneration).

"Thinning" operations for lumber or biofuels do not increase carbon storage but, rather, reduce it, and thinning designed to curb fires further threatens imperiled wildlife species that depend upon post-fire habitat.

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

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

Although fuel-reduction treatments may be necessary to restore historical functionality to fire-suppressed ecosystems, we found little credible evidence that such efforts have the added benefit of increasing terrestrial C stocks.

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

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

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

The 2014 National Climate Assessment chapter for the Northwest is prefaced by four "key messages" including this one: "The combined impacts of increasing wildfire, insect outbreaks, and tree diseases are already causing widespread tree die-off and are virtually certain to cause additional forest mortality by the 2040s and long-term transformation of forest landscapes.

Under higher emissions scenarios, extensive conversion of subalpine forests to other forest types is projected by the 2080s." (Mote et al. 2014.)

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

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

Managing forest lands with concerns for water will be increasingly difficult under new conditions expected for the 21st century. (Sun and Vose, 2016.) Already, concerns have focused on new extremes of low flow in streams. (Kormos et al. 2016.) The 2014 National Climate Assessment Chapter for the Northwest also recognizes

hydrologic challenges ahead: "Changes in the timing of streamflow related to changing snowmelt are already observed and will continue, reducing the supply of water for many competing demands and causing far-reaching ecological and socioeconomic consequences." (Mote et al. 2014.)

Heat, a long-established topic of physics, plays an equally important role at the level of plant and animal physiology—every organism only survives and thrives within thermal limits. For example, Portner et al. (2008) point out, "All organisms live within a limited range of body temperatures" Direct effects of climatic warming can be understood through fatal decrements in an organism's performance in growth, reproduction, foraging, immune competence, behaviors and competitiveness." The authors further explain, "Performance in animals is supported by aerobic scope, the increase in oxygen consumption rate from resting to maximal." In other words, rising heat has the same effect on animals as reducing the oxygen supply, and creates the same difficulties in breathing. But breathing difficulties brought on by heat can have important consequences even at sub-lethal levels. In the case of grizzly bears, increased demand for oxygen under increasing heat has implications for vigorous (aerobically demanding) activity including digging, running in pursuit of prey, mating, and the play of cubs.

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

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

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

Forests are changing in ways they've never experienced before because today's growing conditions are different from anything in the past. The climate is changing at an unprecedented rate, exotic diseases and pests are present, and landscapes are fragmented by human activity often occurring at the same time and place.

The current drought in California serves as a reminder and example that forests of the 21st century may not resemble those from the 20th century. "When replanting a forest after disturbances, does it make sense to try to reestablish what was there before? Or, should we

find re-plant material that might be more appropriate to current and future conditions of a changing environment?

"Restoration efforts on U.S. Forest Service managed lands call for the use of locally adapted and appropriate native seed sources. The science-based process for selecting these seeds varies, but in the past, managers based decisions on the assumption that present site conditions are similar to those of the past.

"This may no longer be the case."

This raises the important issue: are our forests really "suitable" for timber production if the likely impacts of climate change mean that regeneration following this massive clearcutting operation may not be feasible.

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[mdash]and community economic planning[mdash]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[mdash]hotter drought", an emerging characteristic of the Anthropocene[mdash]are the focus of rapidly expanding literature.

[hellip](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.

[hellip]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.

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 [hellip]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.

[hellip]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.

Please consider that the "desired" vegetation conditions may not be achievable or sustainable. Please conduct an analysis as to how realistic and achievable Forest Plan desired conditions are in the context of a rapidly changing climate, along an unpredictable but changing trajectory.

Global warming and its consequences are effectively irreversible which implicates certain legal consequences under NEPA and NFMA and ESA (e.g., 40 CFR [sect] 1502.16; 16 USC [sect]1604(g); 36 CFR [sect]219.12; ESA Section 7; 50 CFR [sect][sect]402.9, 402.14). All net carbon emissions from logging represent "irretrievable and irreversible commitments of resources."

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[hellip]"

Harmon, 2009 is the written record of "Testimony Before the Subcommittee on National Parks, Forests, and Public Lands of the Committee of Natural Resources for an oversight hearing on The Role of Federal Lands in Combating Climate Change." The author "reviews, in terms as simple as possible, how the forest system stores carbon, the issues that need to be addressed when assessing any proposed action, and some common misconceptions that need to be avoided." His testimony begins, "I am here to [hellip]offer my expertise to the subcommittee. I am a professional scientist, having worked in the area of forest carbon for nearly three decades.

During that time I have conducted numerous studies on many aspects of this problem, have published extensively, and provided instruction to numerous students, forest managers, and the general public."

The NEPA document must disclose that most wildland fire ignitions are human-caused, and occur near roads.

Where may we find an analysis of the Forestwide cumulative effects of your fire management policies, including fire suppression policies? The Forest Plan and its EIS did not include a programmatic analysis of the cumulative effects of fire suppression. Part of the agency's mantra for more management includes mitigating the impacts of fire suppression. So to comply with NEPA, the FS must conduct a programmatic analysis of the cumulative effects of its fire suppression policies. Until it does so, the FS cannot assure viability of the black-backed woodpecker, a species that depends upon the direct effects of natural wildland fire.

The FS'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."

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

Mixed-severity fires, and in particular patches of high-severity fire, benefit grizzly bears by increasing cover of

berry producing shrubs (such as huckleberry) that the bears rely upon to get fat before winter, and promoting regeneration of whitebark pine[mdash] the seeds of which are an important food source for the bears (DellaSala and Hanson, 2015, Ch. 4, pp. 89, 101).

Finally, ecological resilience, which the FS implies they are creating through this project, 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 here is the human control of the forest ecosystem through mechanical means in order to maintain unnatural stasis by eliminating, suppressing or altering natural disturbances such as 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).

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. Six et al., 2014 documented that logging to prevent or contain insect and disease has not been empirically proven to work, and because of lack of monitoring the FS can't content this method is viable for containing insect outbreaks.

How much will it cost U.S. taxpayers have the FS implement the project?

What is the best available science for sustaining viable populations of ESA-listed, management indicator species and all sensitive species on the Forest? Past timber harvest activities, roads, mining and related activities (OHV use, including closed roads and trails illegally accessed) must be analyzed in the context of the importance of habitat capability and suitability, as well as connectivity.

Please disclose ongoing soil and water impacts from roads not being adequately maintained. Please disclose the impacts of roads that are not maintained because they are unauthorized or non-system.

The Scoping Notice states, "Fifty-seven percent of the National Forest System lands within the project area have been determined to be suitable for timber production." Please cite the documentation which determined that the specific areas proposed for logging in this proposal are suitable for timber production.

An accurate ecological analysis of the IPNF and project area would reveal too much forest and habitat fragmentation. In describing any landscape departures from the historical range of variability (HRV), please

provide a spatial analysis, comparing true reference conditions to current project area conditions.

Please disclose an accurate comparison of baseline (pre-management) species composition in the project area vs. present-day project area species composition. Likewise, please disclose an accurate analysis of baseline (pre-management) vs present-day regarding structural diversity, patch size, and age class.

Please disclose the impacts of past and ongoing livestock grazing on forest composition, "fuels" arrangement, and all other measurable aspects of vegetation in the project area. Please disclose the impacts of livestock grazing on soil conditions in the project area. Please analyze the interactions between livestock grazing and noxious weeds in the project area.

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.

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

Why can't the FS sacrifice some of its timber goals and set diameter limits to compensate for the deficiency compared to the historic range of large diameter trees (regardless of species) to serve wildlife habitat needs? How will the FS emphasize retention of the largest snags and live trees if you don't provide details on how this is to be accomplished?

The Forest Plan FEIS includes a "Large/Very Large" size class (20"+ dbh). Please disclose how many stands in the project area fall within that Large/Very Large size class, and how many acres of those would be logged. Please estimate how many total trees > 20" dbh would be cut in each unit.

The Forest Plan contains no minimum acreage or distribution requirements for maintaining old growth, ignoring 36 CFR 219.19 viability provisions that would prevent large areas of the IPNF becoming devoid of old growth or old-growth associated wildlife. The FS has not analyzed the wildlife viability implications of managing the IPNF well outside the HRV for old growth, based upon the best available scientific information.

Please compare patch size of the old-growth areas to scientific information on minimum size needed for utilization by old-growth associated wildlife.

The Forest Plan does not cite the scientific basis for the minimum amounts of coarse woody debris to be retained under Guideline FW-GDL-VEG-03.

The Forest Plan does not cite the scientific basis for the minimum amounts of snags to be retained under Guideline FW-GDL-VEG-04. Also the scientific basis for the delineation of snags into two diameter groups using 15" d.b.h. as the division point is not disclosed.

In FW-GDL-VEG-05 it is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the Forest Plan, or if it is intended to render the entire Guideline to be discretionary. Also, the "fire salvage" provision for using untreated areas to meet snag requirement would lead to insufficient retention in logged areas.

Hutto, 2006 addresses the latter subject; from the Abstract:

The bird species in western North America that are most restricted to, and therefore most dependent on, severely burned conifer forests during the first years following a fire event depend heavily on the abundant standing snags for perch sites, nest sites, and food resources. Thus, it is critical to develop and apply appropriate snag-management guidelines to implement postfire timber harvest operations in the same locations. Unfortunately, existing guidelines designed for green-tree forests cannot be applied to postfire salvage sales because the snag needs of snag-dependent species in burned forests are not at all similar to the snag needs of snag-dependent species in green-tree forests. Birds in burned forests have very different snag-retention needs from those cavity-nesting bird species that have served as the focus for the development of existing snag-management guidelines.

Specifically, many postfire specialists use standing dead trees not only for nesting purposes but for feeding purposes as well. Woodpeckers, in particular, specialize on wood-boring beetle larvae that are superabundant in fire-killed trees for several years following severe fire. Species such as the Black-backed Woodpecker (*Picoides arcticus*) are nearly restricted in their habitat distribution to severely burned forests. Moreover, existing postfire salvage-logging studies reveal that most postfire specialist species are completely absent from burned forests that have been (even partially) salvage logged. I call for the long-overdue development and use of more meaningful snag-retention guidelines for postfire specialists, and I note that the biology of the most fire-dependent bird species suggests that even a cursory attempt to meet their snag needs would preclude postfire salvage logging in those severely burned conifer forests wherein the maintenance of biological diversity is deemed important.

In FW-GDL-VEG-06 it is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the Forest Plan, or if it is intended to render the entire Guideline to be discretionary.

The first sentence of FW-GDL-VEG-08 along with the consistency requirement on page 4 of the Forest Plan suggest that any silvicultural system may be used in any proposed treatment unit, regardless of its appropriateness.

Essentially, FW-DC-FIRE-02 and Guideline MA6-GDL-FIRE-01 can be used to justify treatments regardless if they result in forest conditions that would not likely occur naturally, or if the biophysical setting would require frequent, intensive fuel treatments to maintain the desired fuel conditions. Regardless of natural fire regime, "Fire behavior is characterized by low- intensity surface fires with limited crown fire potential." Also, they prioritize fuel reduction over natural processes that create important wildlife habitat components and maintain soil productivity.

Nothing in the Scoping Notice 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 Scoping Notice primarily discusses fuel conditions only in the areas proposed for treatment, yet wildland fire operates beyond artificial ownership or other boundaries. In regards to the proper cumulative effects analysis area for fire risk, Finney and Cohen (2003) discuss the concept of a "fireshed involving a wide area around the community (for many miles that include areas that fires can come from)." In other words, for any given entity that would apparently have its risk of fire reduced by the proposed project (or affected cumulatively from past, ongoing, or foreseeable actions on land of all ownerships within this "fireshed")—just how effective would fuel reduction be? The Scoping Notice fails to include a thorough discussion and detailed disclosure of the current fuel situation within the fireshed within and outside the proposed treatment units, making it impossible to make scientifically supportable and reasonable conclusions about the manner and degree to which fire behavior would be changed by the project.

The Scoping Notice also fails to deal with the fuels issue on the appropriate temporal scale. How landscape-level fire behavior at any period except for very shortly after treatment would be changed or improved is ignored.

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.) And Rhodes also points out that using 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.)

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[mdash]ecosystem sustainability[mdash]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[mdash]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.)

In support of focusing on manipulating limited areas near homes, Finney and Cohen, 2003, state: Research findings indicate that a home's characteristics and the characteristics of a home's immediate surroundings within 30 meters principally determine the potential for wildland- urban fire destruction. This area, which includes the home and its immediate surroundings, is termed the home ignition zone. The home ignition zone implies that activities to reduce

the potential for wildland-urban fire destruction can address the necessary factors that determine ignitions and can be done sufficiently to reduce the likelihood of ignition. Wildland fuel reduction outside and adjacent to a home ignition zone might reduce the potential flame and firebrand exposure to the home ignition zone (i.e., within 30 m of the home). However, the factors contributing to home ignition within this zone have not been mitigated. Given a wildfire, wildland fuel management alone (i.e., outside the home ignition zone) is not sufficient nor does it substitute for mitigations within the home ignition zone (It is questionable whether wildland fuel reduction activities are necessary and sufficient for mitigating structure loss in wildland urban fires.

[hellip](W)ildland fuel management changes the [hellip] probability of a fire reaching a given location. It also changes the distribution of fire behaviors and ecological effects experienced at each location because of the way fuel treatments alter local and spatial fire behaviors (Finney 2001). The probability that a structure burns, however, has been shown to depend exclusively on the properties of the structure and its immediate surroundings (Cohen 2000a).

(Emphasis added.) Our take from Finney and Cohen (2003) is that there is much uncertainty over effects of fuel reduction. The authors point out:

Although the conceptual basis of fuel management is well supported by ecological and fire behavior research in some vegetation types, the promise of fuel management has lately become loaded with the expectation of a diffuse array of benefits. Presumed benefits range from restoring forest structure and function, bringing fire behavior closer to ecological precedents, reducing suppression costs and acres burned, and preventing losses of

ecological and urban values. For any of these benefits to be realized from fuel management, a supporting analysis must be developed to physically relate cause and effect, essentially evaluating how the benefit is physically derived from the management action (i.e. fuel management). Without such an analysis, the results of fuel management can fail to yield the expected return, potentially leading to recriminations and abandonment of a legitimate and generally useful approach to wildland fire management.

In their conclusion, Graham, et al., 1999a state:

Depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fire-adapted species. Such intermediate treatments can reduce the severity and intensity of wildfires for a given set of physical and weather variables. But crown and selection thinnings would not reduce crown fire potential. (Emphasis added.)

Please disclose the project logging impacts on the rate of fire spread. Graham, et al., 1999a point out that fire modeling indicates:

For example, the 20-foot wind speed⁵ must exceed 50 miles per hour for midflame wind speeds to reach 5 miles per hour within a dense Stand (0.1 adjustment factor). In contrast, in an open stand (0.3 adjustment factor), the same midflame wind speeds would occur at only a 16-mile-per-hour wind at 20 feet.

⁵ Velocity of the wind 20 feet above the vegetation, in this case tree tops.

Please disclose the implications of how the fire regime is changing due to climate change.

The FS alleges a need to reduce forest fuels in the wildland-urban interface (WUI). What is it about past projects that left the project area WUI in such a needy condition? Again, the FS must provide a cumulative effects analysis that compares current project area "needs" to accomplishments (or failures) of past projects.

Aside from urging landowners to adopt firewise measures on their own land, there's little that "management" can accomplish in the way of reducing wildland fire risk. When weather conditions arise that are favorable to high intensity fires, which happens more and more these days due to the effects of climate change, those fires will burn regardless of suppression efforts. Please disclose the relative contribution of weather factors to fire spread, intensity, and severity.

The forest plan Glossary definition of WUI under (A) has allowed entities other than the general public to set WUI boundaries outside of NEPA and NFMA processes, and under (B) defines it so vaguely as to expand the delineation of the WUI greatly[mdash]again outside NFMA and NEPA processes.

The vague language of Desired Condition FW-DC-FIRE-03 essentially nullifies its intent that recognizes the desirability of wildland fire.

We want the FS and the public to be comfortable with unplanned wildland fires under some weather conditions in sensible locations, so that the ecosystem benefits can be realized. Simply stated, at the time that response to any given fire is contemplated, we want decision makers to have publicly vetted documentation[mdash]for that specific fire area[mdash]of the benefits of the process that helps create habitat conditions for wildlife, restores forest composition, recycles soil nutrients, creates large dead logs that fall into streams forming native fish habitat, as well as many others. That will provide the public, the news media, and politicians with a fully vetted set of justifications for managing with[mdash]rather than against[mdash]the native ecosystem process of fire. We believe that such planning can and must be undertaken for sustainable forest management to evolve away from the unacceptable present situation. If the FS is unwilling to perform such an analysis for projects such as Buckskin Saddle, then it must undergo programmatic analysis of its fire suppression policies, disclosing the impacts and ecological harm that the agency will subsequently claim must be later addressed by vegetation management and fuel treatment projects across the landscape. Not to mention the enormous financial costs[mdash]also never analyzed or disclosed at any planning level.

Rather than fire starts, FW-OBJ-FIRE-02 should specify a number of acres set by best available science and analysis. The Forest Plan needs much stronger direction and certainty for use of wildland fire for resource benefits.

The Forest Plan FEIS analysis of fire suppression fails to address the constrained budget scenario which implies the FS will not be allocated enough funding to address the problems it states are perpetuated by fire suppression.

MON-VEG-01-01 is part of the circular logic in the Forest Plan's construction, which is that vegetation manipulation is the only way areas of the Forest would be resilient, resistant, meeting Desired Conditions, etc.

The Scoping Notice includes a project objective/need to "Improve the resiliency and resistance of the forest vegetation to disturbances such as wildfire, drought, insects and diseases." It makes no sense, ecologically speaking to "increase resilience" to the identified natural processes. An ecosystem that is fully functioning is naturally resilient. When an ecosystem is disturbed, succession according to natural processes occurs. If previous management has led to restoration needs, then the course of action should be to work with natural processes, removing human- caused impediments as necessary.

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

A significant body of our concerns about the Forest Plan surround its over-reliance on "Desired Conditions" (DCs) as directing management, and too few standards that refrain management. As we pointed out, this results in an overall lack of accountability for the FS to ever accomplish anything positive expressed in the Forest Plan's timeless, aspirational DCs, as well as there being far too few restraints that serve the conservation of biological diversity and promotion of ecological sustainability.

The Forest Plan has so much discretion as to render the aquatic standards arbitrary. The standards pertaining to watersheds and water quality, riparian, aquatic species and habitat are limited, narrowly focused, and contain language that could subvert the intent of the standard. No matter how badly degraded a drainage might be, no aquatic standards or thresholds would properly limit timber sales.

The IPNF now uses the Water Erosion Prediction Project (WEPP) model to assess potential impacts of surface disturbance on aquatic resources in the IPNF. Please provide project area information validating the use of the WEPP model.

Please take a hard look at the condition of all streams and water bodies in the affected watersheds, and explain how those conditions contribute to fish population and trends. Please disclose populations of fish species in the project area, and compare those numbers to minimum viable populations.

Please explain how the timber sale would comply with the Clean Water Act and all state water quality laws and regulations. Designating BMPs is not sufficient for compliance with CWA and NFMA. Please disclose the actual effectiveness of proposed BMPs in preventing sediment from reaching streams in or near the analysis area. What BMP failures have been noted for past projects with similar landtypes? Also, please disclose which segments of roads in the watersheds to be affected by this proposal would not meet BMPs following project activities.

Please disclose the intensity or thoroughness of the alleged surveys for inventorying sediment sources in the project area. See Fly et al. 2011, which describes a thorough survey in the Boise National Forest. Please disclose the metrics you are using to estimate elevated, unnatural sources of sediment yield into streams.

Log hauling itself adds sediment to streams. From an investigation of the Bitterroot Burned Area Recovery Project, hydrologist Rhodes (2002) notes, "On all haul roads evaluated, haul traffic has created a copious amounts of mobile, non-cohesive sediment on the road surfaces that will elevate erosion and consequent sedimentation, during rain and snowmelt events." USDA Forest Service, 2001a also presents an analysis of increased sedimentation because of log hauling, reporting "Increased traffic over these roads would be expected to increase sediment delivery from a predicted 6.30 tons per year to 7.96 tons per year."

Objective FW-OBJ-WTR-01 prioritizes management (logging, fuel reduction) in the watersheds in best condition on the Forest, because of use of vague language "toward a better condition" and "risk factors."

Objective FW-OBJ-WTR-02 prioritize managements (logging, fuel reduction) because of its language "improve[hellip] across acres of subwatersheds[hellip]"

Guideline FW-GDL-WTR-01 offers little to no protection to the impaired waters on the IPNF. Even with an approved TMDL, there is no legal authority to enforce a violation of the TMDL.

In Guideline FW-GDL-WTR-02 the meaning of "hydrologic stability" is unclear.

Please disclose the existing conditions of site specific stream reaches and project effects on water quality, fish and other aquatic resources. Please disclose information regarding the existence and effects of bedload and accumulated sediment. Please analyze and disclose channel stability for specific stream reaches. Please disclose the amount of existing accumulated fine and bedload sediment that remains from the previous logging and road construction.

Kappesser, 2002 discusses an assessment procedure used on the IPNF:

The RSI [Riffle Stability Index] addresses situations in which increases in gravel bedload from headwaters activities is depositing material on riffles and filling pools, and it reflects qualitative differences between reference and managed watersheds[hellip]it can be used as an indicator of stream reach and watershed condition and also of aquatic habitat quality.

Peak flows can be altered by forest harvest activities after removal of canopy through less interception, which results in more snow accumulation and snowmelt available for runoff (Troendle and King 1985). Please disclose the potential for the project to damage channel morphology and aquatic habitat.

Please conduct an analysis of water flow alteration effects on stream bank erosion and channel scouring during spring runoff and/or rain-on-snow (ROS) events. Most segment altering and channel forming events occur during instantaneous flows.

Openings accumulate much more snow than in a forested areas that are not as "open," thus provide a significant contribution to water yield especially during ROS and spring runoff events. The number, mileage and proximity of the roads to the proposed logging units and streams are important because they will also have a significant effect on peak flows and the resultant impact on fish, stream channels and possible flooding.

According to Kappesser, 1992:

The stability condition of a watershed may be broadly determined by evaluating the level of harvest activity (ECA), its spatial distribution with regard to headwater harvest and rain on snow risk and the density of roading in the watershed with consideration of road location relative to geology and slope. Each of these four factors may [be] evaluated against "threshold" levels of activity characteristic of watersheds on the IPNF that are known to be stable, unstable, or on a threshold of stability.

ROS events can be the most channel changing, sediment producing events and can have a significant adverse effect on fish and their habitat (Kappesser, 1991b):

Filling of pools by bedload sediment is seen as a significant factor in the reduction of rearing and overwintering habitat for fish such as West Slope Cutthroat Trout (Rieman and Apperson, 1989). Bedload increases have traditionally been interpreted as the result of channel scour in response to increased peak flows created by timber harvest.

(Also see Kappesser, 1991a.) The Inland Northwest frequently gets at least one mid-winter chinook which is often accompanied by windy and rainy conditions. The warm wind blowing across the snow, especially in relatively open areas on south and southwestern facing slopes between 2,500 to 4,500 feet elevation results in rapid snow melt and high levels of instantaneous water flows.

King, 1994 explains that small headwaters areas are particularly sensitive to the increased water yields due to removal of tree canopy:

Timber removal on 25-37% of the area of small headwater watersheds increased annual water yield by an average of 14.1 inches, prorated to the area in harvest units and roads. Increases in streamflow occurred during the spring snowmelt period, especially during the rising portion of the snowmelt hydrograph. These forest practices also resulted in large increases in short duration peakflows, greatly increasing the sediment transport capacity of these small streams. The cumulative effects of these activities on streamflow in the Main Fork, with only 6.3% of its area in roads and harvest units, were not detectable.

Ziemer, 1998 observed the same phenomenon in his study on flooding and stormflows. Also, King, 1989 observed that "Current procedures for estimating the hydrologic responses to timber removal of third to fifth order streams often ignore what may be hydrologically important modifications in the low-order streams."

USDA Forest Service 1994b states:

It is important to recognize that the Equivalent Clearcut Area model uses tree growth (canopy density) to estimate Spring peak flows and that channels do not recover immediately in response to tree growth. There is a lag time between hilltop recovery (growth) and channel recovery. The length of the lag time is difficult to predict and is likely to be influenced by factors other than simply canopy density (e.g. the role of culvert failures, in-stream activities, geology, etc.).

USDA Forest Service 1994b states "It is important to realize that all models greatly simplify complex processes and that the numbers generated by these models should be interpreted in light of field observations and professional judgement." (III-77.) Harr, 1987 states:

Perhaps the most basic of the erroneous beliefs is the idea that simplicity can be willed on the forest hydrologic system. This belief encourages the implementation of simplistic guidelines, the adoption of arbitrary thresholds of concern, and the search for all-encompassing methodologies to predict consequences of forest activities on water resources. These actions occur sometimes with the blessings of hydrologists or soil scientists but other times over their objections. The belief in simplicity has been nurtured by the rapid increase in the use of computer simulation models in forest planning and the desire to accept the output from such models. Another reason for pursuit of simplicity is the current emphasis on planning called for by NFMA; such planning is often conducted under strict time and budgetary constraints.

I must point out that, on the average, the simplistic methodologies may have resulted in fairly prudent forest management. But rather than being viewed as merely a first attempt at solving a problem, they often seem to inhibit further investigation and development. Also, they tend to lead forest managers and some specialists to believe that hydrologic systems really do function in the manner described by the simplistic methodologies.

Forest hydrologic systems are more complex than one would believe after reading some of the methodologies and procedures that have been proposed to predict cumulative effects of logging on water resources. For example, many of these procedures state that a threshold of harvest activity or intensity will be determined, without specifying how it will be determined or whether it really exists or can be measured. Similarly, implementing a methodology for estimating cumulative effects of harvest operations on water resources does not mean that such cumulative effects either exist or can be measured.

(I)n our desire to simplify, to create a methodology that will predict consequences of harvest activities everywhere or in the average situation, we usually expend considerable energy creating a methodology that predicts

reasonably accurately virtually nowhere. We may implement procedures without providing for testing or monitoring the results to see whether the procedures are, in fact, working. In the process, we may even develop a false sense of security that our methodology can really protect soil and water resources.

Please conduct an analysis of forest plan Riparian Management Objectives (RMOs), including trends toward or away from meeting those RMOs.

Please disclose the results of surveys for native fish occurrence and abundance in project area streams.

The 1998 Bull Trout Biological Opinion (BO) indicates that bull trout are absent when road densities exceed 1.71 mi./mi²., depressed when the road density = 1.36 mi./mi². and strong when road density equals or is less than .45 mi./mi². (P. 67.)

The Watershed Disturbance Rating strongly suggests forestwide direction to attain watershed restoration. Yet, there are no forestwide standards for those parameters, which is needed to provide much stronger prioritization towards meeting forestwide Watershed and Water Quality Desired Conditions.

Please provide an analysis of soil conditions in the analysis area, noting any detrimental soil disturbance and its consequences for diminishing soil and land productivity. Please disclose the extent of soils in the analysis area that are already hydrologically impacted, and analyze and disclose their watershed impacts.

In FW-DC-SOIL-01 the meaning of "Areas with sensitive and highly erodible soils or land types with mass failure potential are not detrimentally impacted or destabilized as a result of management activities" is unclear.

In FW-DC-SOIL-02 the meaning of the term "Managed areas" is unclear. The areal extent could be delineated as a few square feet, a logging unit, a timber sale contract area, an entire watershed, or even a Ranger District.

Forest Plan soil Objective FW-OBJ-SOIL-01 would accomplish little soil restoration. The meaning of "not meeting soil quality criteria" is unclear.

The Forest Plan includes no soil quality standards. By adopting FSM-2500-99-1 the Forest Service does not avoid irreversible soil damage on the IPNF.

There is no Forest Plan requirement to quantify, minimize, or even consider the total amount of detrimentally disturbed soils on the IPNF or in a watershed.

The Forest Plan adopts a proxy—detrimental soil disturbance—rather than more direct measures of management-induced losses or reductions of soil productivity. We are aware of no scientific information based upon IPNF data that correlates the proxy (areal extent of detrimental soil disturbance 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.

FW-GDL-SOIL-01, 02, 03, and 04: It is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the Forest Plan, or if it is intended to render these entire Guidelines to be discretionary.

Guideline FW-GDL-SOIL-04 leaves too much discretion allowing activities on landslide-prone areas.

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.

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.

[hellip] 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 Region 1 Soil Quality Standards (SQS) are the only directives limiting damage to soil during industrial extraction on the IPNF, and even they are 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.⁶

Please disclose soil conditions in the project area that are outside the project treatment units. The cumulative amount of existing soil damage over the entire project area 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 in this project area.

The FS generally provides no idea of the degree of soil impacts in a project area[mdash]except for an estimate of a limited category (detrimental soil disturbance or "DSD") [mdash]but only if a site happens to occur in a unit proposed for logging or burning under the project. Such a narrow view of the cumulative impacts on soils contradicts other FS policy and best available science.

The Soil and Water Conservation Practices Handbook (FSH 2509.22) states: Practice 11.01 - Determination of Cumulative Watershed Effects

Jam Cracker Environmental Assessment, Lolo National Forest, 2016

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.

Booth, 1991 explains how soil quality conditions translate to watershed hydrology and thus, water quality and quantity:

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.

[hellip]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.

[hellip]Flooding, channel erosion, landsliding, and destruction of aquatic habitat are some of the unanticipated changes that [hellip]result from these alterations.

[hellip]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. [hellip]These changes produce measurable effects in the hydrologic response of a drainage basin.

Elsewhere the FS recognizes that amounts of soil compaction and other measures of DSD 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[hellip] 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.

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.) The IPNF (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.)

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.

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.

[hellip]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.)

Please provide an analysis of the hydrological implications of the cumulative soil damage caused by past management added to timber sale-induced damage in project area 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 are effects to be analyzed in a watershed analysis.

Harr, 1987 rejects absolute thresholds for making determinations of significant vs nonsignificant levels of soil compaction in watersheds, but nevertheless he does refer to his experience as noted above by Johnson, 1995. Harr, 1987 states:

[hellip]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. [hellip]The 12 percent figure is arbitrary. Flow changes at lesser amounts of compaction may also cause adverse impacts.

[hellip]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 DSD 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. [hellip] 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.

[hellip]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 IPNF 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 DSD with very mixed results (e.g., Reeves et al., 2011). The point is[mdash]as weak as the standards are[mdash]FS pledges to meet the standards must be taken with a grain of salt.

There is also an issue of reliability and validity of the FS's soil survey methods. 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.

[hellip]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 (DSD7) 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.) USDA Forest Service, 2012a admits that DSD estimates are "not absolute."

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

7 Detrimental Soil Disturbance (DSD) is equivalent to exceeding soil property thresholds

Another cumulative impact the SQS 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 and/or had organic layers displaced to use as temporary log storage and log truck loading and often 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 SQS. Much like system roads, there are no limits to total DSD from landings set by the SQS, and there is no requirement that their extent in a project area be disclosed. Roads and log landings might be limited by other resource considerations such as road densities in sensitive wildlife habitat, but they are not limited by the SQS.

Still more cumulative soil damages the SQS ignore involve existing DSD on areas the FS maintains as part of the "suitable" or productive land base such as timber stands, grazing allotments and riparian zones that are not within the boundaries of any current project activity areas. The SQS do not limit or require disclosure of the existing/prior DSD 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, SQS do not compel the FS to take actions that might restore the soil productivity in such areas because their existing DSD does not matter for determining consistency with the SQS [mdash]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, 2016a explains another major cumulative effect ignored by the SQS, which is the indirect effect of soil damage, or DSD, on sustained yield. It states that the SQS "created the concept of 'Detrimental Soil Disturbance' (DSD) for National Forests in Region One as a measure to be used in assessing potential loss of soil productivity resulting from management activities." USDA Forest Service, 2016a further explains (emphases added):

Without maintaining land productivity, neither multiple use nor sustained (yield) can be supported by our National Forests. Direct references to maintaining productivity are made in the Sustained Yield Act "[hellip]coordinated management of resources without impairment of the productivity of the land" and in the Forest and Rangeland Renewable Resources Act "[hellip]substantial and permanent impairment of productivity must be avoided".

Soil quality is a more recent addition to Forest Service Standards. The Forest and Rangeland Renewable Resources Act (1974) appears to be the first legal reference made to protecting the "quality of the soil" in Forest Service directives. Although the fundamental laws that directly govern policies of the U.S. Forest Service clearly indicate that land productivity must be preserved, increasingly references to land or soil productivity in Forest Service directives were being replaced by references to soil quality as though soil quality was a surrogate for maintaining land productivity. This was unfortunate, since although the two concepts are certainly related, they are not synonymous.

Our understanding of the relationship between soil productivity and soil quality has continued to evolve since 1974. Amendments to the Forest Service Manual, Chapter 2550 - Soil Management in 2009 and again to 2010 have helped provide some degree of clarity on

this issue and acknowledged that the relationship is not as simple as originally thought. The 2009 (2500-2009-1) amendment to Chapter 2550 of the Forest Service Manual states in section 2550.43-5, directs the Washington Office Director of Watershed, Fish, Wildlife, Air and Rare plants to "Coordinate validation studies of soil quality criteria and indicators with Forest Service Research and Development staff to ensure soil quality measurements are appropriate to protect soil productivity" (USFS-FSM 2009). Inadvertently this directive concedes that the relationship between soil productivity and soil quality is 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.)

Please provide a map showing the locations of all past logging units, including the intensity of the logging activities.

The IPNF (USDA Forest Service, 2009c) admits, in regards to project area sites where DSD soils were not to be restored by active management: "For the [hellip]severely disturbed sites,[hellip] "no action"

[hellip]would create indirect negative impacts by missing an opportunity to actively restore damaged soils. (Emphasis added.)

In order to meet NFMA and NFMA regulations' mandates to protect soil productivity, the IPNF adopted the SQS. Again, the SQS requires the FS to delineate specific geographic areas called "activity areas" for the purpose of predicting, measuring, monitoring, and analyzing impacts on soil productivity from management activities. FSM 2500-99-1 includes a mandate to maintain 85% of an activity area in a satisfactory, non-DSD soil condition.

Please explain how your methodology for determining DSD produces statistically reliable data. This also raises questions of the validity of DSD estimation and other analysis methodology, and therefore compliance with the FS's proxy for soil productivity. Please explain how the FS arrives at current DSD estimates, and provide sufficient detail to indicate the intensity of soil surveys or monitoring of past projects.

Please disclose that the SQS methodology for "activity areas" inherently encourages gerrymandering areas not previously logged into project "activity areas", helping to artificially dilute the amount of effective DSD from previously logged units by creating a more favorable average.

Please disclose that DSD percent limit is based upon the amount of damage that is operationally feasible, not scientific data that measures land and soil productivity losses caused by DSD. The SQS were developed internally by the FS without the use of any public process such as Forest Planning, NEPA, or independent scientific peer review.

DSD 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 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[hellip] (A)pplying the 15% areal limit for detrimental damage is not correct... (T)hat was never the intent of the 15% limit[hellip] 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 stated, "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 limit is based largely on what is physically possible, while achieving other resource management objectives" (emphasis added). So the SQS limits are based on feasibility of timber sale implementation rather than concerns over soil productivity; and additionally we have the bulk density increase limit is based upon the limitations of detection by FS bulk density measuring methods[mdash]again, not concerns over soil productivity.

The FS's soil proxy[mdash]its SQS assumption that up to 15% of an activity area having long-term damage is consistent with NMFA and regulations[mdash]is arbitrary. The FS does not cite any scientific basis for adopting its numerical limits. 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. [hellip]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. (Emphasis added.)

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

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[hellip] some sites showed that maximum compaction occurred at a depth of 8 inches[hellip] 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 in the IPNF, stated: "Moderate compaction was achieved by driving a Grappeler 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 SQS standard is the same arbitrary 15%.

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.)

However the SQS definition of DSD considers only alterations to physical properties, but not chemical or biological properties. The SQS is not consistent with best available science.

One of these biological properties is represented by naturally occurring organic debris from dead trees. The SQS recognize the importance of limiting the ecological damage that logging causes due to retaining inadequate amounts of large woody debris, but set no quantitative limits on such losses caused by logging and slash burning. Please disclose the levels of large woody debris in the project area following past management activities, in addressing your obligations to consider cumulative effects.

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.)

"(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.

"The big trees were subsidizing the young ones through the fungal networks. Without this helping hand, most of the seedlings wouldn't make it." (Suzanne Simard: <http://www.ecology.com/2012/10/08/trees-communicate/>) "Disrupting network links by reducing diversity of mycorrhizal fungi[hellip] can reduce tree seedling survivorship or growth (Simard et al, 1997a; Teste et al., 2009), ultimately affecting recruitment of old-growth trees that provide habitat for cavity nesting birds and mammals and thus dispersed seed for future generations of trees." (Simard et al., 2013.) (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>).

Gorzalak et al., 2015:

[hellip]found that the behavioural changes in ectomycorrhizal plants depend on environmental cues, the identity of the plant neighbour and the characteristics of the (mycorrhizal network). The hierarchical integration of this phenomenon with other biological networks at broader scales in forest ecosystems, and the consequences we

have observed when it is interrupted, indicate that underground "tree talk" is a foundational process in the complex adaptive nature of forest ecosystems.

The scientists involved in research on ectomycorrhizal networks have discovered connectedness, communication, and cooperation between what we traditionally consider to be separate

organisms. Such a phenomenon is usually studied within single organisms, such as the interconnections in humans among neurons, sense organs, glands, muscles, other organs, etc. so necessary for individual survival. The FS must consider the ecosystem impacts from industrial management activities on this mycorrhizal network. The industrial forestry management paradigm is unfortunately destroying what it fails to recognize.

Please disclose if and how the IPNF has determined if management activities have reduced the diversity of mycorrhizal fungi in any treatment area.

USDA Forest Service, 2007 states:

Sustained yield was defined in the [hellip]Forest Plan [hellip]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 capacity of the lands ability to produce resources.

That statement is on point: Since the FS has no idea how much soil has been permanently impaired either within the project area or forestwide, "sustained yield" is an empty promise. There continues to be a lack of adequate regulatory mechanisms for protecting soil productivity on the IPNF and Northern Region, as advocated for by Lacy (2001). Since the FS has no idea how much soil has been permanently impaired either within the project area or forestwide, the agency's "sustained yield" is an empty promise. The FS lacks adequate measures for protecting soil productivity on the Forest.

NEPA requires that the FS specify the effectiveness of its mitigations. (40 C.F.R. 1502.16.) Please disclose the effectiveness of DSD mitigation. There is no quantitative monitoring data that demonstrates DSD remediation activities have taken an activity area with DSD amounts over the 15% 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. (Emphases added.)

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

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

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.)

Please provide an analysis of the noxious weeds situation in the analysis area. Please disclose the degree to which the productivity of the land and soil has been affected in the project area and forestwide due to noxious weed infestations, and how that situation is expected to change in the coming years and decades. The IPNF's noxious weed treatment program is mitigation for

management activities which exacerbate the spread of noxious weeds. Please disclose the effectiveness of this mitigation.

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.

So the project will worsen the noxious weed spread in the project area, and even if post-disturbance treatments are implemented, their uncertain efficacy means that the project will significantly increase noxious weed occurrence.

The FS often proposes winter logging as mitigation. Evidence that 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 IPNF 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 SQS 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." (Emphases 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.

In FW-STD-RIP-01 and FW-STD-RIP-02, the meaning of "intact and [hellip]functioning at desired conditions" is unclear. There is no reference to any established objective criteria.

In FW-STD-RIP-02, the last sentence ("Large-scale restoration plans or projects that address other cumulative

effects within the same watershed may be considered as compensatory components and shall be described during site specific project analyses") allows this standard to be ignored in project development as long as the FS makes any claim that the project has some vague "large scale" restoration component.

In FW-GDL-RIP-01, 02, 03, 04, and 05 it is unclear if the use of the word "should" is intended to recognize the second consistency requirement on page 4 of the LMP, or if it is intended to render these entire Guidelines to be discretionary.

The Forest Plan fails to acknowledge the known limitations of the INFISH direction. INFISH deals primarily with riparian zone protection, and does not consider instream and stream bank erosion and sediment deposition during high water yield events, such as spring runoff and rain- on-snow events.

The FS sets an inadequate Aquatic Habitat restoration Objective (FW-OBJ-AQH-01) for the next 15 years, hardly addressing the Forest Plan Goal for this topic.

The Forest Plan does not contain direction that explicitly limits the amount of sediment that would be allowed to enter water bodies from management activities in compliance with NFMA regulations at 36 CFR 219.27(e).

Due to the inability of the FS to receive funding for or perform routine maintenance, a very substantial portion of the IPNF road system is not up to BMP standards, meaning that sediment and other pollution that result are violations of state water quality standards and the Clean Water Act.

The Forest Plan is not responsive to NFMA at 36 CFR 219.27(e) which concerns management practices that cause blockages of water courses.

The Forest Plan does not address the lack locally calibrated coefficients of the Equivalent Clearcut Area (ECA) component of the WATSED model, nor validate the model.

The Forest Plan's aquatic Macroinvertebrate Assemblage Management Indicator Species does not comply with 36 CFR 219.19(a)(1), because the FS does not explain how it assures well- distributed, viable populations of other aquatic species such as bull trout, westslope cutthroat trout, inland redband trout, and western pearlshell mussel.

Please disclose the results of monitoring the Macroinvertebrate Assemblage Management Indicator Species.

The Scoping Notice states:

The landscape architect working on this project will analyze treatment areas to predict what they would look like from various viewpoints. This will help determine if additional changes to the proposed action are necessary to ensure consistency with forest plan direction for scenery.

This, and several other statements in the Scoping Notice illustrate a fatal flaw: the FS is forging ahead with a process that doesn't allow the public to review necessary FS analyses. Another example is that there is nothing in the Scoping Notice for the public to review about wildlife and their habitat needs, despite Forest Plan direction.

Please disclose the funding or other meaningful distinctions between "road maintenance" and "road reconstruction" (Scoping Notice at 29-30) to explain why the FS is saying major actions such as replacing culverts and installing rolling dips are not "reconstruction."

We ask the Forest Service disclose the following information concerning the project area:

[middot] The deferred road maintenance backlog

[middot] The annual road maintenance funding needs

[middot] The annual road maintenance budget

[middot] The capital improvement needs for existing roads

[middot] The road density in the project area

[middot] The number of miles of project area roads that fail to meet BMP standards or design standards

Please disclose the itemized costs for each of the following: new temporary roads, project-related road maintenance, road decommissioning, all other road-related work, sale preparation and administration, project-related weed treatment, other project mitigation, post-project monitoring, environmental analyses and reports, public meetings and field trips, publicity, consultation with other government agencies, responding to comments.

The Forest Plan FEIS concludes that implementation of the Forest Plan "may impact individuals or habitat, but is not likely to result in a trend towards federal listing or loss of viability" for each species. However, it does not

disclose the minimum viable population of any of the Sensitive species (plant, wildlife, or aquatic), nor does it describe the quantity and quality of habitat needed to maintain viable populations of any of the Sensitive species. The Forest Plan lacks science-based habitat Standards based upon the needs of Sensitive species. The Forest Plan does not even include criteria for measuring a viable population in its Glossary.

The FS must address the case law requirement that the FS insure that there exists the quantity and quality of habitat necessary to insure viability of aquatic species of concern. The Ninth Circuit Court of Appeals ruled that the FS "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. The Forest Plan is not based upon scientific research regarding the forestwide amount and distribution of habitat needed to insure viability of vertebrate species of concern. Furthermore, the FS maintains an inaccurate old-growth inventory. What is the FS's way of describing the quantity and quality of habitat that is necessary to sustain the viability of the species in question on the IPNF? Also, please "explain (the) methodology for measuring this habitat."

That Sensitive species are administratively designated by the regional forester highlights a weakness of the biodiversity provisions of the Forest Plan. At any time, the Regional Forester may change or even eliminate the Sensitive species list for the IPNF, without any public process.

The Forest Plan omits old-growth Management Indicator Species, which means there would be no monitoring of wildlife whose special habitat needs are best found in old growth. The Forest Plan's failure to designate management indicator species according to the requirements of the 1982 planning regulations violates NFMA.

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

The proposal is that the Forest Service monitor those species whose status allows inference to the status of other species, are indicative of the soundness of key ecological processes, or provide insights to the integrity of the overall ecosystem. This procedure is a necessary shortcut because monitoring and managing for all aspects of biodiversity is impossible.

No single species is adequate to assess compliance to biological sustainability at the scale of the national forests. Thus, several species will need to be monitored. The goal is to select a small number of focal species whose individual status and trends will collectively allow an assessment of ecological integrity. That is, the individual species are chosen to provide complementary information and to be responsive to specific conservation issues. Thus, the Committee proposed for consideration a broad list of species categories reflecting the diversity of ecosystems and management issues within the NFS.

The Forest Plan and FEIS do not include scientific justification for the adoption of the landbird assemblage (olive-sided flycatcher, hairy woodpecker, chipping sparrow, Hammond's flycatcher and dusky flycatcher) as MIS representing other wildlife (including old-growth associated wildlife species) on the IPNF. In fact the EIS contains an explicit assumption that its implementation cannot possibly affect viability of its chosen indicator species: "These MIS, elk and insectivores, were not selected because of a viability concern."

The use of vegetation habitat proxy is invalid for insuring viable populations of wildlife.

Please disclose statistically robust estimates of population trends of each Sensitive species. Please disclose the intensity of surveys for Sensitive species that have been conducted in the project area. Please provide a sound scientifically-based explanation for any species' apparent absence from the project area.

Traill et al., 2010 and Reed et al., 2003 are published, peer-reviewed scientific articles addressing what a true "minimum viable population" would be, and how that number is typically drastically underestimated. The FS has not identified the best available science that provides scientifically sound, minimum viable populations of any Sensitive species or MIS on the IPNF.

Please disclose the cumulative effects of recreational activities and motorized/mechanic access on wildlife populations.

The use of VMap base data causes unacceptable inaccuracy in the Forest Plan EIS wildlife analysis.

There is no accuracy assessment including confidence intervals in the Forest Plan EIS wildlife analysis.

IN FW-DC-WL-06, the provision directing management to promote large-diameter trees in eagle nesting territories is not based upon any information source from the IPNF that demonstrates it is needed, or on recommendations of any scientific research on managing for bald eagles.

Desired Condition FW-DC-WL-07 encourages occupancy of woodland caribou only within the currently designated Recovery Zone, far less than its historic range. The Recovery Zone is also not a FS established geographic area, which means the DC could be changed without public process.

It is unclear if the word "should" in Forestwide Wildlife Guidelines is intended to render these entire Guidelines to be discretionary.

In FW-GDL-WL-01, 03, 04, 05, 11, 14, 19, 20, 21, 22, 23, 24, and 25 the words "or minimize" are not objectively defined and basically nullify these guidelines.

In order to meet Forest Plan requirements in the Elk Management Unit, the project "should maintain existing levels of elk security" (Forest Plan guideline FW-GDL-WL-13).

Guideline FW-GDL-WL-08 can be read to provide direction to log areas that scientific consensus recognizes as some of the worst places to do so, because of the ecological sensitivity and often rarity of intact post-fire habitats.

Desired Condition FW-GDL-WL-20 states, "(Raptors) that establish nests near pre-existing human activities are assumed to be tolerant of that level of activity." There is no scientific research that validates the inclusion of this assumption for all raptors.

Desired Condition FW-GDL-WL-25 states, "Individual animals that establish nests and den sites near areas of pre-existing human use[hellip] are assumed to be accepting[hellip]" There is no scientific research that validates this assumption for the remaining species "not covered under other forestwide guidelines."

In the absence of meaningful thresholds of habitat loss and no monitoring of wildlife populations at the Forest level, projects will continue to degrade wildlife habitat across the IPNF over time. (See also Schultz 2012.). The FS would never be able to detect the likelihood of complete extirpation of any wildlife species from the IPNF, using such methodology.

The FS must conduct surveys for wildlife, or their dens or nests, in the project area.

Hutto, 2008 cautions against the common practice of landscape scale thinning to "restore" forests to a condition thought to be more congruent with historical conditions:

Black-backed Woodpeckers [hellip]require burned forests that are densely stocked and have an abundance of large, thick-barked trees favored by wood-boring beetles (Hutto 1995, Saab and Dudley 1998, Saab et al. 2002, Russell et al. 2007, Vierling et al. 2008). Indeed, data collected from within a wide variety of burned forest types show that the probability of Black-backed Woodpecker occurrence decreases dramatically and incrementally as the intensity of traditional (pre-fire) harvest methods increases. (Emphases added.)

The Hutto, 2008 Abstract states:

I use data on the pattern of distribution of one bird species (Black-backed Woodpecker, *Picoides arcticus*) as derived from 16,465 sample locations to show that, in western Montana, this bird species is extremely specialized on severely burned forests. Such specialization has profound implications because it suggests that the severe fires we see burning in many forests in the Intermountain West are not entirely "unnatural" or "unhealthy." Instead, 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.

Please evaluate impacts on species that are affected by human activity including the fisher, pine marten, wolverine, Canada lynx, native trout and other fish, elk, woodpeckers, pygmy nuthatches, northern goshawks, flammulated owls and other raptors, fringed myotis, Townsend's big-eared bats, amphibians (such as western toad and Coeur d'Alene salamander), and reptiles.

Please disclose data and the best available science concerning biological relationships and population trends of these species on the IPNF.

The FS relies upon unpublished reports by Samson alleged to prove viability is being maintained for various wildlife species of concern on the IPNF. However, those reports have not been subject to scientific peer review and thus fail to meet the best available science standard. The Samson reports rely upon the databases of outdated, unreliable information as its quantitative source.

The preference for large diameter of nesting trees for the pileated woodpecker is known (McClelland and McClelland, 1999) but because the Forest Plan omitted adoption of old growth MIS, the FS has no viability strategy.

GA-DC-WL-PR-02 allows "low levels of human disturbance" in grizzly and caribou habitat, but this is too vague to be based upon best available science.

The Forest Plan lacks meaningful direction maintaining Landscape Connectivity for wildlife. 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.)

The FS has still not sufficiently dealt with the issue of fragmentation, road effects, and past logging on old-growth species' habitat.

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 IPNF is a major ongoing concern. It is documented that edge effects occur 10-30 meters into a forest tract (Wilcove et al., 1986). The size of blocks of interior forest that existed historically before management (including fire suppression) was initiated must be compared to the present condition. USDA Forest Service, 2004a states:

Forested connections between old growth patches [hellip](widths) are important because effective corridors should be wide enough to "contain a band of habitat unscathed by edge effects" relevant to species that rarely venture out of their preferred habitats (Lidicker and Koenig 1996 and Exhibit Q-17).

Timber harvest patterns across the Interior Columbia River basin of eastern Washington and Oregon, Idaho, and western Montana have caused an increase in fragmentation of forested lands and a loss of connectivity within and between blocks of habitat. This has isolated some wildlife habitats and reduced the ability of some wildlife populations to move across the landscape, resulting in long-term loss of genetic interchange (Lesica 1996,

U.S. Forest Service and Bureau of Land Management 1996 and 1997).

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

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

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

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

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

Connectivity objectives should be set for each landscape unit. [hellip]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. [hellip] 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. [hellip]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. [hellip](l)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. [hellip]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. [hellip](A) way to moderate both the demands for and the stresses placed

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

The IPNF has failed to monitor populations of old-growth associated wildlife, in favor of striving towards DCs for

habitat (vegetation) in project planning. The Committee of Scientists (1999) state:

Habitat alone cannot be used to predict wildlife populations[hellip]The presence of suitable habitat does not ensure that any particular species will be present or will reproduce.

Therefore, populations of species must also be assessed and continually monitored.

(Emphasis added.)

The Forest Plan includes inadequate direction to designate the minimum road system. The Forest Plan is inconsistent with the Travel Management Regulations.

How does the FS propose to afford maintaining the road system in this project area when the funding doesn't exist, and as a result watershed conditions will continue to deteriorate from naturally increasing erosion?

The main ecological (as well as budgetary) problem facing the IPNF is the existing excessive network of roads. Although the main focus of the Travel Management Rule Subpart A was to be this excessive road network, the FS sidesteps the issue at every juncture[mdash]in the design of the Forest Plan, in the design of projects implementing the Forest Plan, and in the systematic avoidance of fully performing its duties under Subpart A, which requires the agency to minimize the ecological and economic liabilities of the excessive road network by significantly downsizing it.

Early in the forest plan revision process, the FS recognized the opportunity the process provided for addressing the excessive road system on the Forest. This was indicated in statements made in the AMS:

The revised Forest Plans need to be in compliance with new laws, regulations, and management direction. Forest Plans also need to incorporate new research and science that has been developed. The new strategies have been developed to aid in the sustainability of all native and desired non-native species.

In January of 2001, a new Forest Roads Rule and Policy was issued which revised regulations concerning the management, use, and maintenance of the National Forest Transportation System. Forest Plan Revision provides the opportunity to incorporate this direction into the Forest Plans (USDA 2001b).

Possible Strategies in Revising Management Direction for Access and Recreation:

[bull] Provide management direction for Access and Travel Management Planning, including criteria for developing access strategies by appropriate modes and season of use.

On the verge of taking bold, necessary strides towards reforming its roads and access management into something ecologically sustainable, the FS issued the revised Forest Plan and FEIS which failed to analyze or address the problem, and then followed that up with a sham

Region 1-directed Travel Analysis Process that failed to follow the Travel Management Rule Subpart A requirements for involving the public in a science-based effort to identify the forestwide minimum road system. The FS is obligated to disclose the project area road system's long-term financial liabilities, and the associated ecological impacts due to inadequate maintenance funding.

Huge bibliographies 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. That there are no road density standards in the forest plan suggests the biased and arbitrary manner of the FS's use of its own "best available science." From the Wisdom et al. (2000) Abstract:

Our assessment was designed to provide technical support for the ICBEMP and was done in five steps. [hellip] 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 make a very strong scientific rationale for including ecologically- based road density standards:

Roads have well-documented, significant and widespread ecological impacts across multiple scales, often far beyond the area of the road "footprint". Such impacts often create large and extensive departures from the natural conditions to which organisms are adapted, which increase with the extent and/or density of the road network. Road density is a useful metric or indicator of human impact at all scales broader than a single local site because it integrates impacts of human disturbance from activities that are associated with roads and their use (e.g., timber harvest, mining, human wildfire ignitions, invasive species introduction and spread, etc.) with direct road impacts. Multiple, convergent lines of empirical evidence summarized herein support two robust conclusions: 1) no truly "safe" threshold road density exists, but rather negative impacts begin to accrue and be expressed with incursion of the very first road segment; and 2) highly significant impacts (e.g., threat of extirpation of sensitive species) are already apparent at road densities on the order of 0.6 km per square km (1 mile per square mile) or less. Therefore, restoration strategies prioritized to reduce road densities in areas of high aquatic resource value from low-to-moderately-low levels to zero-to-low densities (e.g., <1 mile per square mile, lower if attainable) are likely to be most efficient and effective in terms of both economic cost and ecological benefit. By strong inference from these empirical studies of systems and species sensitive to humans' environmental impact, with limited exceptions, investments that only reduce high road density to moderate road density are unlikely to produce any but small incremental improvements in abundance, and will not result in robust populations of sensitive species.

(Emphases added.) Wisdom et al., 2000, which was cited heavily in the forest plan FEIS and is thus considered to be "Best Available Science" by the FS, state in their Abstract:

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.

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.

(Emphases added.) And from the article's Major Findings and Implications:

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.

(Emphasis added.) The heavy bias toward identifying habitat manipulation options (i.e., logging and other active management activities) in the forest plan—which lacks Wisdom et al. (2000) implications for road management—has led to a forest plan that is a recipe for failure.

Desired Condition FW-DC-AR-04 is a Forest Plan Decision prioritizing vast but unspecified acreage of the IPNF for motorized recreation, in the absence of the travel planning required by the Travel Management Regulations.

Objectives FW-OBJ-AR-04, and 05 are Forest Plan Decisions designating unspecified mileages of the IPNF for motorized recreation, in the absence of the travel planning required by Travel Management Regulations and completed by 2015. In addition, because of the existing degraded condition of many motorized travel routes this Desired Condition conflicts with FW-DC-AR-07 and 08.

The Forest Plan is not consistent with best available science on road density in grizzly bear habitat outside of Bear Management Units.

The Forest Plan lacks direction to update roadless area boundaries utilizing a transparent public procedures in order to evaluate unroaded areas contiguous with IRAs and Wilderness.

In FW-DC-TBR-01, including the sentence that begins with "Salvage[hellip]" perpetuates the longstanding conflict between timber production and natural processes which create wildlife habitat. The Desired Condition phrase, "associated desired conditions" is too vague. And FW- DC-TBR-01 fails to recognize that market demand has no regard for ecological sustainability. Since the Forest Service fails to acknowledge the scientific and public controversy of the "salvage" issue, such statements should be excluded from the Forest Plan.

The wording of FW-DC-TBR-03 essentially nullifies any meaningful distinction between suitable and unsuitable land, and together FW-OBJ-TBR-01, MA6-STD-TBR-01, and the ASQ (FW-DC-TBR-04), encourages logging in unsuitable land. One or more of the "purposes" of logging it allows in land that is "unsuitable" appear in every timber sale NEPA document.

FW-DC-TBR-04. The Allowable Sale Quantity (ASQ) of 120 million board feet annually is not based upon scientifically sound modeling that adequately considers ecological and economic constraints. It is simply not ecologically sustainable. It creates a sense of false expectations for forest products industries.

FW-OBJ-TBR-01. This timber target provides incentives which conflict with ecological sustainability. The annual target of offering 45 million board feet is not based upon scientifically sound modeling that adequately considers ecological and economic constraints. It creates a sense of false expectations for forest products industries

FW-STD-TBR-02 perpetuates the fiction that there is a category of natural processes that are some sort of "catastrophe." This effectively translates to dead trees not being logged (not maximizing timber volume produced) as the catastrophe rather than there really being something truly ecologically harmful.

Desired Condition FW-DC-SES-04 perpetuates the Smoky Bear myth that protection from fire is a promise that the government can and should make. Unlike the direction provided in the Forest Plan Fire section, there is no recognized balance with ecological considerations. This Desired Condition does not provide any further increment of public safety.

The FS refused to consider scientific research and opinion that recognizes the critical challenge posed by climate change to global ecosystems and the IPNF. The statement in the 2010 KIPZ Climate Change Report, "Harvested wood products increase the net sequestration on these forests by an undetermined amount" is unsubstantiated by cited scientific research or information.

Climate change science suggests that logging for sequestration of carbon, logging to reduce wild fire, and other manipulation of forest stands does not offer benefits to climate. Rather, increases in carbon emissions from soil disturbance and drying out of forest floors are the result. Managers of national forest lands can best address climate change through minimizing development of forest stands, especially stands that have not been previously logged, by allowing natural processes to function. Furthermore, any supposedly carbon sequestration from logging are usually more than offset by carbon release from ground disturbing activities and from the burning of fossil fuels to accomplish the timber sale, even when couched in the language of restoration. Reducing fossil fuel use is vital. Please analyze, disclose, and consider the full range of scientific information on carbon storage, vegetation management, and wildfire.

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. [hellip]Impending changes in regional climates [hellip]have the capacity for causing great shifts in composition of ecological communities.

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

Please disclose the body of science that implicates logging activities as a contributor to reduced carbon stocks in forests and increases in greenhouse gas emissions.

The LMP's Monitoring Program is inadequate for informing the agency and the public within any valid adaptive management framework.

Indicator MON-VEG-01-02 merely reports on acres burned, and lacks a necessary qualitative component.

Indicator MON-VEG-01-05, the annual measure of old growth and recruitment potential old growth, does not require that the old-growth definition as specified in the LMP Glossary be the measurement criteria utilized to determine if any acre is old growth.

The logic behind Indicator MON-VEG-01-06 is lacking, since annually determining old-growth acres "treated" would reveal nothing about the outcome[mdash]positive or negative[mdash]of those treatments.

The Indicator MON-VEG-01-08 lacks relevance since it would merely measure the "Number of acres influenced by insects and disease."

Indicator MON-VEG-02-01 is inadequate since annually determining acres of noxious weeds "treated" doesn't reveal the effectiveness of those treatments.

Indicator MON-VEG-02-02 is inadequate since the definition of a "site of new non-native invasive plant species" is not given.

Indicator MON-FIRE-01-01. Effectiveness of fuel treatments is not evaluated.

Indicator MON-WTR-01-01. "Number of Best Management Practices[hellip]" This Indicator is too vague to answer the Monitoring Question, "Are soil, water quality, and riparian and aquatic habitats protected and moving towards desired conditions?"

Indicators MON-WTR-02-01, MON-WTR-02-02: Measuring watersheds by "miles of restoration activities" would not be informative. It is also unclear how measuring watersheds by "acres of restoration activities" would be useful since the Forest Service definition of restoration is so lax that every acre treated would be considered restoration.

Indicator MON-WTR-02-03: The meaning of "trended toward" is too subjective. Use of these three indicators would not answer the Monitoring Question.

The Forest Plan fails to include Monitoring Plan Questions and Indicators to validate Watershed Condition Ratings and Watershed Disturbance Ratings with other measures, such as the condition or status of aquatic habitat such as attainment of INFISH RMOs, and with measures of hydrological equilibrium/streambank stability in assessed subwatersheds, and with data gathered for the 1987 Forest Plan monitoring items.

Indicator MON-AQH-01-01 lacks a baseline of unconnected stream habitat for subsequent comparison.

The monitoring program lacks Monitoring Questions and Indicators for the Sensitive westslope cutthroat trout, inland redband trout, and western pearlshell mussel.

The Monitoring Program lacks a measure for determining significant reductions in soil productivity due to land management activities in any timeframe short of forever. There is a lack of any measure of the areal extent of soil damage within any geographic scale.

There is no direction in the Forest Plan for monitoring soil restoration accomplishment.

Monitoring Question MON-FLS-01 is worded too vaguely to provide meaningful answers. The overarching goal of ESA listing is population recovery, which is omitted. A measure of population numbers of grizzly bears is essential for determining attainment of recovery, as is mortality information.

Indicator MON-FLS-01-02. Measuring population numbers of Canada lynx is essential for determining attainment of recovery, as is information on trapping mortality.

Indicator MON-FLS-01-03. Specific to the INFISH monitoring requirements that this Indicator adopts; the IPNF must use monitoring data to determine if project implementation results in attainment of riparian goals and objectives—deemed to be "critical" monitoring by the Forest Service in Forest Plan Appendix B.

The bull trout redd count data must be supplemented by fish survey data for numbers of bull trout in bull trout streams. It is also important to measure population trends of brook trout in bull trout streams for hybridization reasons.

Monitoring Question MON-MIS-01 lacks a requirement to estimate baseline elk population numbers, and measure elk population trends in response to management actions.

Indicator MON-MIS-01-02 is useless as a biological indicator because nothing is required specific to any bird species.

Indicator MON-MIS-01-03 relies upon a measurement system that is not explained anywhere in the Forest Plan, merely commits to monitoring vague "changes" measured somewhere every five years.

Indicator MON-WL-01-01 is useless as a biological indicator because nothing is required specific to any wildlife species.

The FS has failed to monitor populations of wildlife, in favor of striving towards DCs for habitat (actually, vegetation) in project planning. The Committee of Scientists (1999) state:

Habitat alone cannot be used to predict wildlife populations[hellip]The presence of suitable habitat does not ensure that any particular species will be present or will reproduce.

Therefore, populations of species must also be assessed and continually monitored.

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

(Emphasis added.) The Committee of Scientists (1999) provide still more emphases on the importance of monitoring:

The proposal is that the Forest Service monitor those species whose status allows inference to the status of other species, are indicative of the soundness of key ecological processes, or provide insights to the integrity of the overall ecosystem. This procedure is a necessary shortcut because monitoring and managing for all aspects of biodiversity is impossible.

No single species is adequate to assess compliance to biological sustainability at the scale of the national forests. Thus, several species will need to be monitored. The goal is to select a small number of focal species whose individual status and trends will collectively allow an assessment of ecological integrity. That is, the individual species are chosen to provide complementary information and to be responsive to specific conservation issues. Thus, the Committee proposed for consideration a broad list of species categories reflecting the diversity of ecosystems and management issues within the NFS.

Please address this scientific opinion (Committee of Scientists, 1999) which disagrees with Forest Plan assumptions about wildlife habitat management.

Monitoring Question MON-AR-01. With the wide variety of recreation impacts on the wide variety of recreation sites throughout the Forest, this leaves unfulfilled the need for more specific monitoring and reporting.

Monitoring Question MON-AR-02: Identification of the minimum transportation system necessary is a regulatory requirement, so the IPNF must complete forestwide travel planning.

Monitoring Question MON-AR-03: Specific to motorized recreation, identification of the minimum transportation system necessary is a regulatory requirement, and the IPNF must complete its forestwide travel planning.

Monitoring Question MON-WLDN-01. The IPNF has so many acres of roadless areas deserving protection as Wilderness, so the public would be well-served with a Monitoring Question and Indicators that assess wilderness conditions and trends in roadless areas.

Indicator MON-MIN-01-01: The baseline number of unreclaimed abandoned mine sites must be disclosed.

Additionally, including monitoring items for water quality and soil productivity in abandoned mine sites is important for biological resources including human health and safety.

Monitoring Question MON-SOC-01: Data on the contribution to the economy from those gathering non-timber products, hunters, anglers, and recreationists would lead to a more balanced understanding by the agency of how the IPNF sustains local and regional economies.

Many FS analyses rely upon the use of models. The reliability of all the data used as input for these models is not disclosed. Also, the validity of the models was not established for how the FS utilizes them. Please cite the best available scientific information which establishes model validity.

Please disclose the limitations of all models the FS relies upon for the NEPA analyses.

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

The next level of scientific integrity is the notion of "validity." So even if FS data input to its models are reliable, a question remains of the models' validity. In other words, are the models scientifically appropriate for the uses for which the FS is utilizing them? As Huck, (2000) explains, the degree of "content validity," or accuracy of the model or methodology is established by utilizing other experts. This, in turn, demonstrates the necessity for utilizing the peer review process.

Ruggiero, 2007 (a scientist from the research branch of the FS) recognizes a fundamental need to demonstrate the proper use of scientific information, in order to overcome issues of decisionmaking integrity that arise from bureaucratic inertia and political influence. Ruggiero, 2007 and Sullivan et al., 2006 provide a commentary on the scientific integrity and agency use and misuse of science. And the Committee of Scientists (1999) recommend "independent scientific review of proposed conservation strategies[hellip]"

Roger Sedjo, member of the Committee of Scientists, expresses his concerns in Appendix A of their 1999 Report about the discrepancy between forest plans and Congressional allocations, leading to issues not considered in

forest plans such as the IPNF's:

(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.

A Science Consistency Review is long overdue for the revised Forest Plan. The FS prepared Guldin et al. (2003) which:

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

The Committee of Scientists (1999) state:

To ensure the development of scientifically credible conservation strategies, the Committee recommends a process that includes (1) scientific involvement in the selection of focal species, in the development of measures of species viability and ecological integrity, and in the definition of key elements of conservation strategies; (2) independent scientific review of proposed conservation strategies before plans are published; (3) scientific involvement in designing monitoring protocols and adaptive management; and

(4) a national scientific committee to advise the Chief of the Forest Service on scientific issues in assessment and planning.

Please analyze and disclose the cumulative effects of past, ongoing, and proposed management actions, within a logically defined cumulative effects analysis area, on land of all ownerships. Please disclose if the FS has

performed all of the monitoring and mitigation required or recommended in those NEPA documents, and the results of the monitoring. The FS would be unable to properly analyze and disclose cumulative effects of management plan implementation if it is not adequately informed by past project monitoring and plan-mandated monitoring.

The Montana Forest Restoration Committee adopted 13 Principles, written collaboratively by a diverse set of stakeholders which included two Region 1 forest supervisors along with representatives from timber and forest products industries, conservation groups, recreation interests, and others. Principle #3 states:

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

Consistent with this principle, the agency would publicize a landscape assessment of the project area so a genuine scoping process could help determine the project Purpose and Need. Instead, the FS has apparently prioritized the project Purpose and Need based on appropriated funds and Congress's ill-informed priorities for this project area, and promoted them via "collaboration" to subsidize narrow financial interests.

Since the FS has gone out of its way to please a narrow segment of the public in the design of the project before ever notifying the public at large, the agency is also obligated to be open to this wider pool of national forest owners for suggestions concerning alternative development. We support some of the actions proposed, specifically those reducing road related impacts and restoring aquatic habitat and watersheds. However, we request the FS take a more comprehensive approach to restoring aquatic habitat and watersheds than is included in the proposal. Please design an alternative that results in a road system which is fully affordable to maintain on an annual basis, within all of the watersheds affected by the proposal. Please use expected appropriations as the yardstick to measure "affordable", based on recent years' funding levels.

Such an alternative would reduce road densities to meet science-based ecological conditions for wildlife and fisheries. Wisdom et al. (2000) state:

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.

The actions needed to reduce the road system to this affordable level need not themselves be within expected budgets. Indeed, few restoration projects proposed or implemented by the FS are fully funded by appropriated dollars. Figuring out a way to fund road decommissioning would follow from a Decision to implement it. That would be a way to truly collaborate.

In analyzing such an alternative, it may turn out that some of the actions mentioned in the Scoping Notice would be unnecessary or would be modified. For example, some roads proposed for maintenance or upgrading may not be affordable to maintain, or may be located where chronic sedimentation into streams persists. In such cases consideration of highest restoration priorities would require full road obliteration.

Such an alternative would reduce the road network in the project area watersheds consistent with the forest plan and with best available science for maintaining robust populations of native fish.

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

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

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

Such an alternative would not construct any new roads, including temporary roads because, as the Forest Service is aware, construction of temporary roads potentially creates much of the same impact as system roads.

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

In conclusion, please keep both organizations on the list to receive all communications concerning the Buckskin Saddle timber sale. It is our intention that the project ID Team reviews and includes in the Project Record the literature and other documents we've cited herein. Please contact us if you have problems locating any of them.

Sincerely,

/s/

Michael Garrity

Alliance for the Wild Rockies

Helena, Montana

References cited

Adams, P.W and H.A. Froehlich. 1981. Compaction of forest soils. Extension Publication PNW

217. 13 pp.

Allen, Craig D., David D. Breshears, Nate G. McDowell 2015. On underestimation of global vulnerability to tree mortality and forest die-off from hotter drought in the Anthropocene ECOSPHERE ESA Centennial Paper published 7 August 2015.

Angermeier, P. L., and J. R. Karr. 1994. Protecting biotic resources: Biological integrity versus biological diversity as policy directives. BioScience Vol. 44, No. 10, November 1994.

Aubry, Keith B. Kevin S. McKelvey, and Jeffrey P. Copeland, 2007. Distribution and Broad-scale Habitat Relations of the Wolverine in the Contiguous United States. Journal of Wildlife Management 71(7):2147-2158; 2007

Aubry, K.B., C.M. Raley, S.W. Buskirk, W.J. Zielinski, M.K. Schwartz, R.T. Golightly, K.L. Purcell, Richard D. Weir, J. Scott Yaeger, 2013. Meta-Analyses of Habitat Selection by Fishers at Resting Sites in the Pacific Coastal Region. The Journal of Wildlife Management 77(5):965- 974; 2013; DOI: 10.1002/jwmg.563

Bart RR, Tague CL, Moritz MA (2016). Effect of Tree-to-Shrub Type Conversion in Lower Montane Forests of the Sierra Nevada (USA) on Streamflow. PLoS ONE 11(8): e0161805. doi:10.1371/journal.pone.0161805

Booth, Derek B.; 1991. Urbanization and the Natural Drainage System[mdash]Impacts, Solutions, and Prognoses. Northwest Environmental Journal, v. 7, p. 93-118, 1991.

Brais, S. and C. Camire. 1997. Soil compaction induced by careful logging in the claybelt region of northwestern Quebec (Canada). Can. J. Soil Sci. 78:197-206.

Breshears, David D., Neil S. Cobb, Paul M. Rich, Kevin P. Price, Craig D. Allen, Randy G. Balice, William H. Rommei, Jude H. Kastens, M. Lisa Floyd, Jayne Belnap, Jesse J. Anderson, Orrin B. Myers, and Clifton W. Meyer; 2005. Regional vegetation die-off in response to global- change-type drought. Proceedings of the National Academy of Sciences of the United States of America, October 10, 2005.

Bull, Evelyn L. and Richard S. Holthausen, 1993. Habitat use and management of pileated woodpeckers in northeastern Oregon. Journal of Wildlife Management 57(2): 1993. Pp. 335-345.

Bull, E. L., N. Nielsen-Pincus, B.C. Wales, J.L. Hayes. 2007. The influence of disturbance events on pileated woodpeckers in Northeastern Oregon. Forest Ecology and Management 243:320-329.

Bull, Evelyn L. and Arlene K. Blumton, 1999. Effect of Fuels Reduction on American Martens and Their Prey. USDA Forest Service Department of Agriculture, Pacific Northwest Research Station, Research Note PNW-RN-539, March 1999.

Bull, Evelyn L. Richard S. Holthausen and Mark G. Henjum; 1992. Roost Trees Used by Pileated Woodpeckers in Northeastern Oregon. The Journal of Wildlife Management, Vol. 56, No. 4 (Oct., 1992), pp. 786-793.

Bull, Evelyn L., Catherine G. Parks, and Torolf R. Torgersen, 1997. Trees and Logs Important to Wildlife in the Interior Columbia River Basin. Gen. Tech. Rep. PNW-GTR-391. Portland, OR:

U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 55p.

Campbell, John L, Mark E Harmon, and Stephen R Mitchell, 2011. Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions? Front Ecol Environ 2011; doi:10.1890/110057

Carnefix, Gary and Chris Frissell, 2009. Aquatic and Other Environmental Impacts of Roads: The Case for Road Density as Indicator of Human Disturbance and Road-Density Reduction as Restoration Target; A Concise Review. Pacific Rivers Council Science Publication 09-001.

Pacific Rivers Council; PMB 219, 48901 Highway 93, Suite A, Polson, MT 59860)

Carroll, Carlos, Paul C. Paquet, and Reed F. Noss, 2001b. Carnivores as Focal Species for Conservation Planning in the Rocky Mountain Region. *Ecological Applications*, August, 2001, Vol. 11, No. 4 : 961-980.

Castello, J.D., D.J. Leopold, and P.J. Smallidge; 1995. Pathogens, patterns, and processes in forest ecosystems. *Bioscience* 45(1):16_24.

Cherry, M.B. 1997. The Black-Backed And Threetoed Woodpeckers: Life History, Habitat Use, And Monitoring Plan. Unpublished Report. On File With: U.S. Department Of Agriculture, Lewis And Clark National Forest, P.O. Box 869, Great Falls, Mt 59403. 19 P.

Christensen, Alan G.; L. Jack Lyon and James W. Unsworth, 1993. Elk Management in the Northern Region: Considerations in Forest Plan Updates or Revisions. United States Department of Agriculture, Forest Service Intermountain Research Station, General Technical Report INT- 303 November 1993.

Clough, Lorraine T. 2000. Nesting Habitat Selection and Productivity of Northern Goshawks in West-Central Montana. M.S. Thesis, University of Montana, 87 pp.

Cohen, Jack 1999a. Reducing the Wildland Fire Threat to Homes: Where and How Much? Pp. 189-195 In Proceedings of the symposium on fire economics, planning, and policy: bottom lines. April 5-9, 1999, San Diego, CA. USDA Forest Service Gen. Tech. Rep. PSW-GTR-173.

Cohen, Jack and Bret Butler, 2005. Wildlife Threat Analysis in the Boulder River Canyon: Revisited. Fire Sciences Laboratory, USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana. July 26-27, 2005.

Cohen, Warren B., Zhiqiang Yang, Stephen V. Stehman, Todd A. Schroeder, David M. Bell, Jeffrey G. Masek,

Chengquan Huang, Garrett W. Meigs. 2016. Forest disturbance across the conterminous United States from 1985-2012: The emerging dominance of forest decline. *Forest Ecology and Management*. 360 (2016) 242-252

Collins, Brandon M and Scott L Stephens, 2007. Managing natural wildfires in Sierra Nevada wilderness areas. *Frontiers in Ecology and the Environment* 2007; 5, doi:10.1890/070007[copy] The Ecological Society of America. www.frontiersinecology.org

Committee of Scientists, 1999. Sustaining the People's Lands. Recommendations for Stewardship of the National Forests and Grasslands into the Next Century. March 15, 1999

Copeland, Jeffrey P., James M. Peek, Craig R. Groves, Wayne E. Melquist, Kevin S. Mckelvey, Gregory W. Mcdaniel, Clinton D. Long, Charles E. Harris, 2007. Seasonal Habitat Associations of the Wolverine in Central Idaho. *Journal of Wildlife Management* 71(7):2201-2212; 2007.

Crocker-Bedford, D.C. 1990. Goshawk reproduction and forest management. *Wildlife Society Bulletin*; v. 18, no. 3, pp. 262-269.

Cullen, S.J., C. Montagne, and H Ferguson, 1991. Timber Harvest Trafficking and Soil Compaction in Western Montana. *Soil Sci. Soc. Am. J.*, Vol. 55 (1416-1421), September- October 1991.

DellaSala, Dominick A. and Chad T. Hanson, 2015. The Ecological Importance of Mixed- Severity Fires: Nature's Phoenix. Published by Elsevier Inc.

Depro, Brooks M., Brian C. Murray, Ralph J. Alig, and Alyssa Shanks. 2008. Public land, timber harvests, and climate mitigation: quantifying carbon sequestration potential on U.S. Public timberlands. *Forest Ecology and Management* 255: 1122-1134.

Environmental Protection Agency, 1999. Considering Ecological Processes in Environmental Impact Assessments. U.S. Environmental Protection Agency, Office of Federal Activities. July 1999

Everett, Richard L., comp. 1994. Restoration of stressed sites, and processes. Gen. Tech. Rep. PNWGTR- 330. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 123 p. (Everett, Richard L., assessment team leader; Eastside forest ecosystem health assessment; volume IV.)

Finney and Cohen, 2003. Expectation and Evaluation of Fuel Management Objectives. USDA Forest Service Proceedings RMRS-P-29.

Fire Science Brief, 2009. Listening to the Message of the Black-backed Woodpecker, a Hot Fire Specialist. Fire Science Brief Issue 39 February 2009. www.firescience.gov/projects/briefs/04-2-1-106_FSBrief39.pdf

Flatten, Brad, 2003. Determining Appropriate Winter Logging Conditions for Protection of the Soil Resource. Okanogan & Wenatchee National Forests, December 2003 Draft.

Fly, Chase; Scott Bergendorf; John Thornton; Tom Black and Charlie Luce; 2011. Scriver Creek Road Inventory (GRAIP) Report In Support of the Scriver Creek Integrated Restoration Project USDA Forest Service, Boise National Forest. September 14, 2011.

Funk, J., S. Saunders, T. Sanford, T. Easley, and A. Markham. 2014. Rocky Mountain forests at risk: Confronting climate-driven impacts from insects, wildfires, heat, and drought. Report from the Union of Concerned Scientists and the Rocky Mountain Climate Organization. Cambridge, MA: Union of Concerned Scientists.

Goggans, Rebecca, Rita. D. Dixon, and L. Claire S. Seminara, 1989. Habitat Use by Three-toed and Black-backed Woodpeckers, Deschutes National Forest, Oregon. Oregon Department of Fish and Wildlife Nongame Wildlife Program, USDA Deschutes National Forest, Technical Report #87-3-02.

Gorzelak MA, Asay AK, Pickles BJ, Simard SW. 2015. Inter-plant communication through mycorrhizal networks mediates complex adaptive behaviour in plant communities. *AoB PLANTS* 7: plv050; doi:10.1093/aobpla/plv050

Graham, R., et al. 1999a. The Effects of Thinning and Similar Stand Treatments on Fire Behavior in Western Forests. U.S. Forest Service, Pacific Northwest Research Station. General Tech. Rpt PNW-GTR-463. Sept. 1999.

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann, 1992. Old-growth forest types of the northern region. Northern Region, R-1 SES 4/92. Missoula, MT.

Grier, C. C., K. M. Lee, N. M. Nadkarni, G. O. Klock, & P. J. Edgerton, 1989 Productivity of Forests of the United States and Its Relation to Soil and Site Factors and Management Practices: A Literature Review. USDA Forest Service General Technical Report PNW-GTR-222, March 1989.

Guldin, James M., David Cawse, Russell Graham, Miles Hemstrom, Linda Joyce, Steve Kessler, Ranotta McNair, George Peterson, Charles G. Shaw, Peter Stine, Mark Twery, Jeffrey Walte. 2003. The Science Consistency Review: A Tool to Evaluate the Use of Scientific Information in Land Management Decisionmaking. United States Department of Agriculture Forest Service FS-772, September 2003.

Hargis Christina D., John A. Bissonette, and David L. Turner, 1999. The influence of forest fragmentation and landscape pattern on American martens. *Journal of Applied Ecology*, 1999, 36 Pp. 157-172.

Harmon, Mark E, William K. Ferrell, and Jerry F. Franklin. 1990. Effects on carbon storage of conversion of old-growth forest to young forests. *Science* 247: 4943: 699-702

Harmon, Mark E. & Barbara Marks, 2002. Effects of silvicultural practices on carbon stores in Douglas-fir - western hemlock forests in the Pacific Northwest, U.S.A.: results from a simulation model, 32 *Canadian Journal of Forest Research* 863, 871 Table 3 (2002).

Harmon, Mark E. 2001. Carbon Sequestration in Forests: Addressing the Scale Question, 99:4 *Journal of Forestry* 24, 24-25, 29 (2001) (citing C.F. Cooper, Carbon Storage in Managed Forests, 13:1 *Canadian Journal of Forest Research* 155-66 (1983); Harmon et al., *infra* n. 34, at 699-702; R.C. Dewar, Analytical model of carbon storage in trees, soils and wood products of managed forests, 8:3 *Tree Physiology* 239-58 (1991); and E.D. Schulze et al., Managing Forests after Kyoto, 289 *Science* 2058-59 (2000)).

Harmon, Mark E. 2009. Testimony Before the Subcommittee on National Parks, Forests, and Public Lands of the Committee of Natural Resources for an oversight hearing on "The Role of Federal Lands in Combating Climate Change", March 3, 2009. Mark E. Harmon, PhD, Richardson Endowed Chair and Professor in Forest Science, Department of Forest Ecosystems and Society, Oregon State University.

Harr, R. Dennis 1987. Myths and misconceptions about forest hydrologic systems and cumulative effects. Proceedings of the California Watershed Management Conference, November 18-20, 1986, West Sacramento, California. Wildland Resources Center, Division of Agriculture and Natural Resources, University of California, 145 Mulford Hall, Berkeley, California 94720. Report No. 11, February, 1987.

Harris, Larry D. 1984. *The Fragmented Forest : Island Biogeography Theory and the Preservation of Biotic Diversity*. Chicago Press, Chicago, Ill. 211pp.

Harrison S and Voller J. 1998. Connectivity. Voller J and Harrison S, eds. *Conservation Biology Principles for Forested Landscapes*. Ch3:76-97. Vancouver: UBC Press.

Harvey, A.E., J.M. Geist, G.I. McDonald, M.F. Jurgensen, P.H. Cochran, D. Zabowski, and R.T. Meurisse, 1994. Biotic and Abiotic Processes in Eastside Ecosystems: The Effects of Management on Soil Properties, Processes, and Productivity. GTR-323 93-204 (1994)

Hayward, G. D., and R. E. Escano. 1989. Goshawk nest-site characteristics in western Montana and northern Idaho. *Condor*: v. 91, no. 2, pp. 476-479.

Hayward, Gregory D., and Jon Verner, 1994. *Flammulated, Boreal, and Great Gray Owls in the United States: A Technical Conservation Assessment*. USDA Forest Service General Technical Report RM-253

He, Yujie, Susan E. Trumbore, Margaret S. Torn, Jennifer W. Harden, Lydia J. S. Vaughn, Steven D. Allison, James T. Randerson 2016. Radiocarbon constraints imply reduced carbon uptake by soils during the 21st century. *Science* 23 Sep 2016: Vol. 353, Issue 6306, pp. 1419- 1424 DOI: 10.1126/science.aad4273

Heinemeyer, KS and JL Jones. 1994. *Fisher biology and management: a literature review and adaptive management strategy*. USDA Forest Service Northern Region, Missoula, MT. 108 pp.

Hessburg Paul F. and James K. Agee; 2003. An environmental narrative of Inland Northwest United States forests, 1800-2000. *Forest Ecology and Management* 178 (2000) 23-59.

Hillis, Mike; Amy Jacobs, and Vita Wright, 2002. *Black-Backed Woodpecker Assessment*. U.S. Forest Service Region One.

Homann, Peter S., Mark Harmon, Suzanne Remillard, & Erica A.H. Smithwick, 2005. What the soil reveals: Potential total ecosystem C stores of the Pacific Northwest region, USA, 220 *Forest Ecology and Management*. 270, 281 (2005).

Huck, Schuyler W., 2000. Reading Statistics and Research (3rd Edition). New York: Longman, 2000.

Hutto, Richard L., 2006. Toward Meaningful Snag-Management Guidelines for Postfire Salvage Logging in North American Conifer Forests. Conservation Biology Volume 20, No. 4, 984-993, 2006.

Hutto, Richard L. 2008. The Ecological Importance of Severe Wildfires: Some Like it Hot. Ecological Applications, 18(8), 2008, pp. 1827-1834.

Hutto, R.L. 1995. The composition of bird communities following stand-replacement fires in northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology 9:1041-1058.

Johnson, Randy 2016. Looking to the Future and Learning from the Past in our National Forests. USDA Blog. <http://blogs.usda.gov/2016/11/01/looking-to-the-future-and-learning-from-the-past-in-our-national-forests/>

Johnson, Steve, 1995. Factors Supporting Road Removal and/or Obliteration, Memo from Kootenai Forest Hydrologist, February 6, 1995

Jones, Jeff, (undated) A Fisher Management Strategy for the Northern Rocky Mountains (draft). USFS Northern Region.

Kappesser, 1991a. A procedure for evaluating risk of increasing peak flows from Rain On Snow events by creating openings in the forest canopy. Gary Kappesser, Forest Hydrologist, Idaho Panhandle National Forests, March, 1991

Kappesser, Gary, 1991b. The Use of a Riffle Armor Stability Index to Define Channel Stability of Gravel and Cobble Bed Streams. Gary Kappesser, Forest Hydrologist, Idaho Panhandle National Forests, January 1991.

Kappesser, Gary, 1992. Alternative Procedures for Watershed Analysis to Determine Timber Harvest Opportunities and Evaluate the Need for a Forest Plan Revision for the Idaho Panhandle

National Forests. Gary Kappesser, Forest Hydrologist, Idaho Panhandle National Forests, January 1992.

Kappesser, Gary B., 2002. A Riffle Stability Index to Evaluate Sediment Loading to Streams. Journal of the American Water Resources Association Vol. 38, No. 4, August 2002.

Karr, J.R. 1991. Biological integrity: A long-neglected aspect of water resource management. Ecological Applications 1:66-84.

Kauffman, J. Boone, 2004. Death Rides the Forest: Perceptions of Fire Land Use, and Ecological Restoration of Western Forests. Conservation Biology, Vol. 18 No. 4, August 2004, Pp 878-882.

Keith, Heather; Brendan G. Mackey and David B. Lindenmayer. 2009. Re-evaluation of forest biomass carbon stocks and lessons from the world's most carbon-dense forests PNAS July 14, 2009 vol. 106 no. 28 11635-11640

King, J.G. 1989. Streamflow responses to road building and harvesting: a comparison with the equivalent clearcut area procedure. Res. Pap. INT-401. Ogden, UT: USDA-FS, Intermountain Research Station. 13 pp.

King, John G., 1994. Streamflow and sediment yield responses to forest practices in north Idaho. Proceedings from symposium: Interior Cedar-Hemlock-White Pine Forests: Ecology and Management, Spokane WA, March 2-4, 1993. Department of Natural Resource Sciences, Washington State University.

Kirilenko, Andrei P. and Roger A. Sedjo, 2007. Climate change impacts on forestry. Proceedings of the National Academy of Sciences [copy] 2007 by The National Academy of Sciences of the USA.

Kormos, Patrick R., Charles H. Luce, Seth J. Wenger, and Wouter R. Berghuijs 2016. Trends and sensitivities of low streamflow extremes to discharge timing and magnitude in Pacific Northwest mountain streams. Water Resources Research. Published online 2 JUL 2016

Kosterman, Megan K., 2014. Correlates of Canada Lynx Reproductive Success in Northwestern Montana. Thesis presented in partial fulfillment of the requirements for the degree of Master of Science in Wildlife Biology, The University of Montana, Missoula, December 2014. Theses, Dissertations, Professional Papers. Paper 4363.

Krebs John, Eric C. Lofroth, Ian Parfitt, 2007. Multiscale Habitat Use by Wolverines in British Columbia, Canada. *Journal of Wildlife Management* 71(7):2180-2192; 2007

Kuennen, L., G. Edson & T. Tolle, 1979. Soil Compaction Due To Timber Harvest Activities. Northern Region, May 1979

Kuennen, Lou; Henry Shovic, Bill Basko, Ken McBride, Jerry Niehoff, and John Nesser, 2000. Soil Quality Monitoring: A Review of Methods and Trends in the Northern Region. May 2000.

Kutsch, Werner L. Michael Bahn and Andreas Heinemeyer, Editors, 2010. Soil Carbon Dynamics: An Integrated Methodology. Cambridge University Press 978-0-521-86561-6 -

Lacy, Peter M., 2001. Our Sedimentation Boxes Runneth Over: Public Lands Soil Law As The Missing Link In Holistic Natural Resource Protection. *Environmental Law*; 31 Envtl. L. 433 (2001).

Law, B. & M.E. Harmon 2011. Forest sector carbon management, measurement and verification, and discussion of policy related to mitigation and adaptation of forests to climate change. *Carbon Management* 2011 2(1). <http://terraweb.forestry.oregonstate.edu/pubs/lawharmon2011.pdf>.

Law, Beverly E. 2014. Role of Forest Ecosystems in Climate Change Mitigation. Presentation by Beverly E. Law, Professor of Global Change Biology & Terrestrial Systems Science, Oregon State University. Feb. 2014. terraweb.forestry.oregonstate.edu

Lehmkuhl, John F., Leonard F. Ruggiero, and Patricia A. Hall; 1991. Landscape-level patterns of forest fragmentation and wildlife richness and abundance in the southern Washington Cascades. IN: Ruggiero, Leonard F., Keith B. Aubry, Andrew B. Carey, and Mark H. Huff, technical editors, 1991. *Wildlife and vegetation of unmanaged Douglas-fir forests*. USDA Forest Service PNW Gen. Tech. Report. 285 Olympia, WA 474 pp. plus appendix.

Lofroth, E.C., 1997. Northern wolverine project: wolverine ecology in logged and unlogged plateau and foothill landscapes. Wildlife Branch, Victoria, British Columbia, May 7, 1997.

Lorenz, T.J.; Vierling, K.T.; Johnson, T.R.; Fischer, P.C. 2015. The role of wood hardness in limiting nest site selection in avian cavity excavators. *Ecological Applications*. 25: 1 016-1033. <https://www.treesearch.fs.fed.us/pubs/49102>

Mace, R. and T. Manley. 1993. The Effects of Roads on Grizzly Bears: Scientific Supplement. South Fork Flathead River Grizzly Bear Project: Project Report For 1992. Montana Department of Fish, Wildlife and Parks.

Mace, Richard D, John S. Waller, Timothy L. Manley, L. Jack Lyon and Hans Zuuring, 1996. Relationships Among Grizzly Bears, Roads and Habitat in the Swan Mountains, Montana.

Journal of Applied Ecology 1996, 33, 1395-1404.

Malmsheimer Robert W., Patrick Heffernan, Steve Brink, Douglas Crandall, Fred Deneke, Christopher Galik, Edmund Gee, John A. Helms, Nathan McClure, Michael Mortimer, Steve Ruddell, Matthew Smith, and John Stewart 2008. Forest Management Solutions for Mitigating Climate Change in the United States. *Journal of Forestry*. April/May 2008.

Maxell, Bryce; Steve Corn; Paul Hendricks; Ted Koch; Charles Peterson; and Kirwin Werner; 1998. Unpublished letter to USFS Region 1 Species at Risk Task Group: Subject - Inclusion of the Boreal toad (*Bufo boreas boreas*) on the Sensitive SpeciesList for all Region 1 Forests. 8pp.

May, R., Landa, A., vanDijk, J., Linnell, J.D.C. and Andersen, R. 2006. Impact of infrastructure on habitat selection of wolverines *Gulo gulo*. *Wildl.Biol.*12:285-295. doi:10.2981/0909-6396 (2006) 12[285:IOIOHS] 2.0.CO;2.

McClelland, B. Riley, 1977. Relationships Between Hole-Nesting Birds, Forest Snags, And Decay In Western Larch-Douglas-Fir Forests Of The Northern Rocky Mountains. Presented in partial fulfillment of the requirements for the degree of Doctor of Philosophy, University Of Montana, 1977.

McClelland, B. Riley, 1985. Letter to Flathead National Forest Supervisor Edgar B. Brannon regarding old-growth management in draft forest plan. March 12, 1985.

McClelland BR and McClelland PT. 1999. Pileated woodpecker nest and roost trees in Montana: links with old-

growth and forest "health." *Wildlife Society Bulletin* 1999, 27(3): 846- 857.

McRae D.J., L.C. Duchesne, B. Freedman, T.J. Lynham, and S. Woodley 2001. Comparisons between wildfire and forest harvesting and their implications in forest management. *Environ. Rev.* 9: 223-260 (2001) DOI: 10.1139/er-9-4-223 [copy] 2001 NRC Canada

Mitchell, Stephen R., Mark E. Harmon, and Kari E. B. O'Connell. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems.

Ecological Applications 19:643-655. <http://dx.doi.org/10.1890/08-0501.1>

Montana Fish, Wildlife & Parks, 2005. Animal Field Guide: Boreal Toad.
<http://nhp.nris.state.mt.us/animalguide/speciesDetail.aspx?elcode=AAABB01030>

Montana Forest Restoration Committee, 2007. Restoring Montana's National Forest Lands. Guiding Principles and Recommended Implementation. September, 2007. Authored by and the work product of the Montana Forest Restoration Committee. <http://www.montanarestoration.org/restoration/principles>

Moomaw, Bill and Janna Smith, 2017. The Great American Stand: US Forests and the Climate Emergency. Why the United States needs an aggressive forest protection agenda focused in its own backyard. March 2017. Dogwood Alliance, PO Box 7645 Asheville, NC 28802. info@dogwoodalliance.org

Moriarty Katie M., Clinton W. Epps, and William J. Zielinski, 2016. Forest Thinning Changes Movement Patterns and Habitat Use by Pacific Marten. *The Journal of Wildlife Management* 80(4):621-633; 2016; DOI: 10.1002/jwmg.1060

Moser, Brian W. and Edward O. Garton 2009. Short-Term Effects of Timber Harvest and Weather on Northern Goshawk Reproduction in Northern Idaho. *J. Raptor Res.* 43(1):1-10

Mote et al. 2014. Ch. 21: Northwest. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds.,

U.S. Global Change Research Program, 487-513. doi:10.7930/J04Q7RWX.

<http://nca2014.globalchange.gov/highlights/regions/northwest>

Nesser, John A., 2002. Notes from the National Soil Program Managers meeting in Reno as related to soil quality issues. John A. Nesser, Regional Soil Scientist, USDA Forest Service, Northern Region. May 23, 2002.

Noss, Reed F. 2001. Biocentric Ecological Sustainability: A Citizen's Guide. Louisville, CO: Biodiversity Legal Foundation. 12pp. Noss, Reed F., and Allen Y. Cooperrider. 1994. Saving Nature's Legacy: Protecting and Restoring Biodiversity. Island Press.

Noss, Reed F., and Allen Y. Cooperrider. 1994. Saving Nature's Legacy: Protecting and Restoring Biodiversity. Island Press.

Olson, Lucretia E. Joel D. Sauder, Nathan M. Albrecht, Ray S. Vinkey, Samuel A. Cushman, Michael K. Schwartz; 2014. Modeling the effects of dispersal and patch size on predicted fisher (*Pekania [Martes] pennanti*) distribution in the U.S. Rocky Mountains. *Biological Conservation* 169 (2014) 89-98.

Pacific Northwest Research Station, 2004. Western Forests, Fire Risk, and Climate Change, Pacific Northwest Research Station, Issue 6 January 2004. <http://www.fs.fed.us/pnw>.

Page-Dumroese, D.; Jurgensen, M.; Elliot, W.; Rice, T.; Nesser, J.; Collins, T.; Meurisse, R., 2000. Soil quality standards and guidelines for forest sustainability in northwestern North America. *Forest Ecology and Management* 138 (2000) 445-462.

Page-Dumroese, Deborah, 1993. Susceptibility of Volcanic Ash-Influenced Soil in Northern Idaho to Mechanical Compaction. USDA Forest Service Intermountain Research Station, Research Note INT-409. February, 1993.

Pederson, Gregory T., Lisa J. Graumlich, Daniel B. Fagre, Todd Kipfer, and Clint C. Muhlfeld 2009. A Century of Climate and Ecosystem Change in Western Montana: What do temperature trends portend? *Climatic Change* DOI 10.1007/s10584-009-9642-y 2009

P[ouml]rtner, Hans O. and Anthony P. Farrell; 2008. Physiology and Climate Change. *Science*. 31 OCTOBER 2008

Powell, R. A., and W. J. Zielinski. 1994. Fisher. Pages 38-73 in L. F. Ruggiero, K. B. Aubry,

S.W. Buskirk, and W. J. Zielinski, editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine. USDA Forest Service, Rocky Mountain Forest and Range Experimental Station, Fort Collins, Colorado, USA.

Raley, C. M., E. C. Lofroth, R. L. Truex, J. S. Yaeger, and J. M. Higley. 2012. Habitat ecology of fishers in western North America: a new synthesis. Pages 231-254 in Aubry, K.B., W.J. Zielinski, M.G. Raphael, G. Proulx, and S.W. Buskirk, editors. Biology and conservation of martens, sables, and fishers: a new synthesis. Cornell University Press, Ithaca, NY, USA.

Reed, David H., , Julian J. O'Grady, Barry W. Brook, Jonathan D. Ballou, and Richard Frankham; 2003. Estimates of minimum viable population sizes for vertebrates and factors influencing those estimates. Biological Conservation 113 (2003) 23-34

Reeves, Derrick; Page-Dumroese, Deborah; Coleman, Mark. 2011. Detrimental soil disturbance associated with timber harvest systems on National Forests in the Northern Region. Res. Pap.

RMRS-RP-89 Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 12 p.

Reynolds, R. T., R. T. Graham, M. H. Reiser, R. L. Bassett, P. L. Kennedy, D. A. Boyce, Jr., G. Goodwin, R. Smith, and E. L. Fischer. 1992. Management recommendations for the Northern goshawk in the southwestern United States. Rocky Mountain Forest and range Experiment Station and Southwest Region Forest Service. US Dept. of Agriculture, Gen. Tech. Rpt. RM-217.

Rhodes, Jonathan 2007. The Watershed Impacts Of Forest Treatments To Reduce Fuels And Modify Fire Behavior. Prepared for Pacific Rivers Council, P.O. Box 10798, Eugene, OR 97440. 541-345-0119. www.pacrivers.org. February, 2007.

Rhodes, Jon 2002. Bitterroot National Forest Burned Area Recovery Project Post-fire salvage logging field review: 8/20-22/2002. Jon Rhodes, Hydrologist, Center for Biological Diversity.

Ruediger, B., J. Claar, S. Gnaidek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehye, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada lynx conservation assessment and strategy. USDA Forest Service, USDI Fish and Wildlife Service, and USDI National Park Service. Forest Service Publication #R1-00-53. Missoula, MT. 142 pp.

Ruggiero LF, Hayward, G.D. and Squires, J.R., 1994a. Viability Analysis in Biological Evaluations: Concepts of Population Viability Analysis, Biological Population, and Ecological Scale. *Conservation Biology*, Vol. 8, No. 2, June 1994, pp. 364-372

Ruggiero, Leonard F.; 2007. Scientific Independence: A Key to Credibility. From ECO-Report 2007: Bitterroot Ecosystem Management Research Project, Rocky Mountain Research Station, 800 E. Beckwith St., Missoula, MT 59801.

Ruggiero, L.F., K.S. McKelvey, K.B. Aubry, J.P. Copeland, D.H. Pletscher, M.G. Hornocker. 2007. Wolverine Conservation and Management. *Journal of Wildlife Management*, 71(7):2145- 2146.

Ruggiero, Leonard F., Keith B. Aubry, Steven W. Buskirk, L. Jack Lyon, and William J. Zielinski. 1994b. The Scientific Basis for Conserving Forest Carnivores in the Western United States: American Marten, Fisher, Lynx, and Wolverine. Pacific Southwest Research Station, USDA Forest Service. General Technical Report RM-254 September 1994.

Running, Steven W. 2006. Is Global Warming Causing More, Larger Wildfires? *Science Express*, 6 July 2006 (www.scienceexpress.org).

Sallabanks, R.; Bruce G. Marcot, Robert A. Riggs, Carolyn A. Mehl, & Edward B. Arnett, 2001. Wildlife of Eastside (Interior) Forests and Woodlands. Chapter 8 in *Wildlife-Habitat Relationships in Oregon and Washington, 2001* by David H. Johnson and Thomas A. O'Neil (Managing Editors); Oregon State University Press, Corvallis, OR.

Sauder Joel D. and Janet L. Rachlow, 2014. Both forest composition and configuration influence landscape-scale habitat selection by fishers (*Pekania pennanti*) in mixed coniferous forests of the Northern Rocky Mountains. *Forest Ecology and Management* 314 (2014) 75-84

Sauder, Joel D. 2014. Landscape Ecology of Fishers (*Pekania Pennanti*) in North-Central Idaho. Ph.D Dissertation, University of Idaho.

Schultz, C. 2010. Challenges in connecting cumulative effects analysis to effective wildlife conservation planning. *BioScience* 60:545-551.

Schultz, C. A. 2012. The U.S. Forest Service's analysis of cumulative effects to wildlife: a study of legal standards, current practice, and ongoing challenges on a National Forest. *Environmental Impact Assessment Review* 32:74-81.

Schwartz, Charles C., Mark A. Haroldson, and Gary C. White, 2010. Hazards Affecting Grizzly Bear Survival in the Greater Yellowstone Ecosystem. *Journal of Wildlife Management* 74(4):654-667; 2010; DOI: 10.2193/2009-206.

Schwartz, Michael K., Nicholas J. DeCesare, Benjamin S. Jimenez, Jeffrey P. Copeland, Wayne

E. Melquist; 2013. Stand- and landscape-scale selection of large trees by fishers in the Rocky Mountains of Montana and Idaho. *Forest Ecology and Management* 305 (2013) 103-111

Sexton, Timothy O., 1998. Ecological Effects of Post-Wildfire Management Activities (Salvage- Logging and Grass-Seeding) on Vegetation Composition, Diversity, Biomass, and Growth and Survival of *Pinus ponderosa* and *Purshia tridentate*. Master's Thesis, Oregon State University, 1998.

Simard SW, Asay AK, Beiler KJ, Bingham MA, Deslippe JR, Xinhua H, Philip LJ, Song Y, Teste FP. 2015. Resource transfer between plants through ectomycorrhizal fungal networks. In: Horton TR, ed. *Mycorrhizal networks*. Berlin: Springer.

Simard SW, Martin K, Vyse A, Larson B. 2013. Meta-networks of fungi, fauna and flora as agents of complex adaptive systems. In: Puettmann K, Messier C, Coates K, eds. *Managing forests as complex adaptive systems: building resilience to the challenge of global change*. New York: Routledge, 133-164.

Six, Diana L., Eric Biber, and Elisabeth Long 2014. Management for Mountain Pine Beetle Outbreak Suppression: Does Relevant Science Support Current Policy?" *Forests* 2014, 5, 103- 133.

Solomon, S.D. et al., 2007: Technical Summary, in *Climate Change 2007: The Physical Science Basis*.

Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 24, (Feb. 2, 2007).

Spiering, David J. and Richard L. Knight. 2005. Snag density and use by cavity-nesting birds in managed stands of the Black Hills National Forest. *Forest Ecology and Management* 214 (2005) 40-52.

Squires John R., Jeffrey P. Copeland, Todd J. Ulizio, Michael K. Schwartz, Leonard F. Ruggiero, 2007. Sources and Patterns of Wolverine Mortality in Western Montana. *Journal of Wildlife Management* 71(7):2213-2220; 2007.

Squires John R., 2009. Letter to Carly Walker of Missoula County Rural Initiatives. John R. Squires, Research Wildlife Biologist, USDA Forest Service Rocky Mountain Research Station, Forestry Sciences Laboratory, 800 E. Beckwith, Missoula, Montana 59801.

Squires John R., Nicholas J. Decesare, Jay A. Kolbe and Leonard F. Ruggiero 2010. Seasonal Resource Selection of Canada Lynx in Managed Forests of the Northern Rocky Mountains. *The Journal of Wildlife Management* Vol. 74, No. 8 (November 2010), pp. 1648-1660

Squires, J., L. Ruggiero, J. Kolbe, and N. DeCesare. 2006a. Lynx ecology in the Intermountain West: research program summary, summer 2006. USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana.

Squires, J., N. DeCesare, L. Olson, J. Kolbe, M. Hebblewhite, and S. Parks. 2013. Combining resource selection and movement behavior to predict corridors for Canada lynx at their southern range periphery. *Biological Conservation* 157:187-195.

Stephenson, N. L., A. J. Das, R. Condit, S. E. Russo, P. J. Baker, N. G. Beckman, D. A. Coomes,

E. R. Lines, W. K. Morris, N. Ruger, E. Alvarez, C. Blundo, S. Bunyavejchewin, G. Chuyong, S.

J. Davies, A. Duque, C. N. Ewango, O. Flores, J. F. Franklin, H. R. Grau, Z. Hao, M. E. Harmon,

S. P. Hubbell, D. Kenfack, Y. Lin, J.-R. Makana, A. Malizia, L. R. Malizia, R. J. Pabst, N. Pongpattananurak, S.-H. Su, I-F. Sun, S. Tan, D. Thomas, P. J. van Mantgem, X. Wang, S. K. Wiser & M. A. Zavala; 2014. Rate of tree carbon accumulation increases continuously with tree size. *Nature*. 2014.

Sullivan, Patrick J.; James M. Acheson; Paul L. Angermeier; Tony Faast; Jean Flemma; Cynthia

M. Jones; E. Eric Knudsen; Thomas J. Minello; David H. Secor; Robert Wunderlich; Brooke A. Zanetell; 2006. Defining and Implementing Best Available Science for Fisheries and Environmental Policy, and Management. American Fisheries Society, Bethesda, Maryland; Estuarine Research Federation, Port Republic, Maryland. September 2006

Sun, Ge and James M. Vose. 2016. Forest Management Challenges for Sustaining Water Resources in the Anthropocene. *Forests* 2016, 7, 68; doi:10.3390/f7030068

Suzanne Simard "Trees Communicate" webpage. <https://www.youtube.com/watch?v=-8SORM4dYG8&feature=youtu.be>

Thompson, Jonathan R. and Thomas A. Spies 2009. Vegetation and weather explain variation in crown damage within a large mixed-severity wildfire. *Forest Ecology and Management* 258 (2009) 1684-1694.

Traill, Lochran W., Barry W. Brook, Richard R. Frankham, Corey J.A. Bradshaw, 2010. Pragmatic population viability targets in a rapidly changing world. *Biological Conservation* 143 (2010) 28-34.

Troendle, C.A. and R.M. King. 1985. The effect of timber harvest on the fool creek watershed, 30 years later. *Water Resources Research*. 21(12):915-922.

Turner, David P., William K. Ferrell & Mark E. Harmon, 1997. Letter to the Editor, The Carbon Crop: Continued, 277 *Sci.* 1591, 1592 (Sept. 1997).

Turner, David P.; Greg J. Koerber; Mark E. Harmon; Jeffrey J. Lee; 1995. A Carbon Budget for the Forests of the Conterminous United States, 5:2 *Ecological Applications* 421 (1995).

US Fish and Wildlife Service, 1998. Consultation on effects to bull trout from continued implementation of USFS LRMPs and BLM RMPs, as amended by PACFISH and INFISH. USDI Fish and Wildlife Service, Regions 1 and 6.

USDA Forest Service, 1987a. Old Growth Habitat Characteristics and Management Guidelines. Kootenai National Forest, Forest Plan Appendix 17. USDA Forest Service Region One.

USDA Forest Service, 1987b. Appendix to "Old Growth Habitat Characteristics and Management Guidelines." Kootenai National Forest, Forest Plan Appendix 17. USDA Forest Service Region One.

USDA Forest Service, 1987c. Forest Plan Old-Growth Habitat Management Standards, Idaho Panhandle National Forests, USDA Forest Service Region One.

USDA Forest Service, 1987d. Old Growth Management, Idaho Panhandle National Forests, Forest Plan Appendix 27, USDA Forest Service Region One.

USDA Forest Service, 1990. Old-Growth Habitat and Associated Wildlife Species in the Northern Rocky Mountains. Warren, Nancy M. (ed.) USDA Northern Region.

USDA Forest Service, 1993. Wolverine habitat guidelines for the Malheur National Forest. Prepared by Richard Haines, Malheur National Forest; Reviewed by Robert Naney, USFS Region 6, June 1993.

USDA Forest Service 1994b. Savant Sage Final Environmental Impact Statement, Idaho Panhandle National Forests.

USDA Forest Service, 2000a. Environmental Effects of Postfire Logging: Literature Review and Annotated Bibliography. Gen. Tech. Rep. PNW-GTR-486. Wenatchee, WA: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

USDA Forest Service, 2000b. Expert interview summary for the Black Hills National Forest Land and Resource Management Plan Amendment. USDA Forest Service, Black Hills National Forest, Hwy 385 North - R.R. 2, Box 200 Custer, South Dakota 57730 (605-673-9200). October,

2000.

USDA Forest Service, 2001a. Silverbird Post-Fire Harvest Environmental Analysis. Salmon- Cobalt Ranger District, Salmon-Challis National Forest, May 2001.

USDA Forest Service, 2003a. Bristow Area Restoration Project Environmental Assessment, Kootenai National

Forest.

USDA Forest Service, 2004a. Logan Creek Ecosystem Restoration Project Final Environmental Impact Statement. Flathead National Forest.

USDA Forest Service, 2005b. Middle East Fork Hazardous Fuel Reduction Draft Environmental Impact Statement. Bitterroot National Forest.

USDA Forest Service, 2005d. American and Crooked River Project Final Environmental Impact Statement, Nez Perce National Forest.

USDA Forest Service, 2007. Trego DN, Responses to Comments, Fortine Ranger District, Kootenai National Forest, February 2007.

USDA Forest Service, 2007c. Myrtle Creek Healthy Forests Restoration Act Project Final Environmental Impact Statement. Soil Resources. March 2007. Bonners Ferry Ranger District, Idaho Panhandle National Forests

USDA Forest Service, 2008a. Young Dodge Draft Environmental Impact Statement, Rexford Ranger District, USDA Forest Service, Kootenai National Forest, February 2008

USDA Forest Service, 2008b. Young Dodge FEIS/ Responses to Comments-Soils. Rexford Ranger District, USDA Forest Service, Kootenai National Forest, April 2008

USDA Forest Service, 2008f. Gold Crown Fuels Reduction Project Soil Specialists' Report: Past Disturbance and Probable Impacts. Prepared by: Mark Vander Meer & Tricia Burgoyne, Soil Scientists, USDA Forest Service.

USDA Forest Service, 2009a. Lakeview-Reeder Fuels Reduction Project Draft Environmental Impact Statement, Priest Lake Ranger District, Idaho Panhandle National Forests.

USDA Forest Service, 2009c. Excerpt from Lakeview-Reeder Fuels Reduction Project Draft Environmental

Impact Statement. Priest Lake Ranger District, Idaho Panhandle National Forests. January 2009.

USDA Forest Service, 2011c. Griffin Creek Resource Management Project Environmental Assessment. Tally Lake Ranger District, Flathead National Forest, December 2011.

USDA Forest Service, 2012a. Doc Denny Vegetation Management Project Environmental Assessment, Salmon River Ranger District, Nez Perce National Forest, August 2012

USDA Forest Service, 2012d. Travel Management, Implementation of 36 CFR, Part 202, Subpart A (36 CFR 212.5(b)). Memorandum to Regional Foresters, Station Directors, Area Director, IITF Director, Deputy Chiefs and WO Directors. March 29, 2012

USDA Forest Service, 2013a. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Reports 2010 and 2011. March 2013.

USDA Forest Service, 2013b. Travel Management Implementation. Memorandum to Regional Foresters, Station Directors, Area Director, IITF Director, Deputy Chiefs and WO Directors.

December 17, 2013.

USDA Forest Service, 2014a. Como Forest Health Project Draft Environmental Impact Statement, Darby Ranger District, Bitterroot National Forest, August 2014.

USDA Forest Service, 2015a. Deer Creek Soil Resource Report. Prepared by: Chandra Neils, Forest Soil Scientist for: Bonners Ferry Ranger District, Idaho Panhandle National Forests, August 2015.

USDA Forest Service, 2016a. Categorical Exclusion Worksheet: Resource Considerations-Soils. Smith Shields Forest Health Project, Yellowstone Ranger District, Custer Gallatin National Forest.

Van der Werf, G. R.; D. C. Morton, R. S. DeFries, J. G. J. Olivier, P. S. Kasibhatla, R. B. Jackson, G. J. Collatz and J. T. Randerson; 2009. CO₂ emissions from forest loss. Nature Geoscience vol. 2, November 2009.

Vizcarra, Natasha 2017. Woodpecker Woes: The Right Tree Can Be Hard to Find. Science Findings, USDA Forest Service, Pacific Northwest Research Station, Issue 199, August 2017.

Vose, James M. David L. Peterson, and Toral Patel-Weynand (Eds.), 2012. Effects of Climatic Variability and Change on Forest Ecosystems: A Comprehensive Science Synthesis for the U.S. Forest Sector. United States Department of Agriculture, Forest Service Pacific Northwest Research Station General Technical Report PNW-GTR-870, December 2012.

Wasserman, Tzeidle N.; Cushman, Samuel A.; Wallin, David O.; Hayden, Jim. 2012. Multi scale habitat relationships of *Martes americana* in northern Idaho, U.S.A. Res. Pap. RMRS-RP-

94. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 21 p.

Weir, Richard D. and Fraser B. Corbould 2010. Factors Affecting Landscape Occupancy by Fishers in North-Central British Columbia. The Journal of Wildlife Management, Vol. 74, No. 3 (April 2010), pp. 405-410

Westerling, A. L., H. G. Hidalgo, D. R. Cayan, T. W. Swetnam; 2006. Warming and Earlier Spring Increases Western U.S. Forest Wildfire Activity. Science Express, Research Article, July 6, 2006, www.sciencexpress.org.

Williams, A. Park, Craig D. Allen, Alison K. Macalady, Daniel Griffin, Connie A. Woodhouse, David M. Meko, Thomas W. Swetnam, Sara A. Rauscher, Richard Seager, Henri D. Grissino- Mayer, Jeffrey S. Dean, Edward R. Cook, Chandana Gangodagamage, Michael Cai and Nate G. McDowell; 2012. Temperature as a potent driver of regional forest drought stress and tree mortality. Nature Climate Change, PUBLISHED ONLINE: 30 SEPTEMBER 2012 | DOI: 10.1038/NCLIMATE1693

Williamson, J.R. and W.A. Neilsen. 2000. The influence of forest site and rate and extent of soil compaction and profile disturbance of skid trails during ground-based harvesting. Can. J. For. Res. 30:119

Wisdom, Michael J.; Richard S. Holthausen; Barbara C. Wales; Christina D. Hargis; Victoria A. Saab; Danny C. Lee; Wendel J. Hann; Terrell D. Rich; Mary M. Rowland; Wally J. Murphy; and Michelle R. Eames. 2000. Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-Scale Trends and Management Implications. General Technical Report PNW-GTR-485 United States Department of Agriculture Forest Service Pacific Northwest Research Station United States Department of the Interior Bureau of Land Management General Technical Report PNW-GTR-485. May 2000

Witmer, Gary W.; Martin, Sandra K.; Sayler, Rodney D. 1998. Forest Carnivore Conservation and Management in the Interior Columbia Basin: Issues and Environmental Correlates. Gen. Tech. Rep. PNW-GTR-420. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p. (Quigley, Thomas M., ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

Woodbridge, B. and C.D. Hargis, 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

Woodbury, Peter B., James E. Smith & Linda S. Heath, 2007. Carbon sequestration in the U.S. forest sector from 1990 to 2010, 241 *Forest Ecology and Management* 14, 24 (2007).

Wright, Vita, Sallie J. Hejl, and Richard L. Hutto, 1997. Conservation Implications of a Multi- scale Study of Flammulated Owl (*Otus flammeolus*) Habitat Use in the Northern Rocky Mountains, USA. From Duncan, J.R., Johnson, D.H., Nicholls, T.H. Eds. 1997. *Biology and conservation of owls of the Northern Hemisphere: 2d International symposium*; 1997 February 5-9; Winnipeg, Manitoba Gen. Tech. Rep. NC-190. St. Paul, MN: USDA Forest Service, North Central Research Station 635 p.

Yanishevsky, Rosalind M., 1994. Old-Growth Overview: Fragmented Management of Fragmented Habitat. Pp. 7-36 in *Rocky Mountain Challenge: Fulfilling a New Mission in the*

U.S. Forest Service. *Association of Forest Service Employees For Environmental Ethics*, P.O. Box 11615, Eugene, Oregon 97440, February, 1994.