Friends of the Clearwater
Keeping Idaho's Clearwater Basin Wild
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Submitted to the project portal at: https://cara.fs2c.usda.gov/Public//CommentInput?Project=61355
and emailed to: robyn.smith@usda.gov and karen.hardwick@usda.gov

Ms. Smith:

These are comments on the Twentymile Proposed Action (PA) on behalf of Friends of the Clearwater, Native Ecosystems Council, Alliance for the Wild Rockies and WildEarth Guardians. The proposal is for the Elk City-Red River Ranger District on the Nez Perce-Clearwater National Forests (NPCNF). We incorporate the April 18, 2023 comments by Harry Jagemon within these comments.

Please note that in our comments, text in quotes is taken from the PA unless otherwise attributed.

"EMERGENCY!" BYPASSING THE NEPA AND PREDECISIONAL REVIEW/OBJECTION PERIOD/PROCESSES TO EXPEDITE LOGGING

The April 6, 2023 email to the public from District Ranger Robyn Smith ("Subject: Twentymile Project Update") states:

> The project area lies within one of the 250 identified High Risk Firesheds therefore, the NPC is requesting an Emergency Action Determination for this project under the Bipartisan Infrastructure Law section 40807. The reason for requesting this emergency authority is to mitigate the harm to life and property adjacent to NFS land; to control insects or disease; remove hazardous fuels; and protect and restore water resources and infrastructure. The request is currently pending approval. If approved, the Twentymile project will not be subject to the pre-decisional objection review process.

Similarly, the PA states:

> The Secretary of Agriculture, Tom Vilsack, has determined that the Forest Service may carry out Authorized Emergency Actions under section 40807 of the Infrastructure Investment and Jobs Act (PL 117-58) on National Forest System lands in 250 identified High Risk Firesheds. Emergency actions are taken to achieve relief from threats to public health and safety, critical infrastructure, and/or to mitigate threats to natural resources.

> Forests projects proposed under an emergency authority must be approved by the Secretary.
>
> The NPC is requesting approval from the Secretary to implement the Twentymile project as an Emergency Action Determination project. The project lies within one of the 250 identified High Risk Firesheds. The reason for requesting this emergency authority is to mitigate the harm to life and property adjacent to NFS land; to control insects or disease; remove hazardous fuels; and protect and restore water resources and infrastructure.
>
> Should the Secretary of Agriculture grant an Emergency Action Determination, this project will not be subject to the pre-decisional objection review process. It is therefore critical that you provide feedback on this project during this designated combined scoping and comment period, as the public may not be able to raise additional project concerns during an objection period.

So without any analysis, the FS is saying the project meets the criteria in Section 40807 of Public Law 117-58 for emergency actions needed to reduce the risk of wildfire. PL 117-58 was enacted on November 15, 2021. Prior to the District Ranger's April 5 so-called "Update" the public had never heard of this proposal. And the FS prefers that a mere 30 days later the public has no further say in the matter.

There is nothing in the PA that supports the FS cry of "Emergency!" The rationale the PA provided for proposing this project is essentially identical to that for all vegetation "treatment" projects proposed on the NPCNF over the past decade and before.

To understand how the FS plans to move forward with implementing the Twentymile timber sale under this so-called "emergency", a March 10, 2023 memo from FS Chief Moore states:

> Within these designated areas, I have the authority to approve emergency actions for which NEPA compliance actions are not subject to administrative review under 36 CFR 218, and an environmental assessment or environmental impact statement need only analyze the no action alternative and the proposed action. In addition, a proposed emergency action is subject to special injunctive relief standards if challenged in court.
>
> Going forward, the Forest Service will coordinate with the Office of the General Counsel and the Department of Agriculture to ensure departmental awareness and coordination in situations where I determine that emergency authorizations are appropriate for use.
>
> It is my expectation that we will take an Agency approach to address these emergency situations. In addition to expedited compliance authorities, we are deploying other administrative authorities within my discretion to accelerate environmental analysis, contracting, hiring, and project implementation such as:
>
> - Emergency and direct hire authorities to support the Wildfire Crisis Strategy with the objective of hiring new personnel in the most critical positions.

- Expedited contracting authorities or mechanisms such as virtual incident procurement and related incident procurement instruments, sole source and small business authorities, simplified procurement processes, and USDA contracting authorities.

- Prioritize grants and agreements for needed emergency work.

- Exemptions, waivers, expanded inclusions, and expedited mechanisms for emergency programs on joint efforts with USDA agencies and Tribes.

- Emergency consultation to comply with the Endangered Species Act.

- Emergency and programmatic consultation to comply with the National Historic Preservation Act.

- Emergency procedures to comply with the Clean Water Act; and,

- Expedited permitting, certification, and qualification processes as defined in Forest Service directives or as directed by the Chief.

> I am also empowering our Regions and field units to identify those processes and procedures that may limit or delay your ability to implement these emergency actions. To that end, we have created an Emergency Actions Portal [direct link: Emergency Actions Portal - Home (sharepoint.com)] to intake and track your requests to use emergency authorities and identify challenging processes/procedures.
>
> The portal will serve as a one-stop-shop for requesting approval for emergency actions and to request exceptions to existing policy or guidance that is limiting your ability to expedite emergency actions. Use of these authorities must be approved on a case-by-case basis and the portal will be the mechanism to do this…

To best understand the Chief's memo, one need to only substitute the word "lawless" everywhere he says "emergency" or "expedited."

The Chief's "expedited compliance authorities" and other "administrative authorities" call into question the value of the public participating in what appears to be a sham and perfunctory comment process. Clearly the FS considers its mission to be getting out the logs as soon as possible, screw the public and the ecosystems. Apparently nothing in our comments will matter one bit to the Forest Service/USDA.

VIOLATIONS OF LAW, THE FOREST PLAN, THE WING CREEK-TWENTYMILE TIMBER SALES EIS AND ROD

(*Note: This is an abbreviated version of the section found in a separate pdf document entitled "Violations of Law." The full version could not be placed into this document because photos and figures created formatting and file size issues.*)

<u>Background and Introduction</u>

As noted above in these comments, the PA does not fit into the parameters of the provisions of law allowing for the PA's proposed waiving of environmental laws and analysis procedures. That said, the PA also fails to adequately address the Endangered American Wilderness Act, in regards to land not designated as Wilderness. This means documents tiered to that Act – the Forest Plan, the Gospel Hump Wilderness Management Plan, and the Wing Creek-Twentymile Timber Sales EIS and ROD.

Issues of prime concern about the areas that were not designated as Wilderness evolve around wildlife, fish, soils, and watersheds. These concerns were articulated in the legislation, the hearings, and committee reports. For example, the Endangered American Wilderness Act required in section 4(c)(1) the Forest Service (Secretary of Agriculture) to cooperate with Idaho and the Interior Department:

> …in conducting a comprehensive fish and game research program within the Gospel-Hump Area and surrounding Federal lands in north-central Idaho. The Secretary shall assure that this research program includes detailed investigations concerning resident and anadromous fisheries resources (including water quality relationships) and the status, distribution, movements, and management of game populations, in order to provide findings and recommendations concerning integration of land management and development with the protection and enhancement of these fish and game resources.

Also, "the Secretary (of Agriculture)" was ordered to "take particular care to gather and integrate field data on soils types and soil hazards" [Section 4(d)(2)].

One of the biggest impacts to wildlife and fish comes from roads. This was recognized in the legislative record, the Forest Plan, and the Wing Creek-Twentymile Timber Sales EIS and ROD. Whether through the loss of institutional memory or whatever other reasons, the Forest Service is erroneously proceeding as if the decisions to protect fish and wildlife made previously in statute and administrative decisions made after analysis in EISs can be overturned through an "emergency" determination meant to deal with the narrow issue of fire.

<u>The 1875 Road System (including the 9824 and 9829 Roads)</u>

The PA proposes to open up the 1875, 9824, and 9829 roads to the 492 road, something explicitly closed by the Wing Creek-Twentymile ROD and FEIS, which was tiered to pages II-26 and II-27 of the Forest Plan. The Forest Plan deferred any decision on whether to open up a shorter route to the 492 road from the South Fork to Rainy Day Saddle and then the tie-through to the 492 road until a site specific EIS was done. The plan recognized that such a proposal would have serious impacts: "The decision to do this will not be made until the connection is complete, public involvement on the proposal is completed, and trade-offs are considered." (Forest Plan at II-27.) Those tradeoffs and public comments were considered in the Wing Creek-Twentymile ROD and FEIS. The decision was made to close those routes to public use, which the PA recognizes as the current situation on pages 24 and 25.

The Forest Service recognized in that ROD that it was necessary to have "an aggressive access management program to mitigate the impacts" of the project on several resources including wildlife, fisheries, and non-motorized recreation. (ROD at 11.) The ROD closed those roads to use. (ROD at 11, 13, and 21.) Also adopted are mitigation measures and monitoring. (ROD at 19-24.)

The PA's abbreviated process of public involvement violates the Forest Plan requirements cited above. Reversing sound policy decisions without going through an EIS, where those decisions were originally made, is a violation of NEPA.

In 2010, the Forest Service tried to open up the roads above after closing a short segment of the 492 road. The final decision was to keep the status quo. (See Sourdough Final DN and FONSI; also Sourdough Road Access comments by FOC). The current proposal is even worse in that no roads will be decommissioned.

Further, the Forest Service has not fulfilled its obligations under the Wing Creek-Twentymile Timber Sales EIS and ROD. On September 27, 2022 roads 1975, 9824, and 9829 were open or accessible to motor vehicles[1] as our photos demonstrate.[2]

In the photos, the 1875 road here does not access the 492 road. Even if the opening of the tie through to road 492 were legitimate, the fact the side gate is opened on 1875 beyond the junction is not. Further, in the photo below, the fact that the 9824 and 9829 roads are opened makes it possible to drive on the side spur roads, which have no gates. Thus, the entire 9824 road system was illegally open to use.

There are also problems with the 9829 road to the south. The Wing Creek-Twentymile Timber Sales EIS and ROD promised a berm and road ripping (ROD at 21 and FEIS at 127), which is not evident now, assuming it was done. Instead there is a gate that has been bypassed by ATVs as shown in the photos.

The upshot is, the Forest Service has failed to meet the mitigation and monitoring requirements in the Wing Creek-Twentymile Timber Sales EIS and ROD. Side gates were open on the 1875

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[1] On September 27, signs warned of a slide on the 492 road, presumably somewhere near Tenmile Creek. These signs were located at the junction of 492 and 9829 and where 492 descends into Fourmile Creek. However, the road was open between those points and there was no indication on the signs that the road was completely impassable or that it had been fixed. There was no indication on the Forest Service website at the time there was a slide on the 492 road. Regardless, there was evidence of recent use of the 492 road between from Rainy Day and Sixmile Creek, meaning that even if the road were impassible at one point, use was taking place on both sides of the road up to the point of the slide. Further, there is no provision to open up the closed roads in case of a landslide.

[2] Friends of the Clearwater is preparing a report with photo documentation of these and other failures of travel management. This report is the result of a multi-year citizen monitoring effort and should be available in late 2023.

road the Illegal use has been taking place on the 9829 road south of the 492 road for some time. These are in addition to opening up the tie through that was supposed to be closed to public motorized use (except snowmobiles)[3] to protect wildlife. How can the public trust the agency when the Forest Service fails to abide by its legal responsibilities and mandates?

Trail 930 and Road 492

Trail 930, which the PA misleadingly labels road 492C, is not currently a road, if it ever was. According to the Nez Perce National Forest DRAMVU FEIS Volume 2 (March 2017) the route is a trail and any template has been decommissioned for decades and closed to wheeled motorized use (see Appendix B trails page 15 of 15). At most, it was a jeep trail in the distant past. The public Forest Visitor Map, the North Pole and Golden Forest Service topographic maps, and the Wing Creek-Twentymile Timber Sales FEIS at p. 68 all recognize 930 as a trail in a roadless area.

Thus, the PA is false and misleading by stating it is a road in need of maintenance only. It would amount to road construction if a road were built over the trail.

There has been some illegal ATV use on the trail. The photos show the trail at its beginning and clearly demonstrate it is no road.

There is a short, steep, and primitively pioneered spur off the 492 road that leads to a dispersed campsite at the junction of the 884 and 930 trails. The failure of the Forest Service to recognize the reality of the on-the-ground situation demonstrates a lack of knowledge about the area and an apparent loss of expertise. The haste in putting this PA together also demonstrates an insouciance to caring for the land and serving the people. It seems the PA is a slapdash exercise that barely researched agency files, let alone incorporated any field work.

The PA also fails to recognize the history of the 492 road. The Forest Service decided in the ROD on the Wing Creek-Twentymile Timber Sales that citizens wanted: "to maintain the road to a low standard enclosed by trees with minimal evidence of management activities. My decision is to manage the Sourdough Road #492 to maintain the present recreation uses and experiences." ROD at 13. Upgrading the segment of the 492 road from the junction of the 9829 road and some point to access the 930 trail (not quite one mile) would violate this decision.

In sum, the PA would be in violation of existing mandates and direction. It is a backdoor attempt to rewrite the Forest Plan and weaken existing standards. Trying to shoehorn this project into the emergency category is a gross disservice to the American public and the Nez Perce National Forest.

NATIONAL ENVIRONMENTAL POLICY ACT

The April 6, 2023 email to the public from District Ranger Robyn Smith (Subject: Twentymile Project Update) states, "The Twentymile project analysis is anticipated to be completed in an

[3] There is also no indication in the PA the Forest Service has met the monitoring requirements in the ROD and FEIS regarding snowmobile use and winter range. See for example ROD at 21.

environmental assessment." Yet confusingly, the PA states, "By preparing this Proposed Action, agency policy and direction to comply with the National Environmental Policy Act (NEPA) is fulfilled." Therefore we must assume the FS considers the PA to be the same as the Environmental Assessment (EA) alleged to be under development.

The PA states it was written by Sundance Consulting, Inc., but there's no indication that the author(s) have any expertise in the subjects covered by the PA. It doesn't even identify the person(s) who wrote it, or their particular area(s) of expertise. How is NEPA being served with such a situation? There are currently no specialists' reports on the project website—pretty much bare minimum documents as characteristic of the scoping phase.

An Environmental Impact Statement is required

The PA does not adequately address the scientific and analytical controversies it poses, as we discuss in this letter. Furthermore the sheer size of the proposed activities—2,209 acres of mostly clearcutting including old growth, prescribed burning across 6,807 more acres including old growth, ten miles of new road construction, and 36 miles of road "maintenance" of which much is actually heavy reconstruction including refurbishing roads which hardly exist anymore after decades of natural recovery—represents significant impacts on the environment. Of still more significance is twenty-four acres of logging proposed timber harvest in the Eligible Wild and Scenic River (WSR) corridor of the South Fork Clearwater River, threatening at least a portion of this corridor's eligibility for final WSR designation. And the proposed actions would degrade roadless characteristics within an uninventoried roadless area—in the roadless expanse adjacent to the Gospel Hump Wilderness, threatening at least a portion of this area's eligibility for Wilderness designation. The FS must prepare an Environmental Impact Statement (EIS).

Analysis under this PA violates NEPA by failing to take a "hard look." The FS is also not required to provide written responses to our comments, as is required for an EIS—further nullifying agency credibility and public involvement.

A Region 1 memo (USDA Forest Service, 2019b) reveals that the choice to write an EIS is arbitrary, not in consideration of potential significance.

"FIRE! FIRE! FIRE!"

This is another aspect of the FS's cries of "Emergency!"

"The purpose and need for this project were determined after comparing the existing condition with the desired conditions of the area in order to best address the **wildfire crisis**. …In meeting the purpose and need of the proposed action, management actions will address the **wildfire crisis**…" (Emphases added.) The PA doesn't define "wildfire crisis" and in reality, there is none.

"Most of the project area is highly susceptible to crown fire due to significant hazardous fuel loads." Please explain how the forest ecosystems of the South Fork of the Clearwater River, which feature forest stands naturally evolving from mature to old growth, would NOT be susceptible to crown fire. This isn't an urban public park.

"Fuel loadings, especially for old growth/old forest habitats, should be commensurate with historical levels, reducing the risk of stand replacing wildland fire." Nowhere does the PA describe the alleged historical nature of "fuels" in old growth.

The PA claims, "Wildfires that occur could take considerable effort to extinguish, put firefighters at risk, **and could directly impact private property."** The perspective of two co-authors (a former Forest Service researcher and a Missoula County commissioner) illustrates why the PA's identification of wildlands as a risk to communities is wrong:

> …research has shown that home ignitions during extreme wildfires result from conditions local to a home. A home's ignition vulnerabilities in relation to nearby burning materials within 100 feet principally determine home ignitions. … Although an intense wildfire can loft firebrands more than one-half mile to start fires, the minuscule local conditions where the burning embers land and accumulate determine ignitions….. Thus, community wildfire risk should be defined as a home ignition problem, not a wildfire control problem.

(Cohen and Strohmaier, undated.) The fire protection for homeowners implied by the PA is pretty much imaginary. Responsibility for reducing risk of fire burning private structures ought to and does rest squarely on the shoulders of the owners of those structures—not on U.S. taxpayers.

The FS completely omitted any mention of the well-documented uncertainty of their strategy using logging to reduce future fire behavior, especially logging of mature forests, which could serve as fire refugia. It is increasingly understood and accepted that reducing fuels does not consistently prevent large fires and does not reduce the outcome of these fires. *See* Lydersen et al. 2014.

Former FS Deputy Chief James Furnish weighs in:

> For a long time, we have heard that the problem is in the forests, and that we must ramp the pace and scale of work in these forests. The proponents ask for our continued faith that scaling is possible, even though they have been at it for nearly 30 years and most of our home and community loss happens in grasslands and shrublands.
>
> Let me begin by citing the large Jasper Fire, in SD's Black Hills National Forest, circa 2000. Jasper Fire burned almost 90,000 acres of intensively managed Ponderosa pine forest, about 10 percent of the entire national forest. Human caused, it was ignited on a hot, dry, windy July day – quite typical of weather in peak burning periods nowadays. Suppression efforts were immediate and used every tool in the agency's tool box… to no avail. Notably, the burned terrain exemplifies what we consider the best way to reduce fire intensity, if not fireproof, a forest. This mature forest of small saw timber had been previously thinned to create an open stand intended to limit the likelihood of a crown fire. Yet, the fire crowned anyway and raced across the land at great speed, defying control efforts. Much of the area remains barren 20 years later, while the Forest Service slowly replants the area.

I cite this example, because it represents precisely what agencies posit as the solution to our current crisis: 1) aggressively reduce fuel loading through forest thinning on a massive scale of tens if not hundreds of millions of acres (at a cost of several $ billion, and then do it again), while trying to 2) come up with sensible answers about how to utilize the finer woody material that has little or no economic value; and 3) rapidly expanding the use of prescribed fire to reduce fire severity. These solutions are predicated on the highly unlikely (less than 1%) probability that fire will occur exactly where preemptive treatments occurred before their benefits expire. These treatments are not durable over time and space, and only work if weather conditions are favorable, and fire fighters are present to extinguish the blaze.

To be blunt, the ineffectiveness of current practices has led many scientists to suggest, based on peer reviewed science and field research as opposed to modeling, that agency "fire dogma" needs to be revisited. The call for a true paradigm shift is occurring both within and outside the agency. Several truths have emerged:

1) Fires burn in ways that do not "destroy", but rather reset and restore forests that evolved with fire in ways that enhance biodiversity.
2) Forest carbon does not "go up in smoke" – careful study shows that more than 90 percent remains in dead and live trees, as well as soil, because only the fine material burned.
3) The biggest trees in the forest are the most likely to survive fire, and thinning efforts that remove mature and older trees are counter-productive. We are seeing more cumulative fire mortality in thinned forests, than in natural forests that burn.
4) Thinning and other vegetation removal increases carbon losses more than fire itself and, if scaled up, would release substantial amounts of carbon at a time when we must do all we can to keep carbon in our forests.
5) If reducing home loss is our goal, experts are telling us that the condition of the structure itself and vegetation immediately adjacent to the home are the primary drivers of home ignition and loss, and that the condition of vegetation more than 100 feet from the home has nothing to do with the ignitability or likelihood a home will burn.
6) Large, wind-driven fires defy suppression efforts and many costly techniques simply waste money and do more damage. Weather changes douse big fires, people do not.

(Furnish, 2022.) And Downing et al 2022 state, "Focusing on minimizing damages to high-value assets may be more effective than excluding fire from multijurisdictional landscapes."

In his opinion piece in the *Missoulian*, biologist and fire ecologist Hutto (2022) echoes those points. Also see DellaSala (2022). Yet as PA and its cry of "Emergency!" reveals, the FS keeps spewing the same old fear mongering propaganda, representing to the public that logging is needed to protect firefighters and homeowners from fire.

During hot, dry, and/or windy conditions, no amount of "fuel reduction" would significantly alter any of the PA's ill-defined metrics and fire concepts. It is during those occasions when wildland fires cover the most acres, most quickly—largely nullifying all "fuel reduction" and suppression efforts.

Large fires are driven by several conditions that completely overwhelm fuels. (Meyer and Pierce, 2007.) Because weather is often the greatest driving factor of a forest fire, and because the strength and direction of the wildfire is often determined by topography, fuels reduction projects cannot guarantee fires of less severity. (Rhodes, 2007; Carey and Schumann, 2003.)

We question the wisdom of attempting to control wildfire instead of learning to adapt to fire. See Powell 2019 (noting that severe fires are likely inevitable and unstoppable). See also Schoennagel et al., 2017 (explaining, "[o]ur key message is that wildfire policy and management require a new paradigm that hinges on the critical need to adapt to inevitably more fire in the West in the coming decades"). The FS must recognize that past logging and thinning practices likely increased risk of intense fire behavior on this landscape. But instead of learning from these past mistakes, here the FS is committing to making the same mistakes by proposing widespread logging and repeated burning across the landscape. It is well-established that communities (homes) are best protected from fire by home hardening, and judicious removal of fuels within the surrounding 100-200 ft. radius. (Syphard et al. 2014; Cohen, 2000.) The FS fails to disclose the fact that addressing the home ignition zone will do more to protect property than the proposed activities.

See "A New Direction for California Wildfire Policy—Working from the Home Outward" dated February 11, 2019 from the Leonard DiCaprio Foundation. It criticizes policies from the state of California, which are essentially the same FS fire policies on display in the NPCNF. From the Executive Summary: "These policies try to alter vast areas of forest in problematic ways through logging, when instead they should be focusing on helping communities safely co-exist with California's naturally fire-dependent ecosystems by prioritizing effective fire-safety actions for homes and the zone right around them. This new direction—working from the home outward—can save lives and homes, save money, and produce jobs in a strategy that is better for natural ecosystems and the climate." It also presents an eye-opening analysis of the Camp Fire, which destroyed the California town of Paradise.

We also incorporate the John Muir Project document "Forest Thinning to Prevent Wildland Fire …vigorously contradicted by current Science" (Attachment 2).

We likewise incorporate "Open Letter to Decision Makers Concerning Wildfires in the West" signed by over 200 scientists (Attachment 3).

And also see "Land Use Planning More Effective Than Logging to Reduce Wildfire Risk" (Attachment 4).

The risks of fire are best dealt with in the immediate vicinity of homes, and by focusing on routes for home occupier egress during fire events—not by logging national forest lands well away from human occupied neighborhoods. The PA fails to recognize that the only effective way to prevent structure damage is to manage the fuels in the immediate vicinity of those homes, which happed to be well away from all the FS's proposed clearcutting.

The nine-part Wildfire Research Fact Sheet Series was produced by the National Fire Protection Association (NFPA)'s Firewise USA® program, as part of the NFPA/USDA Forest Service cooperative agreement and with research provided by the Insurance Institute for Business and Home Safety (IBHS). They are a product of the research done by the IBHS lab in South Carolina, covering a wide range of issues. This Firewise approach also begs the question—why isn't the NPCNF implementing an aggressive outreach and education program to assist homeowners living in and near national forests?

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.
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> …(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, which the PA fails to acknowledge or recognize. 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.

Finney and Cohen, 2003 recognize: "To reduce expected loss from home ignition, it is necessary and **often sufficient to manage fuels only within the home ignition zone** …**and abide by fire resistant home construction standards**…" (Emphasis added).

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

We strongly support government actions that facilitate cultural change towards private landowners taking the primary responsibility for mitigating the safety and property risks from fire, by implementing firewise activities around their property. Indeed, the best available science supports such a prioritization. (Kulakowski, 2013; Cohen, 1999a) Also, see Firewise Landscaping[4] as recommended by Utah State University, and the Firewise USA website by the National Fire Protection Association[5] for examples of educational materials.

A recent article in Phys.org reports on results of a study by DellaSala and Hanson, 2019:

> They found no significant trend in the size of large high-severity burn patches between 1984 and 2015, disputing the prevailing belief that increasing megafires are setting back post-fire forest regeneration. "This is the most extensive study ever conducted on the high-severity fire component of large fires, and our results demonstrate that there is no need for massive forest thinning and salvage logging before or after a forest fire," says Dr. Dominick A. DellaSala, lead author of the study and Chief Scientist at the Geos Institute. "The perceived megafire problem is being overblown. After a fire, conditions are ideal for forest re-establishment, even in the interior of the largest severely burned patches. We found conditions for forest growth in interior patches were possible over 1000 feet from the nearest low/moderately burned patch where seed sources are most likely."

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.

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

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

FS researchers have long since recognized that logging, especially the extensive and homogeneous logging "regeneration" cuts create, actually *increase* fire severity where the fire might otherwise have been severe. Stone et al. (2008), a technical report based on a presentation in 2004 (Proceedings of the Second International Symposium on Fire Economics, Planning, and Policy: A Global Perspective), discuss a study of a forested area southeast of Missoula, Montana affected by the Cooney Ridge fire complex. The scientists found fire severely and uniformly burned a watershed which had been extensively and homogeneously logged, in contrast to an adjacent watershed with higher fuel loads but greater heterogeneity which experienced mosaic of burn severities. They conclude, "Harvesting timber does not translate simply into reducing fire risk." Similar results have been repeatedly found in other published science.

Also see documents we are submitting as part of this objection:

- Fire Strategy Stuck with old tactics, experts warn
- Colorado's Suburban Firestorm
- Forests need fire — communities do not
- The 'ecological hate speech' developed around wildfire
- Nuance in Wildfire Policy is Badly Needed
- Living With Fire
- Living With Fire, 2009
- A New Direction for California Wildfire Policy
- As California burns, some ecologists say it's time to rethink forest management
- Logging makes forests and homes more vulnerable to wildfires
- Scientists Letter, 2018
- Scientists Letter, 2021

"Only treating fuels in the immediate vicinity of the homes themselves can reduce risk to homes, not backcountry fuel reductions projects that divert scarce resources away from true home protection." DellaSala et al. 2015 (Chapter 13), p. 384 (citing Cohen, 2000; Gibbons et al. 2012; Calkin et al. 2013; Syphard et al, 2014).

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 PA lacks any detailed discussion on fire ecology, instead it demonizes wildland fire even though it is a vital natural process characteristic of this landscape.

Furthermore, the PA's analysis of "hazardous fuels" is overly limited in scope, examining only a tiny snapshot in time. Reality includes durations of time, not just a single instance represented immediately post-action/treatment, etc. "(A)s the regenerated stand grows, it would build back crown fuels." So the implication is that re-treatment or other maintenance of treated areas will be necessary for continued effectiveness is not considered. Yet, the PA analysis only examines a single snapshot in time: "There are no present or reasonably foreseeable future fuels reduction treatments identified within the treatment units, other than those being proposed by the Twentymile Project; therefore, there are no cumulative effects."

The FS is obligated to analyze and disclose the temporal effectiveness of the proposed "fuel" reductions. It's unlikely the area will see unplanned wildland fire the moment the fuel "treatments" are finished. Rhodes & Baker (2008) studied fire records and found that, over the 20-year period that fuel reduction is assumed to be effective, approximate 2.0-4.2% of untreated areas would be expected to burn at high or high-moderate severity. This, considered with the science above, renders the FS's assumption that logging can satisfy the fuel-reduction purpose and need controversial at best.

The PA assumes that if proposed treatments were not to occur and with continued fire suppression, increases in fuel loadings would result in more intense fires. However there is no genuine analysis of the No Action alternative.

Westerling et al. 2006 state that fires in this region, the Northern Rockies, has not been impacted from previous land-use effects; the ecosystem feature of stand-replacing fire is part of the reason why fire suppression has had minimal impact on the fire regime in the Northern Rockies. Noss et al. 2006 agree that fire suppression has very likely not impacted the historical variability of fires in the Northern Rockies. The FS must acknowledge this science and discuss that in relation to the agency's assertion that fire suppression leads to and has caused high-severity fires. Wildfire suppression has little impacted this region because the natural range of variability includes high-severity fires on the order of centuries. *See, e.g.*, Brunelle and Whitlock 2003; Westerling et al. 2006; Eaton 2017.

Riggers, et al. 2001 state:

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

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

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

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

Noss et al. (2006) state:

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

High-severity fire is ecologically important. (Bond et al. 2012.) Snag forest habitat "is one of the most ecologically important and biodiverse forest habitat types in western U.S. conifer forests (Lindenmayer and Franklin 2002, Noss et al. 2006, Hutto 2008)." (Hanson 2010.)

Even if there is scientific legitimacy to the claims that fuel reductions reduce ecological damage from subsequent fire—a claim that is scientifically controversial and unproven for the long term, and left not quantified for any defined short term—the area affected by such projects in recent years is miniscule compared to the entire, allegedly fire-suppressed forest.

It may be that fire suppression in the project area has not, in reality, caused a significantly elevated risk of abnormal fire in the project area. We believe the agency is playing this fire-scare card largely to justify logging as restoration. However, playing the fire scare card is not just a project area issue—it's forestwide. The agency puts the joker in the deck, changing the whole game—not just for one hand as the FS pretends.

Scientific information concerning fire suppression was 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.)

If they are significant at all, the effects of fire suppression are not unique to the Twentymile project area—similar language has been included in NEPA documents for all logging projects on this Forest for at least a decade. If fire suppression effects as described in the PA are occurring, it means that, as forestwide fire suppression continues, the results of this management include continuing **increases in these adverse effects across the entire forest.** So multiply the above list of effects times the extent of the entire forest, and what the agency tacitly admits is, forestwide fire suppression is leading to stand-replacing fires outside what is natural, and that alternation of fire regimes results in wide-scale disruption of habitats for wildlife, rare plants, tree insect and disease patterns and increases the occurrence of noxious weeds. Such analyses and disclosures are not found in the Forest Plan FEIS.

The no-action alternative contemplated under the ICBEMP EIS is the management direction found in the Forest Plan: "Alternative S1 (no action) continues management specified under each existing Forest Service and BLM land use plan, as amended or modified by interim direction—known as Eastside Screens (national forests in eastern Oregon and Washington only), PACFISH, and INFISH—as the long-term strategy for lands managed by the Forest Service or BLM." (USDA FS & USDI BLM 2000. Ch. 5, pp 5-6.)

The philosophy driving the FS strategy to replicate the NRV (i.e. desired conditions) is that emulation of the results of disturbance processes would conserve biological diversity. McRae et al. 2001 provide a scientific review summarizing empirical evidence that illustrates several significant differences between logging and wildfire—differences which the FS fails to address. Also, Naficy et al. 2010 found a significant distinction between fire-excluded ponderosa pine forests of the northern Rocky Mountains logged prior to 1960 and paired fire-excluded, unlogged counterparts:

> We document that fire-excluded ponderosa pine forests of the northern Rocky Mountains logged prior to 1960 have much higher average stand density, greater homogeneity of stand structure, more standing dead trees and increased abundance of fire-intolerant trees than paired fire-excluded, unlogged counterparts. Notably, the magnitude of the interactive

> effect of fire exclusion and historical logging substantially exceeds the effects of fire exclusion alone. These differences suggest that historically logged sites are more prone to severe wildfires and insect outbreaks than unlogged, fire-excluded forests and should be considered a high priority for fuels reduction treatments. Furthermore, we propose that ponderosa pine forests with these distinct management histories likely require distinct restoration approaches. We also highlight potential long-term risks of mechanical stand manipulation in unlogged forests and emphasize the need for a long-term view of fuels management.

Bradley et al. 2016 studied the fundamental premise that mechanical fuel reduction will reduce fire risk. This study "found forests with higher levels of protection had lower severity values even though they are generally identified as having the highest overall levels of biomass and fuel loading." In fact, the study's results suggest the opposite: "(B)urn severity tended to be higher in areas with lower levels of protection status (more intense management), after accounting for topographic and climatic conditions in all three model runs. Thus, we rejected the prevailing forest management view that areas with higher protection levels burn most severely during wildfires." The study goes on to discuss other findings:

> An extension of the prevailing forest/fire management hypothesis is that biomass and fuels increase with increasing time after fire (due to suppression), leading to such intense fires that the most long-unburned forests will experience predominantly severe fire behavior (e.g., see USDA Forest Service 2004, Agee and Skinner 2005, Spies et al. 2006, Miller et al. 2009b, Miller and Safford 2012, Stephens et al. 2013, Lydersen et al. 2014, Dennison et al. 2014, Hessburg 2016). However, this was not the case for the most long-unburned forests in two ecoregions in which this question has been previously investigated—the Sierra Nevada of California and the Klamath-Siskiyou of northern California and southwest Oregon. In these ecoregions, the most long-unburned forests experienced mostly low/moderate-severity fire (Odion et al. 2004, Odion and Hanson 2006, Miller et al. 2012, van Wagtendonk et al. 2012). Some of these researchers have hypothesized that as forests mature, the overstory canopy results in cooling shade that allows surface fuels to stay moister longer into fire season (Odion and Hanson 2006, 2008). This effect may also lead to a reduction in pyrogenic native shrubs and other understory vegetation that can carry fire, due to insufficient sunlight reaching the understory (Odion et al. 2004, 2010).

From a news release announcing the results of the Bradley et al. 2016 study:

> "We were surprised to see how significant the differences were between protected areas managed for biodiversity and unprotected areas, which our data show burned more severely," said lead author Curtis Bradley, with the Center for Biological Diversity.
>
> The study focused on forests with relatively frequent fire regimes, ponderosa pine and mixed-conifer forest types; used multiple statistical models; and accounted for effects of climate, topography and regional differences to ensure the findings were robust.

> "The belief that restrictions on logging have increased fire severity did not bear out in the study," said Dr. Chad Hanson, an ecologist with the John Muir Project. "In fact, the findings suggest the opposite. The most intense fires are occurring on private forest lands, while lands with little to no logging experience fires with relatively lower intensity."
>
> "Our findings demonstrate that increased logging may actually increase fire severity," said Dr. Dominick A. DellaSala, chief scientist of Geos Institute. "Instead, decision-makers concerned about fire should target proven fire-risk reduction measures nearest homes and keep firefighters out of harm's way by focusing fire suppression actions near towns, not in the back country."

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."

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

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 gives "recommendations for moving forward based on best available science."

Typically, attempts to control or resist the natural process of fire have been a contributor to deviations from historic conditions. The FS analyses skew toward considering fire as well as native insects and other natural pathogens as threats to the ecosystem rather than rejuvenating natural processes. It seems to need the obsolete viewpoint in order to justify and prioritize the proposed vegetation manipulations, tacitly for replacing natural processes with "treatments" and "prescriptions." However the scientific support for assuming that ecosystems can be restored or continuously maintained by such manipulative actions is entirely lacking.

The FS's foreseeable budget for the NPCNF would not allow enough vegetation management under the agency's paradigm to "fix" the problems the FS says would be perpetuated by fire suppression. The FS did not conduct any analysis that faces up to any **likely** budget scenario, in regards to the overall management emphases. The implication is clear: logging and fire suppression is intended to continually dominate, except in those weather situations when and where suppression actions are ineffective, in which case fires of high severity will occur across relatively wide areas. No cumulative effects analysis at any landscape scale exists to disclose the environmental impacts.

Also in claiming and implying departures from historic conditions, the FS does not provide a spatial analysis, either for the true reference conditions or of current project area conditions. The FS has no scientifically defensible analysis of the project area **landscape pattern** departure from HRV.

Churchill, 2011 points out:

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

Churchill describes above the ongoing natural processes that will alleviate problems alleged in the PA—without expensive and ecologically risky logging and road building. Since no proper spatial analysis of the landscape pattern's departure has been completed, the PA has no scientifically defensible logging solution.

Despite the fact that the PA makes many claims to the effect that without the proposed treatments there is a high likelihood of highly adverse effects on various resources due to wildfire, it discloses nothing about such effects from recent fires in the general area. The FS's fear-mongering statements about the impacts of fire are speculative and not based upon data or any empirical evidence, in violation of NEPA.

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.**

If the predictions of uncharacteristically severe fire were accurate, one might think that the results of scientific validation of such assumptions would have been conducted in the NPCNF by now, and cited in the PA. We find no data or scientific analysis of those fires' effects validating the FS's predictions of uncharacteristically severe or intense fire effects if the "fuel reduction" is not conducted.

The PA fails to explain the fire implications of no treatment applied to untreated portions of the project area under the action alternatives.

The PA did not provide a genuine analysis and disclosure of the varying amounts and levels of effectiveness of fuel changes attributable to: the varying ages of the past logging, the varying forest types, the varying slash treatments, etc.

There has been extensive research in forests about the ecological benefits of mixed-severity (which includes high-severity) fire over the past two decades, so much so that in 2015 science and academic publishers Elsevier published a 400-page book, *The Ecological Importance of Mixed-Severity Fires: Nature's Phoenix* which synthesizes published, peer-reviewed science investigating the value of mixed- and high-severity fires for biodiversity (DellaSala and Hanson, 2015). The book includes research documenting the benefits of high-intensity wildfire patches for wildlife species, as well as a discussion of mechanical "thinning" and its inability to reduce the chances of a fire burning in a given area, or alter the intensity of a fire, should one begin under high fire weather conditions, because overwhelmingly weather, not vegetation, drives fire behavior (DellaSala and Hanson, 2015, Ch. 13, pp. 382-384).

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.

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.) 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." [Also *see* Black, 2005; Black, et al., 2010; DellaSala (undated); Kulakowski (2013); Hanson et al., 2010; Hart et al., 2015.] And for an ecological perspective from the FS itself, see Rhoades et al., 2012, who state: "While much remains to be learned about the current outbreak of mountain pine beetles, researchers are already finding that **beetles may impart a characteristic critically lacking in many pine forests today: structural complexity and species diversity**." (Emphasis added.)

"Based on observations from field reconnaissance in 2012, 2019, and 2022, existing forested stands are mature or overmature, there is a heavy presence of insect and disease, and a high loading of hazardous fuel." This seems to describe a typical, healthy and naturally functioning forest in north Idaho. Is the PA saying that these conditions were not found here "historically", and if so, what source of information is it relying on to base such a claim?

Frissell and Bayles (1996) state:

> …The concept of range of natural variability …suffers from its failure to provide defensible criteria about **which factors ranges should be measured**. Proponents of the concept assume that a finite set of variables can be used to define the range of ecosystem behaviors, when ecological science strongly indicates many diverse factors can control and limit biota and natural resource productivity, often in complex, interacting, surprising, and species-specific and time-variant ways. **Any simple index for measuring the range of variation will likely exclude some physical and biotic dimensions important for the maintenance of ecological integrity and native species diversity.** (Emphases added.)

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.)

See Attachment 5, which is a collection of news media articles, quoting experts including those in the FS, who do understand the high value of severely burned forest for wildlife and other resources.

The FS fails to disclose or acknowledge the scientific information that indicates severe fires burning over large acreages are normal for the Forest, and that fire intensity and severity are dependent much more upon weather than fuels. It's common knowledge by now. If the purpose for a project is built upon false information about ecological functioning, then the predicted effects of the project are not credible. This PA does not comply with NEPA's requirements for scientific integrity.

Huff et al., 1995 state:

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

> hazards diminish, their influence on fire behavior can linger for up to 30 years in the dry forest ecosystems of eastern Washington and Oregon.

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

As far as the "restoration" being alleged to address the impacts of long-term fire suppression, there is no coherent plan for integrating wildland fire back into this ecosystem. Nothing is being changed to learn from the admitted suppression ecological damage. The war against wildland fire, i.e., nature, is ongoing.

The proposed and ongoing management are all about continuing a repressive and suppressive regime, however the FS has never conducted an adequate cumulative effects analysis of forestwide fire suppression despite the vast body of science that has arisen since the Forest Plan was adopted. The "plan" is clearly to log now, suppress fires continuously, and log again in the future based on the very same "need" to address the ongoing results of fire suppression.

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

The FS has never conducted consultation with the USFWS on its forestwide fire management plan, which has clear ramifications for species listed under the Endangered Species Act.

Tingley et al., 2016 note the diversity of habitats following a fire is related to <u>the diversity of burn severities:</u> "(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.

Ultimately the PA reflects an overriding bias favoring vegetation manipulation and resource extraction via "management" needed to achieve some selected desired conditions, along the way neglecting the ecological processes driving these ecosystems. Essentially the FS rigs the game, as its "desired conditions" would only be achievable by resource extractive activities. But since desired conditions must be maintained through repeated management/manipulation the management paradigm conflicts with natural processes—the real drivers of the ecosystem.

Since the FS's Desired Conditions must be maintained through repeated management/manipulation, the management paradigm conflicts with natural processes—the evolutionary drivers of the ecosystem.

Fire, insects & disease are endemic to western forests and are natural processes resulting in the forest self-thinning. This provides for greater diversity of plant and animal habitat than logging can achieve. In areas that have been historically and logged there are less diversity of native plants, more invasive species, and less animal diversity. Six et al., 2014 documented that logging to prevent or contain insect and disease has not been empirically proven to work, and because of lack of monitoring the FS can't content this method is viable for containing insect outbreaks.

See David Erickson's news article "Experts: more logging and thinning to battle wildfires might just burnt taxpayer dollars". It cites testimony to Congress from scientist Tania Schoennagel (Schoennagel, 2017.)

We likewise incorporate Scientists Letter-Wildfire, 2018, signed by over 200 scientists.

The PA fails to present an analysis of the cumulative effects of livestock grazing on fire regimes. USDA Forest Service 2012c states:

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

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

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

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

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

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

The PA does not 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[6] must exceed 50 miles per hour for midflame wind speeds to reach 5 miles per hour within a dense Stand (0.1 adjustment factor). In contrast, in an open stand (0.3 adjustment factor), the same midflame wind speeds would occur at only a 16-mile-per-hour wind at 20 feet.

The PA also fails to recognize the implications of how the fire regime is changing due to climate change.

And many direct and indirect effects of fire suppression are also ignored in the PA 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.

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

> ...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 does not disclose scientifically-acknowledged limitations of the use of Fire Regime Condition Classes. Fire Regime Condition Class is a metric that estimates the departure of the forest from historic fire processes and vegetation conditions. Fire regime condition class is derived by comparing current conditions to an estimate of the historical conditions that existed before significant Euro-American settlement. The 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 et al., 2023 is new scientific information pertaining to fire. The Abstract states:

> The structure and fire regime of pre-industrial (historical) dry forests over ~26 million ha of the western USA is of growing importance because wildfires are increasing and spilling over into communities. Management is guided by current conditions relative to the historical range of variability (HRV). Two models of HRV, with different implications, have been debated since the 1990s in a complex series of papers, replies, and rebuttals. The "low-severity" model is that dry forests were relatively uniform, low in tree density, and dominated by low- to moderate-severity fires; the "mixed-severity" model is that dry forests were heterogeneous, with both low and high tree densities and a mixture of fire severities. Here, we simply rebut evidence in the low-severity model's latest review, including its 37 critiques of the mixed-severity model. A central finding of high-severity fire recently exceeding its historical rates was not supported by evidence in the review itself. A large body of published evidence supporting the mixed-severity model was omitted. These included numerous direct observations by early scientists, early forest atlases, early newspaper accounts, early oblique and aerial photographs, seven paleo-charcoal reconstructions, ≥18 tree-ring reconstructions, 15 land survey reconstructions, and analysis of forest inventory data. Our rebuttal shows that evidence omitted in the review left a falsification of the scientific record, with significant land management implications. The low-severity model is rejected and mixed-severity model is supported by the corrected body of scientific evidence.

So let's follow the money. Baker et al., 2023 point out that many research scientists who are funded by or work for the FS promote the "low severity fire model" so they can justify the myth that logging will prevent forests from being "destroyed" by the prevailing fire regime: mixed- and high-severity fires. The so-called "emergency situation" is a smokescreen for expedited logging. Since fire cannot be entirely removed from this landscape that will continue to feature mixed- and high-severity fires, actions taken in the Home Ignition Zone of the privately owned structures in the vicinity of the project area—if there were any—are the real key for structure survival. Furthermore, the public has never been provided a guarantee of hazard-free ingress/egress—nor should we. That would essentially involve an annual removal of all combustible vegetation adjacent to roads, and furthermore everywhere in the fireshed from whence a fire could emit firebrands that could be carried by the thermal forces and the wind onto private properties—a ridiculous proposition whereby the U.S. taxpayers provide infinite subsidies for the uncertain benefits of a few. In our Hungry Ridge DEIS comments/Objection, we cited Finney and Cohen, 2003 who state: "The probability that a structure burns, …has been shown to depend exclusively on the properties of the structure and its immediate surroundings (Cohen 2000a)."

Furthermore, those responsible for firefighter safety will always need to mitigate and minimize the risk. This will always involve the choice to withhold personnel from entering dangerous situations, simply because dangers are potentially omnipresent.

It makes no scientific sense to replace dense conifer forests with clearcuts and densely packed little trees–in the name of reducing severe fire behavior. Atchley et al., 2021 note that heavier fuels actually slow fire spread. They also state:

> Wind entrainment associated with large, sparse canopy patches resulted in both mean and localised wind speeds and faster fire spread. Furthermore, the turbulent wind conditions in large openings resulted in a disproportional increase in TKE [Turbulence Kinetic Energy] and crosswinds that maintain fire line width.

Good graphics can be found on the interagency "Living with Fire" publications, such as can be found at: https://www.fs.usda.gov/Internet/FSEDOCUMENTS/fsbdev3020876.pdf. This booklet spans many regions and on page 4 provides the graphics showing that an open pine forest can burn at 150 acres per hour while dense conifer forest can burn at 15 acres per hour with 20 mph. wind speeds.

Another version of "Living with Fire" includes an additional graphic showing "dense confer reproduction" can burn at 650 acres per hour with 20 mph winds: (https://firesafemt.org/img/LivingwFireFSM20091.pdf)–second only to grass and brush fires.

Summing up, the FS has failed to properly analyze and consider the fact that the proposed logging will actually create conditions for more rapid and severe fire spread and cumulative impacts in the coming decades.

And by the way: "There are no private lands within the project area" to save from wildfire. And of the "nearby communities at risk" the PA says, "The Twentymile project is located on the forest's Red River Ranger District approximately **16 miles** southwest of Elk City, **15 miles** northwest of the township of Orogrande, and **12 miles** south of Newsome…" (emphases added).

The Twentymile proposal is being touted as "landscape scale restoration" due to "existing vegetation conditions within the project area …shaped by years of wildfire suppression and lack of timber harvest." Portraying the timber sale as "restoration" is disingenuous—this project is all about timber production.

There is no coherent plan for integrating wildland fire into this ecosystem. This is all about continuing a repressive and suppressive regime, however the FS has never conducted an adequate cumulative effects analysis of forestwide fire suppression despite the vast body of science that has arisen since the Forest Plan was adopted. The PA "plan" is clearly to log now, suppress fires continuously, and log again in the future based on the very same "need" to address the ongoing results of fire suppression.

Continuing direction for this wildfire suppression on the Forest comes from the Forest Plan, which contains the fire policy. With the "no action" alternative required under NEPA, fire suppression is anticipated to be reasonably foreseeable. Fire suppression doesn't imply "no action", but may be included in as part of that alternative if those actions' environmental impacts have been analyzed and disclosed at the programmatic level, such as in the Forest Plan EIS. The problem with this situation is the scale of ecological damage alleged to have occurred because of the wide-scale fire suppression program that began almost 100 years ago wasn't recognized until after the Forest Plan was adopted in 1987. It constitutes significant new information that did not result in any new forest plan decisions or direction, which itself may be adopted properly only as an amendment or revision of the Forest Plan, following proper NEPA procedures.

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

What we see nowadays are these project-level proposals like the Twentymile PA, which would implement a hybrid, reactionary management scheme, continuing to replace wildland fire with logging and burning, but in the absence of an analysis of cumulative, forestwide impacts.

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

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

Hutto (2008) states:

> (C)onsider the question of whether forests outside the dry ponderosa pine system are really in need of "restoration." While stem densities and fuel loads may be much greater today

> than a century ago, those patterns are perhaps as much of a reflection of human activity in the recent past (e.g., timber harvesting) as they are a reflection of historical conditions (Shinneman and Baker 1997). Without embracing and evolutionary perspective, we run the risk of creating restoration targets that do not mimic evolutionarily meaningful historical conditions, and that bear little resemblance to the conditions needed to maintain populations of native species, as mandated by law (e.g., National Forest Management Act of 1976).

Implicit in the Twentymile PA 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 PA 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 will occur more frequently. Other likely scenarios include situations where firefighting might be feasible but resources are stretched thin because of higher priorities elsewhere.

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

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

The FS must have a detailed long-term program for maintaining the allegedly safer conditions, including how areas will be treated in the future following proposed treatments, or how areas not needing treatment now will be treated as the need arises. The public must be informed as to what the scale of the long-term efforts must be, including the amount of funding necessary, and the likelihood based on realistic funding scenarios for such a program to be adequately and timely funded.

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

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

The PA claims there is a need to “reduce the risk of large, uncharacteristic wildland fires by reducing fuel buildup to a level commensurate with historical levels.” Given that many areas of the NPCNF have burned in recent years, please provide documentation showing those recent fires burned “uncharacteristically.”

The FS must prepare an EIS that remedies the above noted analytic and scientific deficiencies.

FOREST SERVICE IS DECEIVINGLY AND DELIBERATELY EXACERBATING CLIMATE CHANGE, ALREADY ON AN EXTREMELY DANGEROUS TRAJECTORY

Ongoing climate catastrophe

Although we have been pushing the FS to recognize the scale of the climate crisis and find appropriate responses, the agency just more deeply augurs its head into the sand. The FS is willfully participating in the destruction of the Earth’s atmosphere. All of the scientific conclusions we cite are common knowledge by now, so it takes callous, active denial to ignore it.

In the recent revised Forest Plan Draft EIS for the Custer-Gallatin National Forest, the FS’s words are, “Climate change is expected to continue and have profound effects on the Earth’s ecosystems in the coming decades (IPCC 2007).” As alarming as the words in the FS’s cited IPCC 2007 are, more recent reports from the Intergovernmental Panel on Climate Change (IPCC) makes that 2007 report seem optimistic. See e.g., IPCC Special Report, 2014 for starters.

In a March 20, 2023 Press Release introducing the SYNTHESIS REPORT OF THE IPCC SIXTH ASSESSMENT REPORT (AR6), the Intergovernmental Panel on Climate Change (IPCC) states, “This Synthesis Report underscores the urgency of taking more ambitious action and shows that, if we act now, we can still secure a liveable sustainable future for all.” It goes on:

> In 2018, IPCC highlighted the unprecedented scale of the challenge required to keep warming to 1.5°C. Five years later, that challenge has become even greater due to a continued increase in greenhouse gas emissions. The pace and scale of what has been done so far, and current plans, are insufficient to tackle climate change.
>
> More than a century of burning fossil fuels as well as unequal and unsustainable energy and land use has led to global warming of 1.1°C above pre-industrial levels. This has resulted in more frequent and more intense extreme weather events that have caused increasingly dangerous impacts on nature and people in every region of the world.
>
> Every increment of warming results in rapidly escalating hazards. More intense heatwaves, heavier rainfall and other weather extremes further increase risks for human health and ecosystems. In every region, people are dying from extreme heat. Climate-driven food and water insecurity is expected to increase with increased warming. When the risks combine with other adverse events, such as pandemics or conflicts, they become even more difficult to manage.

A *Missoulian* article on the release of that report quotes United Nations Secretary-General Antonio Guterres: “Humanity is on thin ice — and that ice is melting fast. …Our world needs climate action on all fronts —everything, everywhere, all at once." That article quotes from the report, "The choices and actions implemented in this decade will have impacts for thousands of years" calling climate change "a threat to human well-being and planetary health." It quotes report co-author and water scientist Aditi Mukherji: "We are not on the right track but it's not too late. Our intention is really a message of hope, and not that of doomsday."

From a 2022 report, "The rise in weather and climate extremes has led to some irreversible impacts as natural and human systems are pushed beyond their ability to adapt." (IPCC Climate Change 2022, Impacts, Adaptation and Vulnerability, Summary for Policymakers - Working Group II Contribution.) Also see news accounts "AP-Report warns of looming climate catastrophe", "BBC-IPCC report warns of 'irreversible' impacts of global warming" and "AP-UN 'house on fire' report".

There is extremely urgent scientific concern expressed over the imminent effects of climate change on the earth's ecosystems, and therefore on civilization itself. The IPCC's 2018 report states that if greenhouse gas emissions continue at the current rate, the atmosphere will warm up by as much as 2.7 degrees Fahrenheit (1.5 degrees Celsius) above preindustrial levels by 2040, inundating coastlines and intensifying droughts and poverty. The report paints a much darker picture of the immediate consequences of climate change than previously described, and says that avoiding the damage requires transforming the world economy at a speed and scale that has "no documented historic precedent."

The 2018 IPCC report describes a world of worsening food shortages and wildfires, and a mass die-off of coral reefs as soon as 2040—a period well within the lifetime of much of the global population. The report "is quite a shock, and quite concerning," said Bill Hare, an author of previous IPCC reports and a physicist with Climate Analytics, a nonprofit organization. "We were not aware of this just a few years ago." The report was the first to be commissioned by world leaders under the Paris agreement, the 2015 pact by nations to fight climate change.

The authors of the 2018 IPCC report project that if greenhouse gas emissions continue at the current rate, the atmosphere will warm by as much as 2.7 degrees Fahrenheit (1.5 degrees Celsius) above preindustrial levels by 2040, inundating coastlines and intensifying droughts and poverty. Previous work had focused on estimating the damage if average temperatures were to rise by a larger number, 3.6 degrees Fahrenheit (2 degrees Celsius), because that was the threshold scientists previously considered for the most severe effects of climate change. The 2018 IPCC report, however, shows that many of those effects will come much sooner, at the 2.7-degree mark.

Executive Order 13990 of January 20, 2021 (Protecting Public Health and the Environment and Restoring Science To Tackle the Climate Crisis) sets the policy of the Biden Administration to "…reduce greenhouse gas emissions; to bolster resilience to the impacts of climate change…". Executive Order (EO) 13990 Section 5 (Accounting for the Benefits of Reducing Climate Pollution) at (a) states, "It is essential that agencies capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account. Doing so facilitates sound decision-making, recognizes the breadth of climate impacts, and supports the international leadership of the United States on climate issues."

Executive Order 14008 of January 27, 2021 (Tackling the Climate Crisis at Home and Abroad) begins, “The United States and the world face a profound climate crisis. We have a narrow moment to pursue action at home and abroad in order to avoid the most catastrophic impacts of that crisis and to seize the opportunity that tackling climate change presents.” Further, President Biden’s Executive Order on the Establishment of the Climate Change Support Office (May 7, 2021) calls it a “**global** climate crisis” (emphasis added).

President Biden’s April 22, 2022 Executive Order 14072 calls on the Secretaries of Agriculture and the Interior, within one year, to “define, identify, and complete an **inventory of old-growth and mature forests on Federal lands**, accounting for regional and ecological variations, as appropriate, and making the inventory publicly available.” (Emphasis added.) EO 14072 recognizes, “Forests provide clean air and water, sustain the plant and animal life fundamental to combating **the global climate and biodiversity crises**, and hold special importance to Tribal Nations.” (Emphasis added.) The Fact Sheet accompanying that E.O. recognizes:

> America’s forests are a key climate solution, absorbing carbon dioxide equivalent to more than10% of U.S. annual greenhouse gas emissions. Federal lands are home to many of the nation’s mature and old-growth forests, which serve as critical carbon sinks, cherished landscapes, and unique habitats.

The Executive Order will “Safeguard mature and old-growth forests on federal lands, as part of a science-based approach to reduce wildfire risk” and “**Enlist nature to address the climate crisis with comprehensive efforts to deploy nature-based solutions** that reduce emissions and build resilience.” (Id., emphasis added.)

We incorporate our August 5, 2022 letter to the Forest Service and BLM in response to the July 15, 2022 Biden Administration Request For Information seeking input on the development of a definition for old-growth and mature forests on Federal lands and requesting public input on a series of questions.

On April 18, 2023 Deputy Chief, Christopher B. French issued a memo to Regional Foresters entitled “Mature Old Growth Guidance: Infrastructure and Investment Jobs Act and Executive Order 14072”. It states:

> In response to E.O. 14072, we recently completed the mature and old-growth (MOG) inventory that is built on the existing old-growth definitions developed by each region over the past 30 years. The inventory methods categorize MOG using approximately 200 combinations of forest type, productivity level and biophysical setting. **We will shortly issue guidance on using this information**. Specific Forest Plan content should guide operations to maintain or contribute toward the restoration of the structure and composition of classified old-growth stands.

(Emphasis added.) Part of any reasonable interpretation of “inventory” as applied to forests would be—is any particular place in a forest **inside** the mature and old-growth inventory, or is it **not**? At this point, the Biden Administration has not produced an inventory that could answer such a question, despite the suggestions it has. No spatially specific or ecological definition of old growth was adopted, which would have incorporated old growth and mature forests' relationships to wildlife, water, and many other natural values.

In "Mature and Old-Growth Forests: Definition, Identification, and Initial Inventory on Lands Managed by the Forest Service and Bureau of Land Management Fulfillment of Executive Order 14072, Section 2(b)" released along with the French memo, we read:

> This **initial inventory report** is national in scale and presents estimates of old-growth and mature forests across all lands managed by the Forest Service and BLM. In preparing this report, published scientific literature was reviewed and scientists were consulted to understand the current work in this area and to get technical assistance in providing what was needed to respond to Executive Order 14072. **Some cited references (e.g., "in preparation" notations) have not yet undergone scientific peer review and are therefore subject to change.**

(Emphases added.) Nothing in the reports just released nor in EO 14072 itself recognize the threat of logging to old growth and mature forests, which—as the Twentymile project exemplifies—is completely absurd.

At this point, any lofty goals for EO 14072 as claimed by the president remain remote. Of huge concern to the global community, this includes prioritizing the role of forests as natural climate solutions, instead of targeting them to serve the prevailing capitalist consumptive values that chronically threaten the entire biosphere and our collective future.

DellaSala, et al. (2023) argue:

> …for stepped-up MOG protections by building on the exemplary Tongass National Forest in Alaska where roadless area protections containing MOG, previously removed under the Trump administration, were recently reinstated by the Biden administration while also supporting an economic transition out of old-growth logging and into previously logged but reforested sites. Nationwide MOG protections would establish U.S. leadership on the Paris Climate Agreement (natural sinks and reservoirs) and the Glasgow Forest Pledge to end deforestation and forest degradation. It would demonstrate progress toward 30 x 30 and present a global model for effective forest and climate response.

The Forest Plan defines areas as suitable for timber production where there is reasonable assurance that such lands can be adequately restocked. Given the changing ecological conditions due to the climate emergency, the likely decreased effectiveness of resistance strategies described by Coop et al, 2020 and the increased risk of vegetative conversion, (especially within areas of regeneration harvest), the FS must provide reasonable assurances that lands proposed for timber production can in fact be adequately restocked, which includes the anticipated time frame. Mere assurances that logged areas will be replanted are not sufficient as climate crisis impacts increase.

Further, equally important to acknowledging the limitations of resistance strategies is the fact that other pertinent scientific findings show warming and drying trends are having a major impact on forests, even without wildfire or insect infestation. See, e.g., Parmesan, 2006; Breshears et al. 2005; Allen et al. 2010, 2015; Anderegg et al. 2012; Williams et al. 2013; Overpeck 2013; Funk et al. 2014; Millar and Stephenson 2015; Gauthier et al. 2015; Ault et al. 2016 ("business-as-usual emissions of greenhouse gases will drive regional warming and drying, regardless of large precipitation uncertainties"); Vose et al. 2016 ("In essence, a survivable drought of the past can become an intolerable drought under a warming climate").

Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews.

Issued on August 1, 2016 and subsequently blocked by the Trump administration, this directive from Executive Office of the President, Council on Environmental Quality was re-implemented as national direction. [See 86 Fed Reg. 10252 (Feb. 19, 2021).]

The 2016 CEQ guidance acknowledges, "changes in our climate caused by elevated concentrations of greenhouse gases in the atmosphere are reasonably anticipated to endanger the public health and public welfare of current and future generations." It directs federal agencies to consider the extent to which a proposed action would contribute to climate change. It rejects as inappropriate any notion that a timber sale is of too small a scale for such consideration:

> Climate change results from the incremental addition of GHG emissions from millions of individual sources, which collectively have a large impact on a global scale. CEQ recognizes that the totality of climate change impacts is not attributable to any single action, but are exacerbated by a series of actions including actions taken pursuant to decisions of the Federal Government. Therefore, a statement that emissions from a proposed Federal action represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding whether or to what extent to consider climate change impacts under NEPA. Moreover, these comparisons are also not an appropriate method for characterizing the potential impacts associated with a proposed action and its alternatives and mitigations because this approach does not reveal anything beyond the nature of the climate change challenge itself: the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large impact.

The EPA has also rejected that same kind of analysis because cumulative effects would always dilute individual timber sale effects. (USDA Forest Service, 2016d at pp. 818-19).

So the FS must quantify greenhouse gas emissions. The agency can only use a qualitative method if tools, methodologies, or data inputs are not reasonably available, and if that is the case, there needs be rationale as to why a quantitative analysis is not warranted. There are plenty of quantitative tools for this analysis. See https://ceq.doe.gov/guidance/ghg-accounting-tools.html; USDA 2014. We seen nothing in the PA to indicate the FS is acting in consistency with this guidance.

Logging harms potential of forest ecosystems to sequester carbon and mitigate effects of climate change

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

The PA states, "In fact, removing carbon from forests for human use can result in a lower net contribution of GHGs to the atmosphere than if the forest were not managed (McKinley et al., 2011…)." The PA is exaggerating and misrepresenting. If people who read the PA look to McKinley et al., 2011, they will also read:

- …most of the aboveground carbon stocks are retained after fire in dead tree biomass, because fire typically only consumes the leaves and small twigs, the litter layer or duff, and some dead trees and logs.

- Generally, harvesting forests with high biomass and planting a new forest will reduce overall carbon stocks more than if the forest were retained, even counting the carbon storage in harvested wood products (Harmon et al. 1996, Harmon et al. 2009). Thinning increases the size and vigor of individual trees, but generally reduces net carbon storage rates and carbon storage at the stand level (Schonau and Coetzee 1989, Dore et al. 2010).

- Methane release from anaerobic decomposition of wood and paper in landfills reduces the benefit of storing carbon because methane has about 25 times more global warming potential than CO2. For some paper, the global warming potential of methane release exceeds its carbon storage potential,

- There are two views regarding the science on carbon savings through fuel treatments. Some studies have shown that thinned stands have much higher tree survival and lower carbon losses in a crown fire (Hurteau et al. 2008) or have used modeling to estimate lower carbon losses from thinned stands if they were to burn (Finkral and Evans 2008, Hurteau and North 2009, Stephens et al. 2009). However, other stand-level studies have not shown a carbon benefit from fuel treatments (Reinhardt et al. 2010), and evidence from landscape-level modeling suggests that fuel treatments in most forests will decrease carbon (Harmon et al. 2009, Mitchell et al. 2009) even if the thinned trees are used for biomass energy. Because the occurrence of fires cannot be predicted at the stand level, treating forest stands without accounting for the probability of stand-replacing fire could result in lower carbon stocks than in untreated stands (Hanson et al. 2009, Mitchell et al. 2009). More research is urgently needed to resolve these different conclusions because thinning to reduce fuel is a widespread forest management practice in the United States (Battaglia et al. 2010).

Logging, especially large trees as the Twentymile PA proposes, would exacerbate climate change. Mildrexler, et al., 2020 state:

- Large-diameter trees store disproportionally massive amounts of carbon and are a major driver of carbon cycle dynamics in forests worldwide.

- We examined the proportion of large-diameter trees on National Forest lands east of the Cascade Mountains crest in Oregon and Washington, their contribution to overall aboveground carbon (AGC) storage, and the potential reduction in carbon stocks resulting from widespread harvest. We analyzed forest inventory data collected on 3,335 plots and found that large trees play a major role in the accumulated carbon stock of these forests. Tree AGC (kg) increases sharply with tree diameter at breast height (DBH; cm) among five dominant tree species. Large trees accounted for 2.0 to 3.7% of all stems (DBH ≥ 1" or 2.54 cm) among five tree species; but held 33 to 46% of the total AGC stored by each species. Pooled across the five dominant species, large trees accounted for 3% of the 636,520 trees occurring on the inventory plots but stored 42% of the total AGC. A recently proposed large-scale vegetation management project that involved widespread harvest of large trees, mostly grand fir, would have removed ~44% of the AGC stored in these large-diameter trees, and released a large amount of carbon dioxide into the atmosphere.

- Given the urgency of keeping additional carbon out of the atmosphere and continuing carbon accumulation from the atmosphere to protect the climate system, it would be prudent to continue protecting ecosystems with large trees for their carbon stores, and also for their co-benefits of habitat for biodiversity, resilience to drought and fire, and microclimate buffering under future climate extremes.

See also DeLuca, 2009. Also, Lutz et al., 2018 (co-authored by dozens of scientists) "recommend managing forests for conservation of existing large-diameter trees or those that can soon reach large diameters as a simple way to conserve and potentially enhance ecosystem services." DeLuca, 2009 points to research that "showed that if the objective of management is carbon storage, old-growth forests are better left standing. …Old growth, rather than being thought of as stagnant with respect to carbon fixation, can sequester atmospheric carbon dioxide long past the achievement of old-growth conditions."

"Older, more decadent and unhealthy forest stands take in less carbon from the atmosphere resulting to a slower rate of carbon sequestration." Multiple scientific research studies we cite in these comments explicitly disagree with that PA statement. "Furthermore, extensive wildfires release large amounts of carbon dioxide (CO2) and other GHG into the atmosphere that contribute to climate change." Again, the scientific information we cite in these comments explicitly disagree with the PA. The FS must reconcile these scientific controversies in an EIS.

One value the 1989 Chief's Position Statement on National Forest Old Growth Values did *not* anticipate is forests' contributions toward a stable climate. Given the dire climate crisis in which we find ourselves, and in order to serve all other values, the FS must analyze and disclose the carbon sequestration potential of the landscapes and ecosystems within which old growth is found.

Law and Moomaw, 2023 state: “Forests are critically important for slowing climate change. They remove huge quantities of carbon dioxide from the atmosphere – 30% of all fossil fuel emissions annually – and store carbon in trees and soils. Old and mature forests are especially important: They handle droughts, storms and wildfires better than young trees, and they store more carbon.”

Law et al. (2022), in a paper entitled “Creating Strategic Reserves to Protect Forest Carbon and Reduce Biodiversity Losses in the United States” assert that “many of the current and proposed forest management actions in the United States are not consistent with climate goals, and that preserving 30 to 50% of lands for their carbon, biodiversity and water is feasible, effective, and necessary for achieving them.”

In a January 12, 2023 News Release, scientists (Birdsey et al., 2023) point out that “Mature Federal Forests Play an Outsized Role in the Nation’s Climate Strategy.” They state:

> A new study published in the peer-reviewed journal Forests and Global Change presents the nation’s first assessment of carbon stored in larger trees and mature forests on 11 national forests from the West Coast states to the Appalachian Mountains. This study is a companion to prior work to define, inventory and assess the nation’s older forests published in a special feature on “natural forests for a safe climate” in the same journal. Both studies are in response to President Biden’s Executive Order to inventory mature and old-growth forests for conservation purposes and the global concern about the unprecedented decline of older trees.

At a time when species are going extinct faster than any period in human history, the survival of species and persistence of healthy ecosystems requires science-based decisions. A new analysis by NatureServe addresses five essential questions about biodiversity–the variety of life on Earth–that need to be answered if we are going to effectively conserve nature. In the first report of its kind, NatureServe, 2023 reveals an alarming conclusion: **34% of plants** and **40% of animals** are at risk of extinction, and **41% of ecosystems** are at risk of range-wide collapse. The analyses presented in the report inform how to effectively and efficiently use our financial resources to make the best conservation decisions.

Recent science supports the need to look beyond historical references to inform proposed actions, in the light of the profound changes expected under a warming climate: “(I)n a time of pervasive and intensifying change, the implicit assumption that the future will reflect the past is a questionable basis for land management (Falk 2017).” (Coop et al., 2020.) While it is useful to understand how vegetative conditions have departed from those in the past, the FS cannot rely on them to define management actions, or reasonably expect the action alternatives to result in restoring ecological processes. The agency needs to shift its management approach to incorporate the likelihood that no matter what vegetation treatments it implements, there are going to be future forest wildfire-triggered conversions to other vegetation types. As such, the FS cannot rely on the success of resistance strategies, as Coop et al., 2020 explains:

> Contemporary forest management policies, mandates, and science generally fall within the paradigm of resisting conversion, through on-the-ground tactics such as fuel reduction or

> tree planting. Given anticipated disturbance trajectories and climate change, science syntheses and critical evaluations of such resistance approaches are needed because of their increasing relevance in mitigating future wildfire severity (Stephens et al. 2013, Prichard et al. 2017) and managing for carbon storage (Hurteau et al. 2019b). Managers seeking to wisely invest resources and strategically resist change need to understand the efficacy and durability of these resistance strategies in a changing climate. Managers also require new scientific knowledge to inform alternative approaches including accepting or directing conversion, developing a portfolio of new approaches and conducting experimental adaptation, and to even allow and learn from adaptation failures.

In 2022 over 90 scientists working at the intersection of ecosystems and climate change sent a letter to Canada's Prime Minister Justin Trudeau, "Regarding the Protection of Canada's Primary Forests." They state:

> When primary forests, whether in Canada or elsewhere, are logged they release significant amounts of carbon dioxide, exacerbating climate change. Because primary forest ecosystems store more carbon than secondary forests, replacing primary forests with younger stands, as Canada is doing, ultimately reduces the forest ecosystem's overall carbon stocks, contributing to atmospheric greenhouse gas levels.
>
> Even if a clearcut forest eventually regrows, it can take over a decade to return to being a net absorber of carbon, and the overall carbon debt in carbon stocks that were removed from older forests can take centuries to repay, a luxury we simply no longer have. Recent studies also indicate that soil disturbance associated with logging results in large emissions of methane (CH4), a powerful greenhouse gas second only to CO2 in its climate forcing effects.

In a scientific finding contradicting typical FS logging justifications, Harmon et al. (2022), showed the vast majority of carbon stored in trees before two large wildfires in California's Sierra Nevada mountain range remained there after the fires.

The FS must reevaluate its normal assumptions about its proposed vegetation manipulations in regards to restocking success and species composition. Significant controversy exists as to the need for such manipulations given the improper use and reliance on historic conditions. In fact, there is a high likelihood based on the aforementioned studies that some areas will not regenerate and will instead result in conversion to different vegetative groups. NEPA mandates that an EIS address this controversy and the science contradicting agency assumptions.

We fully incorporate the document, "Flat Country DEIS cmt Forest Carbon Appendix, 3-16-2020" written by Oregon Wild. From our review of that comment letter, which includes voluminous scientific opinion, every page is fully applicable as comments on your proposal.

Moomaw and Smith, 2017 conclude:

> With the serious adverse consequences of a changing climate already occurring, it is important to broaden our view of sustainable forestry to see forests …as complex

ecosystems that provide valuable, multiple life-supporting services like clean water, air, flood control, and carbon storage. We have ample policy mechanisms, resources, and funding to support conservation and protection if we prioritize correctly.

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

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

The Twentymile PA doesn't recognize or analyze highly relevant information or even consider scientific information that questions its underlying assumptions and makes them scientifically controversial. This is compounded by the multitude of timber sales in this Forest, which represent cumulative effects that could be analyzed for carbon sequestration and global warming impacts at local and regional levels.

Forests are carbon sinks—they store carbon in both the soils and the vegetation. Carbon sinks are important for mitigating the impacts of climate change. The U.S. has many forests owned by the public and managed by the Forest Service. Harvesting wood "represents the majority of [carbon] losses from US forest...." Harris et al. 2016. Additionally, Achat et al. 2015 has estimated that intensive biomass harvests could constitute an important source of carbon transfer from forests to the atmosphere. Pacific Northwest forests hold live tree biomass equivalent or larger than tropical forests. Law and Waring 2015. "Alterations in forest management can contribute to increasing the land sink and decreasing emissions by keeping carbon in high biomass forests, extending harvest cycles, reforestation, and afforestation." Law et al. 2018. The PA has no genuine carbon accounting of the carbon outputs of the proposed project.

Buotte et al. 2019 published an article prioritizing forest lands for preservation based on "carbon priority ranking with measures of biodiversity." This is new and important information that the FS must consider. The researchers mapped "high carbon priority forests in the western US exhibit features of older, intact forest with high structural diversity[], including carbon density and tree species richness." Here is the map from that article:

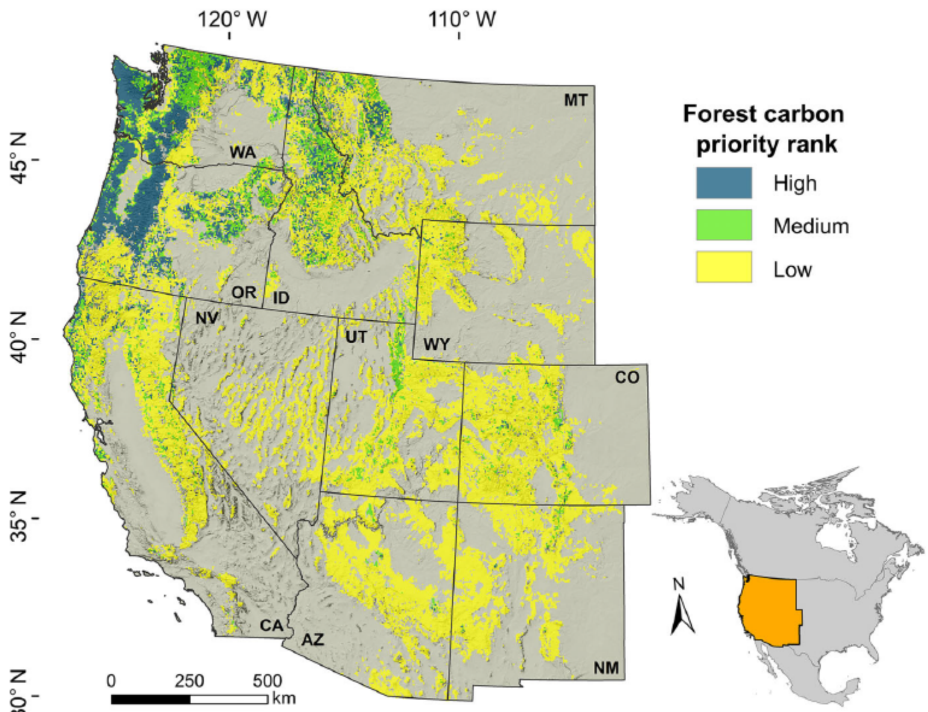

FIG. 1. Forested land in the western conterminous United States classified into priority for preservation to mitigate climate change based on the spatial co-occurrence of low vulnerability to drought and fire and low, medium, and high potential carbon sequestration. WA, Washington; ID, Idaho; MT, Montana; OR, Oregon; CA, California; NV, Nevada; UT, Utah; CO, Colorado; AZ, Arizona; NM, New Mexico.

The above ranks the NPCNF at medium, with pockets of high. This Forest's potential to sequester carbon is significant. Profita (Jan. 1, 2020).

Logging does not serve to increase carbon sequestration in the future. McKinley et al. 2011 states, "Because forest carbon loss contributes to increasing climate risk and because climate change may impede regeneration following disturbance, avoiding deforestation and promoting regeneration after disturbance should receive high priority as policy considerations." One specific strategy McKinley et al. also discusses is decreasing forest harvests, either by interval or intensity, to increase forest carbon stocks. McKinley et al. 2011 recognizes, "Generally, harvesting forests with high biomass and planting a new forest will reduce overall carbon stocks more than if the forest were retained, even counting the carbon storage in harvested wood products." The strategy of harvesting and replanting might work for southeastern forests, but not for the NPCNF. Avoiding deforestation, afforestation, and reducing harvest are the first three strategies that McKinley et al. 2011 list. McKinley et al. 2011 recognizes that avoiding deforestation and reducing harvest as strategies for carbon storage in forests, acknowledging that climate change may impede regeneration, contradicting the PA's representation of it.

The FS's position is that individual projects would have insignificant contributions to global carbon emissions. The obvious problem with that viewpoint is, once can say the same thing about every source of carbon dioxide and other greenhouse gas emission on earth, and likewise justify inaction as does this PA. In their comments on the KNF's Draft EIS for the Lower Yaak, O'Brien, Sheep project, the EPA rejected that sort of analysis, basically because that cumulative effects scale dilutes project effects. (See USDA Forest Service, 2016d at 818-19.) We would add that, if the FS wants to refer to a wider scope to analyze its carbon footprint, we suggest that it actually conduct such a cumulative effect analysis and disclose it in a NEPA document.

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

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

Law and Harmon, 2011 conducted a literature review and concluded:

> Thinning forests to reduce potential carbon losses due to wildfire is in direct conflict with carbon sequestration goals, and, if implemented, would result in a net emission of CO2 to the atmosphere because the amount of carbon removed to change fire behavior is often far larger than that saved by changing fire behavior, and more area has to be harvested than will ultimately burn over the period of effectiveness of the thinning treatment.

Best available science supports the proposition that forest policies must shift away from logging if carbon sequestration is prioritized.[7] Forests must be preserved indefinitely for their carbon storage value. Forests that have been logged should be allowed to convert to eventual old-growth condition. Such management has the potential to double the current level of carbon storage in

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[7] "More logging and reforestation occur annually in the U.S., including on our public lands, than in any other nation in the world." John Muir Project of Earth Island Institute 2018. *Protecting Forests from Logging: The Missing Piece Necessary to Combat Climate Change*. *See also* Hansen et al 2013 High-resolution Global Maps of 21st-Century Forest Cover Change. Science 342: 850-853; Prestemon, J.P., et al. 2015. The global position of the U.S. forest products industry.

some regions. (See Harmon and Marks, 2002; Harmon, 2001; Harmon et al., 1990; Homann et al., 2005; Law, 2014; Solomon et al., 2008; Turner et al., 1995; Turner et al., 1997; Woodbury et al., 2007.)

Moomaw and Smith, 2017 state:

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

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

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

Keith et al., 2009 state:

> Both net primary production and net ecosystem production in many old forest stands have been found to be positive; they were lower than the carbon fluxes in young and mature stands, but not significantly different from them. Northern Hemisphere forests up to 800 years old have been found to still function as a carbon sink. Carbon stocks can continue to accumulate in multi-aged and mixed species stands because stem respiration rates decrease with increasing tree size, and continual turnover of leaves, roots, and woody material contribute to stable components of soil organic matter. There is a growing body of evidence that forest ecosystems do not necessarily reach an equilibrium between assimilation and respiration, but can continue to accumulate carbon in living biomass, coarse woody debris, and soils, and therefore may act as net carbon sinks for long periods. Hence, process-based models of forest growth and carbon cycling based on an assumption that stands are even-aged and carbon exchange reaches an equilibrium may underestimate productivity and carbon accumulation in some forest types. Conserving forests with large stocks of biomass from deforestation and degradation avoids significant carbon emissions to the atmosphere. Our insights into forest types and forest conditions that result in high biomass carbon density can be used to help identify priority areas for conservation and restoration.

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

> Our forests are functioning as carbon sinks (net sequestration) where logging has been

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

Campbell et al., 2012 also refutes the notion that fuel-reduction treatments increase forest carbon storage in the western US:

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

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

Harmon, 2009 is the written record of "Testimony Before the Subcommittee on National Parks, Forests, and Public Lands of the Committee of Natural Resources for an oversight hearing on The Role of Federal Lands in Combating Climate Change." The author "reviews, in terms as simple as possible, how the forest system stores carbon, the issues that need to be addressed when assessing any proposed action, and some common misconceptions that need to be avoided." His testimony begins, "I am here to …offer my expertise to the subcommittee. I am a professional scientist, having worked in the area of forest carbon for nearly three decades. During that time I have conducted numerous studies on many aspects of this problem, have published extensively, and provided instruction to numerous students, forest managers, and the general public."

Climate change science suggests that logging for sequestration of carbon, logging to reduce wild fire, and other manipulation of forest stands does not offer benefits to climate. Rather, increases in carbon emissions from soil disturbance and drying out of forest floors are the result. The FS must minimize manipulation of forest stands, especially stands that have not been previously logged, allowing natural processes to function. Furthermore, logging involves the burning of fossil fuels. Reducing fossil fuel combustion is vital. Everything from travel planning to monitoring would have an important impact in that realm.

Old growth also helps to mitigate the effects of climate change on wildlife habitat. Frey et al., 2016 find: "Vegetation characteristics associated with older forest stands appeared to confer a strong, thermally insulating effect. Older forests with tall canopies, high biomass, and vertical complexity provided cooler microclimates compared with simplified stands. This resulted in differences as large as 2.5°C between plantation sites and old-growth sites, a temperature range equivalent to predicted global temperature increases over the next 50 years." They believe older, more complex forests may help to "buffer organisms from the impacts of regional warming and/or slow the rate at which organisms must adapt to a changing climate…" Large trees serve as important carbon capture and storage (Stephenson et al. 2014). Also see DellaSala and Baker, 2020 and Scientists Letter, 2020. Additionally, forest canopies can buffer climate extremes and promote microclimates that in turn provide refugia for species in the understory—on a daily basis, buffering is most strongly related to forest cover. (Davis et al. 2019b.)

Given the urgency of preventing additional greenhouse gas emissions and continuing carbon sequestration to mitigate climate change, it would be best to protect large trees for their carbon stores, and also for their co-benefits of habitat for biodiversity, resilience to drought and fire, and microclimate buffering under future climate extremes.

Law and Moomaw (2021) assert: "Keeping trees in the ground where they are already growing is an effective low-tech way to slow climate change."

Achat et al. 2015 state, "Compared with other terrestrial ecosystems, forests store some of the largest quantities of carbon per surface area of land." Much stored carbon is within soils. (Id.) Forest management can modify soil organic carbon stocks, losing soil organic carbon when comparing conventional harvests like clearcutting or shelterwood cutting with unharvested forests. (Id.) Not only does it lose the carbon stored in the soils, but cutting trees eliminates the trees' potential to continue to sequester carbon. (Id.)

Recent studies agree that maintaining forests rather than cutting them down can help reduce the impacts of climate change. E.g., Moomaw, et al., 2019: "Stakeholders and policy makers need to recognize that **the way to maximize carbon storage and sequestration is to grow intact forest ecosystems where possible**." (Emphasis added). Another report (Hudiburg et al., 2019) concludes:

> **Allowing forests to reach their biological potential for growth and sequestration, maintaining large trees** (Lutz et al 2018), reforesting recently cut lands, and afforestation of suitable areas **will remove additional CO2 from the atmosphere**. Global vegetation stores of carbon are 50% of their potential including western forests because of harvest activities (Erb et al 2017). Clearly, western forests could do more to address climate change through carbon sequestration **if allowed to grow longer**. (Emphasis added.)

In a literature review from leading experts on forest carbon storage, Law, et al. (2020) reported:

> There is absolutely no evidence that thinning forests increases biomass stored (Zhou et al. 2013). It takes decades to centuries for carbon to accumulate in forest vegetation and soils (Sun et al. 2004, Hudiburg et al. 2009, Schlesinger 2018), and it takes decades to centuries for dead wood to decompose. We must preserve medium to high biomass (carbon-dense) forest not only because of their carbon potential but also because they have the greatest biodiversity of forest species (Krankina et al. 2014, Buotte et al. 2019, 2020).

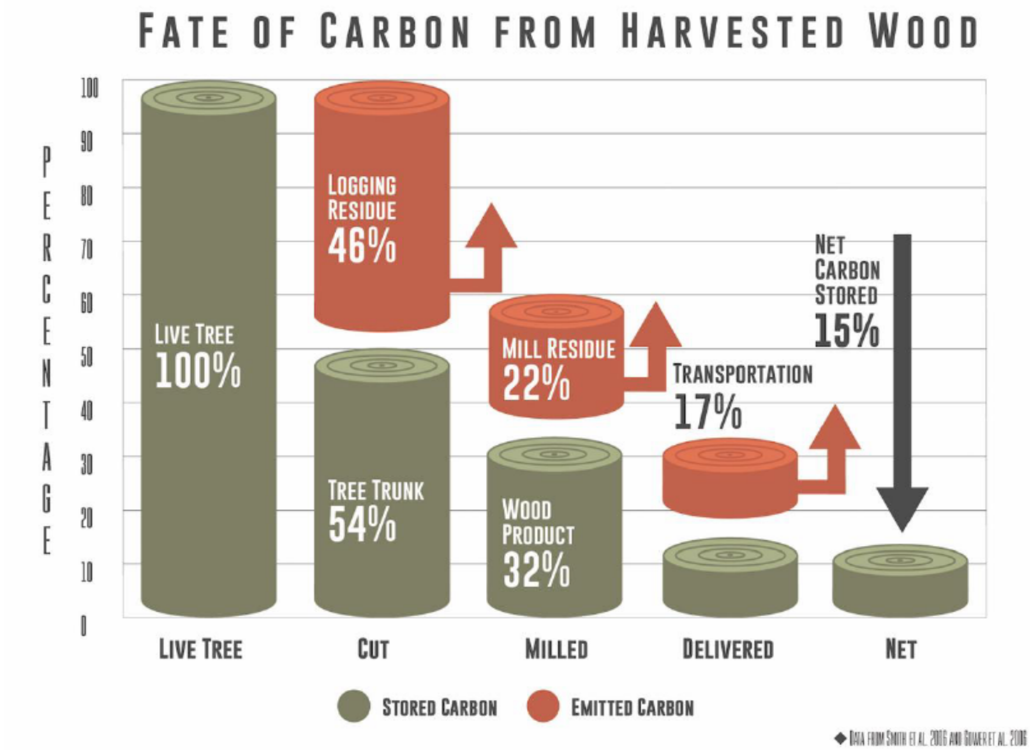
Also *see* Dr. Law explaining these matters in the video, "The Surprising Truth Behind Planting Trees and Climate Change" submitted on data disk as part of this objection.

Law and Moomaw, 2021 recently concluded:

> Recent projections show that to prevent the worst impacts of climate change, governments will have to increase their pledges to reduce carbon emissions by as much as 80%. We see the next 10 to 20 years as a critical window for climate action, and believe that **permanent protection for mature and old forests is the greatest opportunity for near-term climate benefits.** (Emphasis added.)

Logging also doesn't increase carbon storage in the US by reducing future fire emissions. Research has found high carbon losses associated with "fuel treatment" and only modest differences associated with the high-severity fire and low severity fire that fuel treatment is meant to encourage. Campbell et al. 2012. And where some disturbances like insects, disease, and fire kill trees and lower carbon sequestration, logging has the greater impact--up to ten times the carbon from forest fires and bark beetles together. *See* Harris et al. 2016. Please do an analysis that recognizes this.

Also, logging does not keep carbon out of the atmosphere. The below graphic is from the Josephine County Democrats Webpage, Forest Defense is Climate Defense (https://josephinedemocrats.org/forest-defense-is-climate-defense/), where the illustrator used the information in Gower et al. 2003 and Smith et al. 2006 to create the following illustration of how carbon is lost into the atmosphere from logging.



The importance of trees for carbon capture will rise especially if, as recent evidence suggests, hopes for soils as a carbon sink may be overly optimistic. (He et al., 2016) Such a potentially reduced role of soils doesn't mean that forest soils won't have a role in capture and storage of carbon, rather it puts more of the onus on aboveground sequestration by trees, even if there is a conversion to unfamiliar mixes of trees.

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

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

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

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

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

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

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

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

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

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

Westerling, et al. 2006 state:

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

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

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

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

The District Court of Montana ruled in Case 4:17-cv-00030-BMM that the Federal government was required to evaluate the climate change impacts of the federal government coal program.

In March 2019, U.S. District Judge Rudolph Contreras in Washington, D.C., ruled that when the U.S. Bureau of Land Management (BLM) auctions public lands for oil and gas leasing, officials must consider emissions from past, present and foreseeable future oil and gas leases nationwide.

In March of 2018 the Federal District Court of Montana found the Miles City (Montana) and Buffalo (Wyoming) Field Office's Resource Management Plans unlawfully overlooked climate impacts of coal mining and oil and gas drilling. The case was brought by Western Organization of Resource Councils, Montana Environmental Information Center, Powder River Basin Resource Council, Northern Plains Resource Council, the Sierra Club, and the Natural Resources Defense Council.

Davis et al., 2019 state:

> At dry sites across our study region, seasonal to annual climate conditions over the past 20 years have crossed these thresholds, such that conditions have become increasingly unsuitable for regeneration. High fire severity and low seed availability further reduced the probability of postfire regeneration. Together, our results demonstrate that climate change combined with high severity fire is leading to increasingly fewer opportunities for seedlings to establish after wildfires and may lead to ecosystem transitions in low-elevation ponderosa pine and Douglas-fir forests across the western United States.

Forests are already experiencing emissions-driven deforestation, on both the post-fire and post-logging acreage.

The EA does not disclose recent restocking monitoring data and analysis.

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

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

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

Respected experts say that the atmosphere might be able to safely hold 350 ppm of CO_2.[8] So when the atmosphere was at pre-industrial levels of about 280 ppm, there was a cushion of about 70 ppm which represents millions of tons of greenhouse gas emissions. Well, now that cushion is completely gone. The atmosphere is now over 400 ppm CO_2 and rising. Therefore the safe level of additional emissions (from logging or any other activity) is negative. There is no safe level of additional emissions that our earth systems can tolerate. We need to be removing carbon from the atmosphere—not adding to it.[9] How? By allowing forests to grow. Logging moves us away from our objective while conservation moves us toward our objective.

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

<u>Logging and associated activities emit vast amounts of greenhouse gases</u>

Stevens-Rumann, et al., (2018) state: "In the US Rocky Mountains, we documented a significant trend of post-fire tree regeneration, even over the relatively short period of 23 years covered in this analysis. Our findings are consistent with the expectation of **reduced resilience of forest ecosystems to the combined impacts of climate warming and wildfire activity**. Our results suggest that predicted **shifts from forest to non-forested vegetation**. (Emphases added.)

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

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

Law and Harmon, 2011 conducted a literature review and concluded:

> Thinning forests to reduce potential carbon losses due to wildfire is in direct conflict with carbon sequestration goals, and, if implemented, would result in a net emission of CO_2 to the atmosphere because the amount of carbon removed to change fire behavior is often far larger than that saved by changing fire behavior, and more area has to be harvested than will ultimately burn over the period of effectiveness of the thinning treatment.

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

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

The FS has refused to even attempt to cumulatively examine the effects, which is significant as the Northern Region has been approving many supersized clearcuts across the national forests of Montana and Northern Idaho. *See* Bilodeau and Juel, 2021. This region has approved over 93,000 acres of supersized clearcuts just in the last seven years. How much carbon stores would that eliminate? How much fossil fuel would be burned in the clearcutting of that acreage?

There exist quantitative tools for such analyses, such as Eve, et al., 2014. There is nothing in the EA or supporting documents to indicate the FS is accounting for greenhouse gases in any legitimate, quantitative manner.

<u>Interaction of management actions and climate change</u>

Golladay et al., 2016 state, "In an uncertain future of rapid change and abrupt, unforeseen transitions, adjustments in management approaches will be necessary and some actions will fail. However, **it is increasingly evident that the greatest risk is posed by continuing to implement strategies inconsistent with and not informed by current understanding of our novel future**… (Emphasis added).

In the face of increasing climate risk, growing impacts of wildfire and insect activity, plus scientific research findings, the FS must disclose the significant trend in post-fire regeneration failure. The PA fails to do so. The national forests have already experienced considerable difficulty restocking on areas that have been subjected to clear-cut logging, post-fire salvage logging and other even-aged management "systems." NFMA (1982) regulation 36CFR 219.27(c)(3) implements the NFMA statute, and requires restocking in five years.

Vegetation management efforts that propose attempting to replicate pre-European conditions ignores the larger pattern of climate, ignores climate change, and ignores natural succession. Millar and Wolfenden 1999 discuss important patterns within the context of climate change.

The FS (in USDA Forest Service, 2017b) discusses some effects of climate change on forests, including the following statement "In many areas, it will no longer be possible to maintain vegetation within the historical range of variability. Land management approaches based on current or historical conditions will need to be adjusted." Yet, the PA lacks any acknowledgement, awareness or analysis that achieving the desired conditions is very much climate dependent. The PA has no scientific basis to support its assumption that proposed "treatments" will result in sustainable vegetation conditions under increasing temperatures.

Furthermore, the FS doesn't present a scientific basis to support its assumption that proposed "treatments" will result in sustainable vegetation conditions under increasing temperatures. Browne et al., 2019 discussed that adaptational lag to temperature in valley oak (Quercus lobata) can be mitigated by genome-informed assisted gene flow. Even using seed source from local species may not hold for management practices because trees can lag in adapting to temperature. This has not been accounted for.

The PA fails to consider that the effects of climate change on the project area, including that the target "historical" or desired vegetation conditions will likely not be achievable or sustainable. The PA fails to provide any credible analysis as to how realistic and achievable its objectives are in the context of a rapidly changing climate, along an unpredictable but definitely changing trajectory.

The PA fails to analyze and disclose how climate change is already, and is expected to be even more in the future, influence forest ecology. This has vast ramifications as to whether or not the forest in the project area will respond as the FS assumes.

The PA fails to acknowledge the possibility that "…high seedling and sapling mortality rates due to water stress, competing vegetation, and repeat fires that burn young stands," which will likely lead to a dramatic increase in non-forest land acres. (Johnson, et al., 2016.)

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

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

Conventional wisdom dictates that forests regenerate and recover from wildfire, and that forests can regenerate and recover from logging. And these days, "resilience" is a core tenant of FS planning. Unfortunately, assumptions relating to historic and desired conditions are incorrect.

NEPA requires a "hard look" at the best available science relating to future concentrations of greenhouse gases and gathering climate risk as we move forward into an increasingly uncertain and uncharted climate future. This has not been done. The PA does not include a legitimate climate-risk analysis, much less one based on the best available science.

No amount of logging, thinning and prescribes burning will cure the cumulative effects (irretrievable loss) already baked into the foreseeably impending climate chaos. "Treatments" must be acknowledged for what they are: adverse cumulative environmental effects. Logging can neither mitigate, nor prevent, the effects of wildfire or logging. Both disturb forests, and the assumed resilience no longer exists. It is way too late ignore the elephant in the room.

Millar et al. 2007 state:

> Over the last several decades, forest managers in North America have used concepts of historical range of variability, natural range of variability, and ecological sustainability to set goals and inform management decisions. An underlying premise in these approaches is that by maintaining forest conditions within the range of presettlement conditions, managers are most likely to sustainably maintain forests into the future. We argue that although we have important lessons to learn from the past, we cannot rely on past forest conditions to provide us with adequate targets for current and future management. This reality must be considered in policy, planning, and management. Climate variability, both naturally caused and anthropogenic, as well as modern land-use practices and stressors, create novel environmental conditions never before experienced by ecosystems. Under such conditions, historical ecology suggests that we manage for species persistence within large ecoregions.

The PA fails to consider that the effects of climate change on the Twentymile project area, including that FS target NRV or desired vegetation conditions will likely not be achievable or sustainable. The FS is obligated to conduct an analysis as to how realistic and achievable its objectives are in the context of a rapidly changing climate, along an unpredictable but definitely changing trajectory.

<u>Other forest activities emit greenhouse gases</u>

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

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

> Off-road vehicles in California currently emit more than 230,000 metric tons — or 5000 million pounds — of carbon dioxide into the atmosphere each year. This is

> equivalent to the emissions created by burning 500,000 barrels of oil. The 26 million gallons of gasoline consumed by off-road vehicles each year in California is equivalent to the amount of gasoline used by 1.5 million car trips from San Francisco to Los Angeles.
>
> . . . Off-road vehicles emit considerably more pollution than automobiles. According to the California Air Resources Board, off-road motorcycles and all-terrain vehicles produce 118 times as much smog-forming pollutants as do modern automobiles on a per-mile basis.
>
> . . . Emissions from current off-road vehicle use statewide are equivalent to the carbon dioxide emissions from 42,000 passenger vehicles driven for an entire year or the electricity used to power 30,500 homes for one year.

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

For the above reasons, this EA is utterly insufficient. It doesn’t recognize or analyze highly relevant information or consider the science that questions the EA’s underlying assumptions and therefore reveals scientific controversy. It doesn’t disclose high-quality information to the public, and it doesn’t take a hard look at this proposed action in the manner needed. This is compounded by the multitude of projects on the NPCNF, which represent cumulative effects that must be analyzed for carbon sequestration and global warming impacts at local and regional levels. This EA violates the National Environmental Policy Act.

The FS must overhaul its land management approach to one prioritizing conservation of carbon pools, long-term and short-term, to preserve the atmosphere, the biosphere, and prospects for the survival of civilization.

FOREST “RESILIENCE”

The FS believes that increased tree density and tree succession have resulted in a higher susceptibility to insects and disease, and improving resistance to insects means restoring and maintaining more open (less dense) stand structures to reduce tree stress. Yet, the best available science brings into question many FS underlying assumptions about the efficacy of vegetation treatments in reducing the effects from what can be characterized as a natural response to changing climate conditions. See Hart, et al., 2015 (finding that although mountain pine beetle infestation and fire activity both independently increased with warming, the annual area burned in the western United States has not increased in direct response to bark beetle activity); see also Hart and Preston, 2020 (finding “[t]he overriding influence of weather and pre-outbreak fuel conditions on daily fire activity . . . suggest that efforts to reduce the risk of extreme fire activity should focus on societal adaptation to future warming and extreme weather"); see also Black, et al., 2010 (finding, inter alia, that thinning is not likely to alleviate future large-scale epidemics of bark beetle); see also Six, et al., 2018 (study that found during mountain pine beetle outbreaks, beetle choice may result in strong selection for trees with greater resistance to attack, and therefore retaining survivors after outbreaks—as opposed to logging them—to act as primary seed sources could act to promote adaptation); see also Six et al., 2014 (noting "[s]tudies conducted during outbreaks indicate that thinning can fail to protect stands").

The PA states, "The Twentymile …project will contribute towards forest resilience…" "Resilience" is a huge buzzword these days. But what does it actually mean for forest ecosystems? Much of it is distraction, but even worse its use presents false solutions for nonexistent problems, written to justify timber production.

The PA fails to disclose an objective, measurable definition of "resilience." The FS's 2019 Sanpoil EA (Colville National Forest) defines resilience as "the ability of a forested area to survive a disturbance event, specifically wildfire and insect attack, relatively intact and without large scale tree mortality." Whereas we note that the FS demonizes disturbance events that cause lot of tree mortality, such a view conflicts with best available science and ecological knowledge—and conflicts with the most of the values national forests were established to protect, which don't involve resource extraction.

The PA states, "existing forested stands within the project area are mature or overmature, making them more susceptible to insect and disease outbreaks. Insect and disease outbreaks contribute to a high rate of tree mortality, which creates considerable fuel and increases the susceptibility of stands to catastrophic fire." The PA prefers "Forest stands …be more resilient and resistant to extensive insect and disease outbreaks and wildfire." However the PA does not reconcile such a position with the following best available science concerning forests:

> "(A)ttributes such as decadence, dead trees …are important…" (Green et al., 1992).
> "Accumulations of large-size dead standing and fallen trees that are high relative to earlier stages." (Id.)
> "Decadence in the form of broken or deformed tops or bole and root decay." (Id.)

Green et al., 1992 describe Defining characteristics of old growth, which include:

> Old growth forests encompass the late stages of stand development and are distinguished by old trees and related structural attributes. These attributes, such as tree size, canopy layers, snags, and down trees generally define forests that are in and old growth condition.
>
> Definition
> Old growth forests are ecosystems distinguished by old trees and related structural attributes. Old growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include tree size, accumulations of large dead woody material, number of canopy layers, species composition, and ecosystem function.

(O)ld growth is typically distinguished from younger growth by several of the following attributes:

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

The PA fails to disclose or acknowledge the scientific information that indicates severe fires burning over large acreages are normal for the Forest, and that fire intensity and severity are dependent much more upon weather than fuels. It's common knowledge by now. If the purpose for a project is built upon false information about ecological functioning, then the predicted effects of the project are not credible. This PA does not comply with NEPA's requirements for scientific integrity.

"Insect and disease outbreaks contribute to a high rate of tree mortality, which creates considerable fuel and increases the susceptibility of stands to catastrophic fire." There's a large body of scientific evidence the FS is ignoring, which disproves that statement.

"High-intensity fires can negatively impact ecosystem dynamics such as wildlife habitat, watershed conditions." Yet more lies.

The PA creates a set of "Desired Conditions" it uses to justify one of its "primary goals …to …Improve Forest Health." The PA attributes the "Desired Conditions" to the Forest Plan: "Based on observed existing conditions, the Twentymile project area (project area) is not meeting the desired forest conditions identified in the 1987 Nez Perce National Forest Land and Resource Management Plan, as amended (Forest Plan; U.S. Department of Agriculture, Forest Service [USDA FS], 1987a)." However there's a reason the PA doesn't directly cite or quote the Forest Plan in regards to these "Desired Conditions"—and that reason is, the PA is pretty much making them up out of thin air.

"The desired conditions are forest stands that exhibit a variety of density, age, species, and structural conditions to provide a diversity of vegetation and wildlife habitat." Again, where is the PA getting this stuff? Those "desired conditions" certainly weren't developed in any public process.

"To meet the desired future conditions, the proposed treatments would create eleven openings greater than 40 acres in size and would require approval from the Regional Forester and 60-day public notice." Nowhere does the Forest Plan state that huge clearcuts are desired.

"The Forest Plan, completed in 1987, describes the Twentymile Creek area as consisting of "moderately dense stands of grand fir, Douglas-fir, and lodgepole pine. Upper elevations in the area support subalpine fir, Engelmann spruce, and western larch. "Much of the project area has departed from historical conditions and does not meet the desired conditions set forth in the

Forest Plan." Much of the PA resembles a book of fiction. The Forest Plan says little about "historical conditions."

"Over 100 years of fire exclusion has caused the forest to depart from the historical, characteristically open, widely spaced stands dominated by ponderosa pine." What historical evidence is the FS relying upon to support its claim that the Twentymile project area featured "characteristically open, widely spaced stands dominated by ponderosa pine"? What was the historical extent of such stands in the project area?

"In order to reduce wildfire risk to communities, forest health, and other values, recent science (Ager et al, 2021) suggests that fire-adapted conditions should be restored on 35 to 45 percent of a fireshed through a range of fuels and forest management activities, including mechanical thinning and prescribed fire, followed by maintenance treatments at intervals of 10 to 15 years." With so much fiction in that PA statement, this will take some unpacking:

1. The cited study does not use the word "fireshed." (Nor does the PA define "fireshed".)
2. The cited study does not use the words "fire-adapted conditions."
3. The cited study did not arrive at an interval of 15 years—it used 15 years (but not 10 years) as an input to the modeling exercise the study was about.
4. The cited study did not use the word "forest health" except to cite another study: "Fine scale studies of treatment needs on national forests suggest that treating to manage fuels and forest health according to current practices in the field leads to substantially higher estimates of treatment need compared to those generated from studies of historical range of variation (Belavenutti, 2021)." The PA fails to interpret that cryptic statement, which suggests the FS should reject achievement of the historic range of variation in order to "treat" all the forest landscape the Ager et al study was designed to justify.
5. The cited study does not mention 35 percent anywhere.
6. The cited study does not mention 45 percent anywhere.
7. The study only uses the word "thinning" thus: "We assumed the appropriate treatment would be implemented, including thinning and broadcast/pile burning based on silvicultural prescriptions specific to local conditions. **As noted above, we did not model changes in fuels or vegetation or post treatment fire behavior due to lack of data and computational limitations.**"

(Bold text emphasis added.) Clearly the PA cannot be relied upon to correctly interpret and cite scientific research.

We incorporate into these comments the John Muir Project's documents, "Forest Thinning to Prevent Wildland Fire …vigorously contradicted by current Science" and "Do beetle outbreaks in western forests increase fire severity?".

See Attachment 1, which is a collection of news media articles, quoting experts including those in the FS, who understand the high value of severely burned forest for wildlife and other resources.

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

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

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

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

Sallabanks et al., 2001 state:

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

The PA fails to consider scientific information that provides a better alternative to the FS's management paradigm which features certain adopting static Desired Conditions representing conditions the agency believes represents the natural range of variability based the historic range of conditions. Frissell and Bayles (1996) state:

> …The concept of range of natural variability …suffers from its failure to provide defensible criteria about **which factors ranges should be measured**. Proponents of the

> concept assume that a finite set of variables can be used to define the range of ecosystem behaviors, when ecological science strongly indicates many diverse factors can control and limit biota and natural resource productivity, often in complex, interacting, surprising, and species-specific and time-variant ways. **Any simple index for measuring the range of variation will likely exclude some physical and biotic dimensions important for the maintenance of ecological integrity and native species diversity.** (Emphases added.)

McClelland (undated) criticizes the aim to achieve static desired conditions, in that case retaining specific numbers of snags:

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

Castello et al. (1995) discuss some things that would be lost chasing static Desired Conditions:

> Pathogens help decompose and release elements sequestered within trees, facilitate succession, and maintain genetic, species and age diversity. Intensive control measures, such as thinning, salvage, selective logging, and buffer clearcuts around affected trees remove crucial structural features. Such activities also remove commercially valuable, disease-resistant trees, thereby contributing to reduced genetic vigor of populations.

Hayward, 1994 states:

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

Noss, 2001, believes "If the thoughtfully identified critical components and **processes of an ecosystem are sustained**, there is a high probability that the ecosystem as a whole is sustained." (Emphasis added.) Noss 2001 describes basic ecosystem components (emphasis added):

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

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

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

Hutto, 1995 also addresses natural processes, referring specifically to fire:

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

Noss and Cooperrider (1994) state:

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

The Environmental Protection Agency (1999) recognizes the primacy of natural processes:

> (E)cological processes such as natural disturbance, hydrology, nutrient cycling, biotic interactions, population dynamics, and evolution determine the species composition, habitat structure, and ecological health of every site and landscape. **Only through the conservation of ecological processes** will it be possible to (1) represent all native

> ecosystems within the landscape and (2) maintain complete, unfragmented environmental gradients among ecosystems. (Emphasis added.)

Frissell and Bayles (1996) state:

> …The concept of range of natural variability …suffers from its failure to provide defensible criteria about **which factors ranges should be measured**. Proponents of the concept assume that a finite set of variables can be used to define the range of ecosystem behaviors, when ecological science strongly indicates many diverse factors can control and limit biota and natural resource productivity, often in complex, interacting, surprising, and species-specific and time-variant ways. **Any simple index for measuring the range of variation will likely exclude some physical and biotic dimensions important for the maintenance of ecological integrity and native species diversity.** (Emphases added.)

Forest Service researcher Everett (1994) states:

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

Biologist Payne, 1995 includes a commentary on the kind of hubris represented by the FS's view that it can manipulate and control its way to a restored forest by using intensive active 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.** (Emphasis added.)

In other places, the FS has recognized natural processes are vital for ecological integrity. USDA Forest Service, 2009a incorporates "ecological integrity" into its concept of "forest health" thus:

> "(E)cological integrity": Angermeier and Karr (1994), and Karr (1991) define this as:
>
>> The capacity to support and maintain a balanced, integrated, and adaptive biological system having the full range of elements and processes expected in a region's natural habitat.
>> "…the ability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region." That is, an ecosystem is said to have high integrity if its full complement of native species is present in normal distributions and abundances, and if **normal dynamic functions are in place and working properly**. In systems with integrity, the "…capacity for self-repair when perturbed is preserved, and minimal external support for management is needed." (Emphasis added.)

That last sentence provides a measure of resilience the PA doesn't acknowledge. In their conclusion, Hessburg and Agee, 2003 state "Desired future conditions will only be realized by planning for and creating the desired ecosystem dynamics represented by ranges of conditions, set initially in strategic locations with minimal risks to species and processes."

Please explain how much of the forest areas NOT to be treated meet the PA's "Desired Conditions."

Factors that create significant adverse impacts on native species diversity include those not historically not found in nature, including road densities, edge effects due to logged openings, noxious weeds and other invasive species, livestock, compacted and otherwise productivity-reduced soil conditions, and many human-caused fires. There is no natural range of variability of those factors, so the FS must include an analysis that explains how they influence achieving Desired Conditions.

A FS's public relations strategy/justification for pushing destructive and risky logging is raising the specter of some sort of "catastrophe" such as fire or more tree mortality from insects or tree diseases. From a tree farming perspective, this might have some merit, but since this is a national forest where other features such as old growth and birds and predators and clean water are important to the public, the FS ought to widen its management perspective in able to hear the public and fairly weigh scientific information.

The PA pretends that if natural fire regimes were operating here practically all the low and mid-elevation forests would be in open conditions with widely spaced mature and old trees. The FS fails to acknowledge good science, such as that mixed-severity and even low-severity fire regimes result in much more variable stand conditions across the landscape through time. Assumptions that these 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 PA's implications that the proposed treatments will result in predictable wildland fire effects is of considerable scientific doubt (Rhodes and Baker, 2008).

So the PA claims project actions would improve resilience with this project, but this is not the absence of natural disturbances such as wildland fire or insects, etc. Rather, it is the opposite (DellaSala and Hanson, 2015, Chapter 1, pp. 12-13). What the FS is promoting here is the human control of the forest ecosystem through mechanical means in order to maintain unnatural stasis by eliminating, suppressing or altering natural disturbances such as wildland fire and insect or disease effects, to maximize the commercial potential of natural resources. In other words, tree farming. This is the antithesis of ecological resilience and conservation of native biodiversity. Ecological resilience is the ability to ultimately return to predisturbance vegetation types after a natural disturbance, including higher-severity fire. This sort of dynamic equilibrium, where a varied spectrum of succession stages is present across the larger landscape, tends to maintain the full complement of native biodiversity on the landscape. (Thompson et al., 2009).

Vegetation treatments based on historical reference conditions to reduce high-intensity wildfire risk on a landscape scale are undermined by the fact that land managers have shown little ability to target treatments where fires later occur. Barnett, et al, 2016; Rhodes and Baker, 2008 (finding that fuel treatments have a mean probability of 2-8% of encountering moderate- or high- severity fire during the assumed 20-year period of reduced fuels). Analysis of the likelihood of fire is central to estimating likely risks, costs and benefits incurred with the treatment of "fuels." If fire does not affect treated areas while "fuels" are reduced, treatment impacts are not counterbalanced by benefits from reduction in fire impacts. Results from Rhodes and Baker, 2008 indicate that "even if fuel treatments were very effective when encountering fire of any severity, treatments will rarely encounter fire, and thus are unlikely to substantially reduce effects of high-severity fire."

The Twentymile PA is an example of management hubris on a grand scale. Frissell and Bayles (1996) note:

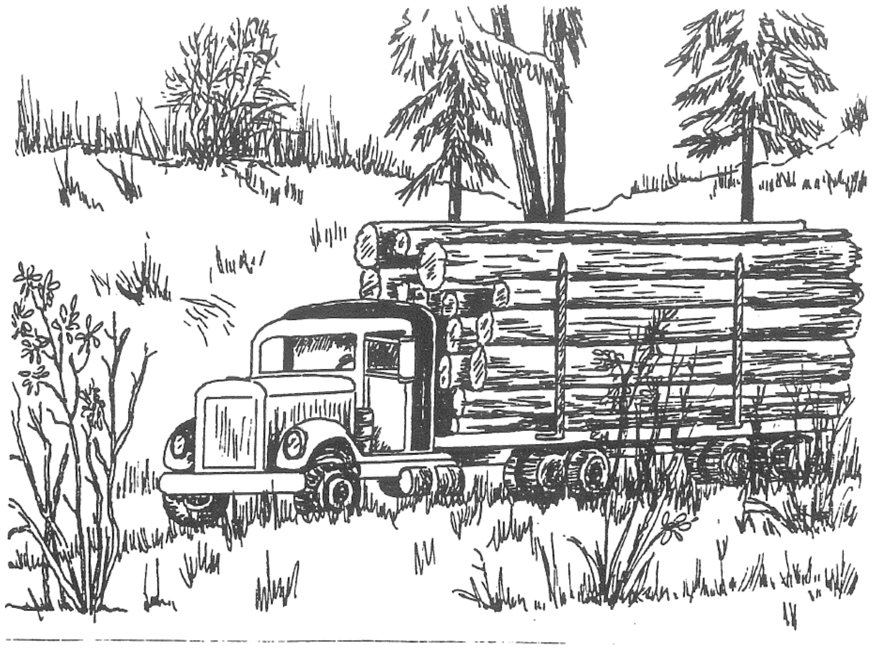
> Most philosophies and approaches for ecosystem management put forward to date are limited (perhaps doomed) by **a failure to acknowledge and rationally address the overriding problems of uncertainty and ignorance about the mechanisms by which**

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

The PA provides absolutely no operational definition of resilience that would allow anybody to actually **measure** the resilience of anything as it now stands, or measure the change in resilience following project activities. An essential component of an operational definition is **measurement**. A simple and accurate definition of measurement is the **assignment of numbers to a variable** in which we are interested. In this case, the variable in which we are interested is resilience, and how the FS measures it in these ecosystems.

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

OLD GROWTH



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

-USDA Forest Service, 1987d

The PA states, “From the FHP visit during the summer of 2019, it is evident that **most of the existing forested stands are densely stocked, and mature or overmature in age and condition** (CFO-TR-19-005-TwentymileTripReport).” (Emphasis added.) Based on that description, our understanding is that there is potentially a lot of old growth in the project area. We do not see any statement to the effect that no old growth would be logged, so we assume the FS will be doing inadequate surveys for old growth as it did with the Hungry Ridge project. We also assume that the Twentymile project would clearcut and otherwise degrade or destroy old growth, as would happen with Hungry Ridge.

We find information that contradicts the above PA statement in Table 3-12 of the PA. That table is partially reproduced below:

Table 3-12 Existing forest structure (tree size classes) within the project area based on Forest Service Region 1 Vegetation Mapping Program (VMAP) vegetation data layer.

Tree Size Class	Acres	% of project area
>=20”	350	2.3%

So if “most of the existing forested stands are densely stocked, and mature or overmature in age and condition” then why does VMAP show so little of that same forest to be of tree class ≥20” diameter at breast height?

The draft EIS for the forest plan revision recognizes that the mixed-severity fire regime is the most prevalent one on the NPCNF. Lesmeister et al. (2019) state, “Because of the spatiotemporal variability across the landscape, mixed-severity fire regimes are the most complex and least understood fire regimes, unique in terms of patch metrics and the life history attributes of native species (Schoennagel et al. 2004, Agee 2005, Halofsky et al. 2011). Fire histories in mixed-severity regimes, in particular, are difficult to determine because most fire history techniques have been developed to study either the low- or high-severity extremes in fire regimes (Agee 2005)." Lesmeister et al. (2019) discuss in more enlightened terms the kind of fire events demonized in the PA's analyses:

> Short-interval severe fires are an important characteristic of mixed-severity fire regimes and are typically considered extreme events and expected to be deleterious to forest succession and diversity (Donato et al. 2009). However, many native plants within these forests possess functional traits (e.g., persistent seed banks, vegetative sprouting, rapid maturation) lending to resilience to short-interval severe fires that result in distinct vegetation assemblages that enhance landscape heterogeneity inherent to mixed-severity fire regimes (Donato et al. 2009). Furthermore, high diversity of vegetation types, driven by short-interval repeat fires in a mixed-severity fire regime landscapes, plays an important role in conservation and the structure of avian communities (Fontaine et al. 2009).

Lesmeister et al., 2019 discuss the positive role that old-growth ("untreated" old growth) plays in countering impacts from high-severity fires—protecting these areas are a part of the climate solution, not a problem to be logged. If there is any increase in the frequency of fire-severity on the landscape, it is likely due to the FS's management practices. Regarding the logging of old growth, best available science indicates it isn't justified.

Old growth is important for many reasons. For one, people enjoy visiting these groves, for the mystery it invokes:

> The birth of "old growth" as the iconic forest can be encapsulated in a few words describing social meanings, time and space: re-enchantment trumped rationality; the eternal present absorbed the chronology of forest growth; mystical places colonized the choreography of sustained yield operations.

(Lee, 2009.) We find nothing in the PA's discussion on old growth that recognizes these societal values. In 1989, Forest Service Chief Dale Robertson issued a "Position Statement on National Forest Old Growth Values" (Chief's Position Statement – see Green et al., 1992). The Chief's Position Statement began, "The Forest Service recognizes the many significant values associated with old growth forests, such as biological diversity, wildlife and fisheries habitat, recreation, aesthetics, soil productivity, water quality, and industrial raw material. Old growth on the National Forests will be managed to provide the foregoing values for present and future generations. …Where goals for providing old growth values are not compatible with timber harvesting, lands will be classified as unsuitable for timber production."

The 1989 Chief's Position Statement included steps national forest managers were to take to reflect this range of old growth values. The direction included:

- Old growth values shall be considered in designing the dispersion of old growth. This may range from a network of old growth stands for wildlife habitat to designated areas for public visitation. In general, areas to be managed for old growth values are to be distributed over individual National Forests with attention given to minimizing the fragmentation of old growth into small isolated areas.

- Regions with support from Research shall continue to develop forest type old growth definitions, conduct old growth inventories, develop and implement silvicultural practices to maintain or establish desired old growth values, and explore the concept of ecosystem management on a landscape basis. Where appropriate, land management decisions are to maintain future options so the results from the foregoing efforts can be applied in subsequent decisions. Accordingly, field units are to be innovative in planning and carrying out their activities in managing old growth forests for their many significant values.

Green et al., 1992 states "…old growth is valuable for a whole host of resource reasons such as habitat for certain animal and plants, for aesthetics, for spiritual reasons, for environmental protection, for research purposes, for production of unique resources such as very large trees." And Hamilton, 1993 states, "Values for such items as wildlife, recreation, biological diversity, and juxtaposition of old-growth stands with other forest conditions need to be considered in relation to Forest land management planning objectives."

Old growth is very important because it provides unique habitat conditions for wildlife, plants, fungi and other life forms which are not well-represented in younger or managed forests. Old growth provides reserves of biological diversity typically depleted in intensively managed stands.

The "Open Letter to The Forest Service on the Importance of Large, Old Trees and Forests" signed in 2020 by dozens of scientists, is incorporated into these comments.

The Kootenai National Forest 1987 Forest Plan included Appendix 17 and other direction (USDA Forest Service 1987a). We incorporate that appendix as well as USDA Forest Service 1987b which contains a list of "species …(which) find optimum habitat in the "old" successional stage…" And Kootenai National Forest (1991) states, "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." (*Also see* USDA Forest Service, 1990a.) We also incorporate the Idaho Panhandle NF's forestwide old-growth planning document (USDA Forest Service, 1987d) and the IPNF Forest Plan's old-growth standards (USDA Forest Service, 1987c) because they provide biological information concerning old growth and old-growth associated wildlife species.

USDA Forest Service, 1987a states:

> Richness in habitat translates into richness in wildlife. Roughly 58 wildlife species on the Kootenai (about 20 percent of the total) find optimum breeding or feeding conditions in the "old" successional stage, while other species select old growth stands to meet specific needs (e.g., thermal cover). Of this total, five species are believed to have a strong preference for old growth and may even be dependent upon it for their long-term survival

(see Appendix I[10]). While individual members or old growth associated species may be able to feed or reproduce outside of old growth stands, biologists are concerned that viable populations of these species may not be maintained without an adequate amount of old growth habitat.

> Wildlife richness is only a part of the story. Floral species richness is also high, particularly for arboreal lichens, saprophytes, and various forms of fungus and rots. Old growth stands are genetic reservoirs for some of these species, the value of which has probably yet to be determined.

The PA also does not properly analyze and disclose the natural historic range vs. current conditions regarding patch size, edge effect, and amount of interior forest old growth in the CNF. 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.

USDA Forest Service, 2004a states:

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[10] USDA Forest Service 1987b.

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."

The Committee of Scientists (1999) state, "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 has also failed to provide adequate protection for designated old growth, resulting in a widespread loss of vital old-growth snag component due to firewood cutting and other activities adjacent to open roads. (*See* Bate and Wisdom, 2004.)

Marcot et al., 1991 make several points about old growth:

- In current planning and management activities on National Forests, old growth has several values (Sirmon 1985), and one of them is its importance as wildlife habitat (Meehan and others 1984, Meslow and others 1981, Raphael and Barrett 1984, Thomas and others 1988). Old growth provides optimal habitat for some management indicator species, including spotted owl, pileated woodpecker, and marten, and for many other species of plants, fish, amphibians, reptiles, birds, and small mammals (Harris and others 1982, Meslow and others 1981, Raphael 1988c, Raphael and Barrett 1984). It also provides thermal and hiding cover for ungulates, especially in winter (Schoen and others 1984, Wallmo and Schoen 1980). Old growth, therefore, plays an important role in providing for productive populations of some species of special ecological and administrative interest. For some of these species, old growth may be a key factor in providing for continued population viability.

- Additional values of old growth are as natural research areas for scientific study (Greene 1988, Sheppard and Cook 1988) and its ecological role in providing long-term forest productivity (Franklin and others 1981, Perry and others 1988). Other interests in old growth include its recreational, aesthetic, and spiritual significance (Anderson 1988), its contribution to watershed protection (Sedell and Swanson 1984), and its importance as a contributor to biological diversity (Harris 1984, Luman and Neitro 1980, Norse and others 1986).

- Without adequate inventories and without a clear understanding of the amount and distribution of old growth it is difficult for the decision maker to determine what is practical or feasible (Ham 1984:69).

- An old-growth inventory must be designed with a specified degree of reliability. The degree of error and confidence in the statements of amount and distribution should be known, at least qualitatively. The reliability of an inventory is a function of many factors. These include the correctness and usefulness of the classification scheme used; the quality of the sampling design by which remote-sensing images are interpreted and vegetation surveys in the field are conducted; the consistency with which inventory criteria are applied across various land units, taking into account the need to vary criteria by forest type and land form; the availability and quality of remotely sensed images: the expense and training involved in having people interpret the remotely sensed images; the experience and training of field crews; and the sample sizes used in field verification testing and from which subsequent classification strata are derived.

- Some wildlife species may have co-evolved with, and depend on, specific amounts and conditions of old-growth forests. Specific kinds, sizes, and patterns of old-growth environments are, therefore, keys to the long-term survival of these species. Land allocations affect the distribution of old growth across the landscape over time and the effectiveness of old growth as habitat for wildlife. Resulting spatial patterns of old growth influence the viability of many wildlife species that depend on the ecological conditions of old forests. Old growth may provide population “reservoirs” for species that find early successional stages of second-growth conifer stands marginal habitat.

- Landscape attributes affecting the perpetuation of old-growth dependent and associated wildlife include the spatial distribution of old growth; the size of stands; the presence of habitat corridors between old-growth or old-forest stands; proximity to other stands of various successional stages and especially for well-developed mature-forest stages and species with different seasonal uses of habitats; and the susceptibility of the old-growth habitat to catastrophic loss (such as wildfire, insects, disease, wind and ice storms, and volcanic eruptions.

- Stand size, in combination with its landscape context (the condition, activities, or both on the adjacent landscape that affect the stand), is of major significance in perpetuating old-growth resources and can have a major effect on their use by wildlife. Wide-ranging species may be able to use stands of various structural- , size- , and age-classes. If such stands are separated by unsuitable habitat or disruptive activities, however, the remaining old-growth stands become smaller in effective (interior) size, more fragmented, and possibly not suitable for occupancy or for successful reproduction. An old-growth inventory that quantifies such stand and landscape attributes is a prerequisite for evaluating possible context and landscape effects on species' presence.

Bollenbacher and Hahn, 2008 state:

- Relative to harvested forests, OG stands had higher species richness (Mazurek and Zielinski 2004; birds: Beese and Bryant 1999), supported more small mammal individuals and biomass (Rosenberg and Anthony 1993; Carey 1995; Carey and Johnson 1995), and allowed for greater movement and genetic diversity (tailed frog *Ascaphus truei*: Wahbe et al. 2004, 2005).

- Related studies examining wildlife responses in OG stands compared to younger stands revealed extensive variability, which may be attributed to differences among studies in location; stand type, treatment and size; and pre- and post-treatment stand conditions. Clearly, more work is needed; in particular, we need to rigorously investigate OG treatment effects on forest structure and composition and wildlife populations in the Northern Region.

Rose et al., 2001 is scientific information on dead wood in forest ecosystems. Snags and down dead wood are a defining element of old growth. They make several good points, citing dozens of other scientific sources. Below, the internal citations are omitted for ease of reading:

- Decaying wood has become a major conservation issue in managed forest ecosystems. Of particular interest to wildlife scientists, foresters, and managers are the roles of wood decay in the diversity and distribution of native fauna, and ecosystem processes. Numerous wildlife functions are attributed to decaying wood as a source of food, nutrients, and cover for organisms at numerous trophic levels. Principles of long-term productivity and sustainable forestry include decaying wood as a key feature of productive and resilient ecosystems. (Internal cites omitted.)
- Inputs of decaying wood are crucial to most aspects of stream processes, such as channel morphology, hydrology, and nutrient cycling.
- Wood decay in forests of the Pacific Northwest has recently become a topic of renewed interest at national and global scales, regarding the role of terrestrial carbon storage in the reduction of atmospheric CO_2 (a greenhouse gas).
- New research over the past three decades has emphasized the significance of decaying wood to many fish and wildlife species, and to overall ecosystem function. The

importance of decaying wood to ecosystem biodiversity, productivity, and sustainability is a keynote topic in two recent regional ecosystem assessments in Oregon and Washington. These, and other publications address both the specific roles of wood decay in ecosystem processes and functions, as well as ecological functions of wildlife species associated with wood decay.

- Interactions among wildlife, other organisms, and decaying wood substrates are essential to ecosystem processes and functions. In the process of meeting their needs, animals accomplish ecosystem work with respect to transformation of energy and cycling of nutrients in wood. For example, chipmunks and squirrels disperse mycorrhizal fungi which play key roles in nutrient cycling for tree growth; birds, bats, and shrews consume insects that decompose wood or feed on invertebrates and microbes; beavers and woodpeckers create habitats by modifying physical structures; arthropods build and aerate soil by decomposing wood material. Relations between wood decay and wildlife have been examined in several recent analyses.
- Managed forests, on average, have lower amounts of large down wood and snags than do natural forests.
- Emphasis on concepts of long-term productivity in this chapter reflects an underlying principle that habitat functions of decaying wood are inextricably linked to ecosystem processes. Careful attention to the whole ecosystem is a prerequisite to successful management of decaying wood for wildlife.

Wood Legacies in Managed Forests

John Hayes

Legacies are structures or components of ecosystems that exist prior to a disturbance and are "inherited" by the post-disturbance community. Legacies can provide important temporal connectivity within a stand, allowing organisms present in a pre-disturbance community to persist in an area following disturbance. In addition, legacy wood can provide structural elements and complexity in a stand that would otherwise require very long periods of time to develop. In managed forests, wood legacies, including large diameter trees, snags, and down wood, are ecologically important structures that play central roles in diverse ecosystem processes and functions, such as geomorphic processes, hydrology, nutrient cycling, and habitat for fish and wildlife. The ecological value of wood legacies has begun to gain widespread recognition only within the past two decades.[122, 164]

As a result of a variety of operational, safety, and economic considerations, application of intensive forest management practices often results in removal of legacy structures from stands and minimal retention of future legacy structures. Growing replacement structures with similar characteristics (e.g., large diameter trees with large diameter branches, thick and deeply-furrowed bark, and complex crown structure) requires decades or longer. Moreover, unless special provisions are made, large diameter trees, snags, and logs with these characteristics may never be produced in forests managed intensively on short- to moderate-length rotations. Habitat quality for species that depend upon or are closely associated with these structures can be seriously diminished with their loss from forest stands. The ecological importance of wood legacies combined with the difficulties of creating replacement structures provide convincing reasons to conserve legacy structures during management activities.

Managing wood legacies through time in managed forests is a multi-staged process. Existing structures that will serve as legacy structures in the post-disturbance environment should be identified prior to a disturbance event, such as logging. In some cases, it may be adequate to rely on the timber sale administrator or loggers to identify appropriate structures and implement the management strategy in the field. Since one intent of legacy structures is to provide various functions through time, it will often be valuable to either individually mark important legacy structures, or to document their location and purpose so that future managers can take the structures into account. Of equal importance, plans for recruitment of future legacy structures should be prepared to ensure that legacy structures will be available in future stands. Innovative silvicultural practices can be employed to create conditions favorable to development of future legacy structures.

- Of the biological agents of wood decay, insects and fungi are the principal players in coniferous forest ecosystems.
- Down wood, snags, and live trees with decay serve vital roles in meeting the life history needs of wildlife species in Oregon and Washington.
- Woodpeckers, sapsuckers, and nuthatches are highly specific in their selection of tree species for nesting and roosting, and this selectivity is attributed to the presence of decay fungi.
- To be useful to most cavity excavators, live trees usually must contain wood in a Class 2 stage of decomposition. For example, strong excavators, such as Williamson's sapsuckers, pileated woodpeckers, and black-backed woodpeckers, select trees with a sound exterior sapwood shell and decaying heartwood to excavate their nest cavities.
- Hollow trees larger than 20 inches (51 cm) in diameter at breast height (dbh) are the most valuable for denning, shelter, roosting, and hunting by a wide range of animals. Hollow chambers are used as dens by black bears, as night roosts by woodpeckers, and as dens, shelter, roosts, and hunting sites by a variety of animals, including flying squirrels, wood rats, bats, American marten, northern flickers and Vaux's swift.
- Hollow trees and down wood are formed from only a few tree species that can maintain bole structural integrity as the heartwood decays. Western redcedar is especially valuable in providing hollow trees because the decay-resistant sapwood remains structurally sound

for centuries. In the Interior Columbia Basin, grand fir and western larch form the best hollow trees for wildlife uses.

- Broomed trees caused by mistletoe, rust, or needlecast fungi may remain alive for decades, and have attributes distinct from decay patches in live trees. Abundant forage is produced from mistletoe shoots and fruits. Regardless of the extent of decay, broom infections provide various habitat functions to wildlife depending on how and where they form along the bole. For example, mistletoe brooms form platforms used for nesting, roosting, and resting sites by owls, hawks, and song birds; roosting by grouse; and resting cover by squirrels, porcupines, and marten.
- The abundance of cavity-using species is directly related to the presence or absence of suitable cavity trees. Habitat suitability for cavity-users is influenced by the size (diameter and height), abundance, density, distribution, species, and decay characteristics of snags. In addition, the structural condition of surrounding vegetation determines foraging opportunities.
- Stumps provide a variety of wildlife habitats. Stumps with sloughing bark (Class 2) provide sites for bat roosts, and foraging sites for flickers, and downy, hairy and pileated woodpeckers. In openings, tall stumps with advanced decay (Class 3) provide nest sites for flickers, and subsequently for blue birds and other secondary cavity-nesters associated with openings. Squirrels and chipmunks also use stumps as lookouts and platforms for cone-shredding.
- Down Woody Material (logs). Down wood affords a diversity of habitat functions for wildlife, including foraging sites, hiding and thermal cover, denning, nesting, travel corridors, and vantage points for predator avoidance. Larger down wood (diameter and length) generally has more potential uses as wildlife habitat. Large diameter logs, especially hollow ones are used by vertebrates for hiding and denning structures. Bears forage for invertebrates in logs during summer and fall. Fishers use large logs to a limited degree as den sites.
- Lynx select dense patches of downed trees for denning. Jackstrawed piles of logs form a habitat matrix offering thermal cover, hiding cover, and hunting areas for species such as marten, mink, cougar, lynx, fishers, and small mammals (Figure 8). Smaller logs benefit amphibians, reptiles, and mammals that use wood as escape cover and shelter. Small mammals use logs extensively as runways (Figure 9). California red-backed voles use Class 2-3 down logs for cover, and feed on fungi (especially truffles) and lichens growing in close association with down wood.
- The moist environment beneath loose bark, bark piles and in termite channels of logs with advanced decay provides a protected area for foraging by salamanders. The cool, moist environment of rotten wood may be required for some species of salamanders to survive heat stress during summer. Decaying wood also provides habitat for invertebrates on which salamanders and other foraging vertebrates feed (e.g., collembolans, isopods, millipedes, mites, earthworms, ants, beetles, flies, spiders and snails). The folding-door spider constructs a silk tube within the cracks and crevices of wood with advanced decay.
- Habitat structures in upper layers of the forest floor (soil, litter, duff) result from processes involving organic material (litter, decaying roots, vertebrate and invertebrate carrion, and fecal matter) and a diverse community of organisms, including bacteria, fungi, algae, protozoa, nematodes, arthropods, earthworms, amphibians, reptiles, and small mammals. The complex trophic web supported by nutrient and moisture conditions

within the litter and duff layers transforms plant material into a variety of degradation products, thereby storing and releasing nutrients within the ecosystem.

- Decaying wood forms many habitat structures in riparian forests. Accumulations of large wood on stream banks provide habitat for small mammals and birds that feed on stream biota, and provide structural diversity in streamside forests.
- The role of down wood in salmon habitat has received much attention over the past two decades. Large wood is a key component of salmonid habitat both as a structural element and as cover and refugia from high flows. Large wood serves key functions in channel morphology, as well as sediment and water routing. The importance of wood to salmon habitat varies from headwater to stream mouth. As stream order increases and gradient decreases in third- to fifth-order streams, down wood is a dominant channel-forming feature. Larger wood deflects water and increases hydraulic diversity, producing a range of pool conditions that serve as habitats for juvenile salmonids in summer. Diverse channel margins are a primary aspect of rearing habitat. Flow obstructions created by large wood provide foraging areas for young salmonid fry that are not yet able to swim in fast currents, and provide refugia to juvenile salmonids at high flow. In higher order streams, flow deflections created by large wood trap sediments and nutrients, and enhance the quality of gravels for spawning. Down wood is less of a channel-forming feature along large rivers, but defines meander cutoffs and provides cover and increased invertebrate productivity for juvenile salmonids.
- Processes that sustain the long-term productivity of ecosystems have become the centerpiece of new directives in ecosystem management and sustainable forestry. Given the key role of decaying wood in long-term productivity of forest ecosystems in the Pacific Northwest, the topic should remain of keen interest to scientists and managers during the coming decade. Below, we highlight functions of decaying wood directly linked to long-term productivity, including influences on the frequency and severity of disturbances such as fire, disease, and insect outbreaks.
- Nutrient Cycling and Soil Fertility. Decaying wood has been likened to a savings account for nutrients and organic matter, and has also been described as a short-term sink, but a long-term source of nutrients in forest ecosystems.
- Nutrient cycling via foliage and fine litter has been well-described. Substantial amounts of nitrogen are returned to the soil from coarse wood inputs, yet even where annual rates of wood input are high, 4 to 15 times more nitrogen is returned to the forest floor from foliage than from large wood. This is a consequence of the higher nutrient concentrations and shorter turnover times of leaf litter compared to wood. The relative contribution of large wood to the total nutrient pool in an ecosystem depends to a large extent, on the size of other organic pools in the system.
- The slow rate of nutrient release from decomposing wood may serve to synchronize nutrient release with nutritional demands in forests, and also to minimize nutrient losses via leaching to the ground water. In addition to nitrogen bound chemically within wood, down wood reduces nutrient losses from ecosystems by intercepting nutrients in litterfall and throughfall. Favorable temperature and moisture conditions also makes large decaying wood sites of significant nitrogen inputs via N-fixation.
- Soil is the foundation of the forest ecosystem. Large wood is a major source of humus and soil organic matter that improves soil development.

- Moisture Retention. Water stored in large decomposing wood accelerates microbial decay rates by stabilizing temperature and preventing desiccation during the summer.11, 160, 376 Moist conditions within the wood favor decay by attracting burrowing and tunneling mammals and invertebrates that improve aeration of wood, and by providing colonization substrate and moisture for mycorrhizae and other fungi. Moist .nurse logs. also provide excellent sites for seedling establishment and production of sporocarps. These processes increase retention and cycling of nutrients within ecosystems and contribute to higher biodiversity and biomass production.
- Mycorrhizae. Mycorrhiza, meaning fungus-root, is a symbiotic association of fungi with plant roots. The fungus improves nutrient and water availability to the host in exchange for energy derived from plant sugars. Mycorrhizae are necessary for the survival of numerous tree families, including pine, hemlock, spruce, true fir, Douglas-fir, larch, oak, and alder. Mycorrhizal associations are a source of nutrients to promote wood decay. By the time a log reaches more advanced stages of decomposition (Class 3) fungal colonization leads to the accumulation of nutrients in hyphae, rhizomorphs and sporocarps, especially for ectomycorrhizal fungi, where >90% of the fungal activity is associated with organic material. Ectomycorrhizal fungi decrease the ratio of carbon to nitrogen in decomposing wood, and mediate nutrient availability to plants while improving nutrient retention by forest ecosystems.
- The energy derived from falling or flowing water is the driving force behind erosion processes in Pacific Northwest forests. By covering soil surfaces and dissipating energy in flowing and splashing water, logs and other forms of coarse wood significantly reduce erosion. Large trees lying along contours reduce erosion by forming a barrier to creeping and raveling soils, especially on steep terrain. Material deposited on the upslope side of fallen logs absorbs moisture and creates favorable substrates for plants that stabilize soil and reduce runoff.
- Stand Regeneration and Ecosystem Succession. Decomposing wood serves as a superior seed bed for some plants because of accumulated nutrients and water, accelerated soil development, reduced erosion, and lower competition from mosses and herbs. In the Pacific Northwest, decaying wood influences forest succession by serving as nursery sites for shade-tolerant species such as western hemlock, the climax species in moist Douglas-fir habitat. Wood that covers the forest floor also modifies plant establishment by inhibiting plant growth, and by altering physical, microclimatic, and biological properties of the underlying soil. For example, elevated levels of nitrogen fixation in Ceanothus velutinus and red alder have been reported under old logs.
- Streams and Riparian Forests. Long-term productivity in streams and riparian areas is closely linked to nutrient inputs, to attributes of channel morphology, and to flow dynamics created by decaying wood. Small wood contributes to nutrient dynamics within streams and provides substrates to support biological activity by microorganisms, as well as invertebrates and other aquatic organisms. Much of the organic matter processed by the aquatic community originates in riparian forests and is stored as logs.
- Large wood is the principal factor determining the productivity of aquatic habitats in low- and mid-order forested streams. Large wood stabilizes small streams by dissipating energy, protecting streambanks, regulating the distribution and temporal stability of fast-water erosional areas and slow-water depositional sites, shaping channel morphology by routing sediment and water, and by providing substrate for biological activity. The

influence of large wood on energy dissipation in streams influences virtually all aspects of ecological processes in aquatic environments, and is responsible for much of the habitat diversity in stream and riparian ecosystems. The stair-step gradients produced by wood in small stream basins supports higher productivity and greater habitat diversity than that found in even-gradient streams lacking wood structure.

- The input rates and average piece size of dead wood generally increase with stand age, although the amount of decaying wood can follow a U-shaped pattern if young forests inherit large amounts of decaying wood and live trees from preceding stands.346
- Insects and pathogens play a key role in maintaining diverse and productive forests by creating habitat and stimulating nutrient cycling
- Intensive forest management activities that have decreased the density of large snags in early forest successional stages (sapling/pole and small tree stages) may have had adverse impacts on the 61 associated wildlife species (Figure 12). Similarly, the lesser amount of large down wood in early forest successional stages may not provide as well for the 24 associated wildlife species. Such results suggest the continuing need for specific management guidelines to provide large standing and down dead wood in all successional stages.
- These silvicultural practices clearly altered the abundance and recruitment of large down wood and snags in managed forests of the Pacific Northwest, including:
    1. Lower abundance of large diameter snags and down wood legacies in managed forests (and streams); e.g. lack of the U-shaped pattern; higher accumulation of smaller-diameter fuels in eastside forests.
    2. Reduced recruitment and retention of large trees to provide future legacies.
    3. Shorter mean residence time for down wood (i.e. faster decomposition as a function of reduced log diameter).
    4. Altered species composition of forests (westside: more Douglas-fir, less western red cedar; eastside: less pine, more true fir species).
- Several major lessons have been learned in the period 1979-1999 that have tested critical assumptions of these earlier management advisory models:
    - Calculations of numbers of snags required by woodpeckers based on assessing their biological potential. (that is, summing numbers of snags used per pair, accounting for unused snags, and extrapolating snag numbers based on population density) is a flawed technique. Empirical studies are suggesting that snag numbers in areas used and selected by some wildlife species are far higher than those calculated by this technique.
    - Setting a goal of 40% of habitat capability for primary excavators, mainly woodpeckers, is likely to be insufficient for maintaining viable populations.
    - Numbers and sizes (dbh) of snags used and selected by secondary cavity-nesters often exceed those of primary cavity excavators.
    - Clumping of snags and down wood may be a natural pattern, and clumps may be selected by some species, so that providing only even distributions may be insufficient to meet all species needs.
    - Other forms of decaying wood, including hollow trees, natural tree cavities, peeling bark, and dead parts of live trees, as well as fungi and mistletoe associated with wood decay, all provide resources for wildlife, and should be considered along with snags and down wood in management guidelines.

    - The ecological roles played by wildlife associated with decaying wood extend well beyond those structures per se, and can be significant factors influencing community diversity and ecosystem processes.
- Furthermore, although the analysis of inventory data presents data on dead wood abundance, management actions at the local level may best be focused on the ecological processes that lead to development of these forest structures rather than on the abundance of structures themselves. Management decisions also may require information on the spatial distribution (landscape pattern) of dead wood, which cannot be estimated from sample-based inventories.
- If detailed data on the current and historical range of natural conditions is lacking (which is likely), it may be preferable to substitute functional target values for specific wildlife species. For example, to provide maximum habitat elements for specific cavity-nesting species, a designated quantity and distribution of snags
- Effective management of decaying wood must do more than simply provide for inputs of dead trees. Rather, management should strive to provide for diversity of tree species and size classes, in various stages of decay and in different locations and orientations within the stand and landscape.
- Green trees function as a refugium of biodiversity in forests. For example, many species of invertebrate fauna in soil, stem, and canopy habitats of old-growth forests do not disperse well, and thus, do not readily recolonize clear-cut areas. The same concept holds for many mycorrhizae-forming fungal species. Added benefits of green tree retention include moderated microclimates of the cutover area, which may increase seedling survival, reduce additional losses of biodiversity on stressed sites, and facilitate movement of organisms through cutover patches of the landscape.
- In situations where forest management objectives extend beyond wood production to broader biological and human values, intensive forestry practices by themselves may inadequately maintain or restore biodiversity, especially in early and late successional forest development phases. Species, processes, and values associated with older stages of stand development (transition and shifting gap stages) are likely impaired or absent from intensively managed stands. Species and processes associated with the early establishment phase also have shorter duration than may occur naturally. This does not mean that intensive forest management practices are incompatible with multiple forest objectives at a landscape scale, but rather that species and processes associated with early and late stages of forest development should be assessed over large areas such as landscapes, subregions, and regions.
- Management for certain species must consider habitat requirements at different spatial and temporal scales. It may then be possible to modify silvicultural practices at the stand scale to meet multiple objectives at landscape and larger scales. The landscape perspective also is pertinent to managing riparian systems, where the role of wood decay in riparian environments varies according to the type and geography of the associated water body.
- The decline of species associated with late-successional forest structures, as well as the prolonged time needed to produce wood legacies, suggests that it is both ecologically and economically advantageous to retain legacy structures across harvest cycles wherever possible, rather than attempt to restore structures that have been depleted. This is especially obvious for slow-growing tree species and very large wood structures.

> Retention of old- growth structural legacies has been identified as critical to conservation of biodiversity between large reserves and conservation areas.

Please see our comments on the Draft Forest Plan and its Draft EIS, for further discussion of old-growth issues and best available science.

Old-Growth Ecosystems

In describing the ecological importance of old growth, the Forest Plan Final EIS at III-35 states:

> Habitat diversity is a measure of the variety, distribution, and structure of plant communities as the progress through various stages. Each stage supports different wildlife species. **One of the most critical elements of diversity in a managed forest is old growth. If sufficient old growth is retained, all other vegetative stages from grassland through mature forest will be represented in a managed forest.**

(Emphasis added.) Stands of trees meeting old-growth criteria are a part of **old-growth ecosystems** as recognized in the above quote from the Forest Plan Final EIS, as stated in the FS's Green et al, and as discussed in Juel (2021) and the scientific sources cited therein.

Franklin and Spies, 1991 also make several relevant points about old growth:

- Old-growth forest is a biological or ecological concept that presumes ecosystems systematically change as they persist over long periods. An ecosystem has, in effect, a series of linked life stages …which vary in composition, function, and structure. Such progressions can take a very long time in forests because the dominant organisms, trees, typically live very long.

- Characterizing old-growth forests is possible based on these concepts. Obviously, a series of ecological attributes must be considered because of the many relevant compositional, functional, and structural features. For practical reasons, however, a working definition—one for everyday use in gathering stand data—emphasizes structural and compositional rather than the conceptually important functional features that are difficult to measure.

- Old-growth forests are later stages in forest development that are often compositionally and always structurally distinct from earlier successional stages.

- The age at which forests become old growth varies widely with forest type or species, site conditions, and stand history.

- Structurally, old-growth stands are characterized by a wide within-stand range of tree sizes and spacing and include trees that are large for the particular species and site combination. Decadence is often evident in larger and older trees. Multiple canopy layers are generally present. Total organic matter accumulations are high relative to other developmental stages. Functionally, old-growth forests are characterized by slow growth of the dominant trees and stable biomass accumulations that are constant over long periods.

- Our failure to study old-growth forests as ecosystems is increasingly serious in considerations of old-growth issues. Without adequate basic knowledge of the ecosystem, we risk losing track of its totality in our preoccupation with individual attributes or species. Definitional approaches to old growth based on attributes, including those that we have presented here, predispose us to such myopia. The values and services represented by old-growth ecosystems will be placed at ever greater risk if we perpetuate our current ignorance about these ecosystems. It will also increase doubts about our ability to manage for either old-growth ecosystems or individual attributes (for example, species and structures) associated with old growth. We must increase ecosystem understanding and management emphasis on holistic perspectives as we plan for replacement of old-growth forests. How can we presume to maintain or re-create what we do not understand? Some may presume that ignorance (on ecological values of old growth) is bliss, but this attitude creates high risk that we will continue to be blindsided by subsequent discoveries.

The FS has exhibited cluelessness about old growth on the NPNF almost since the Forest Plan was adopted. In 2012, twenty years after the Northern Region's publication of the controversial Green et al old-growth criteria, the FS hired a consultant in an attempt to figure out the meaning of the direction for old growth found in the 1987 Forest Plan and Forest Plan FEIS. (*See* Jahn, 2012[11]). Whereas we don't agree with all of the consultant's interpretations and conclusions, that the Jahn (2012) document even exists is a testament to agency muddled thinking and policy.

The PA suggests that new roads would be punched through existing old-growth stands. USDA Forest Service (1990) states, "Roads are generally undesirable within an old-growth habitat patch. The road corridor fragments the habitat by creating edge, and access may result in loss of snags to woodcutting."

Old Growth Analysis Areas (OGAAs)

The PA states, "The project area lies within five NPC prescription watersheds grouped into three Forest Plan OGAA (Figure 13). The minimum 5% old growth and ROG would be maintained in each OGAA." However, the PA provides essentially no details on how the FS is complying with Forest Plan OGAA requirements. At this point, we think it's safe to assume the FS is analyzing old growth the same way it has proposed for its Hungry Ridge project, after that project was enjoined by a federal court. Our Twentymile comments' citing of HR old-growth analyses reflect this assumption.

Forest Plan Old Growth, or "FPOG" is the FS's label for forest stands they assert meet Forest Plan Appendix N old-growth criteria. The Hungry Ridge FEIS at p. 260 defined FPOG as

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[11] A document, "121204JHudsonEmsgPhilJahnOldGrowthIntentIn1987NPForestPlan.pdf" from the Clear Creek project files provides some context on the development of the FS's Jahn, 2012 paper.

“minimum of 15 trees per acre greater than 21 inches dbh.” Nothing the FS has posted on the Twentymile project website discloses the amount or location of FPOG in project area OGAAs.

Given the refusal of the FS to conduct an analysis of old growth for the Hungry Ridge FEIS that conformed to the Forest Plan, what should make us believe the process for Twentymile is legitimate—not just the FS making a pretense of complying with the Forest Plan? Has the FS finally thoroughly evaluated all forest stands in the project area, comparing them to the proper old-growth criteria?

The Hungry Ridge Draft Supplemental EIS (DSEIS) describes the procedures used to newly identify old growth, after the Court ruled the Hungry Ridge (HR) FEIS process illegal:

> A workflow was created to analyze stand exam data which allows us to compare the data to the Nez Perce Forest Plan old growth (FPOG) standards in Appendix N and determine what stands meet forest plan old growth standards. A copy of the workflow can be found in the project record. The workflow uses Field Sampled Vegetation (FSVEG) stand exam data, ArcMap capabilities, historical project data, and arial detection surveys to identify stands that meet the Forest Plan old growth standards.

From examination of the “workflow” document that refers to (“2023NezPerceOGDefFSvegSpAnalysisOldGrowthWorkflow.pdf”), which FOC obtained recently under FOIA, it’s clear the FS has not adequately validated the reliability of the data (FSVEG) used. The FS has merely undertaken a data manipulation exercise. There’s nothing in the DSEIS suggesting the FS has conducted updated field validation. A document from the Hungry Ridge (HR) project (“20220818SeamanOGWorkflowsTimelinesAndInstructions.pdf”) indicates that some data used for evaluation is over 30 years old, and for some stands the FS has no stand exam data: “This workflow is looking at stand exams 30 years old and newer but we are also taking in to account the older stand exams, LIDAR, and VMAP when looking for other possible stands that might meet FP OG that you would include in your ? list.”

The FS also admits this process did not fully utilize the Forest Plan Appendix N criteria in deciding what to call old growth:

> Determination of OG, or not, is based on only 2 factors out of the Appendix N that are listed in the Forest Plan. The factors are number of trees per acre greater than 21” dbh and number of snags per acre greater than 15” dbh. Factors such as DWD, canopy closure, etc were not used in this evaluation.

HR document (“20220830OGStrategyMeetingNotes.pdf”, emphasis added.) Clearly, the FS is too much in a rush to properly follow Forest Plan direction.

Our comments on the original HR Draft EIS, which is pertinent with Twentymile, included:

> “Stands over 150 years old that do not have old growth characteristics may be treated with improvement harvest …” Since the FS assumes that stands 150+ years old have had enough time to develop old growth characteristics, please explain why each 150+ year old

> stand proposed for treatment is deficient in specific Forest Plan or Green et al. old growth criteria. In other words, please disclose what each 150+ year stand proposed for treatment lacks in terms of the old growth characteristics.

It also does not appear that the FS did what Forest Plan Appendix N requires in regards to identifying blocks of old growth. That is, if part of a block is determined to meet old-growth criteria but other portions only meet replacement criteria, the FS must not count the block as old growth in terms of meeting the 5% OGAA standard (nor the Forestwide 10% standard) unless more than 50% of it adequately meets old-growth criteria.

Finally, the Forest plan requires the FS to protect at least 5% "designated" replacement old growth (ROG). That means whatever ROG is identified to meet Forest Plan standards must both be clearly designated as "replacement" old growth and maintained in a durable, publicly available inventory along with the rest of the old growth.

Since the HR DSEIS picks only a subset of Appendix N requirements, the FS fails to demonstrate Forest Plan compliance.

Amount of old growth forestwide on the Nez Perce National Forest

Forest Plan Table II-3 established "Data Requirements and Accomplishment Schedule" which was "needed to improve the Forest's data base, to revise current data base inventories to new standards, and to incorporate new data base requirements that have recently been identified." It directed the FS to "Inventory, Survey and Delineate" old-growth habitat by 1990. By completing that inventory, the FS would also have been able to show compliance with the Forest Plan 10% old growth forestwide standard. However the Court declared that the HR FEIS was not in compliance with the Forest Plan 10% old growth forestwide standard, essentially recognizing the FS has unnecessarily delayed completing the inventory for 30 years.

Now, because the Court declared that the HR FEIS was not in compliance with the Forest Plan 10% old growth forestwide standard, the DSEIS attempted to address that deficiency:

> ***Forest wide:*** The most recent Forest Inventory and Analysis (FIA) data (Reyes and Morgan 2022) indicate that approximately 22.5 percent of the Nez Perce National Forest meets the Forest Plan definition of old growth (minimum of 15 trees per acre greater than 21 inches diameter breast height (dbh)) (90 percent confidence interval: 19.7 – 25.4 percent). The data also shows approximately 14.7 percent of the Nez Perce National Forest meets the Forest Plan definition of old growth (minimum of 15 trees per acre greater than 21 inches dbh, and vertical structure) (90 percent confidence interval: 12.4 – 17.0 percent). Based on this information, the Nez Perce National Forest is above the Forest Plan minimum standard of 10 percent old growth forest wide.

Similarly, the Twentymile PA states, "Based on Reyes et al., 2022, the NPC is above the 10% forest wide old growth minimum Forest Plan requirement using the Forest Plan definition." It has no further details, e.g. the numbers cited above for HR.

The Nez Perce National Forest Plan requires the Forest Service to "Inventory, Survey and Delineate" old-growth habitat by 1990. Over thirty years post-deadline, the FS still cannot produce a reliable forestwide old-growth inventory for the Nez Perce National Forest. Instead, the FS relies upon Forest Inventory and Analysis (FIA) data to claim it is meeting its forestwide 10% minimum.

FIA methodology cannot specify the location and extent of old-growth stands within a national forest. In discussing such methodology, a Northern Region report (Bollenbacher, et al., 2009) states, "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." And, the Forest Service's Czaplewski, 2004 states, "Each FIA sample location is currently a 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."

Sample design for FIA plots is semi-systematic; a sample taken randomly within a systematically placed grid. As stated above, at most each plot samples a maximum of one acre—far smaller than an old-growth stand—and thus resulting estimates cannot indicate the capability to meet biological needs of the associated wildlife. Moreover, the location of plots is confidential, and for good reasons—managers are not allowed to know the location of FIA plots within national forests, to prevent skewing of data which would result from intentionally managing differently at plot locations. As a result, conclusions such as the percentages claimed by the Nez Perce National Forest cannot be verified by independent investigators. This prevents independent peer review—a hallmark of the scientific method.

FIA statistics thus have no correlation to forest plan minimum old-growth stand sizes, nor to spatial needs of wildlife species' habitat needs. No mapping of existing old growth is possible using FIA data. The location of existing old-growth stands cannot be specified using FIA. There has been no systematic scientific study conducted to correlate any FIA estimate with the results from field data of old-growth habitat.

The HR DSEIS states that 22.5% of the NPCNF meets one of the Appendix N criteria (minimum of 15 trees per acre greater than 21" dbh). It also states that 14.7% of the NPCNF meets that plus one additional Appendix N criteria, adding on "vertical structure"[12]. We notice that DSEIS doesn't state that any percentage meets Appendix N FPOG criteria, presumably because the FS knows the other criteria cannot simply be ignored.

Please reconcile the DSEIS/Reyes and Morgan (2022) 22.5% estimate with the HR FEIS statement: "Approximately 13.6 percent of the Nez Perce National Forest meets the Forest Plan definition of old growth (minimum of 15 trees per acre greater than 21 inches dbh) (90 percent confidence interval: 14.4 - 20.2 percent)." The HR DSEIS doesn't explain why the same data source yields such a vast discrepancy.

[12] Reyes and Morgan (2022) explain "vertical structure" means "Where there are 15 or more trees per acre that are 21 inches in DBH or larger, and the additional criteria of a two-story (2), three-story (3) or continuous (C) vertical structure"

We also point out that Reyes and Morgan (2022) did not use the same criteria the FS used to designate old growth for its HR DSEIS OGAA analysis. As noted above, the Reyes and Morgan second criterion is vertical structure, whereas the OGAA analysis second criterion is snags per acre. The DSEIS does not reconcile that difference. We are left wondering why the FS apparently did not even attempt to apply more than two criteria in making either OGAA or forestwide old-growth designations for HR, as a minimum effort. Please disclose the full range of Forest Plan Appendix N old-growth criteria that are available in the data sets the FS is using for Twentymile.

A document, "120911JHudsonCLaneEmsgOldGrowthFIAPlots.pdf" from Clear Creek project files is an email message:

> From: Hudson, Joe B -FS
> To: Lane, Cynthia -FS
> Cc: Hill, Lois R -FS
> Subject: old growth - FIA plots
> Date: Tuesday, September 11, 2012 2:10:06 PM
>
> Cindy, One of the tasks we had identified for the old growth issue was **asking Renatta to run percentages of OG using Nez Forest Plan OG criteria using 150 years as age**. Not sure if we need Phil Jahn's product before doing this or not. My thinking is that since this is a Forest level project it is probably appropriate for the request to Renatta to make the run should come from yourself. You agree?
>
> Joe B. Hudson
> District Ranger

(Emphasis added.) We discuss below the importance of considering age of the trees in stands being evaluated in consideration for old growth designation.

Our comments on the original HR Draft EIS asked how many FIA plot survey locations in Nez Perce National Forest and HR Project Area actually meet either North Idaho old growth (Green et al.) or Forest Plan old-growth criteria. The FS replied, "The exact locations of FIA plots are not disclosed to the Forest." Since FIA data are what Reyes and Morgan (2022) utilized in their analysis, it's clear that the FS cannot cross-validate Reyes and Morgan (2022) conclusions by inspecting the sites they presumed to be indicative of old-growth conditions. The FIA "inventory" of NPNF old growth is akin to an anonymous poll or survey. Not even Forest Supervisor allowed to know where the FIA plots are located on the Forest. The FS is using the FIA for purposes it cannot possibly serve.

FOC's Objection to the original HR draft ROD and Final EIS included:

> …the Forest Service cannot rely on FIA inventory to prove that it is meeting its old growth requirements. 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 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." As Forest Plan Appendix N indicates, the Nez Perce NF has one of those Plans with minimum old-growth stand size requirements. 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.

Furthermore, the HR DSEIS, Reyes and Morgan, and the Twentymile PA don't address the following Forest Plan Appendix N direction:

> Where available, stands should be at least 300 acres. Next best would be a core block of 150 acres with the remaining blocks of no less than 50 acres and no more than 1/2 mile away. If existing old-growth blocks are less than 100 acres, the stands between the old-growth blocks should be designated old-growth replacement. The entire unit consisting of old-growth blocks and replacement old growth should be managed as an old-growth complex. If the old-growth component is less than 50 percent of the complex, the complex should be considered replacement old growth. Within the old-growth complex, only the stands that meet old-growth criteria will be counted toward meeting the allocation for existing old growth. The replacement stands will be counted toward meeting the allocation for replacement old growth.

Much of the roaded Forest has been logged over the 35-year life of the 1987 Nez Perce Forest Plan. Friends of the Clearwater created a map of the Nez Perce National Forest, included as Attachment D, depicting the extent of recent logging project areas. The areas marked out with grayish green are either federally designated Wilderness or Idaho Inventoried Roadless Areas, where little or no logging should have happened. Overtop that FOC overlaid two more sets of geographic information. The orange polygons cover project areas for all logging projects the FS is currently considering or has approved in the last 10 years. (The project names are provided in black letters.) Most of these logging project polygons are sourced from geographic information files provided by the FS. Since we did not have the shapefiles for Clear Creek, Limber Elk, and Red Seigel Projects we drew in these approximate project areas, also in orange, based on maps (not the GIS files) the FS has released to the public.

Clearly evident from this map, in the past decade the FS has proposed projects with boundaries that cover most of the forest where logging is permissible (outside of Wilderness and Roadless).

We did overlay one project outside of this time period; the Red Pines Project (2008). But other than Red Pines, the map doesn't show logging projects earlier than 2013. One can get a sense of projects earlier than 2013 because of the Forest System Roads.

On the map, pink lines represent Forest System Roads. It is reasonable to conclude that most of the existing road network was created to facilitate logging projects.

We would be reasonable to expect the Forest Service to have a fairly complete forest-wide inventory of old growth merely because nearly every area of the Forest outside Wilderness or Roadless has been logged over the life of the 1987 Nez Perce Forest Plan. Our assumption is reasonable because compliance with the Forest Plan involves verifying the old growth within each of the project boundaries.

In sum, the FS should be able to produce a forest-wide inventory from previously generated project area inventories, not merely a questionable estimate based on FIA data. Please disclose such an inventory as part of the Twentymile EIS process, in order to comply with the forestwide 10% old-growth standard.

In 2020 FOC attempted to meet with the Forest Supervisor and the FS's qualified experts regarding its mysterious old-growth inventory, but ultimately the Supervisor refused to cooperate. This is documented in a FOIA "OG FOIA 2020-03332 Final Response", a letter "OG Meeting Request", our notes "OG Meeting notes6-11-20" and email strings "Re Meeting Requestemail 6-15-20.pdf" and "RE Meeting Request".

The FS lacks any established way of maintaining a publicly accessible inventory of old growth, let alone "recruitment" old growth. The latter category need only meet lax criteria, and as far as we're aware, in the 35 years of Forest Plan implementation there's no documentation of the FS ever designating "step down" or "recruitment" old growth which has eventually/later fully met existing old growth criteria. The "recruitment" old growth" is an empty promise to the public, to associated wildlife, and other old-growth values.

Old-growth criteria and failure to apply best available science

The HR Updated Old Growth Analysis (UOGA) states: "North Idaho old growth (NIOG) definition (Green et al. 1992) was not considered when assessing old growth." In the HR FEIS section replaced by the DSEIS it states, "Potential impacts to lands meeting the North Idaho old growth (NIOG) definition (Green et al. 1992) were **included as best available science**." (Emphasis added.) The DSEIS states, "The analyses documented in the Draft SEIS are based on the thorough application of **the science currently available** to the project Interdisciplinary Team." (Emphasis added.) Notably, this does not say the HR DSEIS is applying best available science in regards to old growth.

Moreover, the FS still believes that the Green et al. document is still best available science in regards to old growth, as demonstrated by its February 2023 Record of Decision for the Clear Creek Integrated Restoration project. The February 2015 Clear Creek Final EIS Appendix D states, "The Green et al. definitions are regarded as the "best available science" for the classification of old growth at the site-specific level." And the September 2015 Clear Creek Final EIS Appendix D discusses how Green et al. is to be implemented as best available science:

> Using Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 the following criteria would be used to define old growth:
>
> Each old growth type is determined by minimum criteria including minimum age class of large trees, minimum number of trees per acre with a particular diameter at breast height (DBH), with minimum basal area. Associated stand characteristics include:
> 1) Variation in diameter
> 2) Percent dead or broken top
> 3) Probability of down woody debris
> 4) Percent Decay
> 5) Number of canopy layers
> 6) Snags greater than or equal to 9 inches in diameter

The September 2015 Clear Creek Final EIS Appendix D goes on to present this table:

Table D-2. Old Growth Characteristics1

Minimum Criteria	Minimum Age of Large Trees (Years)	150
	Minimum Number of Trees Per Acre (TPA)	3-10
	Minimum Diameter at Breast Height (DBH) [6]	13-21
	Minimum Basal Area (Square Feet Per Acre) [5]	40-80
Associated Characteristics	Diameter at Breast Height Variation[3]	M-H[7]
	Percent Dead/Broken Top	0-36
	Probability of Down Woody[3]	L-H[7]
	Percent Decay[2]	0-41
	Number of Canopy Layers[4]	1-3
	Snags Greater Than or Equal to 9 Inches DBH[2]	0-42

[1]Green et al., 1992 Varies by Habitat Type -See Green et al. 1992 Old Growth Chart for Complete Description
[2]These values are not minimum criteria. They are the range of means for trees greater than or equal to 9 inches DBH across plots within forests, forest types, or habitat type groups.
[3]These are not minimum criteria. They are Low, Moderate, and High probabilities of abundant large down woody material or variation in diameters based on stand condition expected to occur most frequently.
[4]This is not a minimum criteria. The number of canopy layers can vary within an old growth type with age, relative abundance of different species, and successional stage.
[5]In Old Growth Type 4B, 120 square feet of basal area applies to habitat type groups F, G, and G1, and 80 square feet of basal area applies to habitat type groups H and I. In whitebark pine forest type, 60 square feet of basal area applies to habitat type groups I and J, and 40 square feet of basal area applies to habitat type group K.
[6]In Old Growth Type 7, the 25" minimum DBH only applies to cedar trees. Old trees of other species are evaluated with a minimum DBH appropriate for that species on these habitat types (21" for Douglas fir, grand fir, lodgepole pine, western hemlock, white pine, ponderosa pine; and 17" for subalpine fir, and mountain hemlock). (Green et al, 1992, Errata 2011)
[7]L = Low, M = Medium, H = High.

The September 2015 Clear Creek Final EIS Appendix D continues:

> The primary reason for managing for old growth is to maintain viable populations of old growth dependent species. Our reasoning for maintaining old growth has not changed in the amended old growth description.
>
> The proposed site specific Forest Plan amendment for old growth is consistent with the previous forest plan amendment on old growth. The previous old growth amendment

directed old growth designations to be in riparian areas. Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 indicates that most of the old growth is in lower elevations. The wet riparian habitat conservation areas (RHCA's) are likely to have survived the fires of 1938 and developed into old growth. The Nez Perce Forest Plan indicates that the Forest wide goal is to manage riparian areas to support 80 percent of maximum populations of snag dependent species and all other areas to support 60 percent of maximum populations of snag dependent species.

The Nez Perce National Forests minimum requirements for amount and distribution of old growth has not changed. However, old growth categories are clarified and defined. Currently the Nez Perce National Forest manages for old growth in Management Area 20 (MA 20), verified old growth and recruitment old growth. We have substituted the Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 requirements for old growth but the process to designate and distribute old growth remains the same. The process for assigning recruitment old growth stands also remains the same. It is important to recognize and understand that some watersheds may not have any verified old growth because natural disturbance agents like severe wildfire have removed old growth from the landscape. Because of natural events like the fires of 1910 and 1938, recruitment old growth may be quite young and may take many years before functioning as old growth.

The site specific old growth amendment does not require verifying old growth because verification has already been done in the project area.

Adopting the definitions for old growth found in Green et al. (1992) that define successional stages, stratification by habitat types, and other site conditions would <u>help refine</u> our interpretation of the old growth characteristics described in Appendix N of the Forest Plan. (Emphasis added.)

Additionally, adoption of this amendment would ensure consistent terminology and analysis. Old growth determination is done through data collection in accordance with Region One stand exam protocols that correlate to the definitions found in Green et al (1992).

Following direction to use best available science, the Nez Perce National Forest has updated Forest direction for old growth and snag management. Old Growth Forest Types of the Northern Region by Green, Joy, Sirucek, Hann, Zack and Naumann is the current and best science available for defining old growth. Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 is based on habitat types to determine old growth conditions. Greens research is based on field data called stand exams with over 20,000 samples. (Emphasis added.)

Although Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 criteria for old growth is more complex, **the criteria is also more relevant, more precise and within the capability of the specific Nez Perce National Forest habitat types.** Each habitat type is assigned to a habitat type group which corresponds to an old growth type. Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 defines old growth within the ecological

> conditions with specific criteria that are within the capability of the habitat type. Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 old growth description is based on successional processes in which stands develop into late seral single storied stands or late seral multi storied stands or the stage where climax tree species dominates the stand. (Emphasis added.)

The rationale the FS uses for amending the Forest Plan to adopt Green et al old-growth criteria for Clear Creek logically apply forestwide. There's nothing special about the Clear Creek project area nor its old growth that justify amending the forest plan in that case alone.

Friends of the Clearwater invites an open discussion about how Green et al might be applied as best available science concerning old growth. To date the FS has chosen to be nonresponsive and arbitrary in its actions rather than attempting to identify what consensus may be reached between its experts, independent scientists, and conservation interests.

We understand how the Green et al distinctions between various habitat types opens up the possibility of recognizing and protecting a wide diversity of old-growth conditions on the NPNF which might not as easily be recognized by the Forest Plan Appendix N criteria, which might also result in better addressing wildlife habitat needs. We also see that Green et al recognize that age of large trees is an important feature of old-growth forest and habitat—in fact a minimum criteria—which is not clearly emphasized in Forest Plan Appendix N. But in order to find agreement with the public and to manage genuinely consistent with best available science the FS must halt its abuses of Green et al as the interested public has repeatedly requested. Furthermore, the solution is not to throw out the baby with the bathwater as the HR DSEIS does, both in terms of turning its back on the diversity of habitat types featured in Green et al and ignoring age criteria both Green et al and the Forest Plan EIS recognize.

Abusing Green et al by conflating its <u>old-growth screening criteria</u> with a <u>minimum requirement for old-growth</u>.

This is the controversy the previous section alludes to. This was the topic of a public comment on the Clear Creek project. From the Clear Creek Final Supplemental Impact Statement (FSEIS) at pp. 323-324:

> Your old growth analysis as outlined in the FEIS, your response to public comment and your desire to incorporate the guidelines as a Forest Plan amendment all suggest complete reliance on numbers. For example, the wording in the proposed amendment (FEIS - Appendix D) calls the numbers "definitions" rather than screening criteria. You have used the numbers to calculate overall Forest level of old growth from 2007 Forest Inventory Data (FEIS 3-103) and rely on stand exam numbers as method to "field verify" old growth stands (FEIS 3-104). You suggest that 288 acres of improvement harvest and 2 miles of internal road construction "will not change old growth status per Green et al. (1992 as amended)" - (Draft Record of Decision - page 38). This is presumably due to the fact that the minimum tree numbers as identified by Green et al. (1992) will still remain following logging. The desire to adopt the Green et al. (1992) screening criteria as the definition for old growth in Clear Creek appears to be related to the fact that only 10 trees per acre >21

> inches were utilized for the screening criteria in habitats common to the project area. The existing Forest Plan has six criteria for identifying old growth one of which states: "At least 15 trees per acre > 21 inches diameter at breast height (DBH). Providing trees of this size in the lodgepole pine and sub- alpine fir stands may not be possible." This would call into question the 2007 Forest Wide Inventory since current Forest Plan Definitions were not utilized.

In response, the Clear Creek FSEIS at p. 323 stated: "Please see FEIS Volume 2 (September 2015), Appendix L, response 21/15 (pg. L-12)." From a reading of that "response 21/15" it is clear the FS avoids addressing criticism of the way it applies Green et al.

Juel, 2021 further discusses this topic:

> Green et al., 1992 recognizes a fairly common "old growth type" in the North Idaho Zone where one often finds large, old Douglas-fir, grand fir, western larch, western white pine, Engelmann spruce, subalpine fir, and western hemlock trees on cool, moist environments. (*Id*.) Such old growth is relatively dense: "There are an average of 27 trees per acre 21 inches DBH or more. The range of means across forests and forest types is from 12 to 53." (*Id*.)
>
> However, Green et al., 1992 sets the "minimum number" of trees per acre 21 inches DBH at only ten. (*Id.*). Which means, under the above Idaho Panhandle Forest Plan standard, the "average" stand could experience logging 17 of its 27 largest, oldest trees and still qualify as old growth.
>
> So why does Green et al., 1992 specify such a small minimum number of large, old trees—so far below the recognized average, and even less than the bottom limit of the recognized range? The answer lies in how those authors intended the criteria to be used: "The number of trees over a given age and size (diameter at breast height) were used as **minimum screening criteria** for old growth. …The **minimum screening criteria** can be used to identify stands that **may meet** the old growth type descriptions. " (*Id*., emphases added.) Green et al., 1992 further explain:
>
>> The minimum criteria in the "tables of old growth type characteristics" are meant to be used as a screening device to select stands that maybe suitable for management as old growth, and the associated characteristics are meant to be used as a guideline to evaluate initially selected stands. They are also meant to serve as a common set of terms for old growth inventories. Most stands that meet minimum criteria will be suitable old growth, but there will also be some stands that meet minimum criteria that will not be suitable old growth, and some old growth may be overlooked**. Do not accept or reject a stand as old growth based on the numbers alone; use the numbers as a guide.**
>
> (*Id.*, emphasis in the original.) So the abuse of the Green et al., 1992 minimum large tree screening criteria results in logging of large, old trees from old growth. And even if the existing stand in the above example possesses only the bare minimum large, old trees,

managers could still log smaller and/or younger trees in the old-growth stand without disqualifying it, because numbers of such trees are not a part of the minimum criteria.

Likewise, the Green et al. 1992 minimum total basal area was set well below the recognized range, again presumably for its utilization as a screening device. For the same old growth type discussed above, the "average basal area is 210 ft^2 per acre. The range is 160 to 270 ft^2". Yet the minimum is either 80 or 120 ft^2 depending upon type sub-categorization.[13] Basal area is a measure of stand density, or the square footage of an acre that is occupied by tree stems. So logging a stand with a basal area of 270 ft^2 (upper end of range) down to 80 ft^2 ("minimum") could result in the loss of medium diameter trees—another enticement for managers with timber priorities to log within old-growth stands.

In the above examples, the artificially reduced abundance of younger, smaller trees has unknown but dubious implications for the stand's potential development and habitat quality, since it is deviating from a natural trajectory.

So this leads to the situation where the FS is justifying significant logging disturbance within old-growth stands, making nonsense statements that the logged old growth is still old growth: "…**shelterwood harvest, which can still meet old growth definitions**." (FEIS, emphasis added.) And now, "**Intermediate harvest** would be conducted in a way to **preserve old growth stand characteristics** where the two overlap." (DSEIS, emphases added.)

This is also a topic of Kootenai National Forest (2004), which we incorporate into these comments. It states:

> **The publication "Old-Growth Forest Types of the Northern Region" (Green et al. 1992) is to be used as a means to initially define old growth, not as a management or prescriptive guide.** The Green et al., document is not manual or handbook direction and not formally adopted as Regional guidance. It is, however, the only peer-reviewed document of old growth definitions in the Northern Rockies and recommended for use within Regional protocols. According to Green et al., old growth "…encompasses the later stages of stand development that typically differ from earlier stages in characteristics such as tree age, tree size, number of large trees per acre and basal area. In addition, attributes such as decadence, dead trees, the number of canopy layers and canopy gaps are important but more difficult to describe because of high variability". In other words, minimum attribute characteristics of trees per acre, DBH, age, and basal area along with attributes of snags, structural layering, and downed wood minimally define old growth – not any one attribute or any minimum value of specific attributes.
>
> Pages 11 and 12 of Green et al. state the appropriate use of the document. The following are pertinent quotes from the document to aid in that interpretation:
>
> 1. No set of generated numbers can capture all the variation that may occur at any given age or stage in forest development.
> 2. Because of the great variation in old growth stand structures, no set of numbers can

[13] With the issuance of the Green et al. 1992 (**errata correction 2007**) the Forest Service emphasizes and clarifies that stand basal area is one of the "minimum criteria."

be relied upon to correctly classify every stand.
3. Do not accept or reject a stand as old growth based on the numbers alone; use the numbers as a guide.
4. The minimum criteria are used to determine if a stand is potentially old growth. Where these values are clearly exceeded, a stand will usually be old growth. The associated structural characteristics may be useful in decision making in marginal cases, or in comparing relative resource values when making old growth evaluations.
5. The basic concept is that old growth should represent "the late stages of stand development …distinguished by old trees and related structural attributes."
6. A stand's landscape position may be as important, or more important as any stand old growth attribute. The landscape is dynamic. We need to do more than draw lines to manage this dynamic system. Consider the size of old growth blocks (large blocks have special importance), their juxtaposition and connectivity with other old growth stands, their topographic position, their shapes, their edge, and their stand structure compared to neighboring stands. Stands are elements in dynamic landscapes. We need to have representatives of the full range of natural variation, and manage the landscape mosaic as a whole in order to maintain healthy and diverse systems.

> **The Green et al. document is an aid intended to define, evaluate, and monitor old growth – not to be used as a prescriptive, management guide with minimum attribute values as thresholds. This will not achieve the objective of maintaining old growth.**
>
> Another memo from the Forest Supervisor (May 14, 2003) states, "When minimums are used, they are intended to illustrate the beginning of what could be identified as old growth—or late seral, successional development for a specific habitat group within a specific zone—not what is recommended".

(Emphases in the original.) Although we disagree with a statement in that document ("no one is advocating a 'hands off' policy toward old growth"), its nascent hypothesizing that managing in old-growth stands and replacement old growth might be appropriate, and its interpretation of science, that doesn't nullify the point we are making here on the intended purposes of Green et al and how it is being abused by the NPNF.

An important fact is that the management paradigm upon which the original, current, 1987 Forest Plan is based doesn't insert itself into the natural processes that create and sustain old growth. Within that paradigm, in contemplating management actions the FS is to insure that the specified percentages of existing old growth are retained in OGAAs and forestwide to meet the overarching Forest Plan old-growth Standard: "Provide management for minimum viable populations of old-growth and snag- dependent species by **adhering to the standards stated in Appendix N**" (emphasis added). There is no direction in the Forest Plan to log old growth anywhere for the purposes of somehow improving it, or that logging can still maintain it. Jahn, 2012 addresses this in his section entitled "Protecting Old Growth Habitat In Excess of Minimums Prescribed In the NPNF Plan." On the last three pages of KNF Forest Plan Old Growth Appendix 17, the FS rejects the notion that logging is consistent with preserving old growth. But as seen from the cites in our previous paragraph, and as found in the draft revised forest plan for the Nez Perce-Clearwater National Forests (NPCNF), the FS is promoting the idea that active management should be the defining relationship between the agency and old growth. We are incorporating FOC's various comments on the forest plan revision process, one of which includes scientific criticism the old growth active management paradigm (*see* our April 20, 2020 comments on the Draft Revised Forest Plan for the NPCNF at pp. 134 - 156). In an attempt to sugar coat the habitat destruction logging and road building cause, the FS pretends it can play God in old growth, outperforming the natural processes that are the only known way old growth has ever come to existence in these forest ecosystems. Such hubris does not belong in a context of managing public resources.

The HR FEIS states:

> The most recent Forest Inventory and Analysis (FIA) data (Bush et al. 2010) indicate that approximately 13 percent of the Nez Perce National Forest meets the definition of "north Idaho old growth" (90 percent confidence interval: 10.4 - 15.6 percent) based on the Green et al. 1992 definitions (minimum of 8 trees per acre greater than 21 inches dbh, minimum of 40 square feet basal area per acre, and at least 150 years old).

To us, this means that if the FS were to analyze consistently with Green et al's range of means, it would arrive at a number significantly less than 13% meeting the "north Idaho old growth" criteria. Please explain why this conclusion is unwarranted.

Age criteria must be applied to be consistent with best available science concerning old growth

As we discuss above, the HR UOGA and DSEIS are essentially saying that old growth need no longer contain old trees. The FS is entirely omitting age criteria, apparently to inflate its old-growth inventory. This is contrary to best available science and conflicts with the NPNF's own policies including Green et al, and as stated in current and previous NPNF NEPA documents.

Green et al clearly uses age of large trees as one of its minimum, nondiscretionary minimum criteria. Jahn (2021), the document commissioned by the FS we put into context above, is also clear on this point. Some of his sources are the Forest Plan and Forest Plan FEIS. Jahn (2012) refers to the NPNF 1987 Forest Plan EIS:

> EIS at II-89:
> In order to maintain minimum viable populations of old-growth-dependent species, an estimated 5 percent of the forested acres within prescription watersheds and 10 percent of the total forested acres will be managed as old-growth habitat in all alternatives except one. It is uncertain what percentage of forest communities that are 160 years old or older is suitable old-growth habitat. Nevertheless, the amount of old-growth and older age classes is used as an indicator of the total amount of old-growth habitat available in each alternative.
>
> Editor's Note: The above reference to "150 years or older" for overmature sawtimber (old growth habitat) is believed to be a possible misprint or typographical error. All other references to old growth and the overmature age class of timber, in the NPNF Plan

documents and supporting old growth literature, at the time, cite the age of 160 years.

The Forest Plan FEIS at IV-53 states:

> Given these requirements, and assuming that tree communities that are 160 years old or older provide suitable habitat for old-growth-dependent species, all alternatives will provide the amount and kind of habitat necessary to maintain minimum viable populations of old-growth-dependent species for the first 5 decades (Table IV-17).

And the NPNF's current Clear Creek NEPA documents and project file documents recognize that old trees are essential components of old growth. The Clear Creek FEIS Appendix D adopted by FSEIS and 2023 ROD states:

> The original old growth amendment did not state that the minimum age for old growth is 150 years old. However, on page III-56 of the forest plan describing Management Area 20 – Old Growth, old growth is described as being over mature and 150 years old or older.

111006LHillMWardEmsgOGRefsInNPFP.pdf from Clear Creek project files is an email message:

> From: Hill, Lois
> Sent: Thursday, October 06, 2011
> To: Ward, Michael
>
> The age references for old growth are not described in the NPFP as standards, and we shouldn't assume that they are. **They do, however, give a strong indication of the age range assumptions the planners made when they wrote their FP.**

(Emphasis added.) 120802MWardEmsgProjDevelopmentDiscussioWithJOppenheimer.pdf is from the Clear Creek project files. It includes email messages, wherein the FS is having the dialogue about age criteria vs. no age criteria and FPOG/NIOG:

> From: Ward, Michael
> Sent: Thursday, October 13, 2011 4:38 PM
> To: joppenheimer@idahoconservation.org
> Subject: RE: Has the storm passed?
>
> Old trees, big tree are cool. Most of the DF/GF are valueless. We don't want to cut them down. We want to protect real cool biological O/G. We have a lot of Biological O/G
> We want to treat the mid seral
> We're heavy in mid seral
> Much of the mid seral is over 21"
> According to FP it could be considered O/G which is rediculous.
>
> From: Michael P Ward <michaelward@fs.fed.us>
> Date: Thu, 13 Oct 2011 22:28:11 +0000

To: Jonathan Oppenheimer joppenheimer@idahoconservation.org
Subject: RE: Has the storm passed?

Got a message from Robyn about the O/G stuff...haven't spoke with her yet.
Regardless, here's where we are: (message from Joe)
Talked to Marty. Basically we will use both. . . kinda. . . We will show that we meet the Forest Plan Standard using Forest Plan definition (no age). The FP standard is 5% at the watershed level. This step is basically a check off (mapping exercise) that yes, we will meet FP standards of not entering 5% of stands meeting FP definition.

Once we document that we meet the Forest plan standard and state that we are not going to enter the 5% required under FP, then we bring in best available science (Green et. al.) and use Green et. al. thru alternative development, effects analysis etc. KEY: We will conduct effects analysis using Green et. al.

Confused? No worries. Fort Matt's purpose in the field, and wildlife, we will use Green et. al. definition, i.e., we should be free to treat those acres that don't meet Green et. al. definition, even though they meet FP definition. Basically we could treat all acres minus the 5% meeting Green et. al. that we designate as OG, however that will probably be a discussion the collaborative will need to have.

Marty is willing to come to a team meeting and explain. Maybe we should invite him to the field trip in Oct. I forgot to ask if it would require a FP amendment but I don't think so since we willl be meeting FP standard regardless.

We note that last FS email is addressed to a staff member of a conservation group who was formerly engaging in a collaborative process. Apparently the FS is willing to discuss these matters in the context of collaboration but NOT within the NEPA comment-response context.

Another set of email messages is a document from Clear Creek project files, in the context of the Jahn process (120829CLaneEmsgOLInterpWhitePaperStatementOfWork.pdf):

From: Hill, Lois R -FS
Sent: Wednesday, August 29, 2012 6:10 AM
To: Lane, Cynthia -FS
Cc: Hudson, Joe B -FS; Ward, Michael P -FS; Bienkowski, Matthew W -FS; Roberts, Michelle M -FS; Hill, Lois R -FS
Subject: FW: Urgent...Old Growth Statement of work and Justification

I agree with Joe's comments.

The crosswalk between Green et al. and Forest Plan Appendix N should clearly address the six criteria described on page N-1.

Also, when researching the planning record for the Forest Plan EIS, the focus should be on the assumptions that the planners made and where they drew their definitions from.

> Thanks for getting on top of this so quickly, Cindy.
> --Lois

We also take note of a project file document from recently issued NPNF Decision Notice (for its Green Horse timber sale project). 17-025210826GreenHorseVegetationResource.pdf states: "…old growth (defined as 160+ years, Jahn 2012)."

Even the HR UOGA states, in discussing Forest Plan Management Area 20, "The Forest Plan describes these lands as approximately half of the area has a timber condition class of overmature sawtimber (**150 years or older**)." (Emphasis added.) Under Management Area 20, the Forest Plan states: "Approximately half of the area has a timber condition class of overmature sawtimber (**150 years or older**). The remainder of the area is comprised of immature stands (40-80 years) that will provide for replacement old-growth habitat." (Emphasis added.) Clearly the Forest Plan recognizes that old trees are essential habitat for old-growth associated wildlife: "These lands provide critical habitat for wildlife species dependent on old-growth forest conditions such as the pileated woodpecker, the pine marten, and the fisher." (Id.) Also, "Goals" for MA 20 include one to "Provide 'suitable' habitat (existing and replacement) for old-growth-dependent wildlife species." (Id.)

A June, 2014 document "1.0 Terrestrial & Aquatic Ecosystems and Watersheds" was written as part of the NPCNF's Assessment, a component of forest plan revision. It states, "The different stages of succession are often referred to as seral stages and can be described as follows: …Old Growth is a subset of the late-seral communities. Not only are these dominated by larger, older trees, but they have dead and down material present. Old growth in different forest types looks differently. Green et al. (1992) described old growth characteristics for the Northern Rockies."

Also, the draft Revised Forest Plan includes Glossary definitions:

> Old Growth Forests: Are ecosystems distinguished by **old trees and related structural attributes**. Old growth encompasses the **<u>later stages</u> 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**. In the context of the Nez Perce-Clearwater ecosystem the definitions for old growth are those provided within the document titled "Old Growth Forest Types of the Northern Region (Green et al. 1992, and errata 12/11).
>
> Old Growth Associated Species: the group of wildlife species that is associated with old-growth forest plant communities on the Nez Perce-Clearwater.
>
> Old Growth Habitat: A community of forest vegetation characterized by a diverse stand structure and composition along with a significant showing of decadence. The stand structure will typically have multistoried crown heights and variable crown densities. There is a variety of tree sizes and ages ranging from small groups of seedlings and saplings to trees of large diameters exhibiting a wide range of defect and breakage both live and dead, standing and down. **The time it takes for a forest stand to develop into an old-growth**

> **habitat condition depends on many local variables such as forest type, habitat type, and climate.** Natural chance events involving forces of nature such as weather, insect, disease, fire, and the actions of man also affects the rate of development of old-growth stand conditions. Old-growth habitat may or may not meet the definition for old growth forest.

(Emphases added.) We realize the draft revised Forest Plan is just that—a draft—and isn't currently management direction. However, as the 2012 Planning Rule[14] indicates, the Assessment is intended to help define what the FS believes is best available science.

Until stands of forest trees approach the 160-year breakpoint the Forest Plan FEIS recognizes, they are less likely to have developed the structural diversity (snags, logs on the ground, decadence, canopy layers and canopy closure) needed to support wildlife species' habitat needs. That is the rationale for including those criteria found in Forest Plan Appendix N as part of the standards.

So for example in a section entitled "Important statements from research" Kootenai National Forest (2004) identifies components of complexity as important for the Sensitive species, fisher, which happens to be an NPNF Management Indicator Species.

Such complexity can be seen in the photographs included in "120802MWardEmsgProjDevelopmentDiscussioWithJOppenheimer.pdf".

- Jones, 1991: "…fishers did not use non-forested habitats." "It is crucial that preferred resting habitat patches be linked together by closed-canopy forest travel corridors."
- Ruggiero et al. 1994: "...**physical structure of the forest** and prey associated with forest structures are the **critical features that explain fisher habitat use**, not specific forest types.
- Thomas, 1995: "**Most habitats preferred by fishers have been described as structurally complex, with multiple canopy layers and abundant ground-level structure (in the form of logs, other downed wood, under-story shrubs, etc**.). Powell and Zielinski (1994) listed three **functions of structural complexity**, which may be important for fishers: high diversity of prey populations, high vulnerability of prey items, and increased availability of dens and rest sites. Structure also substantially influences snow accumulation and density, which have been shown to be important variables in fisher habitat use (Raine 1983, Leonard 1980, Powell and Zielinski 1994)."

(Emphases added.) Finally, Attachment A includes documents the NPNF produced for NEPA analyses of previous timber sale projects, to comply with the Forest Plan. Two pdfs (Old Growth SurveysSelway RD 1,2) document 1992 field surveys for old growth on the Selway Ranger District. The document, entitled "OLD GROWTH SURVEY" shows that the NPNF created a standard field survey form using Forest Plan Appendix N old-growth criteria as "CRITICAL

[14] 36 CFR § 219.3 Role of science in planning. "The responsible official shall document how the best available scientific information was used to inform the assessment…" 36 CFR § 219.6 Assessment. (a)(3) "Document the assessment in a report available to the public. …Document in the report how the best available scientific information was used to inform the assessment."

COMPONENTS" and includes a rating for "LARGE TREE AGE" with a breakpoint being 150 years. The critical importance of the age of old trees is not new to the FS, however it is being arbitrarily ignored in the DSEIS/UOGA old-growth inventory process.

Up-to-date field survey data are necessary to identify old growth for the purposes of Forest Plan compliance

Twentymile PA Figure 13 ("Old Growth Analysis Areas") does not identify the location of old growth in project area OGAAs. The FS must map the old growth designations in OGAAs, providing identifying labels on old growth polygons with which one may use to cross-reference to documents disclosing the old-growth character of each corresponding polygon, which could also reveal how the old-growth criteria were being applied for any given polygon. The public must be able to tell how any given stand or contiguous group of stands, represented by mapped polygons, have been chosen.

We do have the FS's descriptions of what data the FS used to identify and designate old growth for the HR DSEIS analysis, and how they did it, as we discussed in a previous section. We assert that the FS used data that was not gathered in the field for the purposes of comparing the old growth criteria with the given stand under consideration, and which cannot reasonably be claimed to reveal sufficient Appendix N criteria. For example, stand exam data is generally gathered as part of "silvicultural" considerations mostly concerned with timber volume and quality. Also, we see that the FS acknowledges that the data is in some cases over 30 years old. The FS is offering the results of this quick-and-dirty analysis in its haste to facilitate logging.

Forest Plan Appendix N states, "Old-growth stands will be identified through the use of stand exam information, aerial photos, and field reconnaissance." A document "Campbell OG analysis note.pdf" in Attachment A explains how the NPNF used queries of existing database and aerial photos to identify "potential oldgrowth" in 1995. Once identified, "The …stands **would need to be field verified** to determine if they could be reallocated to oldgrowth or replacement oldgrowth following the steps outline in Appendix N of the Forest Plan." (Emphasis added.)

For the HR FEIS and HR DSEIS, the FS did not undertake field surveys to validate old growth tentatively identified using remote methods. Instead, the remote methods were considered sufficient, in contradiction to the Forest Plan and NEPA's requirements for scientific integrity.

The document "120906MBienkowskiEmsgOGStandsFieldReviewNotes.pdf" from Clear Creek project files is an email message:

> From: Bienkowski, Matthew W -FS
> To: Hill, Lois R -FS; Kirkeminde, Margaret -FS; Lucas, Megan D -FS; Smith, Karen A -FS; White, Tam -FS; Ward,
> Michael P -FS; Graves, Doug A -FS; Roberts, Michelle M -FS; Hudson, Joe B -FS
> Subject: Proposed NEW Focus Area for Clear Creek
> Date: Thursday, September 06, 2012 2:23:24 PM
> Attachments: 120823IDTMtgNotesmbupdate.docx

The attached “IDT Meeting Notes 8/23/12” to that email states:

> Field Reviews of Potential Old Growth Stands
> …Based on a review of aerial photos, stand exams will be done for the following stands to determine whether they meet the criteria for old growth…

We offer examples of how proper old-growth surveys have been conducted on the NPNF and elsewhere. Attachment A includes documents the NPNF produced for NEPA analyses of previous timber sale projects, to comply with the Forest Plan. One document (Old Growth SurveysSalmon River RD.pdf) is a series of 1992 documents on field surveys for old growth on the Salmon River Ranger District. They utilize a “SCORECARD FOR OLD GROWTH HABITATS” which features Forest Plan Appendix N old-growth criteria for “West-side Mixed Conifer” and “West-side Ponderosa Pine”, which is apparently an early example of the NPNF integrating the Green et al habitat types into the old-growth identification and allocation process. The surveyors also use observations to rate the quality of the old-growth habitat, making notes of the habitat components they observe which biological knowledge indicates are used by old-growth associated wildlife. In these Attachment A documents the surveyors also take notes on actual wildlife sightings while they’re in the forest. Essentially, the surveyors are immersed in the experience of what it means to be in old growth, increasing their credibility as surveyors of old growth in the process.

Attachment B is a document entitled, “Kootenai N.F. – Three Rivers District Old Growth Validation Process – All Proposed Sales.” It includes a section, “Instructions For Old Growth Walkthrough and Write-up” which was “developed in an effort to standardize old growth walkthrough surveys and write-ups.” It also has a section listing old-growth criteria used by the Kootenai National Forest (similar to that in NPNF Forest Plan Appendix N), and includes a blank field form for use by the field surveyor. That form includes a couple lines where the surveyor is to indicate in his or her judgment why the stand meets the old-growth criteria displayed on the form.

Also, KNF Forest Plan Old Growth Appendix 17 (USDA Forest Service, 1987b) reveals those FS managers’ commitment to conduct field surveys:

> During the next decade, each District will work towards completing a field inventory of designated old growth stands. Specific information items will be gathered which will help in monitoring and determining habitat suitability for several indicator species and will help to rate the relative value of each stand. The key information items will be stored in some type of data base to help facilitate use of habitat suitability models for monitoring of dependent wildlife species.
>
> …It is anticipated that as old growth field verification and other stand exams continue, we will find that some designated stands are not suitable old growth habitat while others not previously designated will be found to be suitable. Records of these findings should be kept so that the Forest Plan data base can be updated.

So we know the FS has done in the past, and still can perform, proper old-growth field surveys if it wants to. But for the old growth designators of the HR FEIS and DSEIS process "old growth" is little but an abstraction. They designate with data too unreliable for making valid conclusions, building little credibility in the process.

Finally, the FS doesn't even want the public to be able to field check Twentymile project area old-growth designations. There was no mapped old growth on any documents on the project website at the deadline date for these comments. The FS could potentially sign a Decision in the coming weeks, under the Emergency authority being pursued.

Old-growth maps must include important reference details which would help facilitate navigation so the public can survey the designated FPOG and ROG. By navigation details we mean, for example, roads, trails and streams that are relatively easy to find are juxtaposed on the map with old growth polygons.

In sum, documentation of field surveys using all Appendix N criteria—not an arbitrary subset—is a necessary and integral component of the old-growth inventory process required by the Forest Plan.

Forest Plan old growth percentage standards are not based on best available science.

Our comments on the Hungry Ridge DEIS inquired as to what the historic levels of old growth were before industrial logging arrived on the scene: "What is the HRV for old growth forestwide?" The FS responded, "Estimating the amount of old growth that was historically present in the project area would be speculative." On this topic, our Objection stated:

> …a more recent issue is questioning of the scientific adequacy of the forestwide 10% standard. Our comments on the DEIS asked, "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. Please **estimate** how much old growth in the project area has been destroyed by logging. What is the HRV for old growth forestwide?" The FS responded, "Estimating the amount of old growth that was historically present in the project area would be speculative." That is bizarre—the FS has no qualms about speculating on the amounts of various other categories of forest in the project area, and basing the goals of this project on such speculation. Yet it won't speculate on the amount of old-growth habitat historically needed to maintain viability of its old-growth Management Indicator Species and other old-growth associated wildlife? The FS may be reluctant to discuss the issue because the amount of old growth on the Forest is well below the historic range; and that fact alone shows how the FS is managing inconsistent with best available science in proposing to destroy hundreds of acres of old growth.

Our Objection to the HR ROD states:

> We incorporate by reference FOC's April 13, 2015 objection to the draft Record of Decision for the Clear Creek Integrated Restoration Project and final Environmental Impact Statement, as providing further insight into the old-growth policy and old-growth associated wildlife on the NPNF.

> Ten percent old growth, the forestwide Standard, isn't even within the FS's own "Desired Distributions" for VRUs 3, 7, 10, and 17, and is at the low end for VRU 8.

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

One might assume the NPNF Forest Plan minimum old-growth standards are based upon historic amounts prior to EuroAmerican exploitation, so that maintaining such minimum would safeguard wildlife populations so they wouldn't vanish from any national forest or need listing under the ESA. But estimates of the amount of old growth on the Forest prior to EuroAmerican management are not available nor reliable, because so much forest had been logged long before adoption of old-growth definitions. This is demonstrated in FS statements responding to requests for data on presettlement amounts of old growth. For example, USDA Forest Service, 2019c states:

> Regarding the historic range of variability of old growth in the analysis area, **there is no way to accurately determine how much of the Forest may have met the Green definitions of old growth (Green et al., 1992**). To determine whether a forest stand meets those definitions, it requires detailed information on how many trees per acre exist in the stand over a certain diameter and age, the total stand density, the forest type and lastly, the habitat type group that the stand occupies. **No historical information exists that can provide that level of detail.** Therefore, a numeric desired condition or an HRV estimate for old growth is not included in this analysis. (Emphases added.)

Similarly, the Northern Region's Bollenbacher and Hahn, 2008g state, "actual estimates for the amount of OG are constrained by the limited field inventory data collected before the 1930s, and inconsistent—or absent—OG definitions."

Following his research, Lesica (1996) suggested reliance on 10% as minimum old-growth standard could result in extirpation of some species. He estimated that 20-50% of low and many mid-elevation forests were in old-growth condition prior to European settlement.

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.

Also, Lesica (1996) states, "Results of this study and numerous fire-history studies suggest that **old growth occupied 20-50% of many pre-settlement forest ecosystems in the Northern Rockies**." (Emphasis added.) Lesica, 1996 (also cited in Gautreaux, 1999) stated forest plan standards of maintaining approximately 10% of forests as old-growth **may extirpate some species**. This is based on his estimate that 20-50% of low and many mid-elevation forests were in old-growth condition prior to European settlement. This should be considered some of the best science on historic range of old growth necessary for insuring viability of old-growth associated species.

If the FS was interested in making its old-growth standards consistent with the best available science, it would undertake an amendment process that would increase its "minimum[15]" 10% standard (and the 5% distribution standard) up to a level within the natural range of variability, resembling reference conditions. Unfortunately, it looks as though the Nez Perce National Forest had its preferred "expert" weigh in on this topic: "The Ranger has indicated he is not interested in increasing old growth, believing there is enough OG out there." (111017WildlifeClearCreekNFMAComments.docx)

In regards to our HR Objection statement ("…the FS has no qualms about speculating on the amounts of various other categories of forest in the project area, and basing the goals of this project on such speculation") we submit Clear Creek project file documents. One (111125VRUageclass.pdf) includes a table stating the Desired Condition for various Vegetative Response Units (VRUs), which are categories roughly similar to habitat types or which roughly correspond to Green et al old growth types:

[15] http://dictionary.reference.com defines "minimum" as: "least possible."

					Desired Condition	
	Age Class					
VRU	0-40	41-100	101-150	150+	Climate Modifier	Dominant Habitat Types
1	20-40	40-60	15-20	50-10	Cool Moderately Dry	Abla/xete, Pico/vagl
2	10--20	10--30	10--20	40-60	Cold and Moderately Dry	Pial, Laly
3	15-25	15-35	10--30	20-50	Moderately Warm & Dry	Pipo/phma, Psme/Phma, Abgr/phma
4	15-25	20-40	15-35	10--40	Moderately Warm & Moist	Abgr/asca, Abgr/clun
5	20-40	40-60-	15-20	5--10	Cool and Moderately Dry	Pien/phma, Abla/vaca, Pico/vaca
6	15-25	20-40	15-30	15-45	Cool and Moist	Abla/clun, Abla/mefe, Tsme/clun, Tsme/mefe
7	10--20	15-35	10--30	35-65	Moderately Cool and Moist	Thpl/clun, Thpl/asca
8	15-25	20-40	15-35	10--40	Moderately Warm & Moist	Abgr/asca, Abgr/clun
9	10--20	10--30	10--20	40-60	Cold and Moderately Dry	Pial/vasc, Abla/vasc, Pico/vasc
10	10--20	10--30	10--30	35-65	Cool and Wet	Abla/stam, Pien/smst, Tsme/stam
12	10--20	10--30	5--25	40-70	Warm and Dry	Pipo/agsp, Pipo/feid
17	10--20	15-35	10--30	25-55	Moderately Cool and Moist	Thpl/clun, Thpl/asca

That "Desired Condition" is based upon what the FS believes is the historic range or norm. That document includes the age class of 150+ and except for one or two VRUs, 10% is at the bottom end (or below) the Desired Condition for the 150+ year age class, which is a minimum criteria for old growth in Green et al. The other document (111125VRUdfcmatt.pdf) includes narratives with the numbers (called "Typical stand age class distribution").

This is another topic concerning old growth about which the NPNF refuses to engage in dialogue. Since the wildlife evolved prior to the era of pre-industrial logging when the abundance and distribution range of old growth was much greater than now, the FS has no scientific basis supporting its assumption that merely meeting its Forest Plan old growth percentage standards will maintain viable populations as the Forest Plan requires. Along with climate concerns as discussed in these comments, this is why facilitating the destruction of old growth of any category would be reckless, arbitrary and capricious.

Old Growth and Management Area 21

The Forest Plan at III-56 defines Management Area (MA) 21 as "timber stands in timber productivity classes 3 and 4 that are old-growth, grand fir-Pacific yew vegetative communities that have been identified as moose winter range." See also Forest Plan page III-58.

The PA indicates logging is proposed for MA 21, however compliance with Forest Plan direction is not assured. Specific standards for MA 21 (and inclusions of MA 21 in other management areas) limit logging. (Forest Plan page III-59.) The EIS must demonstrate compliance with the crucial standard: "7. Maintain leave-strips between yew stands sufficient to provide travel corridors for moose." The PA states, "Strips of live trees will be retained between Pacific yew stands as travel corridors for moose." However, nothing of the sort is mapped.

The PA states:

> **Moose populations are believed to have declined substantially within the DAU since 1980s**; however, there has been no population data collected by IDFG on a regular basis (IDFG, 2020). Broadscale declines of moose populations are also happening in other areas along the southern distribution of moose in the United States. Potential contributors to these declines include climate change and related shifts in plant phenology and changes in parasite abundance/impacts (IDFG, 2018).

(Emphasis added.)

Roadless and Old Growth

The EIS must examine old growth in the context of the contribution that the roadless lands may play. The fact that there is no record of logging could indicate the roadless lands may be important for maintenance of old growth.

The South Fork Landscape Assessment provides some analysis and maps that could be useful for the analysis as it relates to roadless and old growth (and to the entire analysis of old growth). Map 44 suggests a dearth of old growth in the project area, including roadless lands, based on historical data, which would be well below forest plan standards. Map 43 suggests more larger trees than map 44, but only a fraction could be considered old growth based upon Forest Plan criteria, which includes age (see p. III-56). This map may not reflect the outcome of later logging.

Forest Service policy and more of the best available science concerning old growth

Juel (2021) cites many scientific references and FS documents, presenting a science- and experiential- based discussion of old growth.

Thomas et al., 1988 emphasized values pertaining to wildlife and diversity in the context of laws and regulations. From a perspective recognizing that meaningful implementation of regulatory requirements must include a concomitant awareness of the limits of scientific knowledge, they advocate **for preserving all that remains**:

> The lack of quantitative information about functional attributes of old growth and habitat associations of potentially dependent plants and animals and the rapidly declining old-growth resource indicates that purposely conservative management plans should be developed and adopted. Our knowledge and understanding of old-growth communities is not adequate to support management of remaining old growth on criteria that provide *minimum* habitat areas to sustain *minimum* viable populations of one or several species. The potential consequences and the distinct probability of being wrong are too great to make such strategies defensible in the ecological sense.
>
> …The answer to— "How much?"—must be predicated on the relatively small amount of unevenly distributed remaining old growth and the current, inconclusive scientific knowledge of old-growth ecosystems. Therefore, the best probability of success is to preserve all remaining old growth and, if possible, produce more.

SUPERSIZED CLEARCUTS ON THE NPCNF

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.

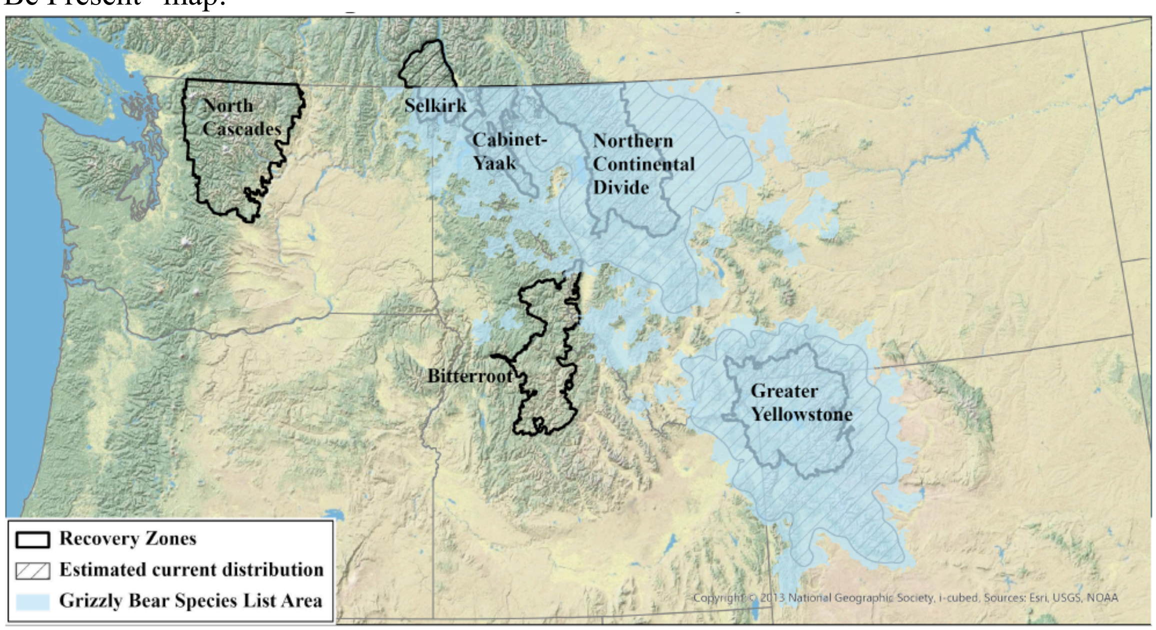
There has never been any NEPA analysis analyzing and disclosing the landscape level cumulative impacts of these massive clearcutting approvals—not at the Northern Region level, and not at the level of the NPCNF. This has implications for highly significant impacts on wildlife that evolved without clearcuts, 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.

GRIZZLY BEAR

We incorporate our discussion on the grizzly bear from our comments on the Draft Forest Plan and EIS (pp. 193-209) as well as our March 11, 2021 supplemental comments on the 2019 Draft Revised Forest Plan Revised Land Management Plan (Draft Forest Plan) and Draft Environmental Impact Statement Land Management Plan Revision (Draft EIS) for the Nez Perce-Clearwater National Forests.

"The U.S. Fish and Wildlife Service (USFWS) does not currently consider grizzly bears likely to be present on any portion of the NPC." This doesn't cite any particular USFWS document, and is a nonsensical, irrelevant statement anyway.

The PA states, "In July 2022 the USFWS updated the species list area map of where grizzly bears 'may be present', which does not include the proposed project area." Below is that "May Be Present" map:



The map shows areas in light blue of known recent documentation of grizzly bears. The USFWS grudgingly included isolated areas to the west of the Twentymile project area, only acknowledging them because these recent occurrences are well-documented. The agencies apparently refuse to acknowledge the possibility of grizzly occurrence in areas beyond those two small blue splotches, which is biological nonsense given the known ability of grizzly bears to cover great distances, and the possibility of grizzly bears—known to avoid areas of human activity—existing there but remaining undetected.

The "May Be Present" map also includes locations to the north, and east of the Twentymile project area.

"The Bitterroot Ecosystem in currently unoccupied, per USFWS's Bitterroot Environmental Impact Statement (USFWS, 2000, pp. 3-14–15)." Another nonsense statement. Besides that EIS being 23 years old, on March 15, 2023 a federal court in Montana ordered the USFWS to re-analyze the recovery of grizzly bears in the BE. The Court recognized non-discretionary legally binding commitments made in the 2000 Record of Decision and Final Rule, plus the USFWS's failure to manage accordingly. The Judge recognized that "as recently as October 2022, grizzly bears have been seen in the Bitterroot Ecosystem." The Judge's order requires the USFWS to supplement its 2000 Final EIS and come up with a new decision.

Since there is solid documentation of recent sightings on the NPCNF, grizzly bear occupancy should be considered well established. Formal consultation on the Forest Plans is out of date. And formal consultation with the USFWS is needed for this project.

Grizzly bears once ranged throughout most of western North America, from the high Arctic to the Sierra Madre Occidental of Mexico, and from the coast of California across most of the Great Plains. Prior to European settlement, scientists believed that approximately 50,000 grizzly bears occupied the western United States between Canada and Mexico. With European settlement of the American West and a federally funded bounty program aimed at eradication, grizzly bears were shot, trapped, and poisoned, reducing the population to just 2 percent of their historic range. As a result of its precipitous decline, The USFWS listed the grizzly bear as a "Threatened" species in the lower 48 states under the Endangered Species Act in 1975. Today scientists estimate there are approximately 2,000 grizzly bears left in the lower 48 states, occupying five isolated populations.

One of the main factors hindering grizzly bear recovery is the lack of connectivity between recovery zones due to degraded habitat conditions caused by a variety of factors, but especially roads. Roads can increase risk of mortality, change bear behavior, resulting in habitat loss, habitat alteration, habitat displacement, habitat fragmentation, and population fragmentation. (Proctor, et al. 2019; MacHutchon & Proctor 2015.) Roads change wildlife habitat in more extreme and permanent ways than other anthropogenic causes of fragmentation. (Forman & Alexander 1998; Spellerberg 1998.) Roads not only cause striking changes to physical landscapes but also alter the ecosystem's general function and the patterns of wildlife use within these landscapes. (Reed et al. 1996; Transportation Research Board 1997; Shirvani et al. 2019.) Traffic on roads can create barriers or filters to animal movement and in some cases the leading cause of animal mortality. (Chruszcz et al. 2003; Clevenger & Wierzchowski 2006; Northrup et al. 2012.) Increased human use on new roads, including legal use during project implementation and illegal public use after project implementation, creates the potential for increased mortality and poaching of grizzly bears—impacts the PA fails to analyze. For these reasons, roads and human activity can negatively impact grizzly bear recovery. (Lamb et al. 2018.) Therefore, Proctor, et al. 2019 conclude:

> Motorized access management would be most beneficial in threatened populations, in areas where roads occur in the highest quality habitats, within and adjacent to identified linkage areas between population units, and in areas that are expected to exceed motorized route thresholds as a result of resource extraction activities.

Twentymile timber sale activities would further reduce grizzly bear connectivity and hinder population recovery in the BE. The FS fails to analyze how the proposed actions would affect grizzly bear habitat security and areas of demographic connectivity, such as discussed in Sieracki & Bader, 2022. Such an analysis requires discrete geographic parameters in which to measure habitat security, and motorized route densities. Yet, specific bear management units have yet to be identified in the NPCNF by any federal or state wildlife agency. Hence the Sieracki & Bader report, which identifies and displays Bear Management Units (BMUs) throughout the Bitterroot National Forest and Lolo National Forest and parts of the Beaverhead-Deerlodge National Forest. Proposed BMUs for the BE (Mattson 2021) and the secure habitat identified in Sieracki & Bader, 2022 provide a foundation for a more robust grizzly bear analysis both within the project area and considering cumulative effects on demographic connectivity.

Habitat conditions outside of official recovery areas are investigated in Bader and Sieracki, 2022—a report evaluating grizzly bear denning habitat and demographic connectivity in and around the Bitterroot Ecosystem/recovery zone. Bader and Sieracki (2022) "predicted 21,091 km2 of suitable denning habitats" in the BE and connection areas, noting:

> Terrain features, distance to roads, and land cover best explained suitable denning habitats in northern Idaho and western Montana. The results support the demographic model for population connectivity, and independent of other factors there is suitable denning habitat for hundreds of Grizzly Bears in the Bitterroot analysis area. We suggest additions to the Bitterroot Grizzly Bear Recovery Area, and that more effective motorized-access management be applied to demographic connectivity areas.

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. The proposed permanent road construction would surely decrease grizzly bear habitat security and connectivity. Furthermore, since the PA fails to disclose the current level or degree of accessibility on all the routes for which it proposes "maintenance" it fails to portray an accurate estimation of the adverse impacts of the project on grizzly bears, other species of conservation concern affected by roads, and indeed many indicators of ecological integrity.

The proposed road reconstruction would adversely impact grizzly bears. Road reconstruction involves blading, brushing, and other improvements. Reconstruction of impassible roads reintroduces motor vehicle traffic to locations where it had subsided or diminished. 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 within three years of the 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.

Merrill, et al., 1999 identify seasonal productive grizzly bear habitats in Idaho including the project area. The authors state that grizzly bears have good chances of surviving and reproducing in the BE "if bears in central Idaho are accorded protection from direct mortality comparable to that provided bears in other recovery areas."

We refer the ID Team to documents FOC received from the FS in response to a FOIA submitted on July 17, 2020, seeking documents relating to all known grizzly bear sightings or grizzly presence on the Nez Perce-Clearwater National Forests (NPCNF) from October 30, 2013 to sometime in mid-2020.

Documents provided in response to the FOIA indicate a grizzly bear was confirmed in the White Bird, ID area in 2019 and another in 2020, which means one likely denned in that vicinity. In 2020 grizzly was confirmed in the End Of The World project area of the Salmon River Ranger District.

In 2019 the grizzly bear known as 927 spent a good portion of 2019 in the Clearwater National Forest in the vicinity of the upper Lochsa River watershed and Lolo Pass. Referring to this grizzly, the NPCNF's Dead Laundry Biological Evaluation states, "One verified grizzly bear observation was been recorded within the Deadwood-Moose Creek and Elizabeth-North Fork HUCs in 2019.

There were other unconfirmed 2019 occurrences of grizzly bears on the NPCNF, as evidenced from tracks or photos, including near Big Cedar (less than 20 miles east of Stites, Idaho), the "Newsome Red River" bear from September 2019, and a second grizzly bear in the Upper Lochsa.

Still, the FS remains in denial that the grizzly bear is a species native to this project area, whose habitat needs must be taken into consideration for project analyses. The agency essentially treats occurrences of bears in the BE as outliers or otherwise transient, rather than explorers who are important for recovery in the BE.

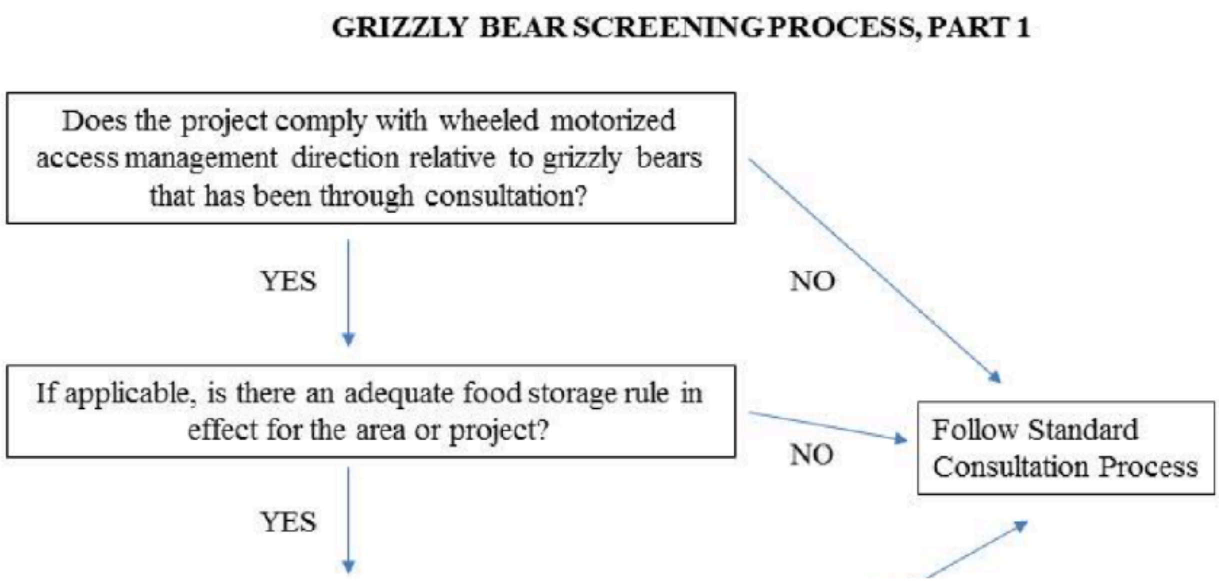
Hertel et al. (2019) discovered that explorer bears are important to connectivity and persistence of the species: "Bolder individuals seem to be more tolerant towards human encroachment and move more easily through human-modified landscapes (Holtmann et al., 2017, Lowry et al. 2012, Hertel et al. 2019)" which has implications for dispersal and population connectivity. Grizzly bears that are roaming into areas not densely occupied, or thought to be otherwise unoccupied, are highly important and should be recognized as resident.

Since there is solid documentation of recent and ongoing grizzly bear occupancy on this Forest, grizzly bear presence should be considered permanently established. Formal consultation on the forest plan is out of date. Updated consultation with the U.S. Fish and Wildlife Service (USFWS) for the grizzly bear is needed on this project and the forest plan.

The USFWS's April 20, 2020 Hungry Ridge concurrence letter for other species states:

> The Forest also determined that the Project tiers to the Programmatic Biological Assessment for Activities that are Not Likely to Adversely Affect Canada Lynx, Grizzly Bear and Designated Canada Lynx Critical Habitat (USFS 2014; Service reference: 06E11000-2015-I-0019) …there are no grizzly bears (Ursus arctos horribilis) …within the Project action area. The Service acknowledges the Forest's use of these programmatics…

That 2014 programmatic Biological Assessment includes a grizzly bear screening process, and below is part of a diagram from therein:



Is there a food storage rule or order covering the Twentymile project area? The FS must act in accordance with best available science and common, standard management procedures to limit risk to grizzly bears in and around the project area and NPCNF. The FS should be following the "standard consultation process" which would start by acknowledging the timber sale is likely to impact the grizzly bear.

Furthermore, we note the FS has failed to regulate black bear baiting in the NPCNF, allowing the state of Idaho to be the sole oversight agency of this abhorrent practice on the NPCNF. In 2007, a grizzly bear was shot and killed at a black bear baiting station in the Kelly Creek watershed in the Clearwater NF. FS management is preventing the grizzly population from recovering in the Bitterroot Ecosystem recovery area (BE). All of this triggers a duty for the FS to re-consult and find a way to reduce or eliminate this take of grizzlies under the ESA.

It's well known that young female grizzly bears tend to establish home territories in close proximity to their mother's. Also, grizzly bears have a strong tendency to avoid highly roaded landscapes, which largely separate the BE from known female grizzly home ranges in other Recovery Areas. In contrast to the BE and the NPCNF as a whole, habitat for bears in other Recovery Areas is delineated by forest plans into Bear Management Units (BMUs) where total and open road densities are limited in order to reduce human caused bear mortality and increase habitat security. [See USDA Forest Service, 1995c (Flathead National Forest Amendment 19); also see USDA Forest Service, 2009d (Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones).]

So what would it take for the FS to institute BMUs and road density standards? In a document received under the FOIA, the FS explains: "Bear Management Units have not been developed for the BE however the Recovery Plan identifies delineation of BMUs as a future task once home range size and habitat use data are available (USFWS 1996). Such data in currently unavailable for the BE because of the lack of resident grizzly bears." Also, "the definition of a population of grizzly bears (i.e. two or more reproductive females or one female reproducing during two separate years) in the Bitterroot Environmental Impact Statement (EIS) (Service 2000, pp. 3-14–15)."

In other words, female grizzly bears would have to migrate into the BE across perilous, roaded landscapes, find a mate, have cubs, and wait for the federal agencies to acknowledge their existence, determine home range size and gather habitat use data—just to enjoy habitat protections provided in other Recovery Areas.

Whether or not grizzly bears, recently confirmed in and around the Clearwater and Nez Perce National Forest, are "residents" is irrelevant. Grizzly bear habitat quality is still potentially outstanding, but only if strong steps are taken to remove the human impediments to natural recovery. Recovery of the grizzly requires its population to grow and its range expand, especially in anticipation of the impending risk of climate change. We not believe the grizzly bear must leap high arbitrary agency-established hurdles to receive adequate habitat protections.

Mattson (2021) is a report investigating grizzly bear recovery in the BE and NPCNF. At pp. 56 - 59 (7.c. Habitat Security on the Nez Perce-Clearwater National Forests) Mattson discusses road densities and core security in proposed BMUs for the NPCNF.

As Mattson (2021) explains, grizzly bear habitat quality in the BE is potentially outstanding, but strong steps are needed immediately to remove the human impediments to natural recovery. Recovery of the overall grizzly bear population in the lower 48 states requires its population to grow and its range expand, especially in anticipation of the impending risk of climate change.

The effects to grizzly bears from the proposed timber sale include potential long term disturbance or displacement due to human presence, road construction and use, motorized use and other mechanized equipment. The presence of these activities and the presence of roads could lead grizzly bears to avoid otherwise suitable habitat.

Proctor et al. (2017) is relevant to judging the trade-off between proposed "treatments" and habitat security for grizzlies, especially the hazards associated with road access.

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.

Schwartz et al. (2010) noted that management for grizzly bears requires provisions for security areas and limits of road densities between security areas. Otherwise, grizzly bear mortality risks will be high as bears attempt to move across highly roaded landscapes to other security areas. The Forest Plan lacks direction regarding road densities located outside of and between security areas.

The FS is aware of the best programmatic agency direction it has adopted to date, that established in Flathead Forest Plan Amendment 19. 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.

Reducing roads and therefore their impacts beyond what the FS seems willing would benefit not only grizzly bears, but most other natural aspects of the ecosystem, as the FS's Access Amendment Draft SEIS for the Cabinet-Yaak Recovery Area states:

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

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

Please see the documents, "Brebner Flat reply brief filed 10.13.20", "ECOS Conservation Online System-grizzly bear" and "Species Profile for Grizzly bear (Ursus arctos horribilis)" which explain why the PA's "no effect" determination is wrong, and contrary to law. The likelihood of grizzly bear occurrence in the NPCNF and project area over the duration of the proposed activities is ignored.

In summary, the FS still essentially ignores the grizzly bear, 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.

WOLVERINE

"Therefore, any use of the project area by wolverines would be transient in nature, and project activities would not affect the suitability of the area as a travel corridor or dispersal zone. There are no reported observations of wolverine in the project area." Just like the grizzly bear, this rare species native to the Forest is essentially being portrayed as an illegal immigrant. What a horrible attitude to be exhibited by a federal land management agency.

On May 26, 2022 a federal court vacated the USFWS's withdrawal of a proposed ESA-listing rule for the wolverine. Later this year a new final listing determination is due to meet the Court's deadline. As part of the process, the USFWS issued a request for new information (Federal Register Vol. 87, No. 225, November 23, 2022) to update the Species Status Assessment (SSA) for the North American Wolverine leading to a final determination to list this species under the Endangered Species Act (ESA). We incorporate our submission to the USFWS in response to the USFWS solicitation, as comments on this PA. Please note the maps on page two of those comments, identifying the Twentymile project area as being a part of the "Current Potential Extent" and 1827 - 2017 "Maximum Extent Occurrences." Those come from USFWS maps.

Wolverines use habitat ranging from Douglas-fir and lodgepole pine forest to subalpine whitebark pine forest (Copeland et al., 2007). Lofroth (1997), in a study in British Columbia, found that wolverines use habitats as diverse as tundra and old-growth forest. Wolverines are also known to use mid- to low-elevation Douglas-fir forests in the winter (USDA Forest Service, 1993).

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

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

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

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

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

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

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

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

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).

Nowhere does the FS describe the quantity and quality of habitat that is necessary to sustain the viability of the wolverine.

The PA also fails to analyze and disclose cumulative impacts of recreational activities on 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.

The FS's irrational position on wolverines is based in part upon a 2013 memo from the Regional Office (USDA Forest Service 2013c). It appears that FS district level specialists are not allowed to arrive at effects conclusions based upon their own expertise and judgment.

FISHER

"Habitat conditions within project associated sub-watersheds meet those that have been identified in the literature as providing a high likelihood of fisher occupancy, and fisher have been documented using the project area." The PA also states:

> There have been extensive fisher surveys conducted across the Forests. Results of hair snare and live trapping have resulted in 164 genetic samples that tested positive for fisher. There have been five hair snare survey locations within the project area, with one producing sufficient DNA to confirm fisher presence. Two hair snares immediately west of the project area did not confirm fisher presence. Additionally, there have been two confirmed records of fisher within the project area (one roadkill and one trapper report) and two other unconfirmed reports.

Krohner (2020) highlights the critical importance of the NPCNF for the management indicator species, fisher:

> Spatial occupancy analyses identified two core areas with higher predicted occupancy estimations: a large area across the Nez-Perce Clearwater National Forest, and a smaller area in the Cabinet Mountain Range crossing the northern end of the shared border of Idaho and Montana. Our results provide empirical evidence supporting previous inference that these areas serve as core habitat for fishers within the northern Rockies (Sauder, unpublished). The prevalence of native haplotype observations in the Nez Perce-Clearwater National Forest (Appendix IV) may indicate that this core area has been of conservation importance for some time. Genetic research by Vinkey et al. (2006) and Schwartz (2007) established that the Nez Perce-Clearwater is where fishers survived their minimum population numbers, while our results from both spatial and non-spatial analyses demonstrate that fishers currently occupy this area to a greater extent. However, our results also demonstrate an absence of fisher detections in large areas across the landscape, even

> within predicted fisher habitat, which suggests the need for continued monitoring to address drivers of fisher distribution and reassess currently defined suitable fisher habitat. Identifying core habitat allows us to make effective use of conservation dollars, and avoid futile attempts to maintain fisher presence in areas where they are not able to persist long-term. Future conservation actions should consider prioritizing areas identified as core habitat.

The FS selected the fisher as one of the management indicator species (MIS), and a Forest Plan standard is to "[m]onitor population levels of all Management Indicator Species on the Forest...Population levels will be monitored and evaluated as described in the Forest Plan Monitoring Requirements (Chapter V of the Forest Plan)." The Forest Plan requires this monitoring every 3-5 years. The FS last published a monitoring report for the Nez Perce National Forest in 2004, and previous to then reviewed fisher data in the monitoring report in 2002. In the 2002 monitoring report, the FS summarized fisher information that was not based on any sampling the agency did or verified. If the FS is not required to produce population monitoring for an entire species on a project-by-project basis over the course of the plan, surely it must account for population trends at the end of the forest-plan period after these projects have been implemented and when the agency decides to revise the plan. Otherwise, when would population trends ever be monitored? But, even now, at revision, the FS admits in its Species of Conservation Concern document that it has no recent data for the fisher. The FS cannot assume that fisher populations are viable based on old data while the impacts of logging and trapping have been cumulatively adding up in the interim.

Starting with the relatively low numbers that the Nez Perce 2002 Monitoring report recognizes, impacts from trapping have been accumulating. Trapping is allowed on the Nez Perce-Clearwater National Forests. In response to an information request from Western Watersheds Project, Idaho Department of Fish and Game (IDFG) reported that traps set for wolves had caught 56 fisher (20 of which died in the traps) since 2012. *See* IDFG Non-target wolf trapping LICYEAR2013-2019 spreadsheet. The year that the FS drafted the assessment, in the 2013-2014 season, IDFG reported that 22 fisher were trapped that season, 10 of which died in traps. While the trappers reporting these numbers indicated the balance were released, we don't know if trapping contributed to mortality shortly thereafter. Also, these are just the numbers reported, so we don't know if there were more unreported, either because trappers chose not to or did not check their traps. While we don't know where this trapping occurred, the FS has recognized that the NPCNF contains a lot of fisher habitat, so it follows that at least some of these numbers were likely from this Forest. Also, it is very reasonably foreseeable that trapping is going to increase for several reasons. For one, Idaho Fish and Game Commission extended the wolf trapping season, so active traps will exist longer on the landscape, and these season modifications impact parts of the Nez Perce-Clearwater National Forests. *See* Idaho Fish and Game Commission (2020), compare with IDFG hunting units map (2020)—both accompanying this letter. The second reason is that trapping depends on access. As discussed above, roads create access for trappers, and in every alternative, logging levels are increasing, and to increase those logging levels the Forest Service will build roads, both temporary and permanent.

Starting with the relatively low numbers in the Nez Perce 2002 Monitoring report, habitat loss has cumulatively impacted fisher as well. The FS has increased logging on this Forest, with some of the highest amounts of timber sold over the last 20 years occurring in recent years. Many of these projects have eliminated and fragmented fisher habitat, with each individual project claiming that it might impact fisher, but would not impact the species as a whole. Those projects, forestwide, have added up, and the FS must now account for them.

The FS apparently has no idea how much fisher habitat has been eliminated with projects over the last few decades. With this letter we include time lapse imaging which demonstrate the cumulative impacts of logging in recent years on old-growth associated species such as the fisher and others, focusing especially on the Hungry Ridge, Doc Denny, and End Of The World project areas. All the areas which show effects of heavy logging in the time span of the time lapse are still many decades away from providing suitable habitat for old-growth associated species.

Allen et al. (2021) found that fishers in their study scavenged more in the winter than in the summer, and hypothesize this is due to the season making them energetically stressed. This increases cumulative effects from trapping, particularly where baiting is allowed.

The PA states:

> Wing Creek-SFCR sub-watershed is above the upper limits of acceptable levels of proportion of open areas at 9%. Harvest in these sub-watersheds, especially regeneration harvest that removes mature forest components and decreases canopy cover below 10%, could reduce probability of fisher occupancy. An increase in openness from 5%-10% can have the effect of decreasing probability of fisher occupancy by almost 40% (Sauder, 2014)."

Still the FS downplays such impacts, relying upon an invalid assessment to claim viability is still assured. "While the regeneration harvest, including units over 40 acres, proposed in the project may reduce the probability of occupancy within the project area and associated sub-watersheds, it represents nominal effects on forest-wide viability for these species given the amounts of habitat available across the Forests." The PA includes no quantified analysis of "the amounts of habitat available across the Forests" nor does it present any analysis that validates the claim, "Connectivity exists to large swaths of fisher habitat just outside the project area boundary."

The PA fails to adequately analyze the cumulative effects on fisher due to trapping or from use of the road and trail networks. 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.

Also Jones, (undated) recognizes:

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

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

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. They also state:

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

The analysis for the fisher, as for most wildlife, doesn't disclose the direct, indirect or cumulative impacts on important habitat components, such as snags, logs, foraging habitat configuration, connectivity, cover, prey species impacts, etc.

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

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

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

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

From Ruggiero et al. 1994b:

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

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

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

Isolating habitat by fragmenting it negatively impacts species. *See* Laurance 2008. Pulsford et al. 2015 describes the importance of habitat connectivity.

Cumulative impacts of climate change are not analyzed for the fisher. McKelvey and Buotte 2018.

The PA cites no scientifically-based analysis on the spatial and structural requirements for fisher survival and successful reproduction. There is no sound, scientifically-based analysis for the Forest Plan or entire Forest comparing forestwide conditions with habitat metrics required to insure fisher viability. The analyses for other wildlife show these same flaws.

CANADA LYNX

The Canada lynx are yet another rare native wildlife species the FS treats as alien to the Forest.

The PA fails to consider, apply, and incorporate best available science and fails to demonstrate consistency with all Forest Plan/NRLMD direction, even though the Forest Plan/NRLMD Amendment allows essentially the same level of industrial forest management activities that occurred prior to Canada lynx listing under the ESA.

The project will result in unauthorized take as defined by Section 9 of the ESA, in violation of the Endangered Species Act (ESA).

The PA does not include an analysis comparing the historic range of lynx habitat components with current conditions.

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

Lynx 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.

Lynx winter habitat in older, multi-storied forests, is critical for lynx preservation. (Squires et al. 2010.) The also reported that lynx winter habitat should be "abundant and spatially well-distributed across the landscape" (Squires et al. 2010; Squires 2009) and in heavily managed landscapes, retention and recruitment of lynx habitat should be a priority.

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

Prey availability for lynx is highest in the summer. (Squires et al., 2013.)

The Lynx Conservation Assessment and Strategy (LCAS 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.

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

Other recent science also undermines the adequacy of the Forest Plan/NRLMD. The FS 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.

And the FS erroneously assumes clearcutting/regeneration logging have basically the same temporal effects as stand-replacing fire as far as lynx re-occupancy. Also conflicting with Forest Plan/NRLMD assumptions is a study by Vanbianchi et al., 2017, who found, "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."

Kosterman, 2014, Vanbianchi et al., 2017 and Holbrook, et al., 2018 each demonstrate that the Lynx Amendment standards are not adequate for lynx viability and recovery, as the FS assumes.

Squires et al. (2013) noted that long-term population recovery of lynx, as well as other species such as the grizzly bear, require maintenance of short and long-distance connectivity. The importance of maintaining lynx linkage zones for landscape connectivity should be maintained to allow for movement and dispersal of lynx. Lynx avoid forest openings at small scales, however effects on connectivity from project-created or cumulative openings were not analyzed in terms of this smaller landscape scale. And connectivity between project area LAUs and adjacent LAUs was not analyzed or disclosed.

The PA fails to analyze and disclose how much lynx habitat is affected by snowmobiles and other recreational activities. As the Kootenai NF's Galton FEIS states, "The temporal occurrence of forest uses such … winter (skiing and snowmobiling) … may result in a temporary displacement of lynx use of that area…"

Because the FS does not consider the best available science and for the reasons stated herein, the FS is unable to demonstrate it is managing consistent with NFMA, the Forest Plan and the Endangered Species Act. The inadequacy of cumulative effects analysis violates NEPA.

NORTHERN GOSHAWK

The Northern Goshawk is another Nez Perce NF MIS, and on the R-1 list as Sensitive. "Goshawk calls were detected in 2021 at Little Wing Creek and Upper Twentymile Creek, but no nests were located. A goshawk call was also detected in 2022 at Little Wing Creek, but no nest was located."

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

Despite the above goshawk call detections, there is no indication the FS has systematically searched for goshawk nest stands in the project area. 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.)

Scientific information indicates analysis must be conducted for adverse impacts in a roughly 6,000-acre northern goshawk home range or the post-fledging area (PFA). Reynolds et al. 1992 goshawk guidelines recommend ratios of (20%/20%/20%) each in the mid-aged forest, mature forest, and old forest Vegetative Structural Stage (VSS) classes for PFAs and foraging areas. Reynolds et al. 1992 calls for 100% in VSS classes 5 & 6 and 0% in VSS classes 1-4 in nest areas.

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

Crocker-Bedford (1990) noted: "After partial harvesting over extensive locales around nest buffers, reoccupancy decreased by an estimated 90% and nestling production decreased by an estimated 97%. Decreases were probably due to increased competition from open-forest raptors, as well as changes in hunting habitat and prey abundance."

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

PINE MARTEN

The Northern Goshawk is another Nez Perce NF MIS. The PA states, "American marten habitat is well represented and available throughout the Forest and project area, exceeding that which is required to maintain viable populations at the regional scale."

Unlike for the grizzly bear, which has been spotted in the project vicinity in recent years but whose presence in the project area is vehemently denied, the PA indicates there have been "no documented observations of marten within the project area" yet the agency says, "Martens are likely to be present within the project area."

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

The PA fails to conduct an analysis of the historic range of marten habitat on the Forest, thus it also fails to conduct the proper cumulative effects analysis.

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

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

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

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

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

PILEATED WOODPECKER

The PA indicates the proposed logging would destroy habitat for species needing the kind of habitat features found in mature and old-growth forests, such as the pileated woodpecker.

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

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

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

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

- Number of potential feeding sites per acre
- Average diameter of potential feeding sites

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

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

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

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

McClelland (1977), states:

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

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

What is the scientific basis the FS relying upon Appendix N Forest Plan snag standards**?** Were those standards based the range of historical conditions for snags on the Nez Perce NF?

Recent scientific research reveals the inadequacy of the snag standards. For one example, Lorenz et al., 2015 state:

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

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

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."

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

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

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

Spiering and Knight (2005) found the following:

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

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

The Twentymile PA fails to quantify the cumulative snag loss in previously logged areas or subject to other management-caused snag loss such as road accessed firewood cutting.

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

The PA fails to quantify snag loss would be expected because of safety concerns which vary with different methods of log removal.

The Twentymile PA does not cite any science to support its assumption that the FS management will result in snags and down logs in abundance to continuously support viable populations. No monitoring is cited to support claims of benefits to snag and down log-dependent species' population numbers or distribution.

No estimates of snags for the project area state how statistically robust the project area surveys are for making accurate estimates and analyses.

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

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

The Twentymile PA does indicate the population trend for the pileated woodpecker is negative: "IMBCR surveys within the Nez Perce National Forest indicate a downward population trend, though limited detections reduce the confidence in the trend direction." It also states, "There have been multiple confirmed and unconfirmed observations of pileated woodpeckers within the project area, but no known nests."

BLACK-BACKED WOODPECKER

The viability of the Sensitive black-backed woodpecker is threatened by fire suppression and other "forest health" policies that specifically attempt to prevent its habitat from developing. "Insect infestations and recent wildfire provide key nesting and foraging habitats" for the black-backed woodpecker and "populations are eruptive in response to these occurrences" (Wisdom et al. 2000). A basic purpose of the FS's management strategy, as exemplified by the PA, is to negate the natural processes that the black-backed woodpecker biologically relies on; the emphasis in reducing the risk of stand loss due to stand density coupled with the increased risk of stand replacement fire events. Viability of a species is in jeopardy if habitat suppression is a forestwide policy.

The significance of project effects (including risk to viability) cannot be determined in the absence of a forestwide cumulative effects analysis of the FS's fire suppression policies.

Please see the Hanson Declaration, 2016 for an explanation of what a cumulative impact is with 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, 2006) 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.

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

> Contrary to what one might expect to find immediately after a major disturbance event, I detected a large number of species in forests that had undergone stand-replacement fires. Huff et al. (1985) also noted that the density and diversity of bird species in one- to two-year-old burned forests in the Olympic Mountains, Washington, **were as great as adjacent old-growth forests**…
>
> …Several bird species seem to be relatively **restricted** in distribution to early post-fire conditions… I believe it would be difficult to find a forest-bird species more restricted to a single vegetation cover type in the northern Rockies than the Black-backed Woodpecker is to early [first 6 years] post-fire conditions. (Emphasis added).

USDA Forest Service 2011c states:

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

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

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

Cherry (1997) states:

> The black-backed woodpecker appears to fill a niche that describes everything that foresters and fire fighters have attempted to eradicate. For about the last 50 years, disease and fire have been considered enemies of the ‘healthy’ forest and have been combated relatively successfully. We have recently (within the last 0 to 15 years) realized that disease

> and fire have their place on the landscape, but the landscape is badly out of balance with the fire suppression and insect and disease reduction activities (i.e. salvage logging) of the last 50 years. Therefore, the black-backed woodpecker is likely not to be abundant as it once was, and **continued fire suppression and insect eradication is likely to cause further decline.** (Emphasis added.)

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

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

Cherry (1997) also notes:

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

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

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

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

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

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

In the nearby Blue Mountains of Eastern Oregon (Bull et al. 1986, Nielsen-Pincus 2005), it was found that grand fir cover types were used approximately 27% of the time for nesting in Bull's 1970s study and 14% of the time in Nielsen-Pincus's study of the same general area in 2003-2004. And yet, the Dead Laundry project would target grand fir for removal in some of the most valuable woodpecker habitat in the project area.

The emphasis on stand thinning and salvage of dying trees is of a concern for the black-backed woodpecker (Hutto 2008, Dudley et al. 2012, and Tingley et al. 2014).

The viability of black-backed woodpeckers is threatened by the FS's fire suppression and other "forest health" policies, which specifically attempt to prevent its habitat from developing. "Insect infestations and recent wildfire provide key nesting and foraging habitats" for the black-backed woodpecker and "populations are eruptive in response to these occurrences" (Wisdom et al. 2000). A basic purpose of the Twentymile 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 NPCNF. Viability of a species cannot be assured, if habitat suppression is a forestwide policy.

The Twentymile PA does not disclose the quantity and quality of habitat necessary to sustain the viability of the black-backed woodpecker.

ROCKY MOUNTAIN ELK

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

The PA fails to provide a meaningful analysis of the 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."

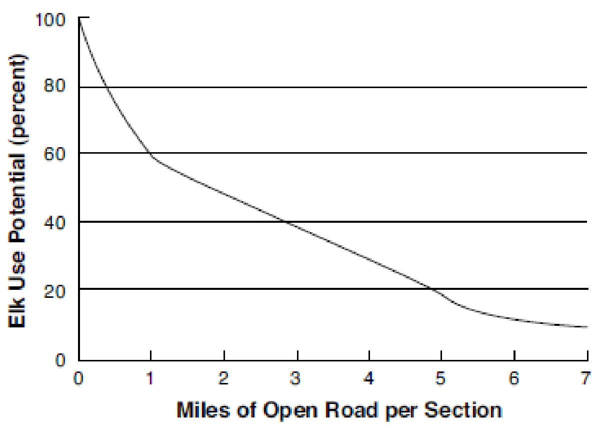
Thomas et al., 1988a also state:

> 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.

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:



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

SNAG HABITAT

The PA states, "at the project scale, snag habitat would be retained according to Appendix N of the Forest Plan that requires an average of 1.4 snags per acre outside of riparian areas. All retained snags must be at least 12 inches DBH, and one snag per 10 acres must be greater than 20 inches DBH." The PA cites Forest Plan Appendix N incorrectly. Blow, the Forest Plan Appendix N "Snag Management Standards" are cited precisely:

> The Forestwide goal is to manage riparian areas to support 80 percent of maximum populations of snag-dependent species and all other areas to support 60 percent of maximum populations of snag-dependent species. This goal requires that we provide 1.8 snags per acre in riparian areas and 1.4 snags per acre in all other areas with 1 snag per 10 acres greater than 20 inches DBH and the rest greater than 12 inches DBH. Providing snags of this size in lodgepole pine stands may not be possible. If not, the largest diameter size available will be provided. Because of loss due to windthrow or other causes, 5 green trees per acre must be designated in order to maintain 1.8 snags per acre in riparian areas through time and 4 green trees per acre must be designated in order to maintain 1.4 snags per acre in all other areas. Of these trees, at least one should be greater than 20 inches DBH and the remainder greater than 12 inches DBH. Wind firm trees, at least 40 feet tall with broken tops, are preferred.

> Location of clumps and individual leave trees should consider:
> 1. Safety.
> 2. Resistance to windfall.
> 3. Efficient logging operation.
> 4. Ease of slash treatment.
> 5. Protection from firewood cutters.
>
> Larch and ponderosa pine are the preferred species. Measures needed to protect existing snags and replacement trees in cutting units will be identified as part of project planning.
>
> It is not necessary to meet these standards on every acre. Leave trees should be grouped into 1-2 acre clumps distributed throughout cutting units. Strive to retain the desired number of trees on a 100-acre basis.
>
> In addition to retaining replacement trees, non-merchantable snags in addition to the snags needed to meet snag management objectives should be left standing wherever possible. In order to comply with OSHA safety standards, snags that are safety or operational hazards will be removed.
>
> Verify the quality, amount, and distribution of snags within project area boundaries during project planning.

In mis-stating the Forest Plan, the PA fails to demonstrate the Twentymile project would be implemented consistent with the Forest Plan, in violation of NFMA.

WHITEBARK PINE

The PA doesn't explain why the proposed activities can't result in "take" as per the Endangered Species Act, even though surveys for this Threatened species won't be conducted.

VIABILITY

We incorporate the discussion on viability from FOC's comments on the Draft Forest Plan and EIS (pp. 131-133).

The Forest Plan defines "viable population" as "A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population in the planning area."

The FS fails to set meaningful thresholds and assumes without scientific basis that project-caused habitat losses will not threaten population viability. Of such analyses, Schultz (2010) concludes that "the lack of management thresholds allows small portions of habitat to be eliminated incrementally without any signal when the loss of habitat might constitute a significant cumulative impact." In the absence of meaningful thresholds of habitat loss and no monitoring of wildlife populations at the Forest level, projects will continue to degrade habitat across the NPCNF over time. (See also Schultz 2012.)

USDA Forest Service, 1987d states:

> Defining viable populations and assessing diversity are difficult tasks in the time frame of the Forest Plan. The wildlife and fisheries section of the Forest Service Handbook on Planning (FSH 1902.12) defines a viable population as one that "consists of the number of individuals, adequately distributed throughout their range, sufficient to perpetuate their long-term existence in natural self-sustaining populations." Shaffer (1981) refines this definition by saying a minimum viable population is one that can withstand these environmental changes and have a 99 percent chance of surviving 1000 years. The terms viable, minimum viable and threshold level are often used interchangeably in relation to population levels. I prefer to distinguish between viable and minimum viable populations and consider a minimum viable population as a population at the threshold level of viability. Above the threshold the population is viable, below it isn't.

Salwasser and Hanley (1980) also list five factors that largely determine population viability. These factors are:

> 1. population size and density;
> 2. reproductive potential;
> 3. dispersal capability
> 4. competitive capability; and
> 5. habitat characteristics.
>
> (T)here are some wildlife species that are very sensitive to Forest activities and development such as timber sales, road construction, and oil, gas and mineral development. …Maintaining viable populations of these species will require special consideration. These species can be lumped into three categories:
> 1. endangered, threatened or sensitive species
> 2. old-growth dependent species; and
> 3. snag dependent species.

The FS must address issues consistent with best available scientific information, such as the "estimated numbers", minimum number of reproductive individuals of each species, and population dynamics.

Traill et al., 2010 and Reed et al., 2003 are published, peer-reviewed scientific articles discussing what constitutes a minimum viable population. The FS does not identify best available scientific information that provides scientifically sound, minimum viable populations for any species.

Traill et al., 2010 state:

> To ensure both long-term persistence and evolutionary potential, the required number of individuals in a population often greatly exceeds the targets proposed by conservation

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

The fact that the Nez Perce NF has not monitored the population trends of its MIS as required by the Forest Plan begs more discussion. 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 Forest makes it imperative that population viability be assessed at least at the forest-wide 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 the FS has not done this either. It is also of paramount importance to monitor population trends (which the FS promised the public it would do during development of the Forest Plan) during Forest Plan implementation in order to validate assumptions used about long-term species persistence i.e., population viability (Marcot and Murphy, 1992; Lacy and Clark, 1993).

Schultz, 2010 criticizes Forest Service wildlife analyses based primarily upon habitat availability, because habitat alone is insufficient for understanding the status of populations. (See also Noon et al., 2003; Committee of Scientists, 1999.). Schultz, 2010 recommendations call for peer review of large-scale assessments and project level management guidelines, and for adoption of robust, scientifically sound monitoring and measurable objectives and thresholds for maintaining viable populations of native species.

Mills, 1994 also criticizes the FS's use of the term "viable" while only referring to habitat characteristics while ignoring population dynamics. Population dynamics refers to persistence of a population over time—which is key to making predictions about population viability. Mills, 1994 explains the range of parameters that must be used to make a scientifically sound assessment of wildlife species viability, including assessing population size, population growth rate, and linkages to other populations. Ruggiero, et al. (1994a) also point out that a sound population viability analysis must utilize measures of population dynamics. Finally, the USDA's 2000 NFMA planning regulations also recognized the importance of consideration of population dynamics for sustaining species. The FS fails to consider best available science on population dynamics.

The PA relies upon Northern Region wildlife habitat relationship models (Samson 2006a, Samson 2006b) or other models. It fails to address the fact that Sampson's analyses are about as old as a Forest Plan was designed to last, and who knows how old the data are that was used in the analyses. Samson did not evaluate long-term viability for the fisher and marten, but he did do so for the goshawk, pileated woodpecker, flammulated owl and black-backed woodpecker. Sampson concluded, "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 PA fails to disclose Sampson's long-term viability conclusions. In his analysis, 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 National Forest Management Act (NFMA) and Endangered Species Act (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 Samson analyses are now more than 20 years old. There have been more wildfires in this time frame, and more large timber sales.

Thus, the short-term viability analysis is scientifically unsound and it is very doubtful it could sustain scientific peer review. Schultz (2010) captured this sentiment in her critique: "some interviewees also thought the work should be peer reviewed, especially if it was conducted by USFS management, and several were skeptical that it would survive such review."

FOC's comments on the Dead Laundry EA provided this same detailed critique of that EA's reliance on Samson assessments. In the responses to comments, the FS wrote nothing regarding those specific criticisms. The FS ignores what it cannot refute.

ACCESS AND TRAVEL MANAGEMENT

Within these comments we incorporate FOC's August 27, 2014 letter to the Forest Supervisor concerning the Nez Perce-Clearwater National Forests' travel analysis (36 CFR § 212 Subpart A). And we incorporate our comments on the Draft Revised Forest Plan, concerning roads, found on pp. 301-323.

In a report prepared for the Environmental Protection Agency, Endicott, 2008 notes the "physical impacts of forest roads on streams, rivers, downstream water bodies and watershed integrity can be dramatic and have been well documented." According to Endicott, 2008, "forestry-related sediment is a leading source of water quality impairment to rivers and streams nationwide." Remarkably, EPA indicates that "up to 90% of the total sediment production from forestry operations" comes from logging roads and steam crossings.[16] A significant portion of this sediment is collected and discharged directly into rivers and streams through ditches, channels, and culverts. (Endicott, 2008.)

The EPA states, "[s]tormwater discharges from logging roads, especially improperly constructed or maintained roads, may introduce significant amounts of sediment and other pollutants into surface waters and, consequently, cause a variety of water quality impacts."[17]

Endicott, 2008 states:

> There is no question that stormwater pollution from industrial logging roads and forest roads is harming and has the potential to harm beneficial uses, including spawning and rearing habitat for salmon and steelhead and drinking water supplies. Important ecological, economic, and social consequences stem from the sediment discharged from ditches, channels, and culverts along forest roads. Ecologically, fine and coarse-grained sediment loading degrades water quality and detrimentally affects fish and other aquatic species' habitat. (Endicott, 2008.) Sedimentation affects streams by reducing pool depth, altering substrate composition, reducing interstitial space, and causing braiding of channels (Rieman and McIntyre 1993), which reduce carrying capacity. The effects of road construction and associated maintenance account for a majority of sediment loads to streams in forested areas;
>
> Sedimentation negatively affects bull trout embryo survival and juvenile bull trout rearing densities. (Shepard et al. 1984 at 6; Pratt 1992 at 6.) An assessment of the interior Columbia Basin ecosystem revealed that increasing road densities were associated with declines in four nonanadromous salmonid species (bull trout, Yellowstone cutthroat trout (*Oncorhyncus clarkii bouvieri*), westslope cutthroat trout (*O. c. lewisi*), and redband trout (*O. mykiss spp.*)) within the Columbia River basin, likely through a variety of factors associated with roads. Bull trout were less likely to use highly roaded basins for spawning and rearing and, if present in such areas, were likely to be at lower population levels.

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[16] *Guidance Specifying Management Measures For Sources of Nonpoint Pollution in Coastal Waters,* EPA Guidance Paper 840-B-93-001c, at 27 (1993); *see also* Endicott 2008 at p. 9.
[17] 77 Fed. Reg. 30473 (May 23, 2012).

> (Quigley and Arbelbide 1997 at 1183.) These activities can directly and immediately threaten the integrity of the essential physical or biological features necessary for bull trout survival.

Endicott, 2008 concluded:

> The physical impacts of roads have detrimental effects on fish and fish habitat. Mechanisms through which roads exert these deleterious impacts include fine sediment effects, changes in streamflow, changes in water temperature caused by loss of riparian cover or conversion of groundwater to surface water, and migration barriers. The physical impacts of roads discussed above have widespread and profound effect on fish habitat and fish communities in populations across a wide range of environments and conditions (Lee at al., 1997).

The Twentymile PA does not demonstrate the FS is managing the project area and forest consistent with the Travel Management Regulations (36 CFR 212) Subpart A which requires the FS to involve the public while conducting a science-based analysis to identify the minimum road system needed to manage the Forest ecologically sustainably and within expected budgets.

"The road system within the project area includes …many un-authorized alignments that are not inventoried and typically, not mapped." The PA does not disclose the conditions of those "un-authorized alignments", nor the degree or extent of these existing non-system roads or "existing templates" in the project area. It's likely most will not be used as timber haul routes, and will therefore likely continue to degrade and erode, which means potential chronic sources of sediment and/or mass wasting. The PA does not analyze and disclose ongoing ecological impacts or economic implications of these non-system roads."

Lacking a proper travel analysis, there is no way for the public to expect the post-project road and trail network would be affordable and maintenance needs could be addressed by expected budgets—or if the erosive forces of nature will be the main manager of the transportation network instead.

The FS has performed no economic analysis that identifies sources of funds needed to maintain the road system. When the project mitigation stops in a year or two, the trajectory for fish habitat conditions will be downward. Beschta et al., 2004 state:

> (R)oad and landing construction is expensive and can siphon limited funds away from effective restoration measures, such as obliteration and maintenance. The backlog in maintenance of U.S Forest Service roads has been estimated to be several billion dollars (U.S. Department of Agriculture Forest Service 2000), and road construction inevitably adds to this seemingly insurmountable backlog. For these reasons**, the construction and reconstruction of roads and landings is not consistent with postfire ecosystem restoration.** (Emphasis added.)

Johnson (1995) states, "For the roads we no longer actively use, our dwindling road maintenance budget will make it difficult to maintain the culvert crossings. When these fail during storm and runoff events, tremendous amounts of sediment can be delivered directly to the channel and from there down to lower streams with significant beneficial uses such as sensitive fish habitat." The FS fails to analyze the significance of this foreseeable lack of maintenance in the project area—the direct, indirect and cumulative effects poorly maintained roads have on water quality.

The PA does not disclose the impacts of project area system roads not maintained in conformance to BMPs or in compliance with standards, because of funding shortfalls or other management inadequacies. The PA does not disclose the impacts of roads that go without maintenance because they are unauthorized or non-system. Nonsystem roads are not on any Forest inventory, and are not addressed by the annual road maintenance budget.

"Temporary roads" often remain on the landscape indefinitely. Beschta et al., 2004 explain that, whatever "temporary" means in this project's context, the newly disturbed sites have most of the hydrological and soil impacts of new road construction over the short- and long-term:

> Accelerated surface erosion from roads is typically greatest within the first years following construction, although in most situations sediment production remains elevated over the life of a road (Furniss et al. 1991; Ketcheson & Megahan 1996). Thus even "temporary" roads can have enduring effects on aquatic systems. Similarly, major reconstruction of unused roads can increase erosion for several years and potentially reverse reductions in sediment yields that occurred with disuse. (Potyondy et al. 1991). Where roads are unpaved or insufficiently surfaced with erosion-resistant aggregate, sediment production typically increases with increased vehicular usage (Reid & Dunne 1984).

Reid & Dunne, 1984 state:

> 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.

Even several years after decommissioning, conditions that affect erosion (e.g. infiltration & erodibility, vegetation cover) undergo nominal improvement (Foltz et al. 2007) and there's no indication that these conditions ever fully recover.

The PA does not incorporate the science-based transportation analysis required under 36 CFR § 212 Subpart A, and so there was no assessment that identified the unneeded roads.

The PA expresses "Goal 2: Improve project area infrastructure by changing access management to provide for a secondary means of egress for the public from the Sourdough or Tenmile Creek area in the case of a large fire and by maintaining roads for quicker ingress and egress for firefighters and the public." The PA cites no direction that compels the FS to change road access for such purposes. There are no private land parcels in the project area, so there's no compelling public safety issue. There is no Forest Plan or regulatory direction to willy-nilly make firefighting access easier across the NPCNF, which would be the logical conclusion of this management proposal. The FS isn't even trying to comply with Subpart B of the Travel Management Rule, which is the procedure to change designations of motorized routes on the Forest.

The FS has failed to finalize its decision for the Designated Routes and Areas for Motor Vehicle Use (DRAMVU) project, applicable to the Nez Perce NF. FOC submitted comments and an objection, and the Regional Office responded with a letter acknowledging the inadequacy of the FEIS. For your convenience, those documents are being provided along with this letter. Those documents also include a critique of the FS's noncompliance with the Travel Management Rule Subpart A, which requires the FS to conduct a science-based analysis for identifying the minimum road system needed to ecologically sustainably manage the NPCNF and within expected budgets.

The FS regulations at 36 CFR § 212 Subpart A require the FS to identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of national forest lands. The NEPA process the FS used for Twentymile project design is not consistent with the Travel Management Regulations at 36 CFR § 212 Subpart A.

On March 3, 2000, the FS set a course to revise 36 CFR Part 212 to shift emphasis from transportation development to managing administrative and public access within the capability of the lands. The proposal was to shift the focus of National Forest System road management from development and construction of new roads to maintaining and restoring needed roads and decommissioning unneeded roads within the context of restoring healthy ecosystems.

On January 12, 2001, the FS issued the final National Forest System Road Management Rule. The rule revised regulations concerning the management, use, and maintenance of the National Forest Transportation System. Consistent with changes in public demands and use of National Forest System resources and the need to better manage funds available for road construction, reconstruction, maintenance, and decommissioning, the final rule removed the emphasis on transportation development and **added a requirement for science-based transportation analysis**. The final rule is to help ensure that additions to the National Forest System road network are those deemed essential for resource management and use; that construction, reconstruction, and maintenance of roads minimize adverse environmental impacts; and that **unneeded roads are decommissioned** and restoration of ecological processes are initiated. (Emphases added.)

The PA does not incorporate the required science-based transportation analysis, and so there was no assessment that identifies all of the unneeded roads. Our comments on the Draft Revised Forest Plan state:

> …the Nez-Clear National Forest has yet to identify, let alone achieve, a MRS that complies with Subpart A requirements. It is unclear if the Forest Service recognizes this fact, as it asserts, "*[i]n 2015, a forest-level roads analysis was completed for the Nez Perce-*

> *Clearwater. This analysis established a minimum road system for arterial, collector, and important local class National Forest roads on the Nez Perce-Clearwater.*"[18] Only NEPA-level decisions can identify the minimum road system, as the analysis may have acknowledged when it explained agency officials utilize the report as it works to identify the MRS.[19]…Further, we question the utility of the 2015 Travel Analysis Report as it recommended only 14 miles of road as "unneeded."[20] The Nez-Clear National Forest contains 7,682 miles of NFS road, and 14 miles represents just 0.18 percent of the total road system. It is beyond likely such a reduction could ever represent long-term funding expectations as required by Subpart A, or that such a small reduction would result in a road system that provides for the protection of NFS lands. A fact the Forest Service seems to recognize since it has decommissioned over 200 miles of road between 2015-2018.[21]As such, the Forest Service cannot rely on its 2015 TAR to adequately inform recommendations that will satisfy Subpart A requirements.

The NPCNF's identification of a paltry 14 miles of road as "unneeded" stands in stark contrast to the red/green map FOC obtained under FOIA concerning the NPNF, from the year 2000.

Forestwide, roads are not being maintained as needed. In the January 7, 2003 Clearwater National Forest Roads Analysis Report it states:

> **Key Findings: Road maintenance funding is not adequate to maintain and sign roads to standard.**
>
> This road analysis clearly shows that annual appropriated maintenance funding is inadequate to maintain the current road system on the Forest. Many roads will continue to build up additional deferred maintenance costs and degrade unless increases in road management funding become available.

Also, "Road maintenance funding is not adequate to maintain and sign roads to standard. …Congressionally appropriated road maintenance funding is approximately 22% of what is needed for the current classified road system." (*Id*.)

Also, "Congressionally appropriated road maintenance funding is approximately 9% of what is needed for the current classified road system." (Nez Perce National Forest Roads Analysis Report, 2006.) That report also admits:

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[18] Draft Revised Forest Plan DEIS, p. 3.4.4-7.

[19] *Id.*, (stating, "The travel analysis report is used by the Nez Perce-Clearwater to prioritize maintenance needs and identify opportunities to decommission roads or put them into intermittent stored service as the Nez Perce-Clearwater works to identify the minimum number of routes needed for an efficient transportation system, as directed in 36 CFR § 212 subpart A.").

[20] *Id.*

[21] *Id.,* p. 3.4.4-10, Table 1. (That DEIS states incorrectly that Table 2 provides decommissioning numbers for the Nez Perce National Forest, but the table's title states "Miles of roads constructed from 1999 to 2018 on the Nez Perce National Forest.").

> Some arterial, collector and local roads are not being maintained to specified standards. In some areas the road system will continue to degrade and this will affect future access to areas served by these roads.

The PA fails to analyze the implications of insufficient funding for the project area.

FOC's August 27, 2014 Travel Analysis letter to the Forest Supervisor cited scientific information including Wisdom, et al. (2000):

> 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.**
>
> **...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.**

36 CFR § 212 Subpart A directs each national forest to conduct "a science-based roads analysis," generally referred to as the "travel analysis process." The FS Washington Office, through a series of directive memoranda, instructed forests to use the Subpart A process to "maintain an appropriately sized and environmentally sustainable road system that is responsive to ecological, economic, and social concerns." These memoranda also outline core elements that must be included in each Travel Analysis Report.

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

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

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

- Produce a Travel Analysis Report summarizing the travel analysis;
- Produce a list of roads *likely not needed for future use*; and

• Synthesize the results in a map displaying roads that are *likely needed* and *likely not needed in the future* that conforms to the provided template.

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

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

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

The huge estimated annual maintenance costs for roads on the NPCNF far exceed all published estimates of road maintenance funding the Forest has received annually for decades. And although the FS never likes to conduct an analysis of or disclose the forest-wide ecological impacts of its road maintenance funding shortfalls, projecting from discussion in Gucinski et al. 2001 helps to start imagining the scale of the impacts.

It is vital to recognize and consider (as the FS fails to do here) 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. (Gucinski et al., 2001)

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. 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, also 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.)

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 FS must not assume the project will adequately mitigate the problems chronically posed by the road network by project roadwork and BMP implementation. 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.”

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 this one. 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.)

The FS may find out later that significant erosion, sediment, or other resource damage problems exist on roads not needed for log hauling, but the PA makes no commitments to bring all the roads up to BMP standards or otherwise fix the damage. The PA fails to consider the resulting impacts on water quality and fish habitat.

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.

We cannot discern if the FS has conducted any on-the-ground surveys for inventorying sediment sources in the project area. Fly et al., 2011 describes a thorough survey in the Boise National Forest.

Roads influence many processes that affect aquatic ecosystems and fish: human behavior (poaching, debris removal, efficiency of access for logging, mining, or grazing, illegal species introductions), sediment delivery, and flow alterations. We incorporate The Wilderness Society

(2014), which discusses some of the best available science on the ecological impacts of roads. We also incorporate the WildEarth Guardians, 2020 report, “The Environmental Consequences of Forest Roads and Achieving a Sustainable Road System.”

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 evaluation 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., 2012).

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.)

The PA does not show that project area Road Management Objectives have been developed consistent with the Travel Management Regulations.

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

The Twentymile PA does not demonstrate that the FS has implemented or applied the minimization criteria in the route designation process, consistent with the objective of minimizing impacts. The PA does not adequately reflect how the FS applied the minimization criteria in its motorized trail and area designations, and the agency's draft DN is arbitrary and capricious and violates the Administrative Procedure Act (APA), NEPA, the National Forest Management Act (NFMA), the Travel Management Rule and the ORV Executive Orders.

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 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."

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

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

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.)

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.

Members of the ID Team for the Clear Creek Project fully expressed concerns in project files for that project. From 110606TransportationNFMAQuestions.docx:

> 2. What is broke or at risk?
> The existing size of the transportation system is in excess of what is needed for current uses of the National Forest land. Newer technologies require a less invasive road system structure. A history of skid road or jammer road use, and not properly stabilizing roads has lead to a higher risk of failure by landslides and culvert washouts. These risks are even higher in landslide prone landscapes.

Another concern with the large transportation system is that it is cost prohibitive to maintain. The Forest cannot currently maintain all of the transportation system. Currently higher priority roads are being maintained to minimal standards, while other roads are not being maintained and have deferred maintenance. Roads with reduced maintenance or no maintenance are at a higher risk of failures and road closures.

More than 50 percent of the Nez Perce National Forest roads were built between 1960 and 1979. Road standards used during construction of these roads employed current BMPs. The life span of BMPs range anywhere from 10 to 50 years with repeated maintenance, so it is likely that many BMPs installed during original construction are at the end of their life span. BMPs productivity and life spans are reduced if maintenance has not occurred. Roads with BMPs near or at the end of their life span have a higher risk of failure.

4. How do you fix it?
Analyze all the system and non-system roads in the area and determine a minimum road system required based on needs and risks. Maintain roads needed for public and administrative use. Prioritize the repair of the needed roads based on risk and needs. Update all needed roads to ensure existing standards are met. Updates may include reconstruction, relocation or maintenance of roadways so they are in a stable condition. During the updates, use BMPs for minimal impact on the watershed.

Decommissioning roads no longer needed for access, that are temporary in nature, that are causing environmental damage or that are redundant.

9. What are the social / resource implications of no actions?
With only limited road maintenance and no decommissioning, roads will fail causing irreparable resource damage. Road fill and culvert failures will have an impact on stream quality. Public safety is also a concern with no action. To protect individuals from failing roads, road closures would be a common occurrence. Limited to no maintenance leads to structure failures of culverts, bridges and road fills. As road densities in the assessment area are considered high, by no action, there will be a continued adverse affects on the wildlife.

10. What are some of the foundational elements used in shaping your responses?
Nez Perce National Forest Plan
Selway Middle Fork Subbasin Assessment
CFR 36, Part 212, Travel Management Rule - Subpart A
Interior Columbia Basin Assessment

(Emphasis added.) From 111017WildlifeClearCreekNFMAComments.docx:

What's broke / at risk (threats) (this is all based on roads which are likely the largest cumulative effects out there. I believe we need to manage motorized uses in identified "sacrifice areas" and restrict motorized use in high quality habitats. I believe there is demand for a restricted roaded setting for hunters to use roads in a non-motorized setting.

From 110606NFMAQuestionsKaren.docx:

> What's broke / at risk
> Roads are the major contributor of sediment to streams, especially at stream crossings. Ditchlines can direct flow and road surface sediment into perennial streams at crossings. These can be a chronic (ongoing) source of sediment to streams. Culverts at crossings are mostly undersized which greatly increases the risk of plugging and failure. Crossing failures can contribute large amounts of sediment to streams. They can be costly to fix and the sediment delivered to streams can take decades to flush out of the system. Road failures also disturb existing vegetation and expose bare soil to potential erosion until the site heals.

The PA fails to demonstrate compliance with all relevant forest plan standards, in violation of the Forest Plan and NFMA. The PA violates the Travel Management Regulations at 36 CFR § 212. It also violates NEPA by failing to use the best available science, and by failing to disclose project inconsistency with the Travel

The FS must prepare an EIS that incorporates the minimum road system prepared in compliance with the Travel Management Rule.

SOIL PRODUCTIVITY

"In the event of an extreme wildfire, SBS is likely to be high. High SBS is associated with consumption of pre-fire surface litter layers, fine roots within several inches of the soil surface, and even large tree roots deep into the soil. Soils may be loose, unable to bind together and retain water. These soils are very susceptible to erosion and often have high surface run-off during rainstorms. As a result, soil productivity would decline." Please cite the results of FS monitoring and/or studies of post-fire conditions following wildland fires on the Forest in recent decades, which the FS is basing the above conclusion.

"The estimated DSD from the Proposed Action is expected to remain below the Forest Plan standard of 20% for all treatment units. Further, by implementing SDEs and ADEs, disturbance levels would be reduced, and recovery times would be shortened. After rehabilitation, DSD would not exceed 15% in any activity area." Please cite the results of FS monitoring and/or studies on the Forest upon which the FS is basing the "reduced" and "shortened" conclusions.

USDA Forest Service 2014a discusses and discloses the complexities of fire and management-induced changes on soils:

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

The R-1 SQS and definition of DSD consider alterations to physical properties, but not chemical or biological properties. The R-1 SQS does not adequately consider best available science, in violation of NEPA. One of these biological properties is partly represented by naturally occurring organic debris from dead trees. The R1 SQS recognize the importance of addressing potential long-term soil impacts due to losses of large woody debris, but include only discretionary guidelines to address the issue.

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.)

Recent research reveals profound biological properties of forest soil ignored by the PA: "(R)esource fluxes through ectomycorrhizal (EM) networks are sufficiently large in some cases to facilitate plant establishment and growth. Resource fluxes through EM networks may thus serve as a method for interactions and cross-scale feedbacks for development of communities, consistent with complex adaptive system theory." (Simard et al., 2015.) The FS has never considered how management-induced damage to EM networks causes site productivity reductions.

The FS fails to consider the role of mycorrhizal fungi in maintaining ecological integrity. Mycorrhizal networks play important roles in mitigating the impacts of climate disruption to forest ecosystems. They facilitate regeneration of migrant species that are better adapted to warmer climates and primed for resistance against insect attacks. (Song et al. 2015.) To achieve these benefits all of the parts and processes of highly interconnected forest ecosystems must be preserved and protected.

Mycorrhizal fungi distribute photosynthetic carbon by connecting the roots of the same or different tree species in a network allowing each to acquire and share resources. Large mature trees become the hubs of the network and younger trees the satellite nodes.

Mycorrhizal networks transmit water, carbon, macronutrients, micronutrients, biochemical signals and allelochemicals from one tree to another, usually from a sufficient tree to a tree in need. This type of source-sink transfer has been associated with improved survivorship, growth and health of the needy recipient trees in the network.

Recognition of kin is also evident between established large hub trees and their seedlings and saplings. Hub trees shuttle their kin more micro-elements and support more robust mycorrhizal networks providing them with a competitive advantage. However, hub trees also share resources with strangers, suggesting these evolutionary mechanisms exist not just for individual species but also at the community level.

Injury to a tree from defoliation by an insect herbivore or by physically removing foliage results in the transmission of defense signals through the connecting mycorrhizal mycelium to neighboring trees. These neighbors respond with increased defense-gene expression and defense-enzyme activity, resulting in increased pest resistance.

In Douglas-fir, sudden injury to a hub tree not only increases defense enzymes of healthy neighbors but elicits a rapid transfer of photosynthate carbon to a healthy neighbor. This suggests that the exchange of biochemicals between trees elicits meaningful changes in the senders' and receivers' behavior that enables the community to achieve greater stability in the face of a changing climate. (Song et al. 2015.)

The complete omission of any consideration of mycorrhizal networks is a symptom of a single minded vision of the future that is inconsistent with the unpredictability of climate-driven change. Instead, forest managers should use scenario building models to explore an envelope of probable futures that becomes wider the further forward one projects. (Lempert, 2002.) In this more multifaceted approach based on complex systems science, managers quantify the likelihood of each scenario and then address the ranges of uncertainties in the ecological, social, and economic dimensions. (Filotas, et al., 2014).

While much of the science demonstrating the importance of mycorrhizal networks is recent, the concepts are not new. For example, the FS's own scientists (Harvey et al., 1994) invoked the relationship between chemical properties and biological properties: "Productivity of forest and rangeland soils is based on a combination of diverse physical, chemical and biological properties." Harvey et al., 1994 further expands on this (emphases added):

> **The Soil as a Biological Entity**
> Traditionally, some have viewed soil as inert and inanimate, and soil properties have often been perceived as distinctive but relatively unchanging—except for plant nutrients—and based on mineral constituents. The organic horizons have, until recently, been largely ignored. Soil microbes have also been ignored, except for a few high-profile organisms (such as soil-borne pathogens and mycorrhizal fungi). Predictions by forest growth models have keyed almost exclusively on vegetation, gross land form, and site characteristics—the aboveground characteristics of the last rotation were assumed to be the best indicator for predicting growth, ignoring soil and related soil-borne processes. If soil potential was reduced, the assumption was that fertilizing could offset any damage. This approach has fostered a significantly overoptimistic view of the health and productivity potential for second generation forests (Gast and others 1991, Powers 1991).

Contemporary studies indicate that **soil quite literally resembles a complex living entity**, living and breathing through **a complex mix of interacting organisms-from viruses and bacteria, fungi, nematodes, and arthropods to groundhogs and badgers**. **In concert, these organisms are responsible for developing the most critical properties that underlie basic soil fertility, health, and productivity** (Amaranthus and others 1989, Harvey and others 1987, Jurgensen and others 1990, Molina and Amaranthus 1991, Perry and others 1987). **Biologically driven properties resulting from such complex interactions require time lines from a few to several hundreds of years to develop, and no quick fixes are available if extensive damages occur (Harvey and others 1987)**.

Microbial Ecology
The variety of organisms residing in forest soils are extensive; all contribute to soil development and function, some in very critical ways (Amaranthus and others 1989). Although this section concentrates on the microbes (primarily bacteria and fungi), we recognized that **several orders of insects, earthworms, and burrowing mammals make significant and sometimes critical contributions to organic matter decomposition, soil mixing, and microbe propagule movement within many forest soils** (Molina and Amaranthus 1991, Wilson 1987).

The numbers and biomass of microbes in forest soil can be staggering; for example 10 to 100 million bacteria and actinomycetes, 1000 to 100,000 fungal propagules, and several kilometers of hyphae (fungal strands) can be present in a single gram of soil (Bollen 1974). The biomass related to such numbers is also staggering. Old-growth Douglas-fir forests of the Pacific Northwest can contain 4200 kg/ha dry weight of fungal hyphae and 5400 kg/ha of ectomycorrhizal root tips alone (Fogel and others 1973). Bacterial biomass could equal or exceed fungal biomass, and **the total biomass of an inland cedar/hemlock forest should be very nearly comparable to a coastal Douglas-fir forest. Thus, microbial biomass in eastside forests could easily reach 10,000 kg/ha and are a force to consider in management methods.**

…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[22] 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.)

Over 25 years ago, Harvey et al., 1994 asked the following question: “Can individuals (or groups) parasitize one another, that is to say, move nutrients or photosynthate around within a stand to

[22] Nitrogen

balance temporary shortfalls? Such movement has yet to be widely demonstrated, except in simple microcosms (Read and others 1985), but it seems likely, particularly on highly variable sites that include harsh or infertile environments (ferry and others 1989)." More recent research answers that question with a resounding **yes**. (E.g. Simard et al., 2015; Gorzelak et al., 2015).

In regards to the profound **biological properties** of forest soil, Simard et al., 2015 conclude from their research on relationships between fungi and plants (how nutrient transfers are facilitated by fungal networks) state, "resource 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., 2013 state, "Disrupting network links by reducing diversity of mycorrhizal fungi… can reduce tree seedling survivorship or growth (Simard et al, 1997a; Teste et al., 2009), ultimately affecting recruitment of old-growth trees that provide habitat for cavity nesting birds and mammals and thus dispersed seed for future generations of trees." Also, Gorzelak et al., 2015:

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

The relationships between soil fungi and plant nutrients should not be anything new to the FS. For example Amaranthus, Trappe, and Molina (in Perry, et al., 1989a) recognized "mycorrhizal fungus populations may serve as indicators of the health and vigor as indicators of the health and vigor as indicators of the health and vigor of other associated beneficial organisms. Mycorrhizae provide a biological substrate for other microbial processes."

Beiler et al., (2009) conclude the "mycorrhizal network architecture suggests an efficient and robust network, where large trees play a foundational role in facilitating conspecific regeneration and stabilizing the ecosystem."

In Simard et al., 2012, scientists focus:

> …on four themes in the recent literature: (1) the physical, physiological and molecular evidence for the existence of mycorrhizal networks, as well as the genetic characteristics and topology of networks in natural ecosystems; (2) the types, amounts and mechanisms of interplant material transfer (including carbon, nutrients, water, defence signals and allelochemicals) in autotrophic, mycoheterotrophic or partial mycoheterotrophic plants, with particular focus on carbon transfer; (3) the influence of mycorrhizal networks on plant establishment, survival and growth, and the implications for community diversity or stability in response to environmental stress; and (4) insights into emerging methods for modelling the spatial configuration and temporal dynamics of mycorrhizal networks, including the inclusion of mycorrhizal networks in conceptual models of complex adaptive systems. **We suggest that mycorrhizal networks are fundamental agents of complex**

> **adaptive systems (ecosystems) because they provide avenues for feedbacks and cross-scale interactions that lead to self-organization and emergent properties in ecosystems.** (Emphasis added.)

The dynamics of this mycorrhizal network extends well beyond an exchange of nutrients, into the essential nature and functioning of the ecosystem itself. The news blog Return to Now published an interview with ecologist Suzanne Simard ("Trees Talk to Each Other in a Language We Can Learn, Ecologist Claims") based upon her research. The blog states:

> What she discovered was a vast tangled web of hair-like mushroom roots — an information super highway allowing trees to communicate important messages to other members of their species and related species, such that the forest behaves as "a single organism." …(Trees) communicate by sending mysterious chemical and hormonal signals to each other via the mycelium, to determine which trees need more carbon, nitrogen, phosphorus and carbon, and which trees have some to spare, sending the elements back and forth to each other until the entire forest is balanced. "The web is so dense there can be hundreds of kilometers of mycelium under a single foot step," Simard says."

The science magazine Nautilus featured Simard in an article, "Never Underestimate the Intelligence of Trees." Simard states:

> I've come to think that root systems and the mycorrhizal networks that link those systems are designed like neural networks, and behave like neural networks, and a neural network is the seeding of intelligence in our brains. …All networks have links and nodes. In the example of a forest, trees are nodes and fungal linkages are links. Scale-free means that there are a few large nodes and a lot of smaller ones. And that is true in forests in many different ways: You've got a few large trees and then a lot of little trees. A few large patches of old-growth forest, and then more of these smaller patches. This kind of scale-free phenomenon happens across many scales.
>
> I made these discoveries about these networks below ground, how trees can be connected by these fungal networks and communicate. But if you go back to and listen to some of the early teachings of the Coast Salish and the indigenous people along the western coast of North America, they knew that already. It's in the writings and in the oral history. The idea of the mother tree has long been there. The fungal networks, the below-ground networks that keep the whole forest healthy and alive, that's also there. That these plants interact and communicate with each other, that's all there. They used to call the trees the tree people. The strawberries were the strawberry people. Western science shut that down for a while and now we're getting back to it. … I think this work on trees, on how they connect and communicate, people understand it right away. It's wired into us to understand this. And I don't think it's going to be hard for us to relearn it.

Also see this phenomenon documented in:

- the film "Intelligent Trees"
- the TED Talk "How trees talk to each other"
- the YouTube video "Mother Tree" embedded within the Suzanne Simard "Trees

Communicate" webpage
- the Jennifer Frazer article in *The Artful Amoeba*: "Dying Trees Can Send Food to Neighbors of Different Species via Wood-Wide Web"
- the Ferris Jabr article: "The Social Life of Forests"
- the *New York Times* article: "The Woman Who Looked at a Forest and Saw a Community"

More scientific research results are in Simard et al. 1997, Simard et al. 1997a, Simard et al. 2009, Simard et al. 2012 & Simard et al. 2018.

What Dr. Simard and an expanding body of scientific research show is that we can no longer view forest ecosystems as a collection of competing entities vying for limited resources, but rather as a cooperative—a community—that exhibits what may be called "Forest Wisdom," with the following core elements:

● Cooperation and Connection: Forests are complex adaptive systems that cooperate and care for trees and other life forms by creating favorable conditions, resisting stress and fostering long life. Sharing for the greater good gives cooperating networks evolutionary advantages over competing individuals.

● Mother Trees: Trees communicate through vast underground fungal networks of hubs and links, sharing nutrients and water, resisting insects and disease and nourishing their progeny until they reach the light. Mother Trees (a term coined by Dr. Simard), the most linked hub in this network, recognize and care for their young.

● Mindless Mastery: Tree intelligence is decentralized and underground. Thousands of root tips gather and assess data from the environment and respond in coordinated ways that benefit the entire forest. Forests achieve a "mindless mastery" through cooperation allowing them to respond in optimal ways to environmental challenges.

● Nature's Phoenix: Forests arise renewed like the mythological phoenix from patches of high-intensity fire to create snag forests as diverse as old-growth. Forests also successfully regenerate in heterogeneous and ecologically beneficial ways following large high-intensity fires.

Understanding Forest Wisdom means changing our perception of how forests function and abandoning the FS's entire "healthy forests" framework. Our forests are not sick, they do not need any chainsaw medicine. In fact, forests are cooperative systems that are essential for helping mitigate global climate disruption and addressing the biodiversity crisis we currently face.

The FS fails to recognize and consider the role of shared mycorrhizal networks and disclose how project activities will affect their function. Researchers are seeking answers to such questions. Sterkenberg, et al. (2019) investigated the abundance and diversity of ectomycorrhizal (ECM) fungi following varying levels of logging, ranging from clearcutting to 100% retention (control treatment). They explain that ECM fungi "represent a large part of the biodiversity in boreal forests. They depend on carbohydrates from their host trees and are vital for forest production, as uptake of nutrients and water by the trees is mediated by the ECM symbiosis. ECM fungal mycelium forms a basis for soil food webs." The researchers conclude:

> Our results confirm the value of retaining trees in forest management as a measure to maintain ECM fungal biodiversity. There was a clear and positive relationship between the amount of retention trees and ECM fungal species richness as well as the relative abundance of ECM fungi in the total fungal community. Frequent ECM fungi are likely to withstand logging with at least 30% of the trees retained, but at reduced mycelial abundance in the soil. Although **clear-cutting cause ECM fungal communities to be strongly impoverished even with FSC requirements of tree retention met**, the most common species survive harvest. Higher levels of tree retention, that is, in continuous cover forestry, may counteract local extinctions also of less frequent species and thus support efforts to manage for sustained high ECM fungal diversity. **Several rare species, and species predominantly confined to old natural forests, appear to rarely re-establish after clear-cutting** and are hence red-listed. For the survival of these species, **protection of forests with high conservation values and forest management directed towards conservation needs are unequivocally needed**. (Emphases added.)

From “A powerful and underappreciated ally in the climate crisis? Fungi” by scientists Toby Kiers and Merlin Sheldrake:

> Globally, the total length of fungal mycelium in the top 10cm of soil is more than 450 quadrillion km: about half the width of our galaxy. These symbiotic networks comprise an ancient life-support system that easily qualifies as one of the wonders of the living world.
>
> Through fungal activity, carbon floods into the soil, where it supports intricate food webs – about 25% of all of the planet’s species live underground. Much of it remains in the soil, making underground ecosystems the stable store of 75% of all terrestrial carbon. But climate change strategies, conservation agendas and restoration efforts overlook fungi and focus overwhelmingly on aboveground ecosystems. This is a problem: the destruction of underground fungal networks accelerates both climate change and biodiversity loss and interrupts vital global nutrient cycles.
>
> Fungi lie at the base of the food webs that support much of life on Earth. About 500m years ago, fungi facilitated the movement of aquatic plants on to land, fungal mycelium serving as plant root systems for tens of millions of years until plants could evolve their own. This association transformed the planet and its atmosphere – the evolution of plant-fungal partnerships coincided with a 90% reduction in the level of atmospheric carbon dioxide. Today, most plants depend on mycorrhizal fungi – from the Greek words for fungus (mykes) and root (rhiza) – which weave themselves through roots, provide plants with crucial nutrients, defend them from disease and link them in shared networks sometimes referred to as the “woodwide web”. These fungi are a more fundamental part of planthood than leaves, wood, fruit, flowers or even roots.
>
> We are destroying the planet’s fungal networks at an alarming rate. Based on current trends, more than 90% of the Earth’s soil will be degraded by 2050. … Logging wreaks havoc below ground, decreasing the abundance of mycorrhizal fungi by as much as 95%, and the diversity of fungal communities by as much as 75%. A large study published in 2018 suggested that the “alarming deterioration” of the health of trees across Europe was caused

by a disruption of their mycorrhizal relationships, brought about by nitrogen pollution from fossil fuel combustion and agricultural fertiliser.

> Mycorrhizal fungal networks make up between a third and a half of the living mass of soils and are a major global carbon sink.
>
> Mycorrhizal fungi are keystone organisms that support planetary biodiversity; when we disrupt them, we jeopardise the health and resilience of the organisms on which we depend. Fungal networks form a sticky living seam that holds soil together; remove the fungi, and the round washes away. Mycorrhizal networks increase the volume of water that the soil can absorb, reducing the quantity of nutrients leached out of the soil by rainfall by as much as 50%. They make plants less susceptible to drought and more resistant to salinity and heavy metals . They even boost the ability of plants to fight off attacks from pests by stimulating the production of defensive chemicals. The current focus on aboveground biodiversity neglects more than half of the most biodiverse underground ecosystems, because areas with the highest biodiversity aboveground are not always those with the highest soil biodiversity.

The FS fails to acknowledge the critical role mycorrhizal fungi networks play in sustaining forests, and provide protections for mycorrhizal networks in programmatic planning and project planning for roads, logging, prescribed burns, recreation and livestock grazing. This is necessary to meet the purposes of NEPA and the biodiversity mandates of NFMA.

The scientists involved in research on ectomycorrhizal networks have discovered connectedness, communication, and cooperation between trees, traditionally viewed as separate competing organisms. Such connectedness is usually studied within single organisms, such as the interconnections in humans among neurons, sensory organs, glands, muscles, other organs, etc. necessary for individual survival. The tree farming mentality reflected in the PA fails to consider the ecosystem impacts from industrial management activities on this mycorrhizal network—or even acknowledge they exist. This management paradigm will inevitably destroy what it refuses to see.

The R-1 SQS and PA do not adequately account for long-term losses in site or land productivity due to noxious weed infestations caused by management actions. The Sheep Creek Salvage FEIS (USDA Forest Service, 2005a) states at p. 173:

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

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

USDA Forest Service, 2015a indicates:

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

The FS has no idea how the productivity of the land been affected in the Twentymile project area and forestwide due to noxious weed infestations, nor any trends. USDA Forest Service, 2005c states:

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

The FS does not cite the results or successes of weed control efforts. Nor is there any data considered regarding trends of invasive species, causes, and cumulative effects.

In focusing only on its flawed DSD proxy, the FS avoids quantifying losses in **soil productivity**, potentially leading to serious long-term reduction in growth of vegetation of all types, with resulting cascading impacts in food chains and ecosystem function.

INVASIVE WEEDS

"Research suggests that compared to the Proposed Action, the No Action Alternative may have a greater impact on invasive weed expansion if one considers the possibility of stand replacing wildfire (Martinson et al., 2008; Freeman et al., 2007)." So the FS is saying supersized clearcuts are not as much a worry as wildfire? Which is native to the ecosystem—clearcuts or wildfires?

"Buckley et al, (2003) suggests that haul roads, skid trails, and main forest routes serve as primary conduits for entry of introduced species into the interior of managed stands." In other words, the indirect effects of logging.

"(L)evels of herbicide application, particularly along roadways, would increase initially under the Proposed Action." The PA does not consider the implications for herbicide use's collateral damage to natural aspects of the ecosystem.

SCIENTIFIC INTEGRITY

As part of the incorporated comments on the NPCNF draft RFP, we included a section entitled "NEPA – Scientific Integrity." Again, these comments incorporate our draft RFP comments in their entirety as comments on the Twentymile PA. Although the context of those comments is the programmatic planning level, most also apply to project planning.

The FS must disclose the statistical reliability of the data the FS relies upon project analyses. Since "an instrument's data must be reliable if they are valid" (Huck, 2000) this means data 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 that litigation context relates to the reliability of the data, which in turn depends upon how well-trained the data-gatherers are with their measuring tools and 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" to yield 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.

FS analysis methodology relies upon assumptions that the FS knows with some precision the parameters that define normal ranges of conditions. The reliability of the data sources used to construct these normal ranges must be disclosed.

The U.S. Department of Agriculture 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 analysis and modeling methodology validity. In other words, are the models scientifically appropriate for the uses for which the FS is utilizing them? As Huck, (2000) explains, the degree of “content validity,” or accuracy of the model or methodology is established by utilizing other experts. This, in turn, demonstrates the necessity for utilizing the peer review process. The FS must disclose the limitations of the models the FS relies upon for project analyses, which begins to address model validity.

The Nez Perce Forest Plan includes a requirement for the FS to validate the models it uses. In Chapter V, the Forest Plan monitoring plan notes a “NFMA Requirement 36 CFR 219.12(K)(2)” and the “Action() …” is “Validation of resource prediction models; wildlife, water quality, fisheries, timber.”

Model results can be no better than as the input data, 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 FS must disclose these limitations. Generally, the FS uses models without any real indication as to how much they truly reflect reality.

In the Clear Creek Integrated Restoration Project FEIS, the NPCNF 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.” (FEIS at 5-14.) 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.

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.”

Where is the evidence that the FS has performed validation of the models it utilizes? There must be documentation of someone using observation or experiment to confirm 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 by the FS must be established for how agency utilizes them. Do any specific scientific studies establish their content validity? Has independent expert peer review process of the models 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.

A 2000 Northern Region forest plan monitoring and evaluation report (USDA Forest Service, 2000c) provides an example of the FS itself acknowledging the problems of data that is old and incomplete, leading to the limitation of models the FS typically uses for wildlife analyses:

> 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 that case, the FS expert believed the data were unreliable and thus they properly questioned the validity of model use.

Another Kootenai NF project EIS (USDA Forest Service, 2007a) notes the limitations of modeling methodology the DSEIS 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.)

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

Beck and Suring, 2011 state:

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

independent field study or by reserving some data used in model development.

Larson et al. 2011 state:

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

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

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

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

The Kootenai NF's Elk Rice EA states, "Be aware the modeling is not an attempt to depict reality, but merely an analysis for comparison purposes." The PA doesn't explain how ANY comparisons would be meaningful, in the context of such limitations. That EA's statement is made about modeling the amount of particulate produced by fire, however the Twentymile PA does no better in discussing the limitations of any modeling upon which its analyses are based.

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

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

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

The Forest Service Manual (FSM) provides direction on how to implement statutes and related regulations. FSM 4000 – Research and Development Chapter 4030 states: "To achieve its Research and Development (R&D) program objectives, the Forest Service shall ... maintain the R&D function as a **separate entity** … with clear accountability through a system that **maintains scientific freedom…**" (Emphasis added). This is difficult in today's political climate ("Help Wanted: Biologists to Save the West From Trump").

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

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

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

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

Sullivan et al. 2006 contrast peer-reviewed literature with gray literature (such as Samson, 2005 and Samson, 2006,) which:

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

Along with Ruggiero, 2007, Sullivan et al., 2006 discuss the dangers of the "Politicization of Science":

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

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

> Often, scientific and political communities differ in their definition of best available science and opposing factions misrepresent the concept to support particular ideological positions. Ideally, each policy decision would include all the relevant facts and all parties would be fully aware of the consequences of a decision. But economic, social, and scientific limitations often force decisions to be based on limited scientific information, leaving policymaking open to uncertainty.
>
> The American Fisheries Society and the Estuarine Research Federation established this

committee to consider what determines the best available science and how it might be used to formulate natural resource policies and shape management actions. The report examines how scientists and nonscientists perceive science, what factors affect the quality and use of science, and how changing technology influences the availability of science. Because the issues surrounding the definition of best available science surface when managers and policymakers interpret and use science, this report also will consider the interface between science and policy and explore what scientists, policymakers, and managers should consider when implementing science through decision making.

As part of their implicit contract with society, environmental scientists are obliged to communicate their knowledge widely to facilitate informed decision making (Lubchenco 1998). For nonscientists to use that knowledge effectively and fairly, they must also understand the multifaceted scientific process that produces it.

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

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

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

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.

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

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

To conform with NEPA's requirements for scientific integrity, the FS must insure the reliability of data relied upon by the models, and validate the models for the uses applied.

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

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

The FS has not undertaken the process of a Science Consistency Review for the Forest Plan or for PA conclusions (Guldin et al., 2003, 2003b.) Guldin et al., 2003:

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

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

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

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

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

CUMULATIVE EFFECTS

It is vital that the results of past monitoring be incorporated into project analysis and planning. The following must be included in the EIS:

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

The PA lacks an analysis of how well past FS projects met the goals, objectives, desired conditions, etc. stated in the corresponding NEPA documents, and how well the projects conformed to forest plan standards and guidelines. Such an analysis is critical for validating the FS's current proposal. 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 must be disclosed and analyzed because if these were not accurate, and the agency is making similar decisions, then the process will lead to failure. For instance, if in previous processes the FS said they were going to do a certain monitoring plan or implement a certain type of management and these were never effectively implemented, it is important for the public and the decisionmaker to know. If there have been problems with FS implementation in the past, it is not logical to assume that implementation will be proper this time. If prior logging, prescribed fire and other "vegetation treatments" have not been monitored appropriately, the FS lacks credibility in regards to this latest proposal.

NEPA requires that high-quality information is available to the public and that NEPA documents concentrate on issues truly significant to the action in question. One highly significant issue is cumulative effects, including fostering understanding of how past actions may have led to the current conditions.

The FS apparently has no idea how well past management actions met the goals, objectives, desired conditions, etc. stated in their respective NEPA documents, and how well the projects conformed to forest plan standards and guidelines. The EIS must include an analysis of how well the statements of Purpose and Need in those NEPA documents were served.

And there can be no proper cumulative effects analysis in a NEPA document tiered to a Forest Plan EIS, if the FS has failed to properly conduct the monitoring as directed by the Forest Plan.

If the FS has been monitoring as we suggest, it would have information about what is a baseline of tree disease and mortality in this area of the Forest—which is highly relevant given the Purpose and Need. Tree mortality is a natural process with varying levels over time and across space. See Franklin et al. 1987. If the agency had been monitoring as per the Forest Plan and to validate previous project assumptions and predictions, the agency would have data that informs the FS claim that regeneration logging, which involves removing most trees whether healthy or not, makes the forest more "resilient" in any way.

The NPCNF's Clearwater Forest Plan is in total accord with what we're arguing here. In Chapter V, it states:

> Project environmental analyses provide an essential source of information for Forest Plan monitoring. First, as project analyses are completed, new or emerging public issues or management concerns may be identified. Second, the management direction designed to facilitate achievement of the management area goals are validated by the project analyses. Third, the site-specific data collected for project environmental analyses serve as a check on the correctness of the land assignment. All of the information included in the project environmental analyses is used in the monitoring process to determine when changes should be made in the Forest Plan.

Older FS NEPA documents support this as well; they set out project-specific monitoring. Because there has apparently been no evaluation of past monitoring, there is just no support for a lot of assumptions in this PA. The FS must disclose high-quality information to the public, use the best science, and take a hard look at the impacts of its project.

The failure to conduct the required Forest Plan implementation monitoring, evaluation and reporting, together with the failure to undertake the kind of hard look under NEPA at the project level, makes it impossible for the decisionmaker and public to grasp the cumulative impacts of this new timber sale proposal.

The PA fails to provide sufficient analysis of other projects in the project area or in proximity. Determining significance requires consideration of context—given there are nearby or contiguous projects in this area, the significance of this action must be analyzed within the long-term and short-term contexts of the area(s) impacted. Significance also addresses intensity, which includes whether the action, in combination with other actions, might have cumulatively significant effects.

The PA provides no analysis or disclosures of FS accomplishment or progress over the 36 years of Forest Plan implementation, nor of any problems it has discovered in trying to carry out all of this industrialization of this National Forest.

The PA cites or provides no analysis revealing the degree of the agency's achieving Forest Plan objectives or goals over the 35-year life of the Forest Plan.

The PA fails to discuss current conditions for key parts of the project area ecosystem. It is largely void of details on existing conditions for many resources. Pursuant to the definition of "environmental assessment," 40 C.F.R. §1508.9 dictates a Federal agency (i.e. The Forest Service) is responsible to "(1) Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact." The analysis is incomplete without reference to existing conditions. Furthermore, it is important to provide this information to grasp the full significance of any impacts of the project especially cumulative impacts. As indicated by 40 CFR §1508.7:

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

It is impossible to judge any potential cumulative impacts of this project if there isn't an understanding of the existing conditions. To omit present conditions frustrates the public's right to high-quality information under NEPA and any meaningful review.

Courts will set aside agency decisions that do not have baseline data. Take, for example, *Northern Plains Res. Council v. Surface Transp. Bd.*, 668 F.3d 1067, 1083–85 (9th Cir. 2011). In Northern Plains Resource Council, the court set aside the agency's decision for not taking NEPA's "hard look" at the impacts of its action when it deferred gathering baseline data on fish and the sage grouse until after approval of the project and for mitigation efforts. "Without establishing the baseline conditions which exist…there is simply no way to determine what effect the proposed [action] will have on the environment and, consequently, no way to comply with NEPA." *Half Moon Bay Fisherman's Mktg. Ass'n v. Carlucci*, 857 F.2d 505, 510 (9th Cir. 1988). The Forest Service has either violated NEPA by not having existing baseline data or not disclosing it in the PA.

ROADLESS EXPANSE

The proposed logging and associated activities would degrade roadless characteristics within an uninventoried roadless area adjacent to the Gospel Hump Wilderness.

We incorporate within these comments the discussion on the roadless resource from the FOC/AWR comments on the Draft Forest Plan and EIS (pp. 271-286).

The USFS Northern Region explains the concept of "Roadless Expanse" in a document entitled "Our Approach to Roadless Area Analysis of Unroaded Lands Contiguous to Roadless Areas" (USDA Forest Service, 2010e). In summary, this paper is FS interpretation of federal case law/judicial history regarding the Roadless Area Conservation Rule. It states that "projects on lands contiguous to roadless areas must analyze the environmental consequences, including irreversible and irretrievable commitment of resources on roadless area attributes, and the effects for potential designation as wilderness under the Wilderness Act of 1964. This analysis must **consider the effects to the entire roadless expanse; that is both the roadless area and the unroaded lands contiguous to the roadless area.**" (Emphasis added.) This is also consistent with the ruling in *Kettle Range Conservation Group v. US Forest Service*, 971 F. Supp. 480 (D. Or. 1997).

The Kootenai National Forest's Lower Yaak, O'Brien, Sheep Draft Environmental Impact Statement explains the concept of "roadless expanse" as explained in USDA Forest Service, 2010e:

> Northern Region (Region 1) Direction for Roadless Area Analysis Region 1 provides additional guidance for roadless area analysis in a draft document titled "Our Approach to Roadless Area Analysis of Unroaded Lands Contiguous to Roadless Areas" (12/2/10). In summary this paper is based on court history regarding the Roadless Area Conservation Rule. The "Our Approach" document states, "projects on lands contiguous to roadless areas must analyze the environmental consequences, including irreversible and irretrievable commitment of resources on roadless area attributes, and the effects for potential designation as wilderness under the Wilderness Act of 1964. **This analysis must consider the effects to the entire roadless expanse; that is both the roadless area and the unroaded lands contiguous to the roadless area**.

(Emphasis added.) The FS is obligated to analyze and disclose impacts on the Roadless Characteristics and Wilderness Attributes of the roadless expanse as a whole. The public must be able to understand if the project would cause irreversible and irretrievable impacts on the suitability of any portion of a roadless expanse for future consideration for Recommended Wilderness designation under forest planning.

The Idaho Roadless Rule provides some definitions of roadless character that have implications for the analysis in this NEPA document:

> Resources or features that are often present in and characterize Idaho Roadless Areas, including:
>
> (1) High quality or undisturbed soil, water, and air;

(2) Sources of public drinking water;
(3) Diversity of plant and animal communities;
(4) Habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those
species dependent on large, undisturbed areas of land;
(5) Primitive, semi-primitive nonmotorized, and semi-primitive motorized classes of dispersed
recreation;
(6) Reference landscapes;
(7) Natural appearing landscapes with high scenic quality;
(8) Traditional cultural properties and sacred sites; and
(9) Other locally identified unique characteristics.

See also, Friends of the Clearwater, 2020 for an examination of the way roadless rules are being exploited to downgrade the wilderness values and roadless characteristics of IRAs.

The inconstancy in the way the FS has evaluated and considered what kinds of actions negatively affect roadless areas so that boundaries should be redrawn to remove recently completed development activities (usually timber sales) has created a policy quagmire. For example, a portion of one inventoried roadless area—the West Fork Crooked River Roadless Area—was recently logged even though the agency claims this area still has roadless and wilderness characteristics.

This contrasts with areas that may show little or no evidence of past development the agency claims still lack these characteristics. These failures at adequate analysis of logging and roadbuilding on wilderness and roadless characteristics have been documented in Friends of the Clearwater, 2020.

Scientific literature emphasizes the importance of unroaded areas greater than 1,000 acres as strongholds for the production of fish and other aquatic and terrestrial species, as well as sources of high quality water. (Henjum et al., 1994.) A growing number of scientific studies indicate the significant value of roadless areas smaller than 5,000 acres and larger than 1,000 acres. (Strittholt and DellaSala, 2001; DeVelice and Martin, 2001; Loucks et al, 2003; Crist et al., 2005; Nott et al., 2005.) In a Nov. 14, 1997 letter to President Clinton urging the protection of roadless areas, 136 scientists noted:

> There is a growing consensus among academic and agency scientists that existing roadless areas–**irrespective of size**–contribute substantially to maintaining biodiversity and ecological integrity on the national forests. The Eastside Forests Scientific Societies Panel, including representatives from the American Fisheries Society, American Ornithologists' Union, Ecological Society of America, Society for Conservation Biology, and The Wildlife Society, recommended a prohibition on the construction of new roads and logging within existing (1) roadless regions larger than 1,000 acres, and (2) **roadless regions smaller than 1,000 acres that are biologically significant**…. Other scientists have also recommended protection of all roadless areas greater than 1,000 acres, at least until landscapes degraded by past management have recovered…. As you have

> acknowledged, a national policy prohibiting road building and other forms of development in roadless areas represents a major step towards balancing sustainable forest management with conserving environmental values on federal lands. In our view, a scientifically based policy for roadless areas on public lands should, at a minimum, protect from development all roadless areas larger than 1,000 acres and **those smaller areas that have special ecological significance because of their contributions to regional landscapes**.

(Emphases added.) Anderson et al., 2012 compared watershed health in Wilderness, roadless, and roaded forest lands:

> The Watershed Condition Framework data identifies 54 percent of all NFS land in properly functioning watersheds, 43 percent in watersheds functioning at risk, and just 3 percent in impaired watersheds. However, these proportions are not evenly distributed across the three land designation categories.
>
> Designated Wilderness areas are most frequently spatially coincident with healthy watershed conditions. Eighty percent of the land within designated Wilderness is located in properly functioning watersheds, while 18 percent is in at-risk watersheds and just 1 percent is in impaired watersheds. Watershed conditions in Inventoried Roadless Areas are not as healthy as in designated Wilderness, but almost two-thirds of their area is still in properly functioning condition. Sixty-four percent of the IRA acreage is in properly functioning watersheds, 34 percent is in at-risk watersheds, and 2 percent is in impaired watersheds. Finally, other Forest Service lands – which make up slightly more than half of the National Forest System – tend to have the least healthy watershed conditions. While 38 percent of the managed landscape is in properly functioning watersheds, most of the roaded lands are in watersheds that are either functioning-at-risk (58 percent) or impaired (5 percent).

WATER QUALITY

The PA states:

> All waterbodies in the project area are tributaries to the SFCR, which has several existing total maximum daily loads (TMDLs) requirements, including requirements for sediment and temperature. All waterbodies within the project area are currently listed as water quality impaired for temperature in the 2018/2020 Idaho Department of Environmental Quality (IDEQ) 303(d)/305(b) Integrated report (IDEQ, 2020). The South Fork Clearwater face drainages (sidewall tributaries) are also impaired for Sedimentation/Siltation.

The PA doesn't demonstrate that project activities wouldn't conflict with the applicable TMDLs.

Also, please see FOC comments on the Draft Forest Plan (pp. 119-120), which explain how logging increases stream water temperatures. The PA doesn't address this in its massive clearcutting discussions.

US Fish and Wildlife Service (1998) recognizes, upland forest canopy removal raises stream temperatures. The FS must address best available science indicating 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).

“The widespread application of SDEs and ADEs over time appears to lead to watershed-scale improvements in water quality (Reiter et al., 2009).” Reiter et al studied “a managed forest of western Washington” without considering NPCNF “SDEs and ADEs.” The FS is obligated to explain how those research results extend to the project area watersheds, if SDEs and ADEs are being justified.

Any conclusion that there will be no measurable increase in sediment is not supported by facts. PACFISH/INFISH buffers cannot stop the sedimentation once it inters the stream, and skid trails, landings, and temporary roads link to existing roads and ditches, where runoff goes down the ditch to a culvert and is conducted into small streams, which carry sediment into larger streams. Below is an illustration of this; the hillside ditch of the road is filled with fine sediment. It was taken on the Clearwater National Forest in the Lowell WUI project in 2018 (before the road in this exact same area was blown out from a landslide).

At center-top-third of this picture is a culvert, which you can't see because of the sediment. Below is a detail shot of the above picture where the culvert is.

FS hydrologist Johnson (1995) points out older roads feature ditches on the inside of the road which greatly increases drainage efficiency, causing peak flows to go far beyond any modeled predictions.

The sediment surrounding the culvert is abundant. If one were to walk to what is depicted on at the top of the above picture and turn around to take a picture of the culvert, the picture that follows is that angle.

Below is a second culvert in that same area, conducting sediment:

This is how sedimentation gets into the stream, which can be upstream of any logging buffers next to the stream. Yet, the PA bases its conclusion that there won't be sedimentation because PACFISH/INFISH buffers or BMPs will stop it.

The following photos also illustrate a few of the problems associated with inadequate road maintenance. On July 7, 2019 an intense thunderstorm dropped rain and hail on portions of the Bitterroot National Forest. These photos are of an open Forest Service Road just south of Lake Como, probably FSR #550. All three were taken a few feet from one another. The first photo shows a stream of stormwater flowing down the road, where water flows off the surface into a draw in the landscape. The length of this stream of water on the road surface was over a quarter-mile—even around curves—essentially cutting a gully instead of flowing off the road within a short distance.

The second photo (above) shows this “stream” at the beginning of its flow off of the road at the location of the discharge of a small culvert (the culvert is not visible in the photo).

The third photo (below) shows the inlet of the culvert—empty of water despite the storm because of the tempering effect of the native forest vegetation in the draw above the road. We point out that, despite the cloudburst, no flow occurs here, because there's no road effect above this culvert. (This also shows the culvert has begun to plug up since the time of installation or previous maintenance, meaning it is becoming vulnerable to a blowout during if a subsequent storm event does cause flow here.)

These three photos are not meant to illustrate water quality problems of any specific stream, because the flow was not followed downslope to any water body destination, which it may or may not have reached before soaking into the soil. Instead, the photos show typical problems of roads without proper drainage features and/or lacking frequent enough maintenance, leading to accelerated erosion during storm or spring runoff events and necessitating more imminent maintenance steps needed to keep the road usable by the public.

FISHERIES

"Cobble embeddedness monitoring, … indicates that all prescription watersheds in the analysis area still do not meet their associated Forest Plan objectives. None of these watersheds meet their fishery\water quality objectives as all streams contained high levels of sand and fine substrates." We must assume this is because of the legacy of past management, because in describing the existing situation the PA says, "Roads in the analysis area would continue to provide chronic sources of sediment to streams, and undersized/failing culverts would continue to degrade stream channels and aquatic habitat." Then, the PA brazenly tries to walk that back: "Further investigation demonstrates (not meeting Forest Plan objectives) is likely due to natural conditions in the area as there are minimal roads and minimal past harvest in the area. Field surveys conducted in 2019 found no measurable sediment input from existing roads."

The Forest Service never disclosed the existing trend in each degraded watershed, but attempts to brush this fact aside: "Appendix A guidance (Conroy and Thompson, 2011) states that "in previously degraded watersheds, especially those identified as below objective in 1987, if there have been no entries or natural disturbances over the past 10 to 20 years, **it could be assumed** that trend is either static or improving" (Emphasis added.) "It might be "assumed", but a genuine basis must support the assumption. There is none, only something about an "improvement in sediment yield."

If there is data that establishes cobble embeddedness trends in project area watersheds, please cite it.

The Forest Plan (Fish and Wildlife Standard #19) requires: "Restore presently degraded fish habitat to meet the fish/water quality objectives established in this Forest Plan (see Appendix A of the Forest Plan)." Also, the Forest Plan (Fish and Wildlife Standard #21) requires: "Meet established fishery/water quality objectives for all prescription watersheds as shown in Appendix A." To comply with these binding standards, logging is prohibited in any watershed that currently fails to meet its Fishery Objective or its Sediment Yield Guideline, unless the Forest Service demonstrates a "positive, upward trend," as explained in the Forest Service's Appendix A Guide (C_017811).

The Forest Service's trend analyses also must address what the Appendix A Guide describes as "key" factors to understanding future cobble embeddedness: stream power and flushing rates. The PA does not address these key factors. The Appendix A Guide explains, "the key is that new sediment inputs remain below the flushing rates considering stream power and the fish/water quality objective of the stream." The FS cannot focus only on sediment, because knowing flushing rates is the key to knowing whether any sediment reductions will lead to reductions in cobble embeddedness too.

For the Hungry Ridge and End Of The World projects, the FS modeled future sediment delivery and cobble embeddedness in each watershed to compare the water quality and fish habitat effects of different alternatives. In those analyses the FS admitted its modeling is very limited. First, the modeling can evaluate only short-term changes in cobble embeddedness, and "cannot be used to predict changes in cobble embeddedness that may occur as the result of long-term declines in sediment yield." Second, its modeling is not reliable for predicting actual results (actual amounts of cobble embeddedness and sediment delivery.

The PA states, "Observational data (NPCNF, 2016) collected in 2016 on the Forest demonstrates that when PACFISH buffers are implemented, no sediment transport into PACFISH buffers or proximate waters occurred over the short or long-term, in association with forest vegetation treatment actions similar to those that would occur under the Proposed Action." However this ignores the effects of road construction and the various categories of "maintenance" which the PA explains would involve a lot of soil disturbance[23]. Moreover, this ignores the impacts of the

[23] "Road activities could include new earthwork; grading and shaping of the road surface; constructing or cleaning ditches, catch basins, culvert inlets/outlets, or other drainage features; roadside brushing; cut slope and fill slope stabilization and spot surface gravel placement; and roadside brushing or clearing and grubbing and surface compaction. Other maintenance actions include curve widening on various corners

use of roads, which would increase markedly over the duration of this logging project, expected to yield 62 million board feet of timber to be hauled out by heavy log trucks.

From an investigation of the Bitterroot Burned Area Recovery Project, hydrologist Rhodes (2002) notes, “On all haul roads evaluated, haul traffic has created 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 on an adjacent national forest, 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.”

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

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

Yet the PA arbitrarily concludes: “…it is anticipated that no effect related to sediment, turbidity or increased cobble embeddedness would occur as a result of the Proposed Action.”

The PA does not disclose the populations or population trends of ESA-listed or Sensitive fish species in or downstream of the project area.

VISUAL QUALITY

The PA concluded that Visual Quality Objective (VQOs) would be met despite the massive clearcutting and burning, including several clearcuts over the generally accepted 40-acre limit. Either VQOs are rather meaningless, or more likely the PA does not present an analysis consistent with more logical interpretations of VQOs and Forest Plan requirements.

In conclusion, the FS’s rush to implement massive clearcutting in the Twentymile project area threatens to destroy many of the natural qualities of this area of the NPNF. The FS must prepare an Environmental Impact Statement in order to serve the purposes of NEPA, provide accurate analysis, and arrive at better alternatives to this reckless proposal.

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and a large turnaround that require earthwork on the existing road prism.”

Please keep each of our organizations on the list to receive all communications concerning the Twentymile timber sale proposal.

Sincerely submitted,

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(Cited references forthcoming)