Friends of the Clearwater
Keeping Idaho's Clearwater Basin Wild
[redacted]

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Benjamin Johnson, District Ranger
St. Joe Ranger District
222 South 7th Street Ste. 1
St. Maries, ID 83861

Re: Lacy Lemoosh Project

Submitted via email to benjamin.johnson2@usda.gov, stanislaw.k.moszynski@usda.gov and amy.thompson@usda.gov

These are comments on the August 2024 Lacy Lemoosh Project Draft Environmental Assessment (EA), on behalf of Friends of the Clearwater (FOC), Alliance for the Wild Rockies (AWR), Inland Empire Task Force and WildEarth Guardians.

INTRODUCTION

The EA states:

- Regeneration harvest with prescribed burning and/or slash piling is proposed across approximately 2,629 acres of the Project Area.
- (T)here are 22 openings greater than 40 acres proposed. … Patch sizes… are now 40 to 291 acres.
- The estimated timber volume planned for harvest in the Lacy Lemoosh project is 62 million board feet (MMBF).
- Approximately 15 miles of newly constructed roads are proposed to gain access
- The proposed transportation system has about 11 miles of temporary roads
- Reconstruction activities are proposed for 20 miles in the Project Area

The implementation of 2,629 acres of clearcuts along with other aspects of the proposal raise questions of significant and cumulative effects, necessitating the preparation of an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA). The logging and road construction proposed, including clearcutting would not be "insignificant" under any definition, nor without significant cumulative effects.

Using the EA process means the Forest Service (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.

The FS must demonstrate consistency with all the applicable direction in the Forest Plan to comply with NEPA and the National Forest Management Act (NFMA). The EA doesn't provide enough discussion or analysis to demonstrate project or management consistency.

The EA states, "The only management area within the Project Area is Management Area 6 (MA6) - General Forest. The desired condition for vegetation within this management area states that vegetation management activities have a dominant role in affecting the composition, structure, and pattern of vegetation." The concerns expressed during the revision process included the use of the forest plan's "desired conditions" as driving the agency to treat MA6 lands as a giant tree farm. In accord with the "dominant role" to be provided for logging, the EA claims "there is a need to…

> • Improve forest health and resiliency to disturbances such as wildfire, drought, insects or diseases,
> • Reduce hazardous fuels within the wildland urban interface and other areas to lessen the severity of wildfires and to enable safe fire suppression efforts,
> • Provide economic benefit to local communities through sustainable use of natural resources and benefits for local communities…

The EA doesn't genuinely consider the ecological problems inherent to this tree farming mentality, except for some recognition that the network of roads in the area needed to maintain the tree farm has caused adverse impacts to water quality:

> (T)here is a need to… Reduce sediment delivery to streams from forest routes to maintain or improve Total Maximum Daily Load (TMDL) related water quality concerns and recover degraded aquatic habitat for native species.

Yet the proposed project would cause a spike of sediment erosion into streams.

Also consistent with this proposal's treatment of the project area as a sacrifice zone for timber extraction, the EA fails to present a cumulative effects analysis for any of the natural values and/or ecosystem services characteristic of the native, fully functioning ecosystem prior to industrial "management." So the EA doesn't take a hard look at the impacts on, e.g., the populations of native fish and wildlife species encompassed within a logical cumulative effects analysis area that includes national forest lands and lands of other ownership in and around the project area.

UNLAWFUL FOREST PLAN

The Lacy Lemoosh project would implement the 2015 revised Forest Plan. FOC and AWR have 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 have taken legal action a few times to force the FS to manage in conformance with environmental laws such as NEPA, NFMA and the Endangered Species Act (ESA). Our groups 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, we incorporate the documentation of public participation in the revised Forest Plan public process within these comments on the Lacy Lemoosh proposal. By implementing the revised Forest Plan with this project, the FS would be operating outside of environmental laws and regulations.

AWR 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. We incorporate the documentation of AWR participation in the NRLMD public process within this comment on the Lacy Lemoosh proposal.

George and Zack, 2001 "recommend that managers: (1) identify the wildlife species they want to target for restoration efforts, (2) consider the size and landscape context of the restoration site and whether it is appropriate for the target species, (3) identify the habitat elements that are necessary for the target species, (4) develop a strategy for restoring those **elements and the ecological processes that maintain them**, and (5) implement a long-term monitoring program to gauge the success of the restoration efforts." (Emphasis added.) None of this is found in the revised Forest Plan.

There will continue to be significant cumulative effects of the FS's chosen way of achieving forest plan "Desired Conditions" for vegetation (manipulate the habitat using heavy-handed industrial activities). The Lacy Lemoosh EA simply does not view ecological damage through the same lens as it does for vegetation conditions. Here is a brief list other factors directly influencing biological diversity under the FS's management regime, and their historic range of variability, or "HRV":

FACTOR	HRV
Road density	zero
Noxious weed occurrence	zero
Miles of long-term stream channel degradation ("press" disturbance)	zero
Culverts	zero
Human-induced detrimental soil conditions	<1%
Maximum daily decibel level of motorized devices	zero
Acres of significantly below HRV snag levels for many decades	zero
Roadless extent	100%
Extent of veg. communities affected by exotic grazers (livestock)	zero
Extent of veg. communities affected by fire suppression	zero

With Forest Plan 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 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.

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 explain how the effects of climate change and white pine blister rust affect the attainability of those desired ranges.

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.

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.

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 unlikely to occur naturally, or if the biophysical setting would require frequent, intensive "fuel treatments" to maintain the desired 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, which is inconsistent with best available science.

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), encourage 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 also 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 automatically being a “catastrophe.”

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’s “desired conditions” rationale is inconsistent with a more holistic ecosystem management approach, which acknowledges forests’ capability of operating in a self-regulatory manner. See our comments on the National Old Growth Amendments (NOGA) Draft EIS, which we incorporate into our comments on this EA, wherein we also critique the FS’s use of desired conditions.

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

The changes to the Forest Plan Monitoring Plan were illegally implemented outside the NEPA process.

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—positive or negative—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…” 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 change to FW-STD-TBR-04 illegally allows the FS to ignore NFMA’s limitation on logging in regards to culmination of mean annual increment. This change is highly significant, requiring NEPA analysis and public involvement at the very least.

The Forest Plan Monitoring Program lacks Monitoring Questions and Indicators for the Sensitive westslope cutthroat trout, inland redband trout, and western pearlshell mussel.

The Forest Plan 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.

<u>Indicator MON-FLS-01-03.</u> Specific to the INFISH monitoring requirements that this Indicator adopts; the IPNF must use monitoring data to determining 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.

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.

The Lacy Lemoosh EA also fails to include anything near an adequate monitoring plan, which might verify assumptions of the EA and also assure compliance with design features, the Forest Plan, and other requirements.

SUPERSIZED CLEARCUTS

The EA states: "Regeneration harvest with prescribed burning and/or slash piling is proposed across approximately 2,629 acres of the Project Area. …there are 22 openings greater than 40 acres proposed. … Patch sizes… are now 40 to 291 acres."

Bilodeau and Juel (2021) investigated how often the FS invoked "exceptions" to the NFMA 40-acre limit to clearcuts and other "regeneration" logging on national forest lands in the bioregion. From 2013 until March of 2021, the Northern Region approved 93,056 acres of these supersized clearcuts, covering an area of land about twice the size of the District of Columbia. If the acres were arranged in a contiguous square, a person with an average walking speed of three miles per hour would have to walk 16 hours just to traverse its perimeter. That acreage only represents supersized clearcuts; because many of the same projects planned openings under 40 acres, the landscape impacts from clearcutting and related logging would be much greater. Managers of the Idaho Panhandle National Forests and Nez Perce-Clearwater National Forests in Idaho requested over half of this acreage, at 33,625 and 23,095 aggregate acres, respectively.

The report also notes that no region of the national forest system outside of the Northern Region approves exceptions to engage in supersized clearcutting.

There has never been any NEPA analysis analyzing and disclosing the landscape level cumulative impacts of these massive clearcutting approvals—not at the Northern Region level, and not at the level of the IPNF. This has implications for highly significant impacts on wildlife that evolved without clearcuts, which is all of them, and especially for species that require large areas of contiguous forest cover such as grizzly bears, wolverines, elk, and fisher.

CUMULATIVE EFFECTS

The EA does not 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. It does not 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.

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 the above monitoring.
- A description of any monitoring, specified in those past project NEPA for the analysis area, which has yet to be completed and/or reported.
- A summary of all monitoring of resources and conditions relevant to the proposal or analysis area as a part of all Forest Plan monitoring and evaluation efforts.

- A cumulative effects analysis which includes the results from the monitoring required by the current and 1987 Forest Plans.

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

These considerations are a critical part of the NEPA analysis. Without this 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 certain monitoring or implement a certain type of management and these were never effectively completed, 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 resilience treatments" have not been monitored appropriately, then there is no valid reason for this project.

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

Please disclose the location and acreages of past, current, and reasonably foreseeable logging, grazing, and roadbuilding activities within the project area.

CLIMATE CHANGE AND CARBON SEQUESTRATION

The FOC et al. scoping comments discuss this issue in great detail. Yet the EA's Climate and Carbon Effects section fails to even consider the scientific sources we cited. It concludes, "…while short-term carbon stocks are likely to continue to increase under a no-action scenario, there are long-term risks of reduced carbon stocks, as a result of older stands where stand-level growth will decline in the coming years, potentially causing the rate of carbon accumulation to decline Therefore, the no action alternative will result in dense, less resilient forest stands at a higher risk to disturbance that may result in them becoming a carbon source." In other words, the analysis presents the same kind of strained logic and biases we discuss above in **UNLAWFUL FOREST PLAN** and in our incorporated NOGA DEIS comments.

Our incorporated comments on the National Old Growth Amendments Draft EIS explain how the FS is not managing consistent with climate and biodiversity related executive orders. Those executive orders are also ignored with the Lacy Lemoosh project.

ALLEGED FOREST NON-RESILIENCE

The EA says of the proposal, "forest health and long-term stability is enhanced by establishing new stands of long lived, early seral, shade-intolerant, drought- and fire-tolerant, insect/disease resistant species (e.g., ponderosa pine, western larch and western white pine)." And the no action alternative "would allow current compositional trends to continue with shade tolerant, fire intolerant species becoming increasingly dominant across the landscape. Desirable species would be progressively crowded out. This shift in stand composition to more shade-tolerant, fire-sensitive species such as grand fir, Douglas-fir and hemlock, would also increase the risk and extent of loss from fire."

If the FS has any sources of data **from the project area or IPNF** that determine the normal range of stand composition for western white pine, ponderosa pine, and western larch, please cite them.

If the FS has any sources of data **from the project area or IPNF** that determine the normal extent of stands of "dominant" western white pine, ponderosa pine, and western larch, please cite them.

In doing so, please use metrics such as sizes and ages of trees, acres "dominated by" the tree species, tree densities, canopy layers, and patch sizes. Please cite your sources of information for establishing the numbers.

The EA alleges that across the project area, proposed vegetation treatments would increase "desired" cover types. Like many analyses of project effects, the EA has little more to say about the staying power of such accomplishments, pretending there would be no fading of such effect over time. This is extremely misleading.

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.

The EA states the FS wants to increase resilience to disturbances such as wildfire, insects and disease, etc. 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.

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

> One often hears that because humanity's impact has become so great, the rest of life on this planet now relies on us for its succession and that we are going to have to get used to managing natural systems in the future—the idea being that since we now threaten everything on earth we must take responsibility for holding the fate of everything in our hands. This bespeaks a form of unreality that takes my breath away… The cost of just finding out enough about the environment to become proper stewards of it—to say nothing

> of the costs of acting in such a way as to ameliorate serious problems we already understand, as well as problems about which we haven't a clue—is utterly prohibitive. And the fact that monitoring must proceed indefinitely means that on economic grounds alone the only possible way to proceed is to face the fact that by far the cheapest means of continuing life on earth as we know it is to **curb ourselves instead of trying to take on the proper management of the ecosystems we have so entirely disrupted.**

(Payne 1995, emphasis added.)

SOIL

The EA does not provide an analysis of detrimental soil disturbance and its consequences for diminishing soil and land productivity. Please disclose the full extent of hydrologically impacted soils across the entire analysis area, 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 Regional Soil Quality Standards the FS 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 <u>soil disturbance</u> in activity areas) to metrics of long-term reductions in <u>soil productivity</u> 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 <u>productivity</u> 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.

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.[1]

Please disclose relevant 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, 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—except for an estimate of a limited category (detrimental soil disturbance or "DSD")—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.

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

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.
>
> …The collection, movement, and storage of water through drainage basins characterize the hydrology of a region. Related systems, particularly the ever-changing shape of stream channels and the viability of plants and animals that live in those channels, can be very sensitive to the hydrologic processes occurring over these basins. Typically, these systems have evolved over hundreds of thousands of years under the prevailing hydrologic conditions; in turn, their stability often depends on the continued stability of those hydrologic conditions.
>
> Alteration of a natural drainage basin, either by the impact of forestry, agriculture, or urbanization, can impose dramatic changes in the movement and storage of water. …Flooding, channel erosion, landsliding, and destruction of aquatic habitat are some of the unanticipated changes that …result from these alterations.

> …Human activities accompanying development can have irreversible effects on drainage-basin hydrology, particularly where subsurface flow once predominated. Vegetation is cleared and the soil is stripped and compacted. Roads are installed, collecting surface and shallow subsurface water in continuous channels. …These changes produce measurable effects in the hydrologic response of a drainage basin.

Elsewhere the FS recognizes that amount of soil compaction and other measures of DSD across a watershed accumulate over space and time to harm watersheds. From USDA Forest Service, 2008f:

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

USDA Forest Service, 2009c states:

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

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.
>
> …**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; such effects must 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:

> …a curvilinear relation between amount of compaction and increased flow is shown.
>
> Numerous plans, guidelines, and environmental impact statements have related the predicted amount of soil compaction to a defined threshold of compaction totalling 12 percent of watershed area. …The 12 percent figure is arbitrary. Flow changes at lesser amounts of compaction may also cause adverse impacts. …Without reference to the stream channels in question, we cannot arbitrarily say nothing will happen until the mythical 12 percent figure is surpassed.

> In some watersheds, compaction was determined from postlogging surveys, but in others, compaction was taken as the area in roads (including cut and fill surfaces), landings, and skid trails.

The FS has at times even quantified past 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. … About 4,526 acres are currently estimated to have sustained detrimental compaction or displacement in the Crooked River watershed due to logging, mining, and road or trail construction.
>
> …An estimated 73 percent (208) of past activity areas on FS lands in American River (and an estimated 69 percent (166) of past activity areas on FS lands in Crooked River) today would show detrimental soil disturbance in excess of 20 percent. (Emphasis added.)

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

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.

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 <u>not within the boundaries of any current project activity areas</u>. 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 <u>sustained yield</u>. 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 "…coordinated management of resources without impairment of the productivity of the land" and in the Forest and Rangeland Renewable Resources Act "…substantial and permanent impairment of productivity must be avoided".
>
> Soil quality is a more recent addition to Forest Service Standards. The Forest and Rangeland Renewable Resources Act (1974) appears to be the first legal reference made to protecting the "quality of the soil" in Forest Service directives. **Although the fundamental laws that directly govern policies of the U.S. Forest Service clearly indicate that land productivity must be preserved, increasingly references to land or soil productivity in Forest Service directives were being replaced by references to soil quality as though soil quality was a surrogate for maintaining land productivity. This was unfortunate, since although the two concepts are certainly related, they are not synonymous.**

> Our understanding of the relationship between soil productivity and soil quality has continued to evolve since 1974. Amendments to the Forest Service Manual, Chapter 2550 – Soil Management in 2009 and again to 2010 have helped provide some degree of clarity on this issue and acknowledged that **the relationship is not as simple as originally thought**. The 2009 (2500-2009-1) amendment to Chapter 2550 of the Forest Service Manual states in section 2550.43-5, directs the Washington Office Director of Watershed, Fish, Wildlife, Air and Rare plants to "Coordinate validation studies of soil quality criteria and indicators with Forest Service Research and Development staff to ensure soil quality measurements are appropriate to protect soil productivity" (USFS-FSM 2009). **Inadvertently this directive concedes that the relationship between soil productivity and soil quality is 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 …severely disturbed sites,… "no action" …would **create indirect negative impacts by missing an opportunity to actively restore damaged soils**. (Emphasis added.)

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 even the FS's questionable 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% <u>increases in bulk density</u>, which is a threshold of when soil compaction is considered to be detectable, and 15% <u>areal limit for detrimental disturbance</u>, which is the soil quality standard threshold for how much of an activity area can be detrimentally disturbed (including compaction from temporary roads and heavy equipment, erosion resulting from increased runoff, puddling, displacement from skid trails, rutting, etc.). With that caveat, what Powers has to say in relation to the soil quality standard is quite revealing (as quoted in Nesser, 2002):

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

The FS's soil proxy—its SQS assumption that up to 15% of an activity area having long-term damage is consistent with NMFA and regulations—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. …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… some sites showed that maximum compaction occurred at a depth of 8 inches… Furthermore, ... subsurface compaction occurred in glacial deposits to a depth of at least 16 inches."

Cullen et al. (1991) concluded: (M)ost compaction occurs during the first and second passage of equipment." Page-Dumroese (1993), investigating logging impacts on volcanic ash-influenced soil 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.)

The EA doesn't provide enough detail to indicate the thoroughness of the surveys, including whether all sources of DSD were inventoried. Geist et al., 1990 describe a methodology using a sampling grid, and they demonstrate that taking bulk soil density samples is quite feasible. This is necessary because deep, not necessarily visible subsurface compaction has been detected long after logging activities (e.g. Page-Dumroese, 1993).

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

> Meaningful soil disturbance standards or objectives must be based on measured and documented relationships between the degree of soil disturbance and subsequent tree growth, forage yield, or sediment production. Studies designed to determine these relationships are commonly carried out as part of controlled and replicated research projects. The paucity of such information has caused problems in determining threshold levels for, or defining when, detrimental soil disturbance exists; and in determining how much disturbance can be tolerated on a given area of land before unacceptable changes in soil function (productive potential or hydrologic response) occur. Given natural variability of soil properties across the landscape, a single set of standards for assessing detrimental disturbance seems inappropriate.
>
> …Each soil has inherent physical, chemical, and biological properties that affect its ability to *function* as a medium for plant growth, to regulate and partition water flow, or to serve as an effective environmental filter. When any or a combination of these inherent factors is altered to a point where a soil can no longer *function* at its maximum *potential* for any of

> these purposes, then its quality or health is said to be reduced or impaired (Larson and Pierce 1991).

Page-Dumroese, et al., 2007 discuss wildly variable results of different soil compaction instruments, which indicates the FS must explain the limitations of the compaction survey methodology. The scientific basis for its accuracy and validity must be established.

Recent research reveals some profound biological properties of forest soil. "(R)esource fluxes though ectomycorrhizal (EM) networks are sufficiently large in some cases to facilitate plant establishment and growth. Resource fluxes through EM networks may thus serve as a method for interactions and cross-scale feedbacks for development of communities, consistent with complex adaptive system theory." (Simard et al., 2015.) The EA does not consider how management-induced damage to EM networks might have caused site productivity reductions.

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

The EA states, "A severe wildfire could destroy sensitive plants in the Project Area, substantially reduce canopy cover and change soil conditions such as mycorrhizal associations, sterilization, structure, or chemistry." Your Homestead EA states, "Canopy removal and disruption of soil mycorrhizae are a concern for many Region One sensitive plant species. …soil mycorrhizae …may be destroyed during ground-disturbing activities." The Lacy Lemoosh EA fails to discusses soil mycorrhizae and their ecological functions.

"(R)esource fluxes though ectomycorrhizal (EM) networks are sufficiently large in some cases to facilitate plant establishment and growth. Resource fluxes through EM networks may thus serve as a method for interactions and cross-scale feedbacks for development of communities, consistent with complex adaptive system theory." (Simard et al., 2015.) 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… 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). Gorzelak et al., 2015:

> …found that the behavioural changes in ectomycorrhizal plants depend on environmental cues, the identity of the plant neighbour and the characteristics of the (mycorrhizal network). The hierarchical integration of this phenomenon with other biological networks at broader scales in forest ecosystems, and the consequences we have observed when it is

> interrupted, indicate that underground "tree talk" is a foundational process in the complex adaptive nature of forest ecosystems.

Also see: "Trees Talk to Each Other in a Language We Can Learn, Ecologist Claims".

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 past or proposed treatment area.

USDA Forest Service, 2007 states:

> Sustained yield was defined in the …Forest Plan …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. Disclose the analytical data that supports proposed soil mitigation/remediation measures. 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. If the FS has monitoring data demonstrating it has done so, please disclose it.

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.)

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. (Emphases added.)

The EA proposes winter logging as mitigation: "Winter operations can be utilized to mitigate impacts on soils with high subsoil erosion hazard. To minimize soil disturbance for any units harvested in the winter, equipment will operate on 12 inches of settled snow, or frozen ground." 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 (USDA Forest Service, 2007c) admits that soil displacement is essentially permanent 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.

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 …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.

NOXIOUS WEEDS

Despite the legacy of heavy-handed management and other anthropogenic activities—actions known to cause the spread of noxious weeds and other invasive plants—the EA fails to disclose the level of weed infestation in the project area. The EA lacks cumulative effects analysis of noxious weeds including the factors contributing to their spread in the project area.

The impacts of noxious weeds are exacerbated by every action that disturbs soil or otherwise upsets the balance of native vegetation. Weed spread from management activities such as logging and burning and use of vehicles or mechanized equipment are a continuous symptom of resource extraction management.

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.

Please disclose the impact of the Lacy Lemoosh project on noxious weed infestations and native plant communities.

Unfortunately, there are no Standards or Forest Plan monitoring items related to noxious weeds. To this day, the FS seems to believe that it can disturb all the land it wants and still deal with the consequential noxious weed invasion with later control actions. The EA fails to cite any science or IPNF monitoring data that demonstrates the FS can significantly reduce noxious weed occurrence.

Noxious weeds are a Pandora's Box loosed on the forest ecosystem—no amount of herbicide use reverses their spread for long. The financial costs of noxious weeds are another part of this elephant in the room. The agency does not account for the economic impacts of increased weed treatments due to projects such as this one, nor of the loss of ecosystem services attributed to noxious weeds being cultivated by management actions.

The FS cannot demonstrate it can competently get a handle on noxious weed infestations its management actions have caused.

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.

WATER QUALITY AND AQUATIC HABITATS

The FS sets an inadequate Aquatic Habitat restoration Objective (FW-OBJ-AQH-01) for the first 15 years of plan implementation, 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 Best Management Practices (BMP) standards, meaning that sediment and other pollution that result are violations of state water quality standards and the Clean Water Act (CWA).

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 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.

Please provide project area information validating the use of the Water Erosion Prediction Project (WEPP) model for assessing potential impacts of surface disturbance on aquatic resources in the IPNF.

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.

The EA doesn't explain how the timber sale would comply with the CWA 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.

The FS assumes that this project will adequately mitigate the problems chronically posed by the road network by project road work and BMP implementation, despite the fact that the FS knows otherwise. Without the sufficient funding to maintain its road system in a timely manner, all the BMP implantation that can be mustered in the context of a project such as this will only be a short-term fix, and the road system will remain an ecological liability. The FS admits such problems in a non-NEPA context (USDA Forest Service, 2010t):

> Constructing and improving drainage structures on Forest roads is an ongoing effort to reduce road-related stream sediment delivery. Although BMPs are proven practices that reduce the effects of roads to the watershed, it is not a static condition. Maintaining BMP standards for roads requires ongoing maintenance. Ecological processes, traffic and other factors can degrade features such as ditches, culverts, and surface water deflectors. Continual monitoring and maintenance on open roads reduces risks of sediment delivery to important water resources.

Also in a non-NEPA context, a forest supervisor (Lolo National Forest, 1999) frankly admits that projects are a "chance to at least correct some (BMP) departures rather than wait until the funding stars align that would allow us to correct all the departures at once."

Please disclose the temporal effectiveness or non-effectiveness of all the road maintenance and upgrading, because merely assuming that the proposed actions will forever mitigate the problems they now exhibit would be obfuscation.

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

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

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

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

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

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

Roads influence many processes that affect aquatic ecosystems and fish: human behavior (poaching, debris removal, efficiency of access for logging, mining, or grazing, illegal species introductions), sediment delivery, and flow alterations. We incorporate WildEarth Guardians (2020) which summarizes best available science on the ecological impacts of roads.

The EA fails to provide sufficient evidence or monitoring data demonstrating BMP effectiveness.

When considering how effective BMPs are at controlling non-point pollution on roads, both the rate of implementation of the practice, and the effectiveness of the practice should both be considered. The FS tracks the rate of implementation and the relative effectiveness of BMPs from in-house audits. This information is summarized in the *National BMP Monitoring Summary Report* with the most recent data being the fiscal years 2013-2014 (Carlson et al. 2015). The rating categories for implementation are "fully implemented," "mostly implemented," "marginally implemented," "not implemented," and "no BMPs." "No BMPs" represents a failure to consider BMPs in the planning process. More than a hundred evaluations on roads were conducted in FY2014. Of these evaluations, only about one third of the road BMPs were found to be "fully implemented" (*Id*., p. 12).

The monitoring audit also rated the relative effectiveness of the BMP. The rating categories for effectiveness are "effective," "mostly effective," "marginally effective," and "not effective." "Effective" indicates no adverse impacts to water from project or activities were evident. When treated roads were evaluated for effectiveness, almost half of the road BMPs were scored as either "marginally effective" or "not effective" (*Id*, p. 13).

A recent technical report by the FS (Edwards et al., 2016) summarizes research and monitoring on the effectiveness of different BMP treatments. Researchers found that while several studies have found some road BMPs are effective at reducing delivery of sediment to streams, the degree of each treatment has not been rigorously evaluated. Few road BMPs have been evaluated under a variety of conditions, and much more research is needed to determine the site-specific suitability of different BMPs (*Id.*; also see Anderson et al., 2011).

Edwards et al., 2016 cites several reasons for why BMPs may not be as effective as commonly represented. Most watershed-scale studies are short-term and do not account for variation over time, sediment measurements taken at the mouth of a watershed do not account for in-channel sediment storage and lag times, and it is impossible to measure the impact of individual BMPs when taken at the watershed scale. When individual BMPs are examined there is rarely broad-scale testing in different geologic, topographic, physiological, and climatic conditions. Finally, in some instances, a single study is used to justify the use of a BMP across multiple states without adequate testing.

Climate change will further put into question the effectiveness of many road BMPs (Edwards et al., 2016). While the impacts of climate will vary from region to region (Furniss et al. 2010), more extreme weather is expected across the country which will increase the frequency of flooding, soil erosion, stream channel erosion, and variability of streamflow (*Id*). BMPs designed to limit erosion and stream sediment for current weather conditions may not be effective in the future. Edwards et al., 2016 state, "More-intense events, more frequent events, and longer duration events that accompany climate change may demonstrate that BMPs perform even more poorly in these situations. Research is urgently needed to identify BMP weaknesses under extreme events so that refinements, modifications, and development of BMPs do not lag behind the need."

Climate change is also expected to lead to more extreme weather events, resulting in increased flood severity, more frequent landslides, altered hydrographs, and changes in erosion and sedimentation rates and delivery processes. (Halofsky et al., 2011.) Many National Forest roads are poorly located and designed to be temporarily on the landscape, making them particularly vulnerable to these climate alterations. (*Id*.) Even those designed for storms and water flows typical of past decades may fail under future weather scenarios, further exacerbating adverse ecological impacts, public safety concerns, and maintenance needs. (Strauch et al., 2015.) At bottom, climate change predictions affect all aspects of road management, including planning and prioritization, operations and maintenance, and design. (Halofsky et al., 2011.)

The FS fails to analyze in detail the impact of climate change on forest roads and forest resources. It should start with a vulnerability assessment, to determine the analysis area's exposure and sensitive to climate change, as well as its adaptive capacity. For example, the agency should consider the risk of increased disturbance due to climate change when analyzing this proposal. It should include existing and reasonably foreseeable climate change impacts as part of the affected environment, assess them as part of the agency's hard look at impacts, and integrate them into each of the alternatives, including the no action alternative. The agency should also consider the cumulative impacts likely to result from the proposal, proposed road activities, and climate change. In planning for climate change impacts and the proposed road activities, the FS should consider: (1) protecting large, intact, natural landscapes and ecological processes; (2) identifying and protecting climate refugia that will provide for climate adaptation; and (3) maintaining and establishing ecological connectivity. (Schmitz and Trainor, 2014.)

It's likely that many of the roads and trails within the project area are currently in need of maintenance activities and some require surface work and drainage improvements to reduce or prevent sediment from entering streams. 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.”

U.S. Fish and Wildlife Service, 2015 states:

> Culverts that remain in the road behind gates and berms that are not properly sized, positioned, and inspected …have an increased risk for failure by reducing awareness of potential maintenance needs. The accumulation of debris has the potential to obstruct culverts and other road drainage structures. Without maintenance and periodic cleaning, these structures can fail, resulting in sediment production from the road surface, ditch, and fill slopes. The design criteria to address drainage structures left behind gates and berms require annual monitoring of these structures.

Does the FS conduct annual monitoring of **ALL** drainage structures left behind gates and berms in the project area?

The EA indicates that with roads put into storage, their impact on watershed function would be minimal, that roads would be stabilized and have a low probability of failure. How often does the FS conduct monitoring or inspection of each stored road in the project area?

USDA Forest Service, 2016b states, “Increased heavy-truck traffic related to log hauling can increase rutting and displacement of road-bed material, creating conditions conducive to higher sediment delivery rates (Reid and Dunne, 1984).” The abstract from Reid and Dunne, 1984 states:

> Erosion on roads is an important source of fine-grained sediment in streams draining logged basins of the Pacific Northwest. Runoff rates and sediment concentrations from 10 road segments subject to a variety of traffic levels were monitored to produce sediment rating curves and unit hydrographs for different use levels and types of surfaces. These relationships are combined with a continuous rainfall record to calculate mean annual sediment yields from road segments of each use level. A heavily used road segment in the field area contributes 130 times as much sediment as an abandoned road. A paved road segment, along which cut slopes and ditches are the only sources of sediment, yields less than 1% as much sediment as a heavily used road with a gravel surface.

USDA Forest Service, 2017e states:

> Potential sediment delivery from roads used for log haul was evaluated using three methods: road encroachment, stream crossings, and sediment modeling. … Roads within 300 feet of a water body are the most probable to deliver sediment (Belt et al. 1992). … Road/stream crossings have a high potential to deliver sediment directly into streams. … Sediment delivery to streams from existing roads and from project-related road activities was modeled using the Roaded WEPP module of the Water Erosion Prediction Project (WEPP).

So despite the fact that increased sediment impacts from log hauling would likely be significant, the Lacy Lemoosh EA fails to quantify, estimate, analyze or disclose such impacts.

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… across **acres** of subwatersheds…"

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. The EA does not disclose all reasons for these waters' status as impaired. The EA does not demonstrate the proposed actions would be consistent with addressing the sources of impairment. Please explain how the timber sale would comply with the Clean Water Act and all state water quality laws and regulations.

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…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, steam channels and possible flooding.

According to Kappesser, 1992:

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

There is a lack of scientific justification for logging and/or burning in RHCAs. The Forest Plans allows for vegetation management to occur in RHCAs to meet desired conditions, so long as project activities do not prevent attainment of desired conditions. A large body of scientific research shows that logging near streams can have long-term and devastating consequences for stream ecological integrity and water quality. Logging in RHCAs can cause degradation of water quality such as stream temperature increases, changes to stream temperature patterns, increased fine sediment inputs, stream bank instability, and other problems. The EA and Forest Plan ignore and downplay the well-documented negative effects and ecological risks associated with logging within streamside corridors. Even non-commercial thinning in RHCAs is, at best, a large scale and ecologically risky experiment in which little is known about the outcome. Risks are considerable, and the outcome can have unintended negative consequences. Rieman et al. (2001) noted: **"…vulnerable aquatic species could be impacted in the short term in ways from which they could not easily recover, even if long-term benefits eventually became evident in later years."**

Studies have found even selective logging may be associated with increases of instream fine sediments (Kreutzweiser et al. 2005, Miserendino and Masi 2010), changes in macroinvertebrate community structure or metrics (Flaspohler et al. 2002, Kreutzweiser et al. 2005), alterations in nutrient cycling and leaf litter decomposition rates (Lecerf and Richardson 2010), and increases in stream temperatures (Guenther et al. 2012). Flaspohler et al. (2002) noted that changes to biota associated with selective logging were found decades after logging. These studies strongly suggest that alterations caused by logging within RHCAs may result in significant changes in water quality parameters and stream biota in many areas; these results are likely tied to dynamics that may be common to many forested streams to varying degrees.

In the draft Forest Plan Revision for the Blue Mountains, the FS discloses: "Research has shown that effective vegetated filter strips need to be at least 200 to 300 feet wide to effectively capture sediment mobilizing by overland flow from outside the riparian management area." It is logical that logging or thinning within 50 to 100 feet from streams (or closer) would cause fine sediment production and allow for sediment delivery into streams, and potentially contribute to stream temperature increases, increased variability in waters quality and aquatic habitat parameters, alterations to stream hydrology, and other negative impacts.

Furthermore, headwater streams and non-fish bearing streams need more, not less, protection (Rhodes et al., 1994; Moyle et al., 1996; Erman et al., 1996; Espinosa et al., 1997). Both Erman et al., 1996 and Rhodes et al., 1994 conclude, based on review of available information, that intermittent and non-fish-bearing streams should receive stream buffers significantly larger than those afforded by PACFISH/ INFISH. The revised forest plan should have fully protected buffers of at least 300 feet for all waterbodies.

The EA also ignores the results of consultation on its previous forest plan in regards to INFISH, which is largely still revised forest plan direction. US Fish and Wildlife Service, 1998 recognizes, <u>upland forest canopy removal raises stream temperatures</u>. The EA ignores best available science which indicates the openings created by the project clearcuts would result in increases to water in streams. (Id.):

> Groundwater entering streams (especially small streams) may be an important determinant of stream temperatures (Spence et al. 1996) or may provide localized thermal refugia in larger stream systems. Where groundwater flows originate above the neutral zone (16-18 meters below the surface in general) groundwater temperatures will vary seasonally, as influenced by air temperature patterns (Spence et al. 1996). Timber harvest from upland areas exposes the soil surface to greater amounts of solar radiation than under forested conditions (Carlson and Groot 1997), elevating daytime temperatures of both air and soil (Fleming et al. 1998, Buckley et al. 1998, Morecroft et al. 1998) and increasing diurnal temperature fluctuations (Carlson and Groot 1997). Relationships between shallow source groundwater flows and air and soil temperatures indicate that harvest activities in upland areas may increase stream temperatures via increasing temperature of shallow groundwater inflows. Other pathways for harvest actions to influence stream temperature include changing the volume and timing of peak flows, elevating suspended sediment levels, and altering channel characteristics (Chamberlin et al. 1991, Spence et al. 1996, USDA and USDI 1998a).

US Fish and Wildlife Service, 1998 also states:

> Bull trout spawning typically occurs in areas influenced by groundwater (Allan 1980; Shepard et al. 1984; Ratliff 1992; Fraley and Shepard 1989). In a recent investigation in the Swan River drainage, bull trout spawning site selection occurred primarily in stream reaches directly influenced by groundwater upwellings or directly downstream of these upwelling reaches (Baxter and Hauer, *in prep.*). In addition, warmer summer stream temperatures, as well as extreme winter cold temperatures that can result in anchor ice, may be moderated by cold water upwellings.
>
> Surface/groundwater interaction zones, which are typically selected by bull trout for redd construction, are increasingly recognized as having high dissolved oxygen; constant cold water temperatures; and increased macro-invertebrate production (R. Edwards, University of Washington, pers. comm. 1998).

Also, Guenther et al. (2012) even found increases in stream temperature in relation to selective logging. They found increases in bed temperatures and in stream daily maximum temperatures in relation to 50% removal of basal area <u>in both upland and riparian areas</u>. Increases in daily maximum temperatures varied within the logged area from 1.6 to 3 degrees Celsius.

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

The EA presents no analysis of forest plan Riparian Management Objectives (RMOs), including current values of all RMOs for all stream reaches, and trends toward or away from meeting those RMOs for all stream reaches. This is an issue of forest plan compliance.

US Fish and Wildlife Service, 1998 indicates that bull trout are absent when road densities exceed 1.71 mi/mi^2, depressed when the road density = 1.36 mi/mi^2 and strong when road density equals or is less than .45 mi/mi^2 (P. 67.)

See US Fish and Wildlife Service (2010), which discusses biological effects of sediment on bull trout and other fish.

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

> The distribution and abundance of westslope cutthroat trout has declined from historic levels (less than 59 percent of historically occupied stream habitat) across its range, which included western Montana, central and northern Idaho, a small portion of Wyoming, and portions of three Canadian provinces (Liknes and Graham 1988, Shepard et al. 2005). Westslope cutthroat trout persist in only 27 percent of their historic range in Montana. Due to hybridization, genetically pure populations are present in only 2.5 percent of that range (Rieman and Apperson 1989). Introduced species have hybridized or displaced westslope cutthroat trout populations across their range. Hybridization causes loss of genetic purity of the population through introgression. Within the planning area, genetically pure populations of westslope cutthroat trout are known to persist in Ruby Creek (MFISH 1992, 2012). Some of these remaining genetically pure populations of westslope cutthroat trout are found above fish passage barriers that protect them from hybridization, but isolate them from other populations.
>
> Brook trout are believed to have displaced many westslope cutthroat trout populations (Behnke 1992). Where the two species co-exist, westslope cutthroat trout typically predominate in higher gradient reaches and brook trout generally prevail in lower gradient reaches (Griffith 1988). This isolates westslope cutthroat trout populations, further increasing the risk of local extinction from genetic and stochastic factors (McIntyre and Rieman 1995).
>
> Habitat fragmentation and the subsequent isolation of conspecific populations is a concern for westslope cutthroat trout due to the increased risk of local and general extinctions. The probability that one population in any locality will persist depends, in part on, habitat quality and proximity to other connected populations (Rieman and McIntyre 1993). Therefore, the several small, isolated populations left in the project area are at a moderate risk of local extirpation in the event of an intense drainage-wide disturbance.
>
> Habitat degradation also threatens the persistence of westslope cutthroat trout throughout their range. Sediment delivered to stream channels from roads is one of the primary causes of habitat degradation. Sediment can decrease quality and quantity of suitable spawning substrate and reduce overwintering habitat for juveniles which reduces spawning success and increases overwinter mortality. Roads can also alter the drainage network of a watershed and thereby increase peak flows. The end result of increased peak flows is decreased channel stability and accelerated rates of mass erosion. Across their range the strongest populations of westslope cutthroat trout exist most frequently in the wilderness, Glacier National Park, and areas of low road densities or roadless areas (Liknes and Graham 1988, Marnell 1988, Rieman and Apperson 1989, Lee et al. 1997).

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

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

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.

VIABILITY AND DIVERSITY

The Biological Evaluation mentions the Regional Foresters Sensitive Species list change from 2011 to 2023. It doesn't provide adequate scientific rationale for species' removals. Viability of populations are not assured.

The EA does not utilize best available science for sustaining viable populations of ESA-listed, management indicator species and other sensitive species on the IPNF. Past logging 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.

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 …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, which is what happened on the IPNF after plan revision.

The Forest Plan omits old-growth Management Indicator Species, which means there would be no monitoring of wildlife whose special habitat needs are best served 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: "These MIS, elk and insectivores, were not selected because of a viability concern."

The EA does not make any meaningful connection between the Forest Plan MIS Landbird Assemblage and project activities. Please disclose the specific habitat needs of all of these bird species, and analyze cumulative impacts on those habitats.

The EA fails to include a cumulative effects analysis for 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. The EA fails to consider best available science concerning biological relationships and population trends of these species on the IPNF.

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.

Schultz (2010) provides a critique of FS wildlife analyses the most prominent being they are based on habitat availability, which alone is insufficient for understanding the status of populations (Noon et al. 2003, Mills 2007). Schultz (2010) recommendations generally call for more peer review of large-scale assessments and project level management guidelines, and to adopt more robust scientifically sound monitoring and measurable objectives and thresholds if maintaining viable populations of all native and desirable non-native wildlife species is to be accomplished.

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

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…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 FS does not disclose statistically robust estimates of population trends of Threatened, Endangered, and 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 native 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 species on the IPNF.

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.

Considering potential difficulties of using population viability analysis at the project analysis area level (Ruggiero, et. al., 1994a), the cumulative effects of carrying out multiple projects simultaneously across the IPNF makes it imperative that population viability be assessed at least at the forestwide scale (Marcot and Murphy, 1992). Also, temporal considerations of the impacts on wildlife population viability from implementing something with such long duration as a Forest Plan must be considered (id.) but this has never been done by the IPNF. It is also of paramount importance to monitor population during the implementation of the Forest Plan in order to validate assumptions used about long-term species persistence i.e., population viability (Marcot and Murphy, 1992; Lacy and Clark, 1993).

Mealey (1983) states: "Well distributed habitat is the amount and location of required habitat which assure that individuals from demes, distributed throughout the population's existing range, can interact. Habitat should be located so that genetic exchange among all demes is possible."

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.

A FS timber sale EIS (USDA Forest Service, 2007a) notes the limitations of modeling methodology the EA relies upon for wildlife analyses (by Samson):

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

The FS relies upon Region-wide database analyses by Samson to conclude that species viability is assured, although the FS does not address the age and reliability of the data. The EA fails to disclose that Samson's conclusions for many wildlife species concerning the long term are "uncertain."

Sampson did not evaluate long-term viability for the fisher and marten, but did for the goshawk, pileated woodpecker, flammulated owl and black-backed woodpecker. Sampson concluded that "In regard to long-term viability, this conservation assessment has found that long-term habitat conditions in terms of Representativeness, Redundancy, and Resiliency are "low" for all species." The FS must disclose Sampson's long-term viability conclusions. Sampson merely uses home range size for each species and makes assumptions of overlap in ranges of males and females. Home range size is then multiplied by the effective population size (n_e - a number that includes young and non-breeding individuals - Allendorf and Ryman 2002) and this is projected as the amount of habitat required to maintain a minimal viable population in the short-term. This simplistic approach ignores a multitude of factors and makes no assumptions about habitat loss or change over time. For the fisher and marten, Samson uses a "critical habitat threshold" as calculated in another publication (Smallwood 2002).

There are several problems with such an approach and the risk to the species would be extremely high if any of the species ever reached these levels in the Northern Region. Surely, all six species would be listed as endangered if this was to occur and the probabilities for their continued existence would be very low. There is also no way that NFMA and ESA requirements could be met of maintaining species across their range and within individual National Forests with such an approach. Mills (2007) captured the futility of such approach in his book on Conservation of Wildlife Populations: "MVP is problematic for both philosophical and scientific reasons.

Philosophically, it seems questionable to presume to manage for the minimum number of individuals that could persist on this planet. Scientifically, the problem is that we simply cannot correctly determine a single minimum number of individuals that will be viable for the long term, because of inherent uncertainty in nature and management…"

Samson also admits that "Methods to estimate canopy closure, forest structure, and dominant forest type may differ among the studies referred to in this assessment and from those used by the FS to estimate these habitat characteristics" and that "FIA sample points affected within the prior 10 years by either timber harvest or fire are excluded in the estimates of habitat for the four species" and finally that "FIA does not adequately sample rare habitats." This especially concerning given the reliance on the FIA queries to identify suitable habitat and the fact that the data used in the analysis is now likely mostly out-of-date.

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).

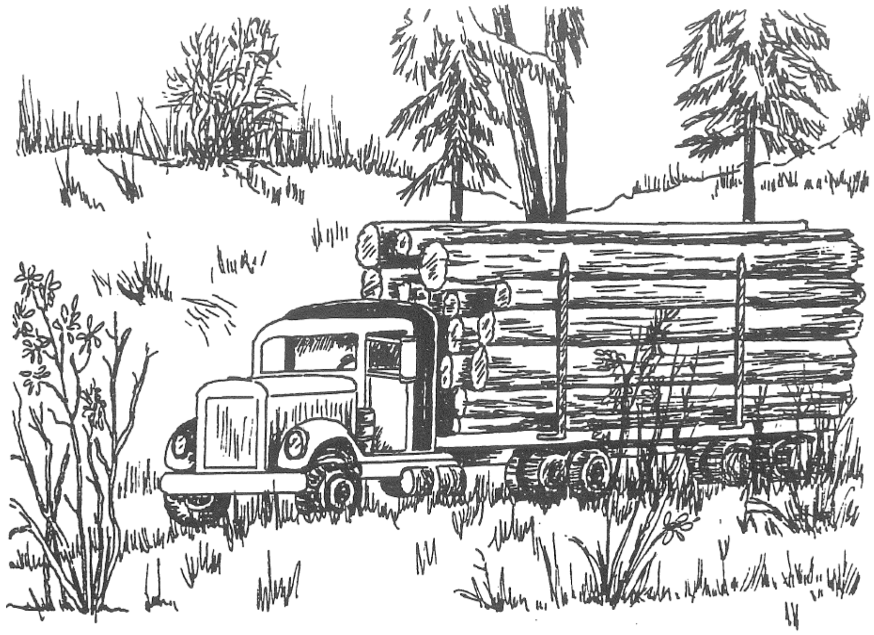
Guideline FW-GDL-WL-08 can be read to provide direction to log areas that scientific consensus recognizes as some of the worst places to do so, because of the ecological sensitivity and often rarity of intact post-fire habitats.

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… are assumed to be accepting…" There is no scientific research that validates this assumption for the remaining species "not covered under other forestwide guidelines."

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

Old Growth



Logging is the chief systematic pressure affecting old-growth communities.

-USDA Forest Service, 1987d

“Regeneration” logging as proposed in large size class stands will set back the stands’ current trajectories towards old-growth condition for almost 200 years. The EA’s noted natural processes causing tree mortality and “defect” are defining characteristics of old growth according to Green et al. When such processes occur, the natural disturbance regimes create heterogeneity:

> [M]ost natural disturbances leave traces and features of the original stand in the form of biological legacies. Biological legacies are organisms, organically derived structures, and organically produced patterns that persist from the predisturbance ecosystem []. and they include logs, intact thickets of understory vegetation, large living trees, and snags. Even intense catastrophic disturbances...can leave enormous numbers and varieties of biological legacies.

(Lindenmayer and Franklin, 2002, pp. 56-59.) Biological legacies are the prelude to old-growth. They not only survive, but they regenerate, they assist other species with persisting, they provide habitat for species that will eventually recolonize disturbed areas, they influence patters of recolonization, they provide energy and nutrients for other organisms, and they can stabilize soil and microbes in a recovering stand. *Id.* at 58. Regeneration cuts (clearcutting, shelterwood cutting, and seed-tree cutting) do none of that and will eliminate all of these benefits, which was not discussed in the EA. This project will eliminate any biological legacies that beetle kill or a future fire will provide.

The EA does not demonstrate the FS is managing the Forest consistent with FW-DC-VEG-03, FW-DC-VEG-05, FW-DC-VEG-07, FW-STD-VEG-01, FW-STD-VEG-02, FW-GDL-VEG-01, W-GDL-VEG-02 and FW-DC-WL-12, nor with the Forest Plan Monitoring requirements associated with old growth.

According to the EA, "there are approximately 615.5 acres of retained existing old growth in 22 stands and 238.5 acres of recruitment potential old growth in 10 stands" in the project area. Please disclose on a map the locations of each of these 32 stands, showing overlap with the various proposed project activities.

Please disclose the total acreage and mapped and/or spatial inventory of all forest stands that have been identified as meeting forest plan old-growth criteria—across the entire IPNF. This includes stands identified as old growth under the 1987 forest plan old-growth criteria.

Please disclose the mapped and/or spatial **forestwide** inventory of all forest stands being managed as "Recruitment Potential Old Growth" which is defined in the Forest Plan as: "Forest stands that do not meet the definition of old growth in Green et al. 1992 (errata corrected 12/11) but are being managed with the goal of meeting that definition in the future."

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. Please disclose the level of mature and old growth forest necessary to sustain viable populations of old-growth associated wildlife species in the area. 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.

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 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…" 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?

The EA has no estimates for the amount of old growth either in the project area or forestwide. The FS should analyze and disclose amounts across Old Growth Analysis Areas[2], which has meaning for viability (amount and distribution of habitat) of old-growth associated species.

There is no indication whether the required monitoring for vegetation (including old growth) has taken place or the results of that monitoring. (See Forest Plan pp. 101 to 107.)

An analysis from the adjacent Kootenai National Forest (Gautreaux, 1999) indicates 22% old growth is near the bottom of "reference conditions" on that Forest, and the present situation is far below 22%. Also, Dueker and Sullivan, 2001 "recognize that historical conditions probably provided a higher level of old forest habitat through time than what is provided by the (KNF) Forest Plan direction (a mean of 27.7% as opposed to 10%)."

Gautreaux, 1999 states:

> …research in Idaho (Lesica 1995) of stands in Fire Group 4, estimated that over 37% of the dry Douglas-fir type was in an old growth structural stage (>200 years) prior to European settlement, approximately the mid 1800's.
>
> Based on research of Fire Group 6 in northwest Montana (Lesica 1995) it was estimated that 34% of the moist Douglas-fir type was in an old growth structural stage (>200 yrs.) prior to European settlement, approximately the mid 1800's.
>
> Based on fire history research in Fire Group 11 for northern Idaho and western Montana (Lesica, 1995) it was estimated that an average of 26% of the grand fir, cedar, and hemlock cover types were in an old growth structural stage prior to European settlement.
>
> …fire history research in Fire Group 9 for northern Idaho and western Montana (Lesica, 1995) estimated that 19-37% of the moist lower subalpine cover types were in an old growth structural stage (trees > 200 yrs.) prior to European settlement. While this estimate is lower than suggested by Losensky's research…
>
> Lesica found an estimated 18% of the cool lodgepole pine sites was in an old growth structural stage (>200 years) prior to European settlement, approximately the mid 1800's. … This same research in Fire Group 8 in drier, lower subalpine types of Montana had over 25% of the stands in an old growth structural stage during the same historical period.

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? Please disclose the historic levels of mature and old growth forest in the project area.

The FS Region 1 report Bollenbacher, et al., 2009 states concerning the FIA inventory: "All northern Idaho plots utilized a primary sample unit (PSU) composed of four fixed radius plots with trees 5 – 20.9 inches tallied on a 1/24th acre plot and trees 21.0 inches DBH and larger tallied on a ¼ acre plot." Also, Czaplewski, 2004 states, "Each FIA sample location is currently a

[2] Methodology in 1987 Forest Plan

cluster of field sub-plots that collectively cover an area that is nominally one acre in size, and FIA measures a probability sub-sample of trees at each sub-plot within this cluster." In addition, Bollenbacher and Hahn, 2008 under "Defining Old Growth" state: "There are no specific criteria for minimum patch size for OG in the Northern Region definitions" but recognize "There are, however, some Forest Land Management Plans that may include guidance for a minimum map unit for OG stands." Despite that, Bollenbacher and Hahn, 2008 try to make a case for smaller minimum stand sizes, saying "The regional vegetation minimum map unit of 5 acres for a stand polygon would be a reasonable lower limit for all vegetation classes of forest vegetation including OG stands." Clearly, whether the FS is using a ¼-acre, one-acre, or five-acre minimum map unit, none conform to the Forest Plan old-growth minimum stand size criteria. Furthermore, it would be ludicrous to propose that any old-growth associated MIS, Sensitive, or ESA-listed species could survive on even a five-acre old-growth stand—there is no scientific evidence to support such a premise.

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.

"About 2,419 acres of proposed regeneration harvest units would reduce the amount of mature forest in the Project Area to about 9,638 acres (59 percent)." Has the FS compared all those stands to old-growth criteria, as part of the project development? Has the FS compared all those stands to recruitment potential old-growth criteria, as part of the project development?

The National Old Growth Amendment Draft EIS does not explicitly state how that EIS's preferred alternative would alter IPNF plan direction concerning old growth. Please disclose the total body of old-growth related forest plan "Plan Elements" and "Monitoring Questions" that are proposed to remain after/result from the National Old Growth Amendment.

Again, we incorporate FOC's comments on the National Old Growth Amendment Draft EIS into these comments on the Lacy Lemoosh EA. Please note that means we are also incorporating Juel, 2021 which is an Attachment to those Draft EIS comments, as comments on IPNF management of old growth.

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… (McClelland, 1979)," and that "managing for a minimum size of 50 acres will preclude the existence of species which have larger territory requirements."

Yet another erratic characteristic of the Forest Plan is, although the Glossary mentions some "goal" of meeting the old growth definition in the future concerning "recruitment potential old growth" the Forest Plan actually contains no such goal. Does the IPNF have an inventory of forestwide and project area "recruitment potential old growth?" Please note we are asking the FS to 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 as recruitment potential 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 they represent?

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

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 that is inconsistent with the best available science.

Likewise the adjacent Kootenai National Forest (KNF) 1987 Forest Plan included similar 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 1987 Forest Plan old growth standards and its Forest Plan Appendix 17 that 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 …(which) find optimum habitat in the "old" successional stage…" Also see USDA Forest Service, 1990a 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 provide 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)ld growth is typically distinguished from younger growth by several of the following attributes:

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

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

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. …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. …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.

The IPNF has failed to cite any evidence that its managing for old growth habitat (i.e., logging and burning old growth) strategy will improve old-growth wildlife species' habitats over the short-term or long-term. In regards to this theory, Pfister et al., 2000 state:

> (T)here is the question of the appropriateness of management manipulation of old-growth stands… Opinions of well-qualified experts vary in this regard. As long term results from active management lie in the future – likely quite far in the future – considering such manipulation as appropriate and relatively certain to yield anticipated results is an informed guess at best and, therefore, encompasses some unknown level of risk. **In other words, producing "old-growth" habitat through active management is an untested hypothesis.** (Pp. 11, 15 emphasis added).

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

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

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 that is needed to document what is unique about old growth—not just a few large trees left over after logging, but decadence, rot, snags, down logs, patchy irregular canopy layers—things that can't be created by the agency's version of "restoration" and which would be depleted by such management actions.

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

SNAGS AND DEAD TREE HABITAT

Please disclose how much snag loss would be expected because of safety concerns during implementing the proposed methods of log removal.

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 please disclose the scientific basis for the delineation of snags into two diameter groups using 15” d.b.h. as the division point.

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 their excavating efforts/utilization. The EA and Forest Plan fail to recognize this scientific finding.

On this 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. Those 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."

Disclose the snag densities in the project area, and the method used to determine those densities. Please disclose the cumulative snag loss in areas previously logged or subject to other causes of snag loss.

Hutto, 2006 discusses the inadequacy of snag guidelines that fail to consider post-fire habitat conditions, a problem of the IPNF Forest Plan:

> 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.

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

Other literature has also indicated the potential for reduced snag abundance due to human influence (Wisdom et al. 2000). And Bate and Wisdom, 2004 investigated management and other human influences on snag abundance. Some findings include:

1. Stands far from roads had almost three times the density of snags as stands adjacent to open or closed roads. No difference in snag density existed for stands adjacent to open versus closed roads. Rather, snag density declined with increasing proximity to nearest road. Consequently, the presence of any road near or adjacent to a stand is an important predictor of substantially reduced density of snags. Ease of access for firewood cutting and other forms of timber harvest is the most likely explanation for reduced snag density near roads.

2. Stands closer to the nearest town had a lower density of snags than those farther from nearest town. This finding implies that stands closer to town, and therefore more accessible to human activities, also are likely areas where firewood cutting is concentrated, resulting in reduced snag density.

3. Stands in the late-seral stage had three times the density of snags as stands in the mid-seral stage, and almost nine times that of stands in the early-seral stage. Stands in the late-seral stage provide essential snag habitat for wildlife that does not appear to be consistently present in younger stands.

4. Stands with no history of timber harvest had three times the density of snags as stands that were selectively harvested, and 19 times the density as that in stands that had undergone a complete harvest. These results suggest that past timber harvest practices have substantially reduced the density of snags, and that snag losses have not been effectively mitigated under past management.

5. Stands adjacent to private land had a lower density of snags within mid- and late-seral stages, in contrast to a higher density in stands surrounded by Forest Service land. These results are likely explained by safety and fire management policies, which call for removal of snags along property boundaries, where such snags often are deemed to pose safety or fire hazards. In addition, increased human access likely contributes to lower snag densities in stands adjacent to private land.

The EA does not <u>cite</u> in the analysis the science that supports the FS assumption that the management will result in snags and down logs in abundance to someday, maybe, several decades later, support viable populations. Is there monitoring to support any claims of benefits to snag and down log-dependent species' population numbers or distribution?

Dudley & Vallauri, 2004 state:

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

HABITAT FRAGMENTATION AND CONNECTIVITY

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

An accurate ecological analysis of the IPNF and project area would reveal too much forest and habitat fragmentation.

Assuring viability also means addressing the issue of fragmentation, road effects, and past logging on wildlife species' habitat. Viability is only assured if individuals of a species can survive migration and dispersal for genetic diversity. 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.)

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 …(widths) are important because effective corridors should be wide enough to "contain a band of habitat unscathed by edge effects" relevant to species that rarely venture out of their preferred habitats (Lidicker and Koenig 1996 and Exhibit Q-17).
>
> Timber harvest patterns across the Interior Columbia River basin of eastern Washington and Oregon, Idaho, and western Montana have caused an increase in fragmentation of forested lands and a loss of connectivity within and between blocks of habitat. This has isolated some wildlife habitats and reduced the ability of some wildlife populations to move across the landscape, resulting in long-term loss of genetic interchange (Lesica 1996, U.S. Forest Service and Bureau of Land Management 1996 and 1997).
>
> Harvest or burning in stands immediately adjacent to old growth mostly has negative effects on old growth, but may have some positive effects. Harvesting or burning adjacent to old growth can remove the edge buffer, reducing the effective size of old growth stands by altering interior habitats (Russell and Jones 2001). Weather-related effects have been found to penetrate over 165 feet into a stand; the invasion of exotic plants and penetration by predators and nest parasites may extend 1500 feet or more (Lidicker and Koenig 1996). On the other hand, adjacent management can accelerate regeneration and sometimes increase the diversity of future buffering canopy.
>
> The occurrence of roads can cause substantial edge effects on forested stands, sometimes more than the harvest areas they access (Reed, et al. 1996; Bate and Wisdom, in prep.).

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

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

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

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

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

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

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

> times as large as an old-growth habitat island surrounded by a buffer zone of mature timber.

Harris, 1984 discusses habitat effectiveness of fragmented old growth:

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

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

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

WILDLIFE POPULATION TREND MONITORING

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 differs from Forest Plan assumptions about wildlife habitat management.

BIG GAME SPECIES

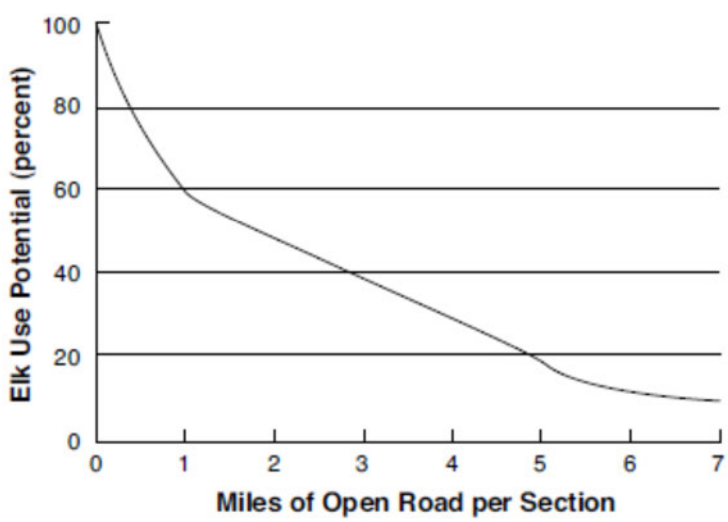
Please disclose how the IPNF is being managed consistent with FW-OBJ-WL-02, FW-GDL-WL-13 and FW-GDL-WL-14.

Please disclose the currently available amount of big game (moose and elk) hiding cover, winter range, and security in the project area, and the amounts during and after project implementation.

Please disclose the methods used to determine big game hiding cover, winter range, and security, and its rate of error as determined by field review.

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:

5. Levels of habitat effectiveness:



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

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

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

Scientific information recognizes the importance of thermal cover, including Lyon et al, 1985. Christensen et al., 1993 also emphasize “maintenance of security, landscape management of coniferous cover, and monitoring elk use…” This USFS Region 1 document also states, “management of winter range to improve thermal cover and prevent harassment may be as important as anything done to change forage quantity or quality.”

And Black et al. (1976) provide definitions of elk cover, including “Thermal cover is defined as a stand of coniferous trees 12 m (40 ft) or more tall, with average crown exceeding 70 percent. Such stands were most heavily used for thermal cover by radio-collared elk on a summer range study area in eastern Oregon (R.J. Pedersen, Oregon Department of Fish and Wildlife—personal communication).” Black et al. (1976) also state:

> Optimum size for thermal cover on summer and spring-fall range is 12 to 24 ha (30 to 60 acres). Areas less than 12 ha (30 acres) are below the size required to provide necessary internal stand conditions and to accommodate the herd behavior of elk.
> …Cover requirements on winter ranges must be considered separately and more carefully. Animals distributed over thousands of square miles in spring, summer and fall are forced by increasing snow depths at higher elevations to concentrate into much restricted, lower-elevation areas in mid- to late-winter. Winter range, because of its scarcity and intensity of use, is more sensitive to land management decisions.

Regarding Black et al. (1976) conclusions, Thomas et al., 1988a state, “We concur. New research on elk use of habitat on summer and winter ranges has become available, however (Leckenby 1984). Land-use planning requirements indicate that a model of elk winter-range habitat effectiveness is required.”

Thomas et al., 1988a also state:

> Thomas and others (1979, p. 104-127) defined two types of cover: thermal and hiding. Thermal cover was "any stand of coniferous trees 12 meters (40 ft) or more tall, with an average canopy closure exceeding 70 percent" (p. 114). Disproportionate use of such cover by elk was thought to be related to thermoregulation. Whether such thermoregulatory activity occurs or is significant has been argued (Geist 1982,Peek and others 1982). In the context of the model presented here, arguing about why elk show preference for such stands is pointless. They do exhibit a preference (Leckenby 1984; see Thomas 1979 for a review). As this habitat model is based on expressed preferences of elk, we continue to use that criterion as a tested habitat attribute. We cannot demonstrate that the observed preference is an expression of need, but we predict energy exchange advantages of such

> cover to elk (Parker and Robbins 1984). We consider it prudent to assume that preferred kinds of cover provide an advantage to the elk over nonpreferred or less preferred options.

The EA acknowledges that noxious weeds are an issue, so where is the analysis of how weed populations and trends are affecting and will affect the forage the FS claims will be improved by the project?

Lyon et al, 1985 also discuss the adverse impacts of roads and clearcuts on elk.

FISHER

The EA does not propose to implement a strategy, based upon 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) are key for recovery of this species in the Northern Region. As with most of the Sensitive wildlife, fishers receive little habitat protection emphasis in the Forest Plan—mostly just move it (via logging) toward desired conditions. The EA does not 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:

> …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."

Please note that 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)."

Jones and Garton, 1994 note, "Fishers seemed to prefer large-diameter Engelmann spruce trees and hollow grand fir logs as resting sites in north-central Idaho (Jones 1991)." Yet the proposal, in implementing Forest Plan direction, would continue to reduce grand fir incidence on the IPNF. The EA presents no analysis of cumulative effects.

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.

The EA does not include a quantitative cumulative effects analysis for fisher considering trapping and use of the road and trail networks in the project area. Hayes and Lewis, 2006 state "The two most significant causes of the fisher's decline were over-trapping by commercial trappers and loss and fragmentation of low to mid-elevation late-successional forests." Hayes and Lewis, 2006 also present a science synthesis in the context of a recovery plan for fisher in the state of Washington. Hayes and Lewis, 2006 state:

> Trapping reduced populations quickly. Despite decades of protection from harvest, fisher populations never recovered in Washington. Fishers use forest structures associated with late-successional forests, such as large live trees, snags and logs, for giving birth and raising their young, as well as for rest sites. Travel among den sites, rest sites, and foraging areas occurs under a dense forest canopy; large openings in the forest are avoided. Commercial forestry removed the large trees, snags and logs that were important habitat features for fishers, and short harvest rotations (40-60 years) didn't allow for the replacement of these large tree structures. Clearcuts fragmented remaining fisher habitat

and created impediments to dispersal, thus isolating fishers into smaller populations that increased their risk of extinction.

The EA does not disclose the direct, indirect or cumulative impacts on important habitat components, such as snags, logs, foraging habitat configuration, connectivity, cover, prey species impacts, etc.

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

The EA doesn't mention pine marten, even though they may be present. Please disclose the IPNF'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 (Moriarity et al., 2016; Bull and Blumton, 1999; Hargis et al., 1999 and Wasserman et al., 2012).

NORTHERN GOSHAWK

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

The EA hardly mentions goshawks, even though they are native to the project area. The EA proposes no-activity areas of 40 acres “be placed around any newly discovered goshawk nest or any nest that has been active in the past five years” but there’s no indication thorough surveys have or will be conducted.

The EA fails to specify, based upon best available science, how goshawk “Post-Fledging Areas” should be protected “to promote nesting success and provide forage opportunities for adults and fledgling goshawks during the fledgling dependency period.”

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)…."

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.

PILEATED WOODPECKER

The IPNF's 1987 Forest Plan old-growth standards (USDA Forest Service, 1987c) were largely built around the habitat needs of one of its management indicator species, the pileated woodpecker. The Lacey Lemoosh EA and current Forest Plan do not 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. Bull and Holthausen 1993, recommend approximately 25% of the home range be old growth and 50% be mature forest. Also see Bull et al., 1992, Bull and Holthausen, 1993, and Bull et al., 1997 for biology of pileated woodpeckers and the habitats they share with other cavity nesting and denning wildlife.

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.

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

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

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

This preferred diameter of nesting trees for the pileated woodpecker 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.

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).”

B.R. McClelland studied the pileated woodpecker habitat needs extensively. McClelland, 1985 (a letter to the Flathead NF forest supervisor) states:

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

McClelland (1977), states:

> (The Pileated Woodpecker) is the most sensitive hole nester since it requires old growth larch, ponderosa pine, or black cottonwood for successful nesting. The Pileated can be considered as key to the welfare of most hole-nesting species. If suitable habitat for its perpetuation is provided, most other hole-nesting species will be accommodated.
>
> Pileated Woodpeckers use nest trees with the largest dbh: mean 32.5 inches;
>
> Pileated Woodpeckers use the tallest nest trees: mean 94.6 feet;
>
> The nest tree search image of the Pileated Woodpecker is a western larch, ponderosa pine, or black cottonwood snag with a broken top (status 2), greater than 24 inches dbh, taller than 60 feet (usually much taller), with bark missing on at least the upper half of the snag, heartwood substantially affected by Fomes laracis or Fomes pini decay, and within an old-growth stand with a basal area of at least 100 sq feet/acre, composed of large dbh classes.
>
> A cluster analysis based on a nine-dimensional ordination of nest tree traits and habitat traits revealed close association between Yellow-bellied Sapsuckers, Mountain Chickadees, and Red-breasted Nuthatches. These three species plus the Pileated Woodpecker and Hairy Woodpecker are relatively grouped by coincident occurrence in old growth. Tree Swallows, Black-capped Chickadees, and Common Flickers are separated from the above five species by their preference for more open areas and their frequent use of small dbh nest trees.

> (Most) species found optimum nesting habitat in stands with a major component of old growth, particularly larch. Mean basal area for pileated woodpecker nest sites was 150 square feet per acre. (McClelland. B.R. and others, 1979)
>
> Many large snags are being cut for firewood. Forest managers should limit firewood cutting to snags less than 15 inches in d.b.h. and discourage use of larch, ponderosa pine, and black cottonwood. Closure of logging roads may be necessary to save high-value snags. Logging slash can be made available for wood gatherers.

WOLVERINE

The EA states the ESA-listed Threatened wolverine “may be present in the Project Area” yet gives a “Rationale for Not Analyzed in Detail” that reads, “Project area lacks primary, female dispersal, and female denning habitat.” The only analysis in the EA is intended to justify that position. Such a simplistic analysis is not consistent with best available science.

The EA fails to justify its “no effect” conclusion. There is no site-specific consideration of habitat connectivity or linkages. Cumulative effects are not analyzed.

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).

Logging and road activities may affect wolverines; published, peer-reviewed research finds: “Roaded and recently logged areas were negatively associated with female wolverines in summer.” Fisher et al., 2013. The “analysis suggests wolverines were negatively responding to human disturbance within occupied habitat. The population consequences of these functional habitat relationships will require additional focused research.” Id.

There has been no project formal or informal consultation regarding the wolverine. The project would violate the Endangered Species Act.

Results from Scrafford et al., 2018 “show that roads, regardless of traffic volume, reduce the quality of wolverine habitats and that higher-traffic roads might be most deleterious. We suggest that wildlife behavior near roads should be viewed as a continuum and that accurate modeling of behavior when near roads requires quantification of both movement and habitat selection. Mitigating the effects of roads on wolverines would require clustering roads, road closures, or access management.”

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

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

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

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

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

Roads and human density are important factors influencing current wolverine distribution (Carroll et al. 2001b); and wolverine habitat selection is negatively correlated with human activity – including roads (Krebs et al. 2007). Wolverine occurrence has shown a negative relationship with road densities greater than 2.8 mi/mi^2 (1.7 km/km^2) (Carroll et al. 2001b).

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

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

Wisdom et al. (2000) state:

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

> wolverine are heli-skiing, snowmobiles, backcountry skiing, logging, hunting, and summer recreation (Copeland 1996, Hornocker and Hash 1981, ICBEMP1996f).

Carroll et al. (2001b) state:

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

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

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

The 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.) Please disclose 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)…
>
> …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.

FRINGED MYOTIS, TOWNSEND'S BIG-EARED BAT

The EA doesn't disclose the FS's strategy and best available science for insuring viable populations of these bat species. The EA doesn't state if these Sensitive native species are found in the project area, or if surveys have been conducted. The EA doesn't quantify suitable habitat for these species.

Fringed myotis bats are associated with drier forest types particularly Ponderosa Pine (Keinath 2004, Lacki and Baker, 2007). Lacki and Baker (2007) demonstrated that most roost snags extended above the existing canopy by an average of 33.8 feet and were larger than random snags (32.5 inches for roost trees and 20.8 inches for random snags). Random snags generally had heights that did not extend above the existing canopy (-8.2 feet). Roost trees occurred in stands with more trees per acre (239 vs 119 per acre) and higher basal areas of trees over 9.8 inches in diameter (125.5 ft^2/acre vs 69.7 ft^2/acre).

In Oregon, bats preferred areas with high snag basal area and a diversity of stands within 250 meters of the roost tree. Bats in Oregon also preferred trees without broken tops. In Idaho, bats preferred roost trees in stands with lessor amounts of edge and fewer stand types within 750 meters of the roost tree.

BLACK-BACKED WOODPECKER

The FS ignores basic black-backed woodpeckers biology and its conflicts with the FS's/forest plan fire exclusion policies.

The FS' own Fire Science Brief, 2009 states, "Hutto found that Black-backed Woodpeckers fared best on sites unharvested before fire and poorest in the heavily harvested sites." As NEPA states, such indirect effects must be taken into account.

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…*
>
> …Several bird species seem to be relatively *restricted* in distribution to early post-fire conditions… I believe it would be difficult to find a forest-bird species more restricted to a single vegetation cover type in the northern Rockies than the Black-backed Woodpecker is

> to early [first 6 years] post-fire conditions. (Emphasis added).

USDA Forest Service 2011c states:

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

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 Lacy Lemoosh 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, Weinhagen 1998).

The viability of black-backed woodpeckers is threatened by the FS's fire suppression and other "forest resilience" policies such as that promoted in the Lacy Lemoosh EA, 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 Lacy

Lemoosh 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.

Please see Hanson, 2016, for an explanation of cumulative impacts are in regard to the backed woodpecker, how the FS failed apply the best available science in their analysis of impacts to black-backed woodpeckers for a timber sale, why FS's (including Samson's) reports are inaccurate and outdated, and why FS's reliance on them results in an improper minimization of adverse effects and cumulative impacts to black-backed woodpeckers with regard to the agency's population viability assessment.

In the Sierra Nevada, Black-backed Woodpeckers preferentially foraged in severely burned stands with larger snags and higher snag densities (Hanson and North 2008).

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

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

The Boise National Forest adopted the black-backed woodpecker as a management indicator species (MIS) in its revised forest plan in 2010:

> The black-backed woodpecker depends on fire landscapes and other large- scale forest disturbances (Caton 1996; Goggans et al. 1988; Hoffman 1997; Hutto 1995; Marshall 1992; Saab and Dudley 1998). It is an irruptive species, opportunistically foraging on outbreaks of wood-boring beetles following drastic changes in forest structure and composition resulting from fires or uncharacteristically high density forests (Baldwin 1968; Blackford 1955; Dixon and Saab 2000; Goggans et al.1988; Lester 1980). Dense, unburned, old forest with high levels of snags and logs are also important habitat for this species, particularly for managing habitat over time in a well-distributed manner. These areas provide places for low levels of breeding birds but also provide opportunity for future disturbances, such as wildfire or insect and disease outbreaks (Dixon and Saab 2000; Hoyt and Hannon 2002; Hutto and Hanson 2009; Tremblay et al. 2009). Habitat that supports this species' persistence benefits other species dependent on forest systems that develop with fire and insect and disease disturbance processes. The black-backed woodpecker is a

> secondary consumer of terrestrial invertebrates and a primary cavity nester. Population levels of black-backed woodpeckers are often synchronous with insect outbreaks, and targeted feeding by this species can control or depress such outbreaks (O'Neil et al. 2001). The species physically fragments standing and logs by its foraging and nesting behavior (Marcot 1997; O'Neil et al. 2001). These KEFs influence habitat elements used by other species in the ecosystem. Important habitat elements (KECs) of this species are an association with medium size snags and live trees with heart rot. Fire can also benefit this species by stimulating outbreaks of bark beetle, an important food source. Black-backed woodpecker populations typically peak in the first 3–5 years after a fire. This species' restricted diet renders it vulnerable to the effects of fire suppression and to post-fire salvage logging in its habitat (Dixon and Saab 2000).
>
> … Black-backed woodpeckers are proposed as an MIS because of their association with high numbers of snags in disturbed forests, use of late-seral old forest conditions, and relationship with beetle outbreaks in the years immediately following fire or insect or disease outbreaks. Management activities, such as salvage logging, timber harvest, and firewood collection, can affect KEFs this species performs or KECs associated with this species, and therefore **its role as an MIS would allow the Forest to monitor and evaluate the effects of management activities on identified forest communities and wildlife species.** (Emphasis added.)

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.

GRIZZLY BEAR

The EA has no analysis for grizzly bears, a species listed as "Threatened" under the ESA and native to this part of Idaho. Apparently the FS assumes that grizzly bears don't occur here. On June 10, 2024 Idaho Fish and Game said a grizzly bear was shot in unit 6 of the Panhandle area near the Lower St. Joe River, which is five miles from St. Maries, Idaho. (See: https://www.ktvb.com/article/news/local/hunter-kills-grizzly-bear-mistaken-black-bear-panhandle-region/293-7a3b3749-8b69-4367-b457-def027ffe5d9) This happened probably less than 10 miles from the Lacy Lemoosh project area.

Two days before the grizzly was shot, the hunter sent Idaho Fish and Game video of a bear at a bait site about five miles northeast of St. Maries. The hunter was concerned that the bear could be a grizzly, according to Idaho Fish and Game. After seeing video of the bear, Fish and Game staffers told the hunter that it was a black bear. The hunter killed the bear. Shortly after, he realized it was actually a grizzly and reported it to Idaho Fish and Game. The hunter was not cited In a news release, the agency said it "regrets the mistake made by its staff, the undue stress the situation caused for the hunter and the loss of the grizzly bear." The agency also said it is "reviewing its staff's part in the incident as a personnel matter."
https://cdapress.com/news/2024/jun/19/fg-says-it-misidentified-grizzly-bear/

The Lacy Lemoosh project would increase accessibility for hunters and therefore make such incidents more likely, especially given the state of Idaho's regressive bear hunting program.

Since there is solid documentation of recent and ongoing grizzly bear occupancy in the Bitterroot Ecosystem, also including documented sightings on the adjacent Clearwater NF, grizzly bear residency in the St. Joe Ranger District should be considered permanent. Formal consultation on the Forest Plan is out of date. Formal consultation with the FWS is needed for this project.

The proposed timber sale activities would further reduce grizzly bear connectivity and hinder population recovery in the Bitterroot Ecosystem/Recovery Zone.

In updating the consultation on forest plan impacts on grizzly bears, the FS should be identifying key habitat components for grizzly bears for prioritizing road density reductions (Proctor, et al., 2020) so populations can recover.

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.

Please analyze the effectiveness of road closures, for the purpose of eliminating human access. We refer to AWR's Amended Complaint for case CV-18-67-DWM for the purposes of explaining how roads affect wildlife, how pervasive are ineffective closures on national forest land, and also for forest plan consultation requirements.

The USFWS's 2022 Species Status Assessment for the Grizzly Bear (Ursus arctos horribilis) in the Lower-48 States finds that the grizzly bear population in the lower 48 states is likely to become in danger of extinction within the foreseeable future throughout all of its range, and that "viability for the grizzly bear in the lower-48 States as a whole only increases under …future scenarios, which rely on increases in conservation efforts such that the [Bitterroot Ecosystem] and North Cascades support resilient populations." In other words, true recovery of the Threatened grizzly population cannot happen without recovery of a robust population in the Bitterroot Ecosystem.

The proposed road construction and reconstruction would significantly impact grizzly bear habitat security and connectivity. Reconstruction of passible roads can increase traffic volumes on roads that were already under some level of motor vehicle use because reconstruction inevitably improves the surface of the road, inviting more public travel.

Although temporary roads are intended to be decommissioned after completion of logging operations, grizzly bear habitat security and connectivity are decreased when temporary roads and constructed and used. Habitat security and connectivity is not restored until temporary roads are successfully decommissioned. And the science shows that it takes years for resident grizzly bears to realize such benefits. In other recovery areas and connectivity areas where there are limitations on motorized access to promote grizzly bear recovery, the amount of temporary roads that the FS can construct and use at any given time must be within stated limits on motorized access.

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 into the Bitterroot Ecosystem/RZ from outside the RZs. The FS seems to have no effective strategy to provide scientifically defensible habitat protections outside RZs that would facilitate functional connectivity between and among core areas or other areas of known/persistent occupancy.

The FS is aware of the best Plan direction it has adopted to date, established in Flathead Forest Plan Amendment 19.[3] 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. Also see McLellan, et al., 1988.

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.

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

Great Bear Foundation et al., 2009 discusses in great detail how the Access Amendment Alternative eventually selected leads to a significant deterioration in an already unacceptable baseline condition for grizzly bears. The scientific discussions in Great Bear Foundation et al. 2009, as well as AWR comments on the Access Amendment DSEIS refute any FS claim to be utilizing the best available science for the grizzly bear.

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

The FS fails to take a hard look at management impacts on the grizzly, fails to disclose and consider all potential grizzly sightings and scientific information discussed above, and fails to consider and impose any measures facilitating better connectivity for migration—from reducing road construction and logging, to requiring personnel to take bear country training and carrying bear spray, to monitoring and reporting bear sightings.

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[3] 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.

CANADA LYNX

The EA makes no mention of Canada lynx, a species listed as "Threatened" under the ESA and native to this part of Idaho. The USFWS listed the Canada lynx as a threatened species under the ESA 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 for Canada lynx occurrence or assessed the suitability of lynx habitat in the project area.

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.

Squires and Ruggiero, 2007 found that "lynx in western Montana prey almost exclusively on snowshoe hares during the winter with little use of alternative prey. Thus, reductions in horizontal cover for hares would degrade lynx habitat."

The FS's LCAS (Ruediger et al. 2000) recommends the agency err on the side of maintaining and restoring habitat for lynx and their prey. Thus, 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.

Ruediger et al. 2000 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. 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. (*Id*.)

Kosterman, 2014 finds that 50% of lynx habitat must be mature undisturbed forest for it to be optimal lynx habitat where lynx can have reproductive success and no more than 15% of lynx habitat should be young clearcuts, i.e. trees under 4 inched dbh. This 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.

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

> First, we demonstrated that lynx clearly use silviculture treatments, but there is a □10 year cost of implementing any treatment (thinning, selection cut, or regeneration cut) in terms of

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

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

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

Kosterman, 2014, Vanbianchi et al., 2017 and Holbrook, et al., 2018 demonstrate that NRLMD/Forest Plan direction is not adequate for lynx viability and recovery.

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

WESTERN (BOREAL) TOAD

The EA fails to consider 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. …(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. …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.

The EA fails to include or cite any analysis considering the quality and quantity of habitat necessary to maintain a viable population of this species in the IPNF

MONARCH BUTTERFLY

The Biological Evaluation states, "Effects from project would be immeasurable." The FS does not consider which aspects of its management might affect this species so impacts WOULD be measurable, consistent with the fact that they are listed as a Sensitive species. The EA fails to include or cite any analysis considering the quality and quantity of habitat necessary to maintain a viable population of this species in the IPNF.

TRAVEL MANAGEMENT

The EA fails to demonstrate the FS is managing the project area consistent with the Travel Management regulations and related executive orders.

The FS asserts project-related road decommissioning would result in "a positive trend for subwatersheds within the Project Area" however the EA's analysis fails to support that claim in analyzing the project as a whole. Although road decommissioning and other mitigations could be implemented separately from the proposed new road building and logging, the EA doesn't consider such an option. The "Purpose and Need" prioritizes the wrong issues.

Of the roads to be decommissioned, the EA states, "Some of these roads may have already achieved a hydrologically stable state through vegetation regrowth." It fails to identify which those it is talking about, along with their extents and locations. This is consistent with the EA's insufficient impacts analyses from roads. There are no reliable metrics used by the EA's analysis to support its claims.

The EA doesn't disclose how much the work on any particular road segment (reconstructed, maintained or decommissioned) would reduce sediment yield, and by how much and for what duration—as compared to the No Action Alternative. Likewise, it also does not disclose how much the any particular new permanent or temporary road segment would **increase** sediment yield, by how much and for what duration—as compared to the No Action Alternative. The promise of "positive trend for subwatersheds in the Project Area" goes unsubstantiated in the EA.

The EA also doesn't disclose how the funding of the maintenance of the road network would be accomplished over the long term to conserve water quality. The project proposal is merely the repeat of the management paradigm that caused the existing water quality problems—a paradigm of industrial exploitation that leaves water quality chronically depressed.

The EA does not adequately analyze or disclose ongoing soil and water impacts from roads not being adequately maintained. It focuses on roads to be treated for log hauling, and makes vague commitments to decommission some roads even though funding is highly uncertain.

Please clarify distinctions between road maintenance ("such as adding ditch relief culverts, drivable dips… etc.") and road reconstruction ("on roads that have been stored or are not drivable with passenger vehicles."). Those examples for "maintenance" go well beyond maintaining the original design and function of the roads. Likewise, if what exactly constitutes "reconstruction" of stored or not drivable roads?

Please disclose the following information concerning the project area:

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

The EA does not adequately analyze and disclose the cumulative effects of recreational activities and motorized/mechanic access on wildlife populations.

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—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 EA mentions 21 miles of "non-system roads. Please explain why each segment exists on the landscape. How many total miles of "non-system roads" exist in the project area, beyond the 21 miles proposed to be decommissioned?

The EA does not analyze the impacts of roads that are not maintained because they are unauthorized or non-system, and not addressed by this project.

The EA mentions "stored roads." Please disclose the NEPA document(s)/decision(s) that resulted in those roads being stored, and the approximate dates those roads were "stored." We want to understand the duration of open-and-used vs. closed-and stored.

The EA doesn't make a firm commitment to actually carry out all the decommissioning described. If decommissioning is proposed for roads not to be used for logging activities, please identify their sources of funding.

The Washington Office memorandum dated March 29, 2012 (USDA Forest Service, 2012d) directed the following:

- A TAP must analyze all roads (maintenance levels 1 through 5);
- The Travel Analysis Report must include a map displaying roads that will inform the Minimum Road System pursuant to 36 C.F.R. § 212.5(b), and an explanation of the underlying analysis;
- The TAP and Watershed Condition Framework process should inform one another so that they can be integrated and updated with new information or where conditions change.

The December 17, 2013 Washington Office memorandum (USDA Forest Service, 2013b) clarifies that by the September 30, 2015 deadline each forest must:

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

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

The Travel Management Regulations at 36 CFR **§** 212.5 state:

> (b) Road system—(1) *Identification of road system.* For each national forest, national grassland, experimental forest, and any other units of the National Forest System (§ 212.1), the responsible official must identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands. In determining the minimum road system, the responsible official must incorporate a science-based roads analysis at the appropriate scale and, to the degree practicable, involve a broad spectrum of interested and affected citizens, other state and federal agencies, and tribal governments. The minimum system is the road system determined to be needed to meet resource and other management objectives adopted in the relevant land and resource management plan (36 CFR part 219), to meet applicable statutory and regulatory requirements, to reflect long-term funding expectations, to ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance.

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.

The 2003 Analysis of the Management Situation (AMS) Technical Report presented information on the financial liabilities of the IPNF's National Forest System Roads:

> For the IPNFs, the annual maintenance budget would need to be approximately $6.6 million dollars and the cost to bring all roads up to their assigned maintenance level is estimated at $520 million dollars.

Table 1-28: Summary of Road Miles and Estimated Maintenance Costs by Objective Maintenance Levels

FOREST	Total Miles	Estimated Annual Maintenance Costs	Estimated Deferred Maintenance Costs
Idaho Panhandle			
Objective Maint. Level 5	99	$206,415	$99,000
Objective Maint. Level 4	258	$894,228	$1,291,290
Objective Maint. Level 3	1,965	$3,075,225	$44,275,380
Objective Maint. Level 2	2,452	$1,500,624	$96,008,060
Objective Maint. Level 1	6,819	$988,755	$378,454,500
TOTAL	**11,593**	**$6,665,247**	**$520,128,230**
Kootenai			
Objective Maint. Level 5	98	$576,534	$76,815,242
Objective Maint. Level 4	121	$3,477,540	$91,161,521
Objective Maint. Level 3	1,526	$7,347,690	$190,441,748
Objective Maint. Level 2	1,759	$3,410,701	$34,173,852
Objective Maint. Level 1	4,419	$14,043,582	$122,927,742
TOTAL	**7,923**	**$28,856,047**	**$515,520,105**

Source: USFS Infra database
Note: Approx. 28 miles of road on the IPNFs has unassigned Objective. Maint. Levels.
Approx. 31 miles of road on the KNF has unassigned Objective. Maint. Levels

(AMS Technical Report, 115.) It is important to note that the $6.6 million estimated annual maintenance costs far exceed all published estimates of road maintenance funding the IPNF has received annually at least since the AMS was published.

Although the FS never likes to conduct an analysis of—nor disclose the forest-wide ecological impacts of—its road maintenance funding shortfalls, projecting from discussion in Gucinski et al. 2001 (cited in the AMS) helps for imagining the scale of the impacts.

Gucinski et al., 2001 recognize the ongoing ecological damage of roads—regardless of the adequacy of maintenance funding:

> Undesirable consequences include adverse effects on hydrology and geomorphic features (such as debris slides and sedimentation), habitat fragmentation, predation, road kill, invasion by exotic species, dispersal of pathogens, degraded water quality and chemical contamination, degraded aquatic habitat, use conflicts, destructive human actions (for example, trash dumping, illegal hunting, fires), lost solitude, depressed local economies, loss of soil productivity, and decline in biodiversity.

Has the FS issued a Motor Vehicle Use Map (MVUM) for lands covering the project area? If so, what was the process the FS used to designate the routes open to the currently authorized motorized uses, as per the MVUM? The EA must demonstrate compliance with the minimization requirements of 36 CFR 212 Subpart B and the Executive Orders related to Subpart B.

Please disclose the full extent of documented illegal/unauthorized motorized access or use in the project area

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

Roads influence many processes that affect aquatic ecosystems and fish: human behavior (poaching, debris removal, efficiency of access for logging, mining, or grazing, illegal species introductions), sediment delivery, and flow alterations (Trombulak and Frissell 2000). (Also see: Gucinski et al. 2001; Wisdom et al., 2000; Pacific Rivers Council, 2010.)

Frissell, 2014 states:

> Roads are ecologically problematic in any environment because they affect biota, water quality, and a suite of biophysical processes through many physical, chemical, and biological pathways (Trombulak and Frissell 2000, Jones et al. 2000). The inherent contribution of forest roads to nonpoint source pollution (in particular sediment but also nutrients) to streams, coupled with the extensive occurrence of forest roads directly adjacent to streams through large portions of the range of bull trout in the coterminous US, adversely affects water quality in streams to a degree that is directly harmful to bull trout and their prey. This impairment occurs on a widespread and sustained basis; runoff from roads may be episodic and associated with annual high rainfall or snowmelt events, but once delivered to streams, sediment and associated pollutant deposited on the streambed causes sustained impairment of habitat for salmon and other sensitive aquatic and amphibian species. Current road design, management of road use and conditions, the locations of roads relative to slopes and water bodies, and the overall density of roads throughout most of the Pacific Northwest all contribute materially to this impairment. This effect is apart from, but contributes additively in effect to the point source pollution associated with road runoff that is entrained by culverts or ditches before being discharged to natural waters.

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 by systematically avoiding full compliance with Subpart A, which requires the agency to minimize the ecological and economic liabilities of its 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 forest plan revision 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:**
> • 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 IPNF 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 which didn't comply with 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. … 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.

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—makes the forest plan lacking in restoration direction.

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.

FIRE ECOLOGY

Nothing in the EA 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 only active management restores forests.

See: "'Blatant manipulation': Trump administration exploited wildfire science to promote logging" as just one more reason the executive branch cannot be trusted in regards to scientific issues, especially fire.

Please 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.

Please 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.

Please disclose the forestwide cumulative impacts of the IPNF policy decision to replace natural fire with logging and prescribed burning.

Weather and climate primarily drives fire behavior, not hazardous fuels. (Schoennagel et al., 2017); Whitlock, et al., 2015). If weather and climate drive fire, logging is not going to mitigate this primary driver.

Hart et al. (2015) found that mountain pine beetles and fire activity have each independently increased due to warmer temperatures, but mountain pine beetles have not caused the increase in fire activity. In sum, the better available science shows that mountain pine beetle outbreaks are not causing a hazardous fuels buildup and "hazardous fuels" do not cause increased fire severity, so the best available science shows that this project will neither reduce hazardous fuels nor lessen the severity of wildfires, and may actually have the opposite effect. This needs to be examined and discussed with the best available science.

Science suggests that there are far too few large dead trees to maintain ecologically healthy forests. [Hanson (2010) pp. 19-20 (citing Rocca and Romme 2009, Romme et al. 1986).] Wildfire, insects, and disease will lead to dead trees, so allowing these disturbance events, whether they happen in a short, intense time frame or a longer time frame, to continue is going to be the best route for ecologically healthy forests.

High severity fires are normal for area. (See Hanson, 2010.) Moderate and high-severity fire rotations span centuries (at least 200 years) in western North America (Odion et al., 2014; Baker et al., 2006), so science suggests the project area is within its historical range.

Please disclose the acreage of authorized but unfunded ecosystem burning and other non-logging related fuel reduction actions on the IPNF at the end of the last fiscal year.

The FS also likes to trot out the premise that tree mortality from native insect activity and other agents of tree mortality increase risk of wildfire. Again, this is not supported by science. Meigs, et al., 2016 found "that insects generally reduce the severity of subsequent wildfires. … By dampening subsequent burn severity, native insects could buffer rather than exacerbate fire regime changes expected due to land use and climate change. In light of these findings, we recommend a precautionary approach when designing and implementing forest management policies intended to reduce wildfire hazard and increase resilience to global change."

The way the subject of severe tree mortality from fire is treated in the EA and Forest Plan fails to recognize the large body of science on post-fire forest landscapes that has arisen in recent years—science not acknowledged in the Forest Plan. The FS ignores overwhelming evidence that post-fire forests represent uniqueness and biological diversity, as explained by reporters, scientists, FS experts, and other people interviewed for the articles displayed below.

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

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

We incorporate into these comments on the EA the words in the *Missoulian* article below. We highlight a few here:

- Burned forests play a critical role in the health and diversity of the Western landscape.
- Black-backed woodpeckers only gather in substantial numbers in areas hit hard by wildfire.
- Western tanagers …thrive in low-severity fires. Juncos prefer medium-severity burns. Black-backed woodpeckers, mountain bluebirds, and olive-sided flycatchers like their forests well done.
- The species that really like severely burned forests tend to be species that are tough to find, species whose populations are not what you'd call robust.
- It came as a part of a professional recognition that sometimes fire is good, that it's a necessary and natural process in healthy forests.
- Fire is …critical for red-stemmed ceanothus, a plant whose seeds can lay dormant for centuries while waiting for the flames. It's a favorite of deer and elk and moose…
- Spirea loves fire, as does fireweed and arnica and dragontail mint and pine grass. Bicknell's geranium …only appears in burns.
- (Boreal) toads like to bask in the sun and tend to produce bumper crops of tadpoles once the canopy is burned away. Researchers studying the toads think that fire suppression might be a major cause of the toad's decline in recent decades.
- Some bugs, like some birds, prefer low-intensity fires. Others want a more charred wood. It means all the fire types are important.
- A burned landscape …is no less fragile a habitat type than is a wetland. …A burned area is probably the most sensitive place you could be working in.
- We talk about forest restoration after a fire, but it just got restored. That's what fire does.

Community
Community
Medical Center Babies
Church Directory
NIE
Agriculture News
Free E-mail

Your Health
Directory of Healthcare Professionals
Hike Bike Run

Web For You
First Interstate Bank Offer
Therapist Directory
Cash Loans

Visiting
Visitor Guide
Cultural Treasures Guide

Outdoors

Birds in the black: Through following avian wildlife, a UM scientist has discovered that burned forests play a critical role in the health and diversity of the Western landscape
By MICHAEL JAMISON of the Missoulian

University of Montana professor of ornithology and research scientist Richard Hutto began studying fire's effect on birds soon after the 1988 fires blackened thousands of acres in Montana and Yellowstone National Park. Of particular interest was the black-backed woodpecker's reliance on hotly burned forests.
Photographed by MICHAEL GALLACHER of the Missoulian

WEST GLACIER - Back in the summer of 1988, when research scientist Richard Hutto started asking questions about the possible benefits of wildfires, the time wasn't exactly ripe for a reasoned discussion.

Yellowstone National Park was going up in smoke, national forests looked like war zones, and the public was clamoring for more wildland firefighters, more firefighting dollars and more protection from blazes. Headlines nationwide screamed out adjectives such as "torched," "blackened" and "destroyed."

"What I wanted to know," Hutto said, "was what in the world is a burned forest worth? Is there any value at all in all that destruction?"

With support from the National Geographic Society, Hutto set off on his search for answers, a search that would follow the unlikely path of the black-backed woodpecker. After visiting some three dozen sites burned in 1988, "one of the most interesting things that popped up right away was the fact that there was a whole lot of life out there," he said. "It wasn't the biological desert we were told it would be."

Hutto, like most of America, "was raised to believe all fires are bad."

The problem, he said, is that science and society never made the distinction between a fire that claims lives and property and a fire that burns across the West's wild landscapes.

"We use the same language for both," he said, and generally it's the language of the negative - fire as foe, not friend.

But it didn't take long for Hutto to find 100 separate species booming the year after the burn. Surprisingly, many of those were found only in severely burned forests - the blacker the better.

He focused his work on black-backed woodpeckers, birds that seemed to flock to fire like moths to the flame.

"I'd never seen them anywhere else, essentially," said Hutto, a professor of fire ecology and ornithology at the University of Montana.

And so for the next 15 years, he tracked the birds through forests - and through the scientific literature. He pored over studies of vegetation types, looking for lists of birds that appeared frequently in certain sorts of habitats. In all, he found 15 avian species that seemed to prefer recent burns to all other forest types.

But again, the most extreme was the black-backed woodpecker, "which actually seemed to require burned areas," Hutto said.

All the studies were anecdotal, though. What he needed was hard evidence.

For a decade and then some, Hutto helped craft and conduct systematic bird surveys on Forest Service lands, "in every kind of vegetative type out there."

The results supported his suspicions: Black-backed woodpeckers only gather in substantial numbers in areas hit hard by wildfire.

The next step, he said, was to figure out what sort of burn the birds need. He considered what sort of forest was on the ground before the burn, computed the severity of the fire, crunched data on whether the land was logged or left to nature after the burn.

Again, he was surprised.

"We found the severity issue is really interesting," Hutto said. "Severity is a big, big deal. A fire is not a fire is not a fire. There are species that are very particular about what kind of fire they like."

Western tanagers, for instance, thrive in low-severity fires. Juncos prefer medium-severity burns. Black-backed woodpeckers, mountain bluebirds and olive-sided flycatchers like their forests well done. And the woodpeckers generally prefer thick-barked trees, ponderosa pine and Douglas fir, trees that withstand all but the hottest fires.

Perhaps not surprisingly, the species that really like severely burned forests tend to be species that are tough to find, species whose populations are not what you'd call robust.

Hutto suspects that might have something to do with national wildfire policy, beginning with the big burns of 1910. Some three million acres went up in smoke that year throughout Montana and Idaho, prompting an aggressive firefighting policy aimed at snuffing every blaze.

Species that for millennia had evolved with fire, were actually dependent upon fire, did not fare so well under the post-1910 policy, Hutto suspects. It's tough enough to live in a narrow niche. It's even tougher when forest management eliminates that niche.

It wasn't until about the time that Hutto first started asking questions about fire and ecology that the scientific community was willing to give fire its due. It was, they concluded, a natural force that could be used as a tool for managing forests on the landscape level.

In 1983, the first fire was quietly left to burn in the Bob Marshall Wilderness, a lightning strike that grew finally to 230 acres.

"It was a huge moment for people who had been taught for decades that all fires are bad and should be put out immediately," Dale Luhman told the Missoulian last year. Luhman is resource assistant for the Forest Service. "But it came as part of a professional recognition that sometimes fire is good, that it's a necessary and natural process in healthy forests."

Most folk know about lodgepole pine and their serotinous cones that open only under the heat of wildfire. But beyond the lodgepole, almost all Western landscapes are fire-adapted to some degree, from the soil beneath to the plants and animals above.

Western larch, for instance, hate the shade. They need a fire to create a clearing, and then they have about three to five years to take root before the window of opportunity is shaded over by competitors.

Fire is also critical for red-stemmed ceanothus, a plant whose seeds can lay dormant for centuries while waiting for the flames. It's a favorite of deer and elk and moose, popular big-game species that gobble it down like so much leafy ice cream.

Spirea loves fire, as does fireweed and arnica and dragontail mint and pine grass. Bicknell's geranium, like ceanothus, only appears in burns.

Then there's the mysterious boreal toad, which some scientists believe might be another in the growing list of known fire-dependent species. Turns out, the toads like to bask in the sun and tend to produce bumper crops of tadpoles once the canopy is burned away.

Researchers studying the toads think that fire suppression might be a major cause of the toad's decline in recent decades. It is an argument not lost on Hutto, who believes his woodpeckers and other species might be few and far between in part because their blackened habitat has been greatly diminished by way of fire suppression.

For the black-backed woodpecker, Hutto figures it all comes down to beetles, particularly beetles that specialize in burned areas.

"Their biology is amazing," he said. Some bugs have infrared detectors built into their thorax, detecting the heat of a wildfire from 100 miles away. Others have antennae that can sniff out smoke.

"They evolved that way because fire has been a natural part of the process for so long," he said. "The world is built around these big fires. The diversity of life needs wildfire."

The beetles generally move into trees killed or weakened by the blaze, and the birds move in to eat the beetles.

Some bugs, like some birds, prefer low-intensity fires. Others want a more charred wood. It means all the fire types are important, Hutto said, including the red-hot, high-intensity burns that run fast across the forest, scorching everything in their path.

"The birds," he said, "that's just scratching the surface. If the public knew how special these burned areas are, our perception might change. We might change the way we think about fire."

Hutto's been convinced by the "big mixed flocks of woodpeckers you see in the winter. You only see that after a fire. We still have no idea how important these areas are for supporting the wintering population."

He figures they're migrating to the wildland fires even as the flames create their future habitat, drawn by the towering columns of smoke that can spiral 30,000 feet into the sky. They work the bugs for a few years, until another smoke column appears on the horizon, following the flames like so many morel mushroom pickers.

To help pin down where they live when fire is absent, other scientists are sampling blood from black-backed woodpeckers, hoping to map the birds' genetic distribution by way of DNA analysis.

"We know they're semi-nomadic, in a sense," Hutto said, "but we don't really know how far they range or how much overlap there is between populations."

The more he understands the woodpeckers, he said, the more science will understand the role of fire. His woodpeckers are a tool, he said, a way to tease out the mysteries of habitat and life cycles.

Hutto hopes the answers to his questions might someday inform the way we log burned areas after a fire - the way we value a burned landscape. It is no less fragile a habitat type than is a wetland, he said.

"Personally, I've come to think we need to change our thinking on salvage logging," he said. "There are other values in the forest. In fact, a burned area is probably the most sensitive place you could be working in."

And yet current forest policies often exempt fire salvage logging from rigorous environmental review.

"The public really hasn't caught on to this yet," Hutto said. "People still want to get the cut, get the trees they see as wasting away. They want the economic value."

But there are values, he said, far older and more fundamental that are too often ignored.

"We talk about forest restoration after a fire," he said, "but it just got restored. That's what fire does. We know that, but we can't seem to get the message out.

"Until you start thinking like a black-backed woodpecker, you just ain't going to get it."

Reporter Michael Jamison can be reached at 1-800-366-7186 or at mjamison@missoulian.com.

We incorporate the words in the following *Billings Gazette* article as comments on the EA. We highlight a few here:

- As fire burns across the landscape, it releases huge amounts of nutrients tied up in slowly decomposing plants, leaves, twigs and trees. When those nutrients settle into the soil and slow, steady rains come - as they have recently - the underground roots get a charge and life springs from the ground.
- It's doing exactly what it should be doing. It's the epitome of how the system should work.
- The regrowth of plants not only is the first step toward revegetating the landscape but also plays an important role in stabilizing the soil, reducing erosion and lessening runoff.
- Fire …reinvigorates the environment.

Billings Gazette
Published on Wednesday, October 11, 2006.

Out of fire's destruction comes new growth

By MIKE STARK
Of The Gazette Staff

For all of a wildfire's smoke, heat and bluster, it doesn't always leave behind death and destruction.

In recent weeks, carpets of bright green grass have sprung up in places charred and blackened by this summer's largest fires, including the Derby Mountain, Pine Ridge and Bundy Railroad complexes.

"That stuff is coming on pretty fast," said Chuck Roloff, with the Natural Resources Conservation Service in Big Timber, who has been tracking the aftermath of the Derby Mountain fire.

As fire burns across the landscape, it releases huge amounts of nutrients tied up in slowly decomposing plants, leaves, twigs and trees. When those nutrients settle into the soil and slow, steady rains come - as they have recently - the underground roots get a charge and life springs from the ground.

This year, in the aftermath of Montana's large fires, it has been textbook.

"It's doing exactly what it should be doing," said Larry Padden, a rangeland management specialist for the Bureau of Land Management in Billings. "It's the epitome of how the system should work."

The regrowth of plants not only is the first step toward revegetating the landscape but also plays an important role in stabilizing the soil, reducing erosion and lessening runoff.

In most cases, what was growing on a patch of land before the fire is what will return, usually in greater abundance. In many places, cool-weather annual grasses tend to come on fast, but then they have to fight for sunlight, nutrients and moisture with longer-lived perennial grasses.

"There's a real big competition game going on right now," Padden said.

In the area of the Derby Mountain fire, 3 to 5 inches of rain have fallen in recent weeks that, unlike gullywashers that roll roughshod over the ground, have been steady and slow enough to percolate into the soil, Roloff said.

Some of the grasses now are 2 to 3 inches tall. One of the most visible examples is near Reed Point, where the Derby Mountain fire burned up to Interstate 90.

"That looked pretty nuked about a month ago," he said. "But it's coming back."

Some species, such as sagebrush, are much slower to return. And in heavily timbered forests, places where sunlight rarely reached the ground in the first place, the recovery can take longer.

Padden looked at one of those spots late last week and saw hardly anything growing.

"It's pretty bleak under there, and it'll take some time," he said.

A few weedy species will crop up next year, perhaps with some native forbs and grasses. Land managers keep an eye for opportunistic invasive species, such as cheatgrass or leafy spurge, that move into disturbed areas - including those hit by firefighting bulldozers - and crowd out native species.

Despite the vigorous post-fire growth this fall, much progress remains to be made, Padden said. Although the growing plants help provide grazing fodder for wildlife and stock, erosion remains a concern.

"We're not out of the woods yet. We're hoping for an average or above-average winter," Padden said.

A good snowpack and freeze in the winter, along with spring rains, will help keep the plant roots from dehydrating and will promote further growth.

Fire may exact an economic toll - that was certainly the case this year in terms of property damage and millions of dollars spent on firefighting - but it has for eons been a source for recycling nutrients and spurring new life.

"It reinvigorates the environment," Padden said.

We incorporate the words in the below Spokesman Review article as comments on the EA. We highlight a few here:

- Waters in Idaho and Montana are famous for their thriving native populations of bull trout and westslope cutthroat trout because of—and despite—major forest fires. …(They) are well adapted to big 100-year or even 500-year fire events.
- While hot fires can bare the ground, change soil composition and temporarily foul stream sections with sediment, they also tend to add a lot of large woody debris to stream channels. The logs create scour areas that expose the clean and larger gravels important for spawning, incubation, and fry rearing as well as for insect production. Large wood also provides lots of cover and channel complexity that fish such as bull trout and cutthroat trout have an affinity for. A lot of deadfall can provide a fair bit of shade to protect stream temperatures. And fire often delivers nutrient pulses that can stimulate primary productivity, making more bugs and other fish food.

Wildfires can be a boon to fisheries

Rich Landers richl@spokesman.com, (509) 459-5508

Fishermen need not fear the impact of fire on their sport.

But they need to keep their guard up when humans want to fiddle in their favorite mountain streams.

The St. Joe River, Kelly Creek, Fish Creek and other waters in Idaho and Montana are famous for their thriving native populations of bull trout and westslope cutthroats because of – and despite – major forest fires.

Idaho Fish and Game Department research confirms that native fishes, especially those that can migrate, are well-adapted to big 100-year or even the 500-year fire events.

While hot fires can bare the ground, change soil composition and temporarily foul stream sections with sediment, "they also tend to add a lot of large woody debris to stream channels," said Chip Corsi, Idaho Fish and Game Department regional manager in Coeur d'Alene.

The logs create scour areas that expose the clean and larger gravels important for spawning, incubation, and fry rearing as well as for insect production, he said.

"Large wood also provides lots of cover and channel complexity that fish such as bull and cutthroat trout have an affinity for," he said. "A lot of deadfall can provide a fair bit of shade to protect stream temperatures.

"And fire often delivers nutrient pulses that can stimulate primary productivity, making more bugs and other fish food."

Intense fires, such as those in 1910, can kill fish in some areas by raising water temperatures.

But if the fish have a history of migrating, and the drainage is not otherwise impaired, fish will return to spawn in following years, he said, citing the most recent fisheries studies following the intense 1990s fires near Boise.

Native fisheries – more specifically "healthy" native fisheries – are adapted and resilient to natural events such as intense forest fires, he said.

"Had the migratory component of those fish populations been impaired for other reasons – migration barriers, over-fishing, de-watering, pollution, and so on – the likelihood of recolonization, and hence resiliency, goes way down."

We also incorporate the words in the following *Washington Post* article as comments on the EA We highlight a few here:

- Life doesn't end with a forest fire. The trees of the forest may be destroyed, but the forest community isn't destroyed—it's rejuvenated.

- Although crown fires killed the trees in July and August 2000, seeds often survived in the cones, which were saturated with water. A rapid crown fire may singe a cone, but the seeds will be protected. After the fire, as the cones dry out, the seeds will drop out. Undamaged cones will open with dry wind and be carried away. During the ensuing fall, seeds were dispersed upslope by afternoon winds formed by hot air rising from the valleys. Seeds may also have been pushed in any direction by strong winds generated by cold fronts.

- Once the seeds hit the ground and germinated, the plants thrived in nutrient-rich ash. With fall and spring rains, plus melting snow, the nutrients seeped into the mineral soil. It's gourmet city for coniferous tree seedlings.

- Up to 70 percent of the plant species in some forests in the northern Rocky Mountains are well adapted to survive severe burning.

- Standing dead trees …played an important role by providing transitory shade that helped moderate the ground surface temperature during the heat of the day.

- Fires also ushered in surprise plants that can show up by the thousands that weren't there before. The seeds of these plants can lay dormant from 200 to 400 years, and they only germinate after a fire.

By Mark Matthews
Special to The Washington Post
Monday, September 16, 2002; Page A09

During the summer of 2000, the biggest fires since 1910 burned through the Bitterroot and Lolo forests that surround the college town of Missoula, Mont., charring about 370,000 acres and destroying 70 homes.

During the past two summers, while fires have raged in other parts of the country, those seemingly dead forests have had a chance to burst back to life, offering a clear picture of how forests recover from fire--and scientists an exceptional arena for study.

“Life doesn't end with a forest fire,” said Peter Stickney, a retired U.S. Forest Service plant ecologist. “The trees of the forest may be destroyed, but the forest community isn't destroyed—it's rejuvenated.”

While seedlings were planted in some of the charred areas, more than 19,000 acres at Ninemile remained untouched, and officials wanted to know how the most intensely burned drainages—about 7,000 acres worth—were faring.

Because the fires burned cooler in some spots and hotter in others—incinerating everything down to mineral soil—recovery could occur in a mosaic pattern. Not a bad thing, per se, but natural regeneration—if it occurred too slowly—could adversely affect wildlife diversity and future logging operations. A slow recovery might also lead to erosion on steep slopes, which could jeopardize water quality and native fisheries.

Steve Slaughter, a Ninemile silviculturist, hired a half-dozen seasonal workers to count the number of trees that had germinated in the past two years in the eerie, sun-baked forests. As the workers made their way through narrow canyons and up to alpine ridges, ranging in elevation from 3,500 feet to 7,500 feet, crew members routinely stopped to measure random plots of 1/100th acre in size—an 11.8-foot radius on flat ground—and count every tree by species within the circle. Some germinants barely peeped out of the gray, ashy soil, while others stretched up to six inches in height.

Glen Teeters, a crew member and retired teacher from Alberton, Mont., said the rebirth looked pretty good. “I'd say about 90 percent of the units we surveyed were coming back adequately.”

On a few steep slopes where the fire burned so hot it did not even leave any ash, the baked soil remained barren. But in many other areas, Teeters tried not to tread on the germinants that carpeted the slopes for acres on end.

Ray Shearer, a plant ecologist with a U.S. Forest Service lab in Missoula, isn't surprised by the bounty. “Nature is absolutely amazing,” he said.

Although crown fires killed the trees in July and August 2000, seeds often survived in the cones, which were saturated with water.

“A rapid crown fire may singe a cone, but the seeds will be protected,” Shearer said. “After the fire, as the cones dry out, the seeds will drop out. Undamaged cones will open with dry wind and be carried away.”

During the ensuing fall, seeds were dispersed upslope by afternoon winds formed by hot air rising from the valleys. Seeds may also have been pushed in any direction by strong winds generated by cold fronts.

Trees in the Ninemile area had produced a good cone crop right before the 2000 fires, Slaughter said. Once the seeds hit the ground and germinated, the plants thrived in nutrient-rich ash. With fall and spring rains, plus melting snow, the nutrients seeped into the mineral soil. “It's gourmet city for coniferous tree seedlings,” Stickney said. In another year or two, most of the ash will disappear.

Other benefits for the trees included more moisture in the soil, more light and less competition from brush and forbs, broad-leafed herbaceous plants. Standing dead trees also played an important role by providing transitory shade that helped moderate the ground surface temperature during the heat of the day.

But the Ninemile crew saw much more than trees.

“In truth, fire is a force of transition that modifies a forest community of plants and animals,” Stickney said. “It allows certain types of plants to be there that wouldn't be there otherwise.”

Plants that root in the duff—such as twinflower, kinnikinnik and prince's pine—perished, but others “you couldn't kill with the fires we had that summer,” Stickney said. “Up to 70 percent of the plant species in some forests in the northern Rocky Mountains are well adapted to survive severe burning.”

During his surveys in the spring and summer, Teeters recalled seeing slopes covered with mass flowerings—sheets of golden arnica, rose-purple fireweed, lavender-blue aster, purple lupine, white spirea, and straw-colored pine grass. Where the fire had not burned severely, the four-foot, white-flowered stalks of bear grass waved in breezes like giant bottle cleaners.

Many of the plants, such as lupine, aster and arnica, survived because their root crowns or rhizomes were protected from the fire's heat by mineral soil.

Other plants, such as fireweed and pearly everlasting, colonized the area after drifting in as light, feathery seeds from unburned sites.

Some plants flowered in mass only the first year following the fires; others, only the second. Some species, such as Bicknell's geranium—a delicate, stringy plant with tiny, pink flowers—and dragonhead, will quickly disappear after this second summer, and be unseen until the next fire event. Some perennials, such as fireweed and wild hollyhock, will flower in mass several more years.

Fires also ushered in surprise plants that “can show up by the thousands that weren't there before,” Stickney said. “The seeds of these plants can lay dormant from 200 to 400 years, and they only germinate after a fire.”

The most studied surprise plant is shiny leaf ceanothus, commonly known as snowbrush for its masses of small white flowers. “The seed of ceanothus has to go through two doors of treatment before it can germinate,” Stickney said. “First, it cannot absorb moisture until it is treated with heat. Second, the seed then has to go through a cold treatment before it can germinate.”

Stickney believes that dragonhead, of the mint family, and Bicknell's geranium follow the same process. “When you see the same thing happening 20 or 30 times in various places, you start to figure that those seeds are doing the same thing.”

Herbs now dominate the regenerating forest at Ninemile, but shrubs will take over during the next few summers. In a couple of decades, trees will again be the dominant species.

It will take a few more years for most forest visitors to note that the trees have returned to the charred forests. Teeters, for one, thinks the charred landscape will become more inspirational as time passes.

"I recently visited Yellowstone National Park," where crown fires charred thousands of acres of lodgepole pine forests in 1988, he said. "I think the fires made the park even better. They opened up the woods and made the park much more interesting to drive through. Plus, those trees are growing back like crazy—everywhere you look."

Next, we incorporate the words in another *Missoulian* article, as comments on the EA. We highlight a few here:

- It came as part of a professional recognition that sometimes fire is good, that it's a necessary and natural process in healthy forests.

- It's an excellent complex of fires. It's going to create a whole lot of different resource benefits. The benefits, are quite extensive and complex, and it's very hard to list them all.

- Most of the region's big stands of larch are more than 200 years old, and many are between 400 and 800 years old. That means that when you look at the autumnal mosaic of green and gold - created by stands of evergreens and golden larch - you're really looking at the patchwork of a historic fire.

- The outfitting community understands that the short-term loss could, in fact, be a long-term gain. The fires will open up more browse for deer and elk and moose, which are, of course, the outfitters' bread and butter. It's part of that complex connection of resource benefits.

- Fire is the only way we have to manage Western ecosystems at the landscape level. If we're patient enough to let nature work, the benefits to the future will be huge. Tomorrow's forests will be healthier, and tomorrow's fires will be smaller. There's a tremendous value in fire. We need to remember, all these lands have burned before, and they're all going to burn again. It's nothing new.

What in the blazes?
By MICHAEL JAMISON of the Missoulian

Official says letting fires burn sometimes can have great benefits

HUNGRY HORSE - Two decades back, in the summer of 1983, the unthinkable happened deep in the heart of the Bob Marshall Wilderness.

Lightning struck, a tree burst into flame, a wildfire crept up a mountainside - and firefighters simply sat back, waiting and watching.
No hand crews, no helicopters, no smokejumpers. Eventually, left to roam where fuel and wind would take it, the fire burned across some 230 acres.

"It was a huge moment for people who had been taught for decades that all fires are bad and should be put out immediately," said Dale Luhman. "But it came as part of a professional recognition that sometimes fire is good, that it's a necessary and natural process in healthy forests."

Today, Luhman is resource assistant on the Forest Service's Spotted Bear Ranger District, located at the northern end of the Bob Marshall Wilderness Complex near the town of Hungry Horse.

In the years since that unthinkable event, he said, foresters have become even more convinced that wildfire should sometimes be allowed to burn.

Which is exactly why, when lightning hit Pagoda Mountain and Little Salmon Creek the night of July 19, there were, once again, no hand crews, no helicopters, no smokejumpers.

This time, the fire was joined by other fires, until more than a dozen separate starts spread into what would become known as the 88,334-acre Little Salmon Complex.

"It's an excellent complex of fires," said Steve Wirt, wilderness fire manager on the Spotted Bear District. "It's going to create a whole lot of different resource benefits."

The benefits, he said, are "quite extensive and complex, and it's very hard to list them all."

Most folk know about lodgepole pine and their serotinous cones that open only under the heat of wildfire. But Wirt points out that almost all Western landscapes are fire-adapted to some degree, from the soil beneath to the plants and animals above.

Western larch, for instance, hate the shade. They need a fire to create a clearing, Wirt said, and then they have about three to five years to take root before the window of opportunity is shaded over by competitors.

Most of the region's big stands of larch are more than 200 years old, he said, and many are between 400 and 800 years old. That means that when you look at the autumnal mosaic of green and gold - created by stands of evergreens and golden larch - you're really looking at the patchwork of a historic fire.

"It's like looking through time at a fire that happened hundreds of years ago," Wirt said.

But not everyone, of course, is happy with the Forest Service's policy of letting wilderness fires burn - a plan known as Wildland Fire Use in agency jargon.

When the Little Salmon Complex ran through the Bob Marshall this summer, it ran over outfitters' hunting grounds, as well as a few long-established outfitting camps. For people who make their money in the wilderness, a policy that allows the woods to burn can be unsettling at best.

"I can't tell you how much time we've been spending with the outfitters," said Deb Mucklow, district ranger on the Spotted Bear. "We've tried to minimize the impacts in every way possible."

That's meant allowing some wiggle room in the outfitting permits and keeping in daily contact with the 40 or so outfitters who operate in lands affected by the Little Salmon Complex.

"We really tried to keep as much of the forest open as possible," Mucklow said.

She and her staff helped outfitters get access the general public did not enjoy. She helped them find alternate routes, helped them get into the woods in time to set up fall hunting camps.

The outfitters themselves "really pulled together as a group, too," Mucklow said. Some lost business, with clients scared off by reports of fire and smoke. Those outfitters gave up their permitted camps to outfitters who still had clients but could not use their traditional camps.

"The Forest Service did a good job working with us," said Belinda Rich, whose husband is a Seeley Lake outfitter. "For a stressful event, it went pretty darn well."

The Rich family actually lost part of their traditional hunting grounds to the fires, she said, "and it almost took the whole camp."

But, she said, "we understand that allowing it to burn and get back into a normal fire process again is important."

Mick Cheff agrees. He's been outfitting for longer than he cares to recall, "and we got hit worse than anybody," he said. "We have two main camps, and we were burned out of both of them."

Still, he said, the Forest Service "did a great job working with us outfitters. It's been a real good partnership. I myself am actually in favor of the let-burn policy. This year, though, we got a little more than we'd hoped for."

Still, Cheff says, the outfitting community understands that the short-term loss could, in fact, be a long-term gain. The fires, he said, will open up more browse for deer and elk and moose, which are, of course, the outfitters' bread and butter.

"It's part of that complex connection of resource benefits," Wirt said.

Take red-stemmed ceanothus, for instance. The plant's seeds can lay dormant for 400 years or more, waiting for the heat (and subsequent freeze and thaw) that enables them to germinate.

New growth pops up only in the year after a fire. Then, the plants grow for a couple of decades, producing seeds that drop and lay dormant, waiting for another fire.

"It's the ice-cream plant for our browsers," Wirt said. "The deer, elk and moose just love it. It's a key plant on their winter range, and it really carries them through the long winters."

And so the fires that disrupt the outfitters spark the plants that sustain the big game that the outfitters rely upon.

Which may explain why the outfitters aren't screaming louder about the Wildland Fire Use program, even if they aren't entirely thrilled.

"Sure, some people will be impacted," Luhman said. "But you really can't overestimate the benefits of fire in Western forests. And if you can't allow natural processes in the wilderness, where can you?"

Which is not to say wilderness has become a hands-off, anything-goes inferno of unchecked wildfire. In fact, of the 50 or more starts sparked in the Bob this summer, only a dozen or so were classified as Wildland Fire Use fires. The others were snuffed or steered or otherwise managed by firefighters.

Within the 1.5 million-acre wilderness complex, about 90,000 acres burned, and within those 90,000 acres there remains a whole lot of green. Wirt figures that, on average, big Western wildfires usually burn hot across about 10 percent of their total acreage. Another 40 percent or 50 percent of the acres burns moderately, sweeping the underbrush out while leaving the mature trees. The remaining 30 percent or 40 percent is untouched.

"The Little Salmon created a beautiful fire mosaic," Wirt said. "From a modern land manager's view, it was very successful."

From yesterday's land manager's view, however, it was shocking.

Western wildfire policy has evolved through many years, Wirt said, beginning in the years directly following the big fires of 1910, when 3 million acres of Montana and Idaho went up in smoke.

Then came the "10 a.m." policy, when firefighters were expected to have a blaze in hand by midmorning following the evening lightning storm.

"I was fighting fire in those days," Wirt said. "You'd get a call in the middle of the night and take off, hiking into some remote wilderness."

It worked great, he said, until the 1970s, when land managers realized that all the wood they'd kept from burning had been stacking up for decades. They had missed, he said, at least two natural fire cycles, and the pile of fuel was growing.

"There was a recognition that we couldn't put all the fires out anymore," Wirt said. And, at the same time, "we were beginning to understand how to work with fire as a natural tool in the ecosystem."

The subsequent policy - known commonly as "let it burn" - smoldered along quietly until 1988, when parts of Yellowstone National Park burned. It was hard to say what was hotter, Wirt said, the policy, the politics or the fires themselves.

Land managers reassessed and set new parameters for allowing wildland fires to burn.

Today, he said, the side rails for wildland fires are set long before the fire season. A fire management unit is demarcated (such as the Bob) and within that, fire management areas are plotted. Then, parameters are set, including the time of year and the climate and the type of terrain.

When a fire starts, land managers use those designations, as well as more immediate information, to determine whether to let a fire run or to attempt to snuff it.

If it's far from the wilderness edge and doesn't look like it might run out onto private land, then it's likely to be managed under the Wildland Fire Use policy.

In the case of the Little Salmon, Luhman said, land managers figured they had about 450,000 acres of wiggle room between the fire and any potential hazards, and so they stepped back to monitor the fire.

Later fires, however, were snuffed, or at least wet down, as land managers were concerned about their location or the fact that so many acres already were burning on adjacent lands.

The idea, Luhman said, was to use fire as a management tool while still keeping some of the wilderness open. And so they let the Little Salmon Complex burn up north, while smothering other wildfires in the Bob's southern portion.

"Generally," he said, "it's a natural event, and we're going to let it run its natural course. I mean, a big reason of having wilderness in the first place is to let nature do its thing. But there are social considerations, as well, and we try to take all that into account."

And so firefighters fought wilderness fires all summer, even as the Little Salmon Complex burned largely unchecked.

That is not to say, however, that it was entirely unchecked. In fact, people were checking it every day, from the air and from the ground, monitoring growth and heat and wind and weather and a host of other variables.

"This isn't a passive thing," Luhman said. "We might not be fighting the fire, but we're very active on it."

The idea, he said, is not just to let fire run wild everywhere.

"Ecologically, that might be fine," he said. "But socially, how much fire can we handle at a time?"

That question - how much fire we can handle - is also central to the wilderness fire policy. Fires burning in the backcountry take a back seat to fires burning into subdivisions, and with resources already spread thin, Mucklow figures there weren't enough people or dollars to work the fires on her district, even if they had wanted to.

"We've known for years that we can't control all the fires everywhere all at once," she said. "There's only so much you can do."

And part of what you can do is to stand back and do nothing at all. Wirt believes that, having stood back in 1983 and watched as 230 acres of wilderness went up in smoke. Since then, he's watched thousands of acres burn, and he's seen how time and Mother Nature conspire to regenerate healthy forests.

"Fire is the only way we have to manage Western ecosystems at the landscape level," he said. "If we're patient enough to let nature work, the benefits to the future will be huge. Tomorrow's forests will be healthier, and tomorrow's fires will be smaller. There's a tremendous value in fire. We need to remember, all these lands have burned before, and they're all going to burn again. It's nothing new."

Reporter Michael Jamison can be reached at 1-800-366-7186 or at mjamison@missoulian.com

We incorporate the words in the below KCET article as comments on the EA. We highlight a few here:

- Three weeks, $40 million in firefighting costs, five injuries, and …one lost home later, the Lake Fires quietly burned itself out, leaving a wide swath of devastation in its wake. Or so I imagined. But on this bright morning in early October, hiking through some of the worst burn, I'm surrounded by green leaves, flowing water, and the bright songs of birds. If this is devastation, it's the hopeful kind.

- The grove's aspens were hit hard by the fire: the forest is blackened… And yet this forest isn't killed. Just three months after the Lake Fire, the aspens are coming back, and they're doing so at a rate that …surprises, …new trees already three and four feet tall growing throughout the forest. Nearby willow shrubs, not be outdone, are sporting new growth five and six feet tall.

- Woodpeckers are among the first birds to arrive in a freshly burned California forest, and as they mine the snags' trunks for beetle larvae they also take time to create new real estate opportunities, in the form of cavity nests in the standing snags. A male downy or hairy woodpecker will dig out three or four cavities. His mate will select one and they'll move in. That leaves two or three perfectly good new homes for other birds, and potentially for smaller mammals.

- One Jeffrey pine after another …had been marked off as dead by the Forest Service. Most had verdant new green needles crowding out the fire-damaged brown ones. When examined by foresters, those green needles had been lurking in leaf buds, protected from the brief flash of heat that had killed the trees existing needles. Now, in a flush of new growth—the phenomenon is called "flushing"—the Jeffery pines were showing that reports of their death had been exaggerated.

FORESTS

Forest Renews Itself in the Wake of 'Devastating' Lake Fire

Chris Clarke | October 27, 2015

Behind an incinerated Wilderness sign, Chad Hanson looks at a rejuvenated aspen grove | Photo: Chris Clarke/KCET

In June, the Lake Fire near Big Bear in the San Bernardino Mountains burned an area the size of San Francisco: 31,359 acres, just shy of 49 square miles. My neighbors and I in Joshua Tree watched nervously as the bright orange flames lit the night sky to the west, and smoke hung heavy for weeks in our skies and our lungs.

It wasn't a huge fire by Californian standards, but it was intense, with individual flames so large we could see them from 35 miles away, and fire crews struggled to cover ground on the steep and broken slopes of San

Gorgonio Mountain's north face. For three weeks we watched and crossed our fingers as neighbors upslope were evacuated, and when the fire finally petered out in early July with just one dwelling burned our relief was ambiguous: that one house belonged to someone many of us in town knew. This fire was personal.

Three weeks, $40 million in firefighting costs, five injuries, and that one lost home later, the Lake Fire quietly burned itself out, leaving a wide swath of devastation in its wake. Or so I imagined. But on this bright morning in early October, hiking through some of the worst of the burn, I'm surrounded by green leaves, flowing water, and the bright songs of birds. If this is devastation, it's the hopeful kind.

I've hiked into the hills above the Heart Bar Campground, up in the headwaters of the Santa Ana River, to take a look at the forest three months after the Lake Fire went out. With me is Chad Hanson of the John Muir Project, a forest ecologist who lives in nearby Big Bear. (Full disclosure: the John Muir Project is a project of Earth Island Institute, for which I worked a decade ago.) I'm a little out of breath: we've just hiked in two miles up and over the ridge between the Santa Ana and Fish Creek. It's just a moderate climb of about 400 feet and change, but at 7,200 feet we're about 5,000 feet higher than where I woke up this morning.

Hanson's used to the altitude, so I breathe while he talks. We're in the popular Aspen Grove area, right at the north edge of the San Gorgonio Wilderness, about 1,500 acres of land designated a "high-intensity" burn area in the Lake Fire. The grove's aspens were hit hard by the fire: the forest is blackened, as is the Forest Service's wooden sign announcing the wilderness boundary.

And yet this forest isn't killed. Just three months after the Lake Fire, the aspens are coming back, and they're doing so at a rate that even surprises Hanson, new trees already three and four feet tall growing throughout the forest. Nearby willow shrubs, not to be outdone, are sporting new growth five and six feet tall.

"The fire didn't kill the aspens here," says Hanson. "It just killed the top growth. The roots came through fine. I'd guess there are about five times as many aspen trees in this grove now as there were before the fire."

A giant aspen grove can often be a single organism, a network of subterranean roots with hundreds of trees growing from it, all germinated from a single seed centuries ago. Each tree may live 100 years or less but the organism lives on, growing new trees to replace those that die. Whether the Aspen Grove here on Fish Creek is one organism or several, the fire seems to have damaged it only in the same sense that a mower damages a healthy lawn. The top portion removed, the grove is growing back.

That's not to say the fire hasn't changed the aspen grove radically. Above the last three months' new shoots, blackened aspen trunks stand stark against a flawless blue sky. Where a year ago the breeze would have raised the sound of a million aspen leaves clapping softly, it now whistles a little through bare branches. You can still smell the fire: it's faint, as though someone in the neighborhood burned some cordwood in a fireplace a few hours ago.

The smoke scent is a minor note. Mostly, there's sun, the song of birds and the busy whine of insects, and the musical passage of Fish Creek as it heads clear and cold over one blackened shelf, and then another.

I'd expected the Lake Fire's high intensity burn area to be somber, promising renewal only in the abstract for people who could spot subtle signs of recovery. Instead, the place is *cheerful*, the life in it exuberant.

We fight forest fires. It's what we do. The notion that naturally occurring fire is wholly destructive is deeply ingrained in modern American culture. It predates Bambi. It predates Smokey the Bear. Though earlier human societies had a more measured relationship with wildfire, the attitude toward wildfire in the American West has been almost uniformly negative since the so-called "Big Blowup" of August 1910, in which an estimated 3 million acres of forests burned in 11 western states, and at least 85 people killed. In the wake of that fire season, the U.S. Forest Service -- just five years old when the Big Blowup hit -- determined as an agency that prevention was its main strategy for managing forest fires, and in fact a main strategy of the agency for all aspects of forest management.

A hint of one possible reason can be gained from U.S. government's assessment of the damage done by fires in the Big Blowup. As reported by the Forest History Society,

> *Official reports after the Big Blowup estimated that 1,736 total fires burned more than 3 million acres of private and federal land and consumed an estimated 7.5 billion board feet of timber.*

A "board foot" is a standard measure of a tree destined to be cut down and then cut up for lumber. A standard two-by-four ten feet long is about 4.4 board feet. Aside from the obvious tragedy involved in the human death toll from the Big Blowup, the devastation with which that nascent Forest Service was concerned in 1910 was with the loss not of western forest ecosystems, but with the commodities that could be extracted from those ecosystems.

Here's another hint: unlike the National Park Service, the Bureau of Land Management, the U.S. Fish and Wildlife Service, and other federal agencies tasked with managing and preserving public lands and the wildlife that depends on them, the U.S. Forest Service is part of the U.S. Department of Agriculture. Our National Forests have long been seen, first and foremost, as a crop, and anything that threatens the harvest of board feet is a crisis to be fought.

For more than 70 years after the Big Blowup, fire was treated as an out and out enemy by federal agencies. During that time, though, the science marched off in a different direction. By the time the forests of Yellowstone

National Park famously caught fire in 1988, a few federal land management agencies had nuanced their position somewhat. A century of fire suppression had changed the West's forests: fuel loads were increasing because the frequent small fires that would have consumed dry brush, grasses, and small trees had been prevented. Gone were the "open, park-like" forests settlers had found in the 19th Century. Ecologists began to study the history of fires in the Western states, including a lengthy prehistoric record of Native people setting deliberate fires to manage the landscape.

Science was a few steps ahead of public awareness: the National Park Service took a huge amount of public criticism in 1988 for letting wildfires burn in parts of Yellowstone where public safety wasn't directly threatened. But with the advent of controlled fires as a fuel reduction tool, more and more members of the public have come to realize that absolute fire suppression isn't the best approach to managing fire.

Which doesn't mean, however, that high intensity wildfires have been accepted as a natural part of the larger ecosystem of western forests. The Wikipedia entry on the Yellowstone fires of 1988 contains an apt summation of land managers' ambivalence toward fire:

> *Before the late 1960s, fires were generally believed to be detrimental for parks and forests, and management policies were aimed at suppressing fires as quickly as possible. However, as the beneficial ecological role of fire became better understood in the decades before 1988, a policy was adopted of allowing natural fires to burn under controlled conditions, which proved highly successful in reducing the area lost annually to wildfires.*

In other words: We used to think fires were bad and put them out immediately. Now we know better and let them burn, because that reduces the amount of fires to which we would "lose" area. Even though we grant lip service to the benefits of fire, we still see them as a loss to be minimized. A let-burn policy isn't an acceptance of fire's value. It's merely fighting fire with fire.

The notion that even high-intensity fire can be a good thing for forest ecosystems, that forests and their denizens might suffer if not allowed to burn, still seems to go against all that is right and good. California media outlets, these days, warn of a coming cataclysm as drought-stressed trees make the state's forests more likely to catch fire, in tones alarmist enough to suggest those coming fires are a dire threat to... to something.

Here in the renewing aspen grove, those warnings seem distant indeed.

A new Aspen Grove grows in the ashes of the old I Photo: Chris Clarke/KCET

"This forest is responding like it's already next spring," says Hanson, absently petting a five-foot clonal aspen sprout. It seems true. Next spring, given a modicum of rain or snow, the Fish Creek watershed will almost certainly burst into bloom, but hints of that color to come already dot the sunnier parts of the forest. From where we stand we see purple Erigeron in full bloom, bright crimson Indian paintbrush on sunny slopes, native goldenrod with yellow flower heads nodding under their own weight, all of them attracting a startling diversity of butterflies.

Butterflies aren't the only insects that see opportunity here. Even before the Lake Fire was brought under control in July, infrared-sensing native beetles started heading toward the burn from miles around. Finding trees newly killed by the fire, they lay their eggs under the bark. Those eggs hatch out and larvae begin tunneling through the wood.

That process causes distress to those who measure standing trees in board feet: the boring can reduce or destroy a tree's value to lumber mills. But from the perspective of other users of the forest, the beetles greatly increase the trees' value. Woodpeckers are among the first birds to arrive in a freshly burned California forest, and as they mine the snags' trunks for beetle larvae they also take time to create new real estate opportunities, in the form of cavity nests in the standing snags.

"A male downy or hairy woodpecker will dig out three or four cavities," says Hanson. "His mate will select one and they'll move in." That leaves two or three perfectly good new homes for other birds, and potentially for small mammals.

Downy and hairy woodpeckers, flickers, and (farther north in the Sierra Nevada) black-backed woodpeckers move into a burned forest within weeks of the fire to carve out new homes. Other birds, so-called "secondary cavity nesters" such as sapsuckers, can only use snags once they've been dead for a few years, after the wood has weathered a bit and become softer.

As for mammals, you might expect a huge amount of carnage during a large fire such as the Lake Fire. But even those mammals too small to cover ground quickly and escape the fire have an escape route: they go down. "Burrowing animals can easily weather even a high-intensity fire," says Hanson. "Soil temperatures don't change much once you get farther down than a couple inches."

"Pocket gophers do really well in the wake of a fire," Hanson adds. " They have networks of burrows that keep them safe from fires, and then" -- Hanson gestures at the exuberant regrowth of aspen and willow -- "well, they eat roots and shoots. There are a lot of roots and shoots here right now."

There are a few pocket gopher burrow entrance holes here and there throughout the aspen grove; little mounds of lighter soil against the charcoal-enhanced topsoil. I wonder how much carbon those gophers will sequester over the next few years, tilling the remains of the Lake Fire down into the soil a foot or three deep.

Some larger mammal has been sampling the aspen leaves: I see a few shoots that have had their leaves trimmed off up 14 inches or so off the ground. Was a rabbit responsible, or a woodrat? Hard to say, and the newly blackened mud in Fish Creek is so crisscrossed with animal tracks it's hard to identify any of the smaller ones.

"This is just a great example of how the environment can thrive after a high-intensity burn," says Hanson. "The soil has this sudden infusion of nutrients, from the ash from the trees and shrubs. There's more sunlight now, and more opportunities for plant growth. And the animal population responds to that."

A month ago this Jeffrey pine might have been written off for dead. Now, a flush of healthy needles attests to its survival. | Photo: Chris Clarke/KCET

We hike back up over the ridge to our vehicles, through a stretch of mixed medium- and low-intensity burn. On our way in, Hanson had pointed out one Jeffrey pine after another that he guessed had been marked off as dead by the Forest Service. Most had verdant new green needles crowding out the fire-damaged brown ones. When examined by foresters, those green needles had been lurking in leaf buds, protected from the brief flash of heat that had killed the trees' existing needles. Now, in a flush of new growth -- the phenomenon is called "flushing" -- the Jeffrey pines were showing that reports of their death had been exaggerated.

Other native plants show similar patchy damage. Many of the hillside's black oaks had been killed to the ground; of those, most of the blackened trunks sport new growth from the soil level, grown three or four feet in three months. Manzanitas, with a reputation for being among the most flammable of native plants, had burned profusely in some places, halfheartedly in others. A few manzanitas along the road are half consumed, the other half as green as pampered garden specimen plants.

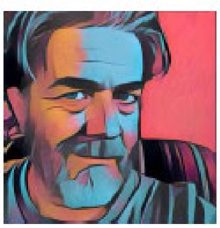
I'm struck, once again, by how cheerful the scene seems. Far from being a scene of devastation, just three months after the Lake Fire the general feel of the landscape is one of exuberant renewal.

A study published some years back in the journal Forest Ecology and Management suggested that before 1800, about 1.8 million hectares of California -- 4.4 million acres and change -- burned in an average year. The total California acreage burned in 2015, in a year widely regarded as a serious fire year, was 814,485 acres -- less than 20 percent of that prehistoric average.

I begin to wonder, as Hanson and I stop halfway to our cars to watch a female hairy woodpecker probe a new snag for beetle larvae, whether the state of California doesn't actually suffer from a fire deficit. A century of fire suppression has created an artificial forest, one with fewer of the patchy, regenerating high-intensity burn areas. It's a truism in ecological sciences that boundaries between habitats are especially rich in biodiversity. By suppressing fires for a century, have we reduced California's forest biodiversity?

The answer may partly lie in how a forest like this changes in the first decade after a burn. Fortunately for me, I don't need to wait around for a decade to find out: Hanson and I reach our cars and head off for the site of the Butler Fire, which burned about 14,000 acres not far from here in 2007. He wants to show me what happens when a burned forest is allowed to regrow without post-fire logging or other interventions.

I'll describe that hike in Part 2 of this series.



ABOUT THE AUTHOR
CHRIS CLARKE
Chris Clarke is KCET's Environment Editor. He is a veteran environmental journalist and natural history writer currently at work on a book about the Joshua tree. He lives in Joshua Tree.

We incorporate the words in the following *Mail Tribune* article below as comments on the EA. We highlight a few here:

- Fires have been burning across this landscape for tens of thousands of years. As fire moves across the landscapes, it selectively kills trees and thins the forest. Species most adaptive to frequent fire events survive. Over time, these landscapes become fire adaptive ecosystems. They are not only fire adaptive, but fire dependent.
- As ecologists, we don't look at a forest as recovering from a fire but as a succession. It's not good or bad. We are monitoring it so we will have a better understanding over the long term. We are learning from this.
- With some plants or animals, a fire doesn't make any difference to them. Others, it does matter. For instance, hermit warblers have no habitat here now because they are in the trees. But they will be back eventually.

Rogue River-Siskiyou National Forest rebuilding after massive 2002 Oregon fire
9:28 AM, Jul 9, 2012 |
Written by
PAUL FATTIG
Mail Tribune

MEDFORD, Ore. (AP) — Like silent sentinels guarding the legacy of the 2002 Biscuit fire, blackened trees tower over the budding bright green conifers growing up from the forest floor.

The stark contrast is in the Babyfoot Lake Botanical Area in the Rogue River-Siskiyou National Forest, a site where the Biscuit-fire blowtorch burned particularly hot.

"But with plants and animals after a fire, there are winners, losers and spectators," explained Lee Webb, biologist for the forest during the 2002 Biscuit fire.

"A wildfire is not bad or good," he added of a naturally caused blaze. "It just is."

Webb was a member of the Burned Area Emergency Rehabilitation team that began a scientific assessment of the fire's impact even before the fire was out.

He had been studying the Babyfoot Lake area since the mid-1970s.

Now retired after working 30 years in the forest, he continues to keep tabs on the aftermath of the fire in the Babyfoot Lake area.

The glacially formed lake is tucked just inside the eastern edge of the 183,000-acre Kalmiopsis Wilderness Area.

The trailhead to the lake is about a dozen air miles west of Kerby, a hamlet some 25 road miles south of Grants Pass.

A region known for its rich botanical diversity, it includes some 200 species of trees, shrubs, herbs, lichens, mosses and fungi, most of which scientists expect will return as the forest slowly rebuilds from the ground up.

"Fires have been burning across this landscape for tens of thousands of years," observed Tom Sensenig, the U.S. Forest Service's ecologist for southwestern Oregon. "As fire moves across the landscapes, it selectively kills trees and thins the forest. Species most adaptive to frequent fire events survive.

"Over time, these landscapes become fire adaptive ecosystems," he added. "They are not only fire adaptive, but fire dependent."

For instance, he noted that a stand of knob cone pine on Fiddler Mountain a few miles northeast of Babyfoot popped up after the fire's intense heat opened their cones. The cones are encased in a thick resin that can only be released when the heat reaches about 250 degrees, he explained.

When it comes to winners and losers, the rare Brewer spruce in the area was both, he said.

"When the fire burned through the Babyfoot area, it was very intense — a crown fire that was basically a stand replacement fire," he said, noting it killed many of the rare spruce in that area.

"But just over the ridge, the fire dropped to the ground, creating an environment for Brewer spruce to germinate," he said. "There is now a stand of Brewer spruce growing there."

Over the approximately 700 square miles burned by the fire, given the various factors that impacted the blaze, it burned in a variety of intensities, he said.

"There was a tremendous diversity of impacts throughout the area," said Sensenig who gave a presentation last year on fire ecology and the Biscuit fire to graduate students at Yale University's School of Forestry & Environmental Studies.

The agency continues to study the impact of the fire on 80 ecological sites it has established, which are re-measured every 10 years. Some of the sites were established prior to the fire, some as early as the 1970s.

"As ecologists, we don't look at a forest as recovering from a fire but as a succession," he explained. "It's not good or bad. We are monitoring it so we will have a better understanding over the long term. We are learning from this.

"These are long-term studies that will be continuing long after I'm gone," he added.

Back on the trail, Webb noted the mile-long path to the lake is now a scorching hike on a hot summer afternoon, thanks to the loss of the forest canopy.

"It's a little depressing to some people because they were used to walking through the shade," Webb said. "But when you start to look at it, the dead trees in their own way have their own beauty."

Some of the trees have shed their burned bark like last winter's coat, leaving a smooth buckskin.

At their feet rise young conifers, some 6 feet tall, including pine, fir and several rare Brewer spruce, also known as weeping spruce.

"All these young trees you see are post-fire," he said. "It took a few years for the conifers to really get going but they are coming back now."

"It's still not like a young forest that is closing things off, it is filling back in," he said.

Bracken fern is thriving along sections of the trail near a small stream trickling down a narrow canyon. Lady ferns step lightly from the damp but rocky soil. And red monkey flowers are about to burst forth from the damp soil.

More water is probably in the stream after the fire than before because the dead trees are no longer drawing water from the ground, Webb will tell you.

Indeed, the skeletal forest isn't sucking up anything now.

Farther along there are huckleberry bushes, although it is too early in the season to find a ripe berry. Tendrils of wild blackberry, a low bush native to the area, also can be seen along the trail.

An elderberry tree, already about five feet high, is sprouting up along the trail.

On rock outcroppings, sedum plants with pink blossoms are flourishing. The succulents often survive fire because they are farther away from vegetation that fuels a blaze, he noted.

"With some plants or animals, a fire doesn't make any difference to them," Webb said. "Others, it does matter. For instance, hermit warblers have no habitat here now because they are in the trees. But they will be back eventually."

Near the lake, most of the greenery remaining is on the north end near the outlet. That includes Brewer spruce, white fir and Port Orford cedar as well as azaleas in bloom.

"This patch somehow survived," he said.

But a hundred feet away, the trees were killed by the fire, as they were on the south and west sides of the lake.

The fire appears to have had little impact on the lake's inhabitants, including eastern brook trout, bass and rough-skinned newts.

"They were all spectators," Webb said.

Although a decade may seem a long time to humans, it is but a short time in nature, he said.

"In 10 years from now, there will more trees down," he said. "The conifers you see now that are already as tall as we are, they will be twice the size they are in another decade.

"It will start to look like a young forest at that point," he said. "There will be less forage than there is now."

But he figures it will be at least a century before the old-growth forest returns.

"Some of these big trees were probably a hundred to a couple of hundred years old when the fire came," he said. "It will take awhile before they are the size of the big ones that burned in 2002.

"It will be the 22nd century when people finally come here and think this is what it probably looked like before Biscuit," he said.

We incorporate the words in the following *Crown Of The Continent* article as comments on the EA. Some highlights:

- In the Northern Rockies, …for the vast majority of forest types within the region, the predominant fire regime is one of infrequent, intense, stand-replacement fires—not one of frequent, low-intensity, understory burns. With ever-present fire in the system, we might expect that plants and animals have, over evolutionary time, not only come to survive severe fire, but to depend on severe fire for their persistence and success.
- Despite widespread death associated with fire, severely burned forest systems are neither "destroyed" nor "lifeless." As an ecologist and teacher who frequently speaks to public audiences, I have become more and more sensitive to the fact that most people have never heard that there are some plant and animal species that are hard to find anywhere outside a forest that was severely burned fewer than 10 years before. Indeed, the biological magic associated with severe disturbance events is apparently one of nature's best-kept secrets!
- Many …bird species reach their greatest abundance in burned forests. These include the Three-toed Woodpecker, Hairy Woodpecker, Olive-sided Flycatcher, Clark's Nutcracker, Mountain Bluebird, American Robin, Townsend's Solitaire, Cassin's Finch, Dark-eyed Junco, Chipping Sparrow, and Red Crossbill.
- Amazingly, within burned forest perimeters, Black-backed Woodpeckers are almost entirely absent from unburned patches within those fire perimeters, and they become more common as fire severity increases! The same pattern is true of a number of other species, including the American Three-toed Woodpecker, Hairy Woodpecker, Mountain Bluebird, and Tree Swallow.
- Conditions created by a stand-replacement forest fire are biologically unique at the very least in terms of the biomass of standing dead trees that remain, and to a much greater extent, in terms of ecosystem structure and function. While timber harvesting is a form of ecological disturbance, it is a poor substitute for fire-based disturbance because it does not result in numerous, burned, standing-dead trees. Such trees are the most critical component of a biologically diverse post-fire ecosystem and that single component contributes significantly to the production of unique successional pathways and unique wildlife communities that we see after fire.
- One of the most common management activities following forest fires is salvage logging. Perhaps we need to change our thinking when it comes to logging after forest fires. With respect to birds, no species that is relatively restricted to burned-forest conditions has ever been shown to benefit from salvage harvesting. In fact, most timber-drilling and timber-gleaning bird species disappear altogether if a forest is salvage-logged. Therefore, if we want our land-use decisions to be based, at least in part, on whether a proposed activity affects the ecological integrity of our forest systems, burned forests should be the LAST, rather than the first places we should be going for our wood.

- For birds, standing dead trees are one of the most special biological attributes of burned forests. They house equally unique beetle larvae that become abundant because they feast on the wood beneath the bark of trees that have died and are, therefore, defenseless against attack. If we value and want to maintain the full variety of organisms with which we share this Earth, we must not only recognize that burned forests are quite "healthy," but must also begin to recognize that post-fire logging removes the very element — standing dead trees — upon which each of those special bird species depend for nest sites and food resources.
- People naturally want to harvest trees after fire because the only thing they can see is wastefulness. But there is no waste in nature. Burned forests, even severely burned forests, are forests that have been "restored" in the eyes of numerous plant and animal species and in the eyes of an informed public. The burned trees are essential for maintaining an important part of the biological diversity we value today, and are the foundation for the forests of the future. Fire (and its aftermath) should be seen for what it is: a natural process that creates and maintains much of the variety and biological diversity that we see in the Northern Rockies.


CROWN OF THE CONTINENT
THE UNIVERSITY OF MONTANA
MAGAZINE
fall 2011 issue 6


The beauty of a

burned forest

The only thing that's constant in the Crown is change.

story and photos by RICHARD HUTTO

In the Northern Rockies, forests that have escaped fire are rare. In the Crown, fire is just as important as rainfall and sunlight are to plants and animals. For the vast majority of forest types within the region, the predominant fire regime is one of infrequent, intense, stand-replacement fires—not one of frequent, low-intensity, understory burns. With ever-present fire in the system, we might expect that plants and animals have, over evolutionary time, not only come to survive severe fire, but to depend on severe fire for their persistence and success. That is the story I want to tell here.

Despite widespread death associated with fire, severely burned forest systems are neither "destroyed" nor "lifeless." As an ecologist and teacher who frequently speaks to public audiences, I have become more and more sensitive to the fact that most people have never heard that there are some plant and animal species that are hard to find anywhere outside a forest that was severely burned fewer than 10 years before. Indeed, the biological magic associated with severe disturbance events is apparently one of nature's best-kept secrets!

Following the widespread fires of 1988, I was curious to see whether the forests of Yellowstone, Glacier and elsewhere between the two parks had become transformed into lifeless biological deserts, as implied by press reports at the time

See next page

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Following the widespread fires of 1988, I was curious to see whether the forests of Yellowstone, Glacier and elsewhere between the two parks had become transformed into lifeless biological deserts, as implied by press reports at the time (and as implied still by similar reports that follow major fire events even today), or whether the actual story is something different. During the two summer seasons immediately following the 1988 fires, a number of field assistants and I visited 34 different burned-forest sites in western Montana and northern Wyoming and we recorded the bird community composition in each. Contrary to what one might expect to find immediately following a major disturbance event like wildfire, we detected a surprisingly large number of species in forests that had undergone stand-replacement fires.

More specifically, we detected an average of 45 species per site, and a total of 87 species in the sites combined. Some of the most commonly detected species included the Hairy Woodpecker, American Robin, Mountain Bluebird, and Dark-eyed Junco (Figure 1, blue bird photo on right). Further analysis showed that 15 of the 87 bird species were more abundant in the early post-fire communities than they were reported to be in any other major vegetation type within the northern Rockies. Thus, birds were not only present, but the bird communities in recently burned forests were interestingly different in composition from those that characterize other Rocky Mountain cover types (including early-successional clearcuts, which are not at all similar in bird community composition).

The most amazing finding was that one bird species, the Black-backed Woodpecker, Picoides arcticus, seemed to be nearly restricted in its habitat distribution to forests that had been burned in the recent past. How did I determine that Black-backs were relatively restricted to recently burned forests? I compiled bird survey data that were available from published studies associated with a dozen different vegetation types. The Black-backed Woodpecker was detected less than 10% of the time in unburned vegetation types, but was detected about 80% of the time in studies conducted in burned forests (Figure 2, photo on left). Because these data were derived from a literature-based meta-analysis of studies that differed in duration and survey methodology and were drawn from a relatively small number of vegetation types, I encountered some skepticism—the pattern could have been an artifact of the incomplete range of vegetation types surveyed, or an artifact of combining results from studies that used different methods used to survey birds. At about the same time, I began working with the USFS Northern Region to develop a bird monitoring program that would involve use of the identical field methods across as large a range of vegetation types as possible. Now, 20 years later, the USFS Northern Region Landbird Monitoring Program stands as one of the largest bird point-count databases of its kind in the world, with sample locations drawn from a wide range of vegetation types across northern Idaho and western Montana. By combining those data with data collected from locations distributed within more than 50 fires that had burned in western Montana during the past 20 years, I am now able to ask, once and for all, whether the Black-backed Woodpecker is relatively restricted to burned forest conditions.

After summarizing information from more than 50,000 survey locations distributed across nearly every vegetation type occurring in the northern Rockies, it is clear that the restricted distribution pattern is not an artifact of problems associated with my earlier meta-analysis. The Black-backed Woodpecker is, as my earlier study suggested, nearly restricted in its habitat distribution to burned forest conditions.

Just take the time to look carefully at a Black-backed Woodpecker—everything about it, including its jet-black coloration, seems to reflect a long evolutionary history with burned forests. As I like to point out, the black coloration against a blackened tree is no less impressive than the white coloration of a ptarmigan against snow—both coloration patterns have undoubtedly evolved over long time periods in association with their respective environmental backdrops! The Black-backed Woodpecker capitalizes on the population explosion of wood-boring beetle larvae in burned forests, as do several other woodpecker species. Because many burned trees die, they can no longer defend themselves against beetles by swamping the eggs and larvae with pitch exuded into their burrows. Consequently, the adult beetles have evolved to fly in immediately after fire to lay their eggs on now-defenseless trees that still have plenty of good wood beneath that scorched bark. Some beetle species are so specialized to live in fire-dominated systems like those here in the Crown, that they have evolved infrared sensors that allow them to detect heat from miles and miles away so that they can colonize recently burned forests as rapidly as possible. Although the Black-backed Woodpecker is the most extreme species in terms of its restriction to, and evolutionary history with, burned forests, many additional bird species reach their greatest abundance in burned forests (15 of 87 species detected in burned forests, as I noted above). These include the Three-toed Woodpecker, Hairy Woodpecker, Olive-sided Flycatcher, Clark's Nutcracker, Mountain Bluebird, American Robin, Townsend's Solitaire, Cassin's Finch, Dark-eyed Junco, Chipping Sparrow, and Red Crossbill. All the woodpeckers feed on the abundant beetle larvae beneath the bark of standing, fire-killed trees, while flycatchers and bluebirds take advantage of the open conditions for pouncing on or sallying after flying insects, and seedeaters capitalize on the increased availability of seeds from both cone-bearing trees, some of which wait for more than 150 years for fire to heat and open their cones, thereby releasing their seeds.

The story doesn't end with birds, of course. I have barely scratched the surface of the amazing biological story behind severe fire. In addition to the specialized beetles, there are cone-bearing tree species that require severe fire for the heat needed to open their cones, and there's the fire morel, which is also relatively restricted to severely burned forests. It's no wonder that we enjoy a boom year for morel mushrooms at the local farmer's market following a severe forest fire season in western Montana. The seeds of Bicknell's geranium can wait in the soil for more than 100 years until a severe fire allows them to break from that dormancy, germinate, and complete their life cycle.

By definition, fire specialists such as the Black-backed Woodpecker or the lodgepole pine depend heavily on very specific conditions to realize their own success. Therefore, if we study the patterns of distribution and success of these fire-dependent species across the variety of burn severities within burned-forest perimeters, we can gain insight into the kinds of fires

that constitute the naturally occurring fire regime in areas that were historically occupied by the specialists. Very specific kinds of fires must have provided the environmental backdrop against which these specialized native species evolved; so what kinds of historical fires were they? Amazingly, within burned forest perimeters, Black-backed Woodpeckers are almost entirely absent from unburned patches within those fire perimeters, and they become more common as fire severity increases! The same pattern is true of a number of other species, including the American Three-toed Woodpecker, Hairy Woodpecker, Mountain Bluebird, and Tree Swallow. As I expressed in a recent publication—some like it hot! These results are profound because they imply that the very fires often regarded as "unnatural" and "destructive" are the very fires that provide the best conditions for the most fire-dependent plant and animal species.

Land managers can't create the magic through severe cutting—fire is critical.

One could argue that any loss of burned forest acreage due to past fire suppression activity has been compensated for, at least in part, by timber harvesting activities. As evidenced by letters submitted to the editors of local newspapers after any major fire event, many people believe that the conditions present after a clearcut or following one of the newer green-tree retention or forest restoration cuts are basically the same as those present after a severe fire. They are wrong. Conditions created by a stand-replacement forest fire are biologically unique at the very least in terms of the biomass of standing dead trees that remain, and to a much greater extent, in terms of ecosystem structure and function. While timber harvesting is a form of ecological disturbance, it is a poor substitute for fire-based disturbance because it does not result in numerous, burned, standing-dead trees. Such trees are the most critical component of a biologically diverse post-fire ecosystem and that single component contributes significantly to the production of unique successional pathways and unique wildlife communities that we see after fire.

"NATURAL" FIRE REGIMES IN THE CROWN

People have slowly come to accept the fact that low-severity fires burned historically, but they still view severe events as "unnatural" events. How often have you read the following? "Dry, ponderosa pine-dominated forests of the western United States are widely believed to have experienced a buildup of fuels in the past century due to a combination of over-aggressive fire suppression efforts, overgrazing, and overharvesting. As a result, those western forests suffer from more extreme fire behavior because they burn with unnatural or unprecedented intensity." Unfortunately, we may be inappropriately extrapolating results from ponderosa pine systems that are quite common the Southwest, to the more mesic ponderosa pine systems and the mixed-conifer forest types that make up the vast majority (about 85%) of forested area in the Crown.

Indeed, severe fires are routinely referred to as "catastrophic" events in the popular press regardless of forest type, and such terminology even appears in proposed congressional legislation drafted to deal with severe fire's aftermath. Given the current rate at which land managers are implementing forest restoration projects specifically designed to prevent severe fire sometimes well outside the dry, ponderosa pine system, one would hope that generalizations about the state of our forests are broadly applicable.

The ecology and life history adaptations of living organisms are greatly underused as sources of reliable information in the debate about what constitutes "natural" forest conditions and fire regimes in any forest type. This is surprising, given that the goal of forest restoration is to return forests to conditions that reflect their evolutionary past. Through their precise selection of suitable habitat, plant and animal species carry an abundance of historical information about the environments within which they evolved. Moreover, that evolutionary history is valuable because it runs much deeper than the 100- to 500-year reach of most historical (e.g., fire-scarred tree-ring) studies. The plants and animals featured here are talking through their adaptations about the importance of severe fire on our landscapes; are we listening?

Because most have not heard this story, there is considerable public pressure to "salvage" what little remains after severe fire.

One of the most common management activities following forest fires is salvage logging (Figure 8). Perhaps we need to change our thinking when it comes to logging after forest fires. With respect to birds, no species that is relatively restricted to burned-forest conditions has ever been shown to benefit from salvage harvesting. In fact, most timber-drilling and timber-gleaning bird species disappear altogether if a forest is salvage-logged. Therefore, if we want our land-use decisions to be based, at least in part, on whether a proposed activity affects the ecological integrity of our forest systems, burned forests should be the LAST, rather than the first places we should be going for our wood.

For birds, standing dead trees are one of the most special biological attributes of burned forests. They house equally unique beetle larvae that become abundant because they feast on the wood beneath the bark of trees that have died and are, therefore, defenseless against attack. If we value and want to maintain the full variety of organisms with which we share this Earth, we must not only recognize that burned forests are quite "healthy," but must also begin to recognize that post-fire logging removes the very element — standing dead trees — upon which each of those special bird species depend for nest sites and food resources.

WHY DO WE FIND IT SO HARD TO CELEBRATE SEVERE-FIRE EVENTS?

The biological facts are unambiguous and readily apparent to anyone who wants to venture out and look for him or herself, so why do we so often fail to embrace the early successional stages—burned trees and all—that follow stand-replacement fires? There are a number of reasons, but the most important is that the public continues to be told that all fires are bad, which, as I have outlined here, is patently false. Even if the public were to become convinced that severe fires are natural and necessary for ecosystem health, we now have a problem because humans have settled nearly everywhere. That human presence requires fire suppression to be a priority nearly everywhere. Wilderness, parks, and roadless areas are really our primary hope for the maintenance of naturally severe fire regimes, and we are lucky in the Crown of the Continent to have an abundance of such areas along with an abundance of non-wilderness areas far enough removed from the urban interface to allow severe fire to burn naturally.

SEVERE DISTURBANCE MAKES THE WORLD A DANGEROUS BUT INTERESTING PLACE

Burned forest habitat is one of nature's best-kept secrets because the public really hasn't been told about the magical transformation a forest undergoes after severe fire. And I barely touched on some of the more fascinating stories about plants and animals that are restricted to burned-forest conditions. Being unaware of these stories, people naturally want to harvest trees after fire because the only thing they can see is wastefulness. But there is no waste in nature. Burned forests, even severely burned forests, are forests that have been “restored” in the eyes of numerous plant and animal species and in the eyes of an informed public. The burned trees are essential for maintaining an important part of the biological diversity we value today, and are the foundation for the forests of the future. Fire (and its aftermath) should be seen for what it is: a natural process that creates and maintains much of the variety and biological diversity that we see in the Northern Rockies. The next time you are lucky enough to walk through an intact, severely burned forest, I hope you can now properly recognize it as a beauty mark rather than a scar on our magnificent Crown of the Continent landscape.

Dr. Richard L. Hutto is Professor and Director of the Avian Science Center at the University of Montana in Missoula. Hutto has conducted research on migratory landbirds in Mexico in winter, the Southwest during spring and fall, and in the Northern Rockies in summer for more than 30 years. He developed and continues to supervise the USFS Northern Region Landbird Monitoring Program, which is now in its 20th year of operation, and he has been studying the ecological effects of fire on bird communities for 20 years as well. Dr. Hutto was host of "Birdwatch," a nationally televised PBS series that ran from 1999-2001. Because he is moved by what birds have to teach us about land stewardship, Hutto established the Avian Science Center on the University of Montana campus to promote ecological awareness and informed decision making through the synthesis and dissemination of science-based information on western birds (http://avianscience.dbs.umt.edu/).

“It’s no wonder that we enjoy a boom year for morel mushrooms at the local farmer’s market following a severe forest fire season in western Montana. The seeds of Bicknell’s geranium can wait in the soil for more than 100 years until a severe fire allows them to break from that dormancy, germinate, and complete their life cycle.**”**
Richard Hutto, professor and director of the Avian Science Center
University of Montana

We incorporate the words in still another *Missoulian* article as comments on the EA. We highlight a few here:

- We always seem to think we need to restore the forest after a fire, but this is the restoration. Some of these plants have been waiting 100 years for this event to occur.
- If you want to maintain the diversity of life on this planet, you need fire.
- Black-backed woodpeckers and three-toed woodpeckers seem to thrive in the most severely burned forests, honing in on post-fire beetle infestations.
- Years two through four are the big years for black-backed woodpeckers. And for beetles. What I am left with, again and again, is the realization of how unique this is, and how much more we need to know.

Missoulian, Sunday, August 1, 2004

One year after fire Black Mountain is springing back to life
By SHERRY DEVLIN of the Missoulian

The mother junco scolded from a blackened tree as the young researcher made his way through the fireweed, nearing the hidden nest.

Carefully, he parted the chest-high wildflowers, revealing the nest below - mud, twigs and fluff.

Bruce Robertson's visit was brief, so as not to interrupt the feeding. He needed but one piece of information this morning: How many baby juncos remained in the little palm-sized nest?

Three fuzzy babies snuggled amid the fireweed, two fewer than on Robertson's last visit. "The chipmunk's been here," he said.

The mother junco complained louder, insistent on delivering a tiny green worm to her brood.

"Chip, chip, chip," the bird warned. "Go away."

And Robertson was gone, off to check another nest built this summer in the forest burned by the Black Mountain fire.

A year ago this week, when lightning set fire to Black Mountain, all eyes were on the neighborhoods at risk: hundreds of homes on Horseback Ridge, O'Brien Creek, Lyon Gulch and Cedar Ridge Road.

Three homes eventually burned - late on the afternoon of Aug. 16, 2003 - when high winds blew the Black Mountain fire on a 5-mile, 5,000-acre run.

Within hours, nearly 1,000 firefighters were throwing water and dirt at hot spots all across Black Mountain and its sister to the south, Blue Mountain.

By the time the last of three incident command teams left town Sept. 15, the Black Mountain fire had burned 7,061 acres and created a black-stick forest on Missoula's western edge.

A year later, homes have been rebuilt and neighborhoods are back about their workaday routines. Now, the forest and its renewal is the story - one that University of Montana professor Dick Hutto describes as "incredible."

Careful not to downplay the fire's initial threat to homes and lives, Hutto encourages visitors to celebrate the Black Mountain fire.

"I cannot imagine anything more beautiful," he said one morning last week, surrounded by a mountainside of wildly blooming fireweed. "This is the most biologically amazing thing we have going. It is absolutely unique."

A three-toed woodpecker hammered on a blackened snag, hunting beetle larvae. Fledgling juncos flitted from branch to branch, testing their just-sprouted feathers.

Hutto and his students, Robertson among them, have counted 100 species of birds in the burned area this spring and summer. Ninety-five percent of them use the dead trees for homes or food.

The other 10 percent, including the black-eyed juncos, build their nests on the ground in a veritable forest of wildflowers: fireweed, spirea, yarrow, wild geraniums, showy asters and bluebells.

Ninebark and snowberry are thick, and tall. Finger-high larch trees stand delicately, but resolutely, alongside their burned ancestors.

"We always seem to think we need to restore the forest after a fire, but this is the restoration," Hutto said. "Some of these plants have been waiting 100 years for this event to occur."

In 1988, after the much-publicized wildfires in Yellowstone National Park, Hutto and others set out to look at the effects of fire on a forest. What happens next?

The answer came quickly: "There is a lot that you find in a burned forest that you don't find anywhere else," Hutto said. "There are birds you only find in burned forests and flowers and shrubs and other critters.

"If you take away the fires, then you lose those birds and plants and critters. If you take away the fires, where are you going to find a morel mushroom? Or a black-backed woodpecker?

"If you want to maintain the diversity of life on this planet, you need fire."

The more he looks at burned forests, the more Hutto understands their complexity. His work on the Black Mountain fire, in fact, is focused on some of those subtleties:

Are there species found only in severely burned forests? In moderately burned forests? In low-intensity burns? And what effect did the pre-fire condition have on the post-fire response? And what about salvage logging? How does that affect the fire-dependent species?

Robertson, a doctoral student at UM, is studying the burned area's booming population of juncos, which nest on the ground and in holes left by burned-out tree roots.

In three months, he has watched the forest floor transform itself: from black ash to green to a pastel rainbow. Along the way, he's seen himself change as well.

"I started out like everybody else, talking about how much acreage the fire destroyed," Robertson said. "Now I see the renewal and restoration. There's something new - something amazing - every day."

This day, he finds a chipping sparrow nest perched ever so delicately on the auburn branch of a little fire-killed Douglas fir tree.

And a dozen long, long caterpillars munching their way up 4-foot-high fireweed plants.

And baby juncos a few days from leaving the last of 70 nests he's monitored since May.

"I called this territory 'The Land of Broken Dreams,' "Robertson said, "because the male and female had three failed nests before this one finally succeeded. They just never gave up."

Juncos, chipping sparrows and western tanagers seem to prefer medium-severity burns, where the forest is a mix of standing dead and green trees.

In the burned area, juncos averaged 1.7 successful nests this summer, a reproductive boom.

Black-backed woodpeckers and three-toed woodpeckers seem to thrive in the most severely burned forests, honing in on post-fire beetle infestations.

"They'll just go through the roof next year," Hutto said. "Years two through four are the big years for black-backed woodpeckers."

And for beetles.

"What I am left with, again and again, is the realization of how unique this is," Hutto said, "and how much more we need to know."

That's why Hutto and others, including UM's Avian Science Center, the Lolo National Forest and the Montana Natural History Center, have sponsored dozens of field trips to Blue Mountain this spring and summer.

"Public land is the only hope for these burned ecosystems," he said. "These are the only places left where we can let fire play its natural role."

The education will take a while, Hutto conceded, at least in part because some of the needed fires must burn severely.

"We need the catastrophic fires," he said. "Of course, we don't want to see houses burn down or lives lost, but some of these species only live in severely burned forests. They need the toasted stuff."

And they're loving life on Blue Mountain these days, Robertson said. Just watch the junco parents tend their young, relentlessly delivering worms and ants and daddy longlegs to the nest.

"I counted six deliveries every 30 minutes," he said. "Imagine that. It's a huge job feeding those chicks, but they're really, really committed to it."

The mother junco hopped along a charcoal tree branch, chipping at Robertson and waving her latest catch at the babies.

He went about his way, carefully picking through the fireweed so as not to leave a trail for would-be predators.

A calliope hummingbird zipped by, showing off. The sun broke through the early morning haze, setting the wildflowers ablaze.

"What a paradise," Hutto said. "What a celebration."

Reporter Sherry Devlin can be reached at 523-5268 or at sdevlin@missoulian.com

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The Sandpoint Ranger District's Buckskin Saddle EA admits that slash on the ground increases the risk of fire severity: "Flame lengths would increase following harvest, and this is mainly due to an increase in slash." The Lacy Lemoosh EA doesn't adequately reconcile such facts with the claims of reducing risk of fire, and it fails to say how long slash typically is left before burning.

Fire suppression will continue. It seems there will be no end to this damaging, reactive management scheme. As long as tree farming is allowed to dominate national forest management, enlightened approaches to fire will never happen.

DellaSala, et al. (1995) state:

> Scientific evidence does not support the hypothesis that intensive salvage, thinning, and other logging activities reduce the risk of catastrophic fires if applied at landscape scales ... At very local scales, the removal of fuels through salvage and thinning may hinder some fires. However, applying such measures at landscape scales removes natural fire breaks such as moist pockets of late-seral and riparian forests that dampen the spread and intensity of fire and has little effect on controlling fire spread, particularly during regional

> droughts. ... Bessie and Johnson (1995) found that surface fire intensity and crown fire initiation were strongly related to weather conditions and only weakly related to fuel loads in subalpine forest in the southern Canadian Rockies. . . . Observations of large forest fires during regional droughts such as the Yellowstone fires in 1988 (Turner, et al. 1994) and the inland northwest fires of 1994 . . . raise serious doubts about the effectiveness of intensive fuel reductions as "fire-proofing" measures.

Veblen (2003) states:

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

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.

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

Many direct and indirect effects of fire suppression are must be analyzed and disclosed at the project level and as well as in the programmatic context. For example, Ingalsbee, 2004 describes the direct, indirect, and cumulative environmental impacts of firefighting:

> Constructing firelines by handcrews or heavy equipment results in a number of direct

environmental impacts: it kills and removes vegetation; displaces, compacts, and erodes soil; and degrades water quality. When dozerlines are cut into roadless areas they also create long-term visual scars that can ruin the wilderness experience of roadless area recreationists. Site-specific impacts of firelines may be highly significant, especially for interior-dwelling wildlife species sensitive to fragmentation and edge effects.

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

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

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

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

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

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

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

The 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).

The IPNF has not conducted a thorough and complete analysis of forestwide cumulative effects of fire management policies, including fire suppression policies. The Forest Plan and its FEIS 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 species that depend upon the effects of natural wildland fire such as the black-backed woodpecker (Hutto 1995, Hutto 2006, Hutto 2008); boreal toad, (Hutto 2006); mountain bluebird, American three-toed woodpecker, and olive-sided flycatcher (Hutto 2005, Hutto 2006).

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

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

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

The premise that thinning and other mechanical treatments replicate natural fire is contradicted by science (for example see Rhodes and Baker 2008, McRae et al 2001, and Rhodes 2007).

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

In his testimony before Congress, DellaSala, 2017 discusses "…how proposals that call for increased logging and decreased environmental review in response to wildfires and insect outbreaks are not science driven, in many cases may make problems worse, and will not stem rising wildfire suppression costs" and "what we know about forest fires and beetle outbreaks in relation to climate change, limitations of thinning and other forms of logging in relation to wildfire and insect management" and makes "recommendations for moving forward based on best available science."

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

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 …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.

The EA 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 EA 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 EA 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.)

In FW-DC-TBR-01, including the sentence that begins with "Salvage…" 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 FS fails to acknowledge the scientific and public controversy of the “salvage” issue, such statements should be removed from the Forest Plan.

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

Similarly, Hutto and Patterson, 2016 state, “the variety of burned-forest conditions required by fire-dependent bird species cannot be created through the application of relatively uniform low-severity prescribed fires, through land management practices that serve to reduce fire severity or through post-fire salvage logging, which removes the dead trees required by most disturbance-dependent bird species.”

Hutto et al., 2016 urge “a more ecologically informed view of severe forest fires”:

> Public land managers face significant challenges balancing the threats posed by severe fire with legal mandates to conserve wildlife habitat for plant and animal species that are positively associated with recently burned forests. Nevertheless, land managers who wish to maintain biodiversity must find a way to embrace a fire-use plan that allows for the presence of all fire severities in places where a historical mixed-severity fire regime creates conditions needed by native species while protecting homes and lives at the same time. This balancing act can be best performed by managing fire along a continuum that spans from aggressive prevention and suppression near designated human settlement areas to active “ecological fire management” (Ingalsbee 2015) in places farther removed from such areas. This could not only save considerable dollars in fire-fighting by restricting such activity to near settlements (Ingalsbee and Raja 2015), but it would serve to retain (in the absence of salvage logging, of course) the ecologically important disturbance process over most of our public land while at the same time reducing the potential for firefighter fatalities (Moritz et al. 2014). Severe fire is not ecologically appropriate everywhere, of course, but the potential ecological costs associated with prefire fuels reduction, fire suppression, and postfire harvest activity in forests born of mixed-severity fire need to considered much more seriously if we want to maintain those species and processes that occur only where dense, mature forests are periodically allowed to burn severely, as they have for millennia.

Bradley et al., 2016 found that areas of more intensive management tend to burn more severely than unmanaged forests:

> There is a widespread view among land managers and others that the protected status of many forestlands in the western United States corresponds with higher fire severity levels due to historical restrictions on logging that contribute to greater amounts of biomass and fuel loading in less intensively managed areas, particularly after decades of fire suppression.

> … On the contrary, using over three decades of fire severity data from relatively frequent-fire pine and mixed-conifer forests throughout the western United States, we found support for the opposite conclusion—burn severity tended to be higher in areas with lower levels of protection status (more intense management)… Our results suggest a need to reconsider current overly simplistic assumptions about the relationship between forest protection and fire severity in fire management and policy.

The NEPA analysis fails to consider this scientific perspective.

Despite the fact that the EA makes many statements to the effect that without the proposed treatments there is a high likelihood of highly adverse effects on various resources due to wildfire (especially in describing effects of the No Action alternative) the EA discloses essentially nothing about such effects from recent fires in the project area or vicinity.

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

> The prescriptions and techniques appropriate for accomplishing a treatment require understanding the fuel changes that result from different techniques and the fire behavior responses to fuel structure**. Fuel treatments, like all vegetation changes, have temporary effects and require repeated measures, such as prescribed burning, to maintain desired fuel structure.**

Fire Regime Condition Class is a metric that estimates the departure of the forest from historic fire processes and vegetation conditions. Fire regime condition class is derived by comparing current conditions to an estimate of the historical conditions that existed before significant Euro-American settlement. This method likely has very limited accuracy and tends to overestimate the risk of higher-severity fire posed by fuel loads, as documented by studies of recent fires (Odion and Hanson, 2006). Those researchers state:

> Condition Class, was not effective in identifying locations of high-severity fire. … In short, Condition Class identified nearly all forests as being at high risk of burning with a dramatic increase in fire severity compared to past fires. Instead, we found that the forests under investigation were at low risk for burning at high-severity, especially when both spatial and temporal patterns of fire are considered.

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

> Several of the biases …are embodied in the Fire Regime Condition Class (FRCC) approach (Hann and Bunell, 2001), which is widely used to provide an index of the potential for uncharacteristically severe fire and fire regime alteration. The FRCC relies on of estimates of mean fire intervals, but does not require that they be estimated on the basis of site-specific historical data. It emphasizes fire scar data, but does not require its collection and

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

Baker, 2015, states: "Programs to generally reduce fire severity in dry forests are not supported and have significant adverse ecological impacts, including reducing habitat for native species dependent on early-successional burned patches and decreasing landscape heterogeneity that confers resilience to climatic change."

Baker, 2015 concluded: "Dry forests were historically renewed, and will continue to be renewed, by sudden, dramatic, high-intensity fires after centuries of stability and lower-intensity fires."

Baker, 2015 writes: "**Management issues…** The evidence presented here shows that efforts to generally lower fire severity in dry forests for ecological restoration are not supported."

In his book, "Fire Ecology in Rocky Mountain Landscapes" William Baker writes on page 435, "…a prescribed fire regime that is too frequent can reduce species diversity (Laughlin and Grace 2006) and favor invasive species (M.A. Moritz and Odion 2004). Fire that is entirely low severity in ecosystems that historically experience some high-severity fire may not favor germination of fire-dependent species (M.A. Moritiz and Odion 2004) or provide habitat key animals (Smucker, Hutto, and Steele 2005)." And on page 436: "Fire rotations equal the average mean fire interval across a landscape and are appropriate intervals at which individual points or the whole landscape is burned. Composite fire intervals underestimate mean fire interval and fire rotation (chap 5) and should not be used as prescribed burning intervals as this would lead to too much fire and would likely lead to adversely affect biological diversity (Laughlin and Grace 2006)."

Baker estimates the high severity fire rotation to be 135 - 280 years for lodgepole pine forests. (See page 162.). And on pp. 457-458: "Fire rotation has been estimated as about 275 years in the Rockies as a whole since 1980 and about 247 years in the northern Rockies over the last century, and both figures are near the middle between the low (140 years) and high (328 years) estimates for fire rotation for the Rockies under the HRV (chap. 10). These estimates suggest that since EuroAmerican settlement, fire control and other activities may have reduced fire somewhat in particular places, but a general syndrome of fire exclusion is lacking. Fire exclusion also does not accurately characterize the effects of land users on fire or match the pattern of change in area burned at the state level over the last century (fig. 10.9). In contrast, fluctuation in drought linked to atmospheric conditions appear to match many state-level patterns in burned area over the last century. Land uses that also match fluctuations include logging, livestock grazing, roads and development, which have generally increased flammability and ignition at a time when the climate is warming and more fire is coming."

Schoennagel et al., 2004 state: "High-elevation subalpine forests in the Rocky Mountains typify ecosystems that experience infrequent, high-severity crown fires []. . . The most extensive subalpine forest types are composed of Engelmann spruce (Picea engelmannii), subalpine fir (Abies lasiocarpa), and lodgepole pine (Pinus contorta), all thin-barked trees easily killed by fire. Extensive stand-replacing fires occurred historically at long intervals (i.e., one to many centuries) in subalpine forests, typically in association with infrequent high-pressure blocking systems that promote extremely dry regional climate patterns."

Schoennagel et al., 2004 state:

> (I)t is unlikely that the short period of fire exclusion has significantly altered the long fire intervals in subalpine forests. Furthermore, large, intense fires burning under dry conditions are very difficult, if not impossible, to suppress, and such fires account for the majority of area burned in subalpine forests.
>
> Moreover, there is no consistent relationship between time elapsed since the last fire and fuel abundance in subalpine forests, further undermining the idea that years of fire suppression have caused unnatural fuel buildup in this forest zone.
>
> No evidence suggests that spruce–fir or lodgepole pine forests have experienced substantial shifts in stand structure over recent decades as a result of fire suppression. Overall, variation in cli-mate rather than in fuels appears to exert the largest influence on the size, timing, and se-verity of fires in subalpine forests []. We conclude that large, infrequent stand replacing fires are 'business as usual' in this forest type, not an artifact of fire suppression.
>
> Contrary to popular opinion, previous fire suppression, which was consistently effective from about 1950 through 1972, had only a minimal effect on the large fire event in 1988 []. Reconstruction of historical fires indicates that similar large, high-severity fires also occurred in the early 1700s []. Given the historical range of variability of fire regimes in high- elevation subalpine forests, fire behavior in Yellowstone during 1988, although severe, was neither unusual nor surprising.
>
> Mechanical fuel reduction in subalpine forests would not represent a restoration treatment but rather a departure from the natural range of variability in stand structure.
>
> Given the behavior of fire in Yellowstone in 1988, fuel reduction projects probably will not substantially reduce the frequency, size, or severity of wildfires under extreme weather

conditions.

The Yellowstone fires in 1988 revealed that variation in fuel conditions, as measured by stand age and density, had only minimal influence on fire behavior. Therefore, we expect fuel- reduction treatments in high-elevation forests to be generally unsuccessful in reducing fire frequency, severity, and size, given the overriding importance of extreme climate in controlling fire regimes in this zone. Thinning also will not re-store subalpine forests, because they were dense historically and have not changed significantly in response to fire suppression. Thus, fuel-reduction efforts in most Rocky Mountain subalpine forests probably would not effectively mitigate the fire hazard, and these efforts may create new ecological problems by moving the forest structure out-side the historic range of variability.

Whereas the EA claims to be reducing risk of wildfire by reducing forest canopy density—including in old growth—the proposed action will result in increased fire severity and more rapid fire spread. This common sense is recognized in a news media discussion of the 2017 Eagle Creek fire in Oregon:

Old growth not so easy to burn:

Officials said the fire spread so rapidly on the third and fourth days because it was traveling across lower elevations.

The forests there aren't as thick and as dense as the older growth the fire's edge is encountering now - much of it in the Mark O. Hatfield Wilderness, Whittington said.

Whittington said because there's more cover from the tree canopy, the ground is moister -- and that's caused the fire to slow. Also, bigger trees don't catch fire as easily**, he said. (Emphasis added.)**

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. ...(I)t is questionable whether wildland fuel reduction activities are necessary and sufficient for mitigating structure loss in wildland urban fires.
>
> …(W)ildland 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 speed[4] 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,

[4] Velocity of the wind 20 feet above the vegetation, in this case tree tops.

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.

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

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

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

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

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 Lacy Lemoosh, 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—also never analyzed or disclosed at any planning level.

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

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

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 Lacy Lemoosh, 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—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.

SCIENTIFIC INTEGRITY

The FS is obligated to consider best available science. Our comments in various sections of these comments point out that resource analyses are not consistent with best available science.

Our Objection to the Forest Plan notes that the scientific basis for its standards, guidelines, and other components/direction is not well established. 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 it plays out in project design.

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 Lacy Lemoosh 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."

Huck, 2000 states:

> The basic idea of reliability is summed up by the word consistency. Researchers can and do evaluate the reliability of their instruments from different perspectives, but the basic question that cuts across these various perspectives (and techniques) is always the same: "To what extent can we say the data are consistent?" …(T)he notion of consistency is at the heart of the matter in each case.
>
> …(R)eliability is conceptually and computationally connected to the data produced by the use of a measuring instrument, not to the measuring instrument as it sits on the shelf.

During litigation of a timber sale on the Kootenai NF (CV-02-200-M-LBE, Federal Defendants Response to Motion for Preliminary Injunction), the FS criticized a report provided by plaintiffs, stating "(Its) purported 'statistical analysis' reports no confidence intervals, standard deviations or standard errors in association with its conclusions."

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

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

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

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

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

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

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

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

As Huck, (2000) explains, the degree of "content validity," or accuracy of the model or methodology is established by utilizing other experts. This, in turn, demonstrates the necessity for utilizing the peer review process. The validity of the various models utilized in the EA's analyses have, by and large, not been established for how agency utilizes them. No studies are cited which establishes their content validity, and no independent expert peer review process of the models has occurred.

Larson et al. 2011 state:

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

USDA Forest Service, 2000c (a FS forest plan monitoring and evaluation report) provides an example of the agency acknowledging the problems of data that are old and incomplete, leading to the limitation of models the FS typically uses for wildlife analyses for old-growth wildlife habitats:

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

In the above case, the FS expert believed the data were unreliable, limiting the usefulness and applicability (validity) of the model. In other places in this objection—particularly regarding old growth—we discuss this staleness of data.

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…"

The EA violates NEPA because the FS has not insured the reliability of data input to the models, the FS has not validated the models for the way the EA utilizes them, and the FS has overly narrowed the information it considers to be best available science.

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

Beck and Suring, 2011 state:

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

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

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

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

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

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

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

A Science Consistency Review is long overdue for the revised Forest Plan. (See Guldin et al., 2003, 2003b).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.

ECONOMIC ANALYSIS

How much will it cost U.S. taxpayers have the FS implement the project? The EA fails to present enough economic analysis to prove this huge subsidy would be, on balance, a good investment of taxpayer dollars.

Please disclose the funding source for non-commercial activities proposed.

The economic analysis fails to provide a robust basis for the claimed project revenues.

The EA does not disclose reasonably itemized monetary costs of the project activities. Along with the costs of those specific project actions, the costs of road maintenance proportionately attributable to this project area, and the cumulative financial impacts of carrying out fire suppression policy were not analyzed and disclosed.

The EA refers to something called a "job." It says, "The project is expected to create or maintain 64 jobs and $5,269,000 in labor income on an annual average basis." How long would that go? What is the expected income from the average "job" for the jobholder? No definition of job is provided. No basis for the numbers of "jobs" or amount of "labor income" is provided.

Please disclose the annual profits of private companies benefitting from this proposal.

We ask the FS disclose the following information concerning the project area:

- The deferred road maintenance backlog
- The annual road maintenance funding needs
- The annual road maintenance budget
- The capital improvement needs for existing roads
- 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

- new permanent roads
- project-related road maintenance
- road decommissioning
- road storage
- all other road-related work
- reconstruction and realignment on trails
- conduct all non-harvest related burning
- biomass removal
- permitting
- enforcing motorized travel restrictions
- responding to comments and objections
- collaborative meetings and other stakeholder group activities which incur costs from FS participation or attendance
- develop rock pit/quarries
- post-project monitoring
- precommercial thinning
- sale preparation and administration
- project-related weed treatment
- other project mitigation
- environmental analyses and reports
- public meetings and field trips
- publicity
- consultation with other government agencies
- FS employee salaries (or payouts to private consultants) for performing project analyses and administration

SCENERY

With all the lasting visual scars from the logging and roadbuilding, does the FS really believe that over a thousand acres of clearcuts, traversed by new roads gouged into the landscape, maintains the scenery or a quality recreational experiences for visitors?

CONCLUSION

As our comments demonstrate, the project's impacts were not analyzed consistent with best available science. Likely significant impacts were not adequately considered in the EA. The FS is obligated to take a few steps back and prepare an EIS.

The scientific and other sources cited in these and previous comments are intended to be added to the project record. We will provide to the FS a copy of any and all of them simply upon emailed request to Jeff Juel.

Finally, at the moment these comments were being submitted electronically, there was no option on the project website to actually download them to the online portal via https://www.fs.usda.gov/project/?project=60853. So we are exercising our only option by emailing to them to the three FS email addresses listed on page 1. Kindly reply via email on September 30 to acknowledge timely receipt/submission.

Sincerely submitted,

Jeff Juel

Jeff Juel, Forest Policy Director
Friends of the Clearwater
[redacted]

And on behalf of:
Adam Rissien, ReWilding Manager
WildEarth Guardians
[redacted]

Mike Garrity
Alliance for the Wild Rockies
[redacted]

Paul Sieracki
Inland Empire Task Force
[redacted]

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