January 16, 2020

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Coconino National Forest Supervisor Laura Jo West
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Submitted via email to: 4fri_comments@fs.fed.us

Dear Ms. West, Mr. Best, and Mr. Bosworth:

This letter is submitted on behalf of Sierra Club – Grand Canyon Chapter, WildEarth Guardians, and Conservation Congress regarding the Four Forests Restoration Initiative (4FRI) Rim Country Project Draft Environmental Impact Statement (DEIS). This comment is timely because the Notice of Intent was published in the Federal Register on October 18, 2019 with a 90-day comment period ending January 16, 2020.

The Sierra Club's mission is "to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; and to educate and enlist humanity to protect and restore the quality of the natural and human environments." Inspired by nature, the Sierra Club's more than 3.5 million members and supporters work together to protect our communities and the planet. Sierra Club has regularly participated in stakeholder meetings since 2010 and protection of the region's forests and wildlife is a high priority for our membership in Arizona. Our members have a significant interest in this proposal as we have been very involved in protection of Arizona's public lands and the wildlife that depend on them. The Sierra Club supports the need for forest restoration to protect wildlife habitat, watersheds, ecological integrity and ecosystem function. Our members believe that ecological values should always take priority over economic gain when managing our forests.

WildEarth Guardians (hereafter, "Guardians") is a non-profit corporation, incorporated in New Mexico, with over 275,000 members nationwide, including many members who regularly recreate on the Apache-Sitgreaves, Coconino and Tonto National Forests. Guardians' primary goals include protection and restoration of endangered species and their associated habitats, along with other sensitive ecosystems in the southwestern United States that have been impaired as a result of decades of misguided active management. Many members and staff of WildEarth Guardians live and/or recreate in Arizona and frequently use and enjoy, and intend to continue using and enjoying, the Rim Country area for recreational, aesthetic, and scientific activities.

The Conservation Congress (CC) is a grassroots 501 (c) 3 nonprofit conservation organization incorporated in the state of California in 2004. We work to protect National Forest lands and native wildlife in northern California. The Conservation Congress is part of Voices for Public Lands (VPL), an informal coalition of public lands conservation groups united by a commitment to the values enumerated in VPL's Declaration of Principles for Public Lands.

The Sierra Club and WildEarth Guardians both submitted timely scoping comments on the Proposed Action in letters dated August 11, 2016. Both scoping comments were highly detailed, based upon our participation in this proposal as well as the original 4FRI Project. Our scoping comments cited dozens of scientific references as well as Forest Service policy, regulations, and federal court decisions. The Rim Country DEIS doesn't properly acknowledge the content of our comments or the science, policy, regulations and legal precedents they cite. We therefore incorporate by reference both our comments letters as comments on this DEIS and request that you provide written responses to those comments, just as the National Environmental Policy Act (NEPA) requires the Forest Service (FS) to respond in writing to comments in this present letter.

We incorporate by reference what the Sierra Club scoping comments incorporated, namely the Sierra Club appeal of the 2015 revised Apache-Sitgreaves National Forests Land and Resource Management Plan—filed in partnership with the Center for Biological Diversity, Grand Canyon Wildlands Council, Western Watersheds Project, and White Mountain Conservation League.

We also agree with and incorporate by reference the 4FRI "stakeholder" comments submitted to the Forest Service in a letter dated January 16, 2020. Sierra Club is not an "official" stakeholder in the 4FRI process, because Sierra Club is not a signatory to the 4FRI Charter, but the Club has been participating in 4FRI stakeholder meetings and field trips for almost a decade and agrees with the comments submitted by that group.

Passages quoted in these comments are from the DEIS, unless explicitly attributed to another source.

INTRODUCTION

The Rim Country planning area has been heavily altered by the combination of logging, livestock grazing, fire suppression, and road building. Because of the extensive direct, indirect and cumulative ecological damage from roads, we fully support the proposal to decommission hundreds of miles of roads. Likewise, other proposed measures to remove the human-caused impediments to natural recovery are very worthy. These are:

- Restoring riparian areas by removing noxious or invasive plants, protecting them from livestock grazing, and promoting, protecting or planting native aquatic or riparian species.
- Restoring streams by reestablishing former drainage patterns, stabilizing slopes, restoring vegetation, protecting sites from livestock grazing, and removing stock tanks.
- Restoring springs by restoring natural flow regimes, removing dilapidated or non-functioning infrastructure, protecting from inappropriate recreational activities, and protecting from livestock grazing.

But a major concern we have is that there isn't enough certainty those restoration actions will come to pass. The DEIS doesn't identify a single watershed-damaging road segment for decommissioning, for example. It doesn't specify for rehabilitation any particular spring or riparian area where human activities have caused, or are causing chronic erosion or sediment pollution.

The DEIS heavily emphasizes the threat of fire, mostly blaming fire suppression for current vegetative conditions leading to the alleged need to "treat up to 953,130 acres." We are concerned an excessive prioritization on logging and burning (and the associated road construction) could compromise the restoration actions we fully support. Further, the DEIS does not explain how Collaborative Forest Landscape Restoration Program funds or other sources of money will be allocated for dealing with the various landscape restoration needs. It fails to explain how the various restoration actions will be prioritized, leaving us skeptical that the Rim Country analysis area would be restored in a truly holistic manner.

That the plan doesn't deal with a major disruptor of ecosystem function in the analysis area—livestock grazing—adds greatly to our concern.

In regards to FS road decommissioning, it is all too common for it to remain on hold indefinitely because of insufficient funding. In one recent example on the Lolo National Forest, the agency defaulted on commitments made years earlier to decommission a lot of roads—and therefore restore watersheds—because agency priorities for timber production were boosted.[1]

From our review of the DEIS, the ecological damage from "mechanical treatments" (logging and biomass removal) and prescribed burning are understated, and the ecological risks posed by the existing human-caused imbalances in vegetation are exaggerated.

THE NARRATIVE

It seems there was an unspoken but very pervasive Narrative in play since the inception of the 4FRI Rim Country planning process. The Narrative is a lot like this:

- The Forest Service possesses information to be able to describe what the landscape looked like virtually everywhere in the Rim Country analysis area prior to Euro-American influence.
- The natural processes under which these ecosystems evolved cannot restore the landscape from the damages inflicted by human actions. On the contrary, if these natural forces are

[1] 2007 Frenchtown Face Record of Decision vs. 2019 Soldier-Butler draft decision.

allowed to function on this damaged landscape without management intervention, the result will be wildfire—extremely severe, widespread and destructive.

- These "catastrophic" (aka "uncharacteristic") wildland fires will degrade wildlife habitat much more than human actions already have, so that terrestrial native species' populations will not recover for decades—if ever.
- These "catastrophic" fires will result in so much soil damage that massive erosion will choke the waters and aquatic native species' populations will not recover for decades—if ever.
- Because of their unnatural intensity these "catastrophic" fires will be the reason infrastructure on private lands, including large numbers of homes, will be destroyed.
- Native tree afflictions such as mistletoe and bark beetles will just add salt to the wounds.
- Management actions (vegetation "treatments") over virtually the entire landscape will prevent "uncharacteristic" fires and burning homes.
- Livestock grazing and fire suppression can continue indefinitely, needing only slight tweaks to eliminate the widespread ecological damage they've caused.
- Collateral damage including direct, indirect, and cumulative impacts from logging and/or burning of 953,130 acres, and building 330 miles of new roads, can and will be "minimized."

In other words, the Narrative assumes forests already damaged from logging, livestock grazing, road construction, and fire suppression can be restored while the same actions are applied extensively throughout the Rim Country landscape. This Narrative follows largely from inaccurate suppositions found in Title IV of the Omnibus Public Lands Management Act of 2009 (also known as the Collaborative Forest Landscape Restoration Act or CFLRA).

Such an implausible story is inherent with politically instilled solutions to misperceived and overly simplified "unhealthy" conditions on national forests. In the DEIS, the assumptions of the CFLRA are accepted *a priori*—they are not properly tested against actual conditions in the Rim Country analysis area.

The Narrative is needed to justify a predetermined outcome—logging and burning over close to a million acres of publicly owned land. The Alternative Development Workshops embraced this Narrative, worded in the form of a Draft Purpose and Need. So before any public involvement began, the scope was already determined. Public concerns expressing views inconsistent with the Narrative were filtered out of the process, ignored, or disregarded. Inevitably, the Alternative Development Workshops ended with the Narrative intact and unchallenged. As a result, the range of action alternatives considered and fully analyzed in the DEIS excludes legitimate differing views.

ILLEGITIMATE COLLABORATIVE FOREST LANDSCAPE RESTORATION PLAN

This so-called "project" is to be designed and implemented under the auspices of the Collaborative Forest Landscape Restoration Program (CFLRP). However, from a review of the DEIS, it is obvious this is not really a project. The 4FRI Rim Country "project" is the result of a hybrid planning process which has some elements of project planning, but more closely resembles programmatic forest planning. To distinguish this entity from project planning and

note its derivation from the CFLRP, in these comments we refer to it as the "4FRI Rim Country Collaborative Forest Landscape Restoration Plan" ("**CFLRPlan**" for short).

Using this hybrid process, the programmatic Rim Country CFLRPlan would authorize major vegetation alterations on an area of land larger than over three dozen individual U.S. national forests. Using this CFLRPlan process, the relevant, pertinent, and important details such as the amount, extent, degree, and methodology of vegetation removal in forested stands or any other specific geographic unit does not have to be spelled out in the NEPA document prior to the decision to heavily alter the vegetation using intensive logging and/or burning. In this process, such relevant, pertinent, and important details are to be determined during a later, post-Decision decisionmaking process conducted by agency employees and non-agency stakeholders, who do not have to disclose their rationale or second level decisions to the taxpayer/owners of these national forests in any legal procedural manner.

In other words, with this hybrid process the NEPA document need not conform to NEPA. Whereas the Rim Country CFLRPlan would authorize major vegetation alterations on nearly a million acres of national forest land, the direct, indirect, and cumulative impacts do not have to be analyzed and disclosed as NEPA requires for projects.

Within this programmatic CFLRPlan process, the three existing Forest Plans are largely irrelevant. Pertinent management direction expressed as standards, guidelines, goals, objectives, desired conditions and other existing Forest Plan direction does not have to be explicitly addressed in the DEIS. And the results of implementation monitoring, required under existing Forest Plans, and even that of the first iteration of 4FRI, are also irrelevant for the 4FRI Rim Country CFLRPlan purposes. As the DEIS states, "This analysis is independent of any preceding or subsequent environmental analysis that may occur in the national forests across northern Arizona."

In 1999 Roger Sedjo, a member of the Committee of Scientists convened to advise the agency during the rewrite of the national forest planning rule, expressed concerns about the discrepancy between forest plans and Congressionally mandated programs (the CFLRP being the present example):

> (A)s currently structured there are essentially two independent planning processes in operation for the management of the National Forest System: forest planning as called for in the legislation; and the Congressional budgeting process, which budgets on a project basis. The major problem is that there are essentially two independent planning processes occurring simultaneously: one involving the creation of individual forest plans and a second that involves congressionally authorized appropriations for the Forest Service. **Congressional funding for the Forest Service is on the basis of programs, rather than plans, which bear little or no relation to the forest plans generated by the planning process.** There is little evidence that forest plans have been seriously considered in recent years when the budget is being formulated. Also, the total budget appropriated by the Congress is typically less than what is required to finance forest plans. Furthermore, the Forest Service is limited in its ability to reallocate funds within the budget to activities not specifically designated. **Thus, the budget process commonly** provides fewer resources than anticipated by the forest plan and often also **negates the "balance" across activities**

> **that have carefully been crafted into forest plans. Balance is a requisite part of any meaningful plan.** Finally, as noted by the GAO Report (1997), fundamental problems abound in the implementation of the planning process as an effective decision making instrument. Plans without corresponding budgets cannot be implemented. Thus forest plans are poorly and weakly implemented at best. Major reforms need to be implemented to coordinate and unify the budget process. (Committee of Scientists, 1999 Appendix A, emphases added.)

So the programmatic Rim Country CFLRPlan, as outlined in the DEIS, substitutes for the existing Forest Plans because the latter were hardly used to guide or direct CFLRPlan design. And the development of this hybrid programmatic CFLRPlan is conducted in disregard of the existing programmatic planning regulations—the 2012 Planning Rule. The CFLRPlan is, in effect, a set of forest plan amendments for which the agency doesn't want to follow proper procedures to implement.

And during development of this CFLRPlan, consistency with relevant direction from the three forest plans need not be demonstrated. The DEIS states, "Forest Plan consistency evaluations are located in each specialist report, and design features to ensure that activities are consistent with Forest Plans are noted in appendix C." While those reports repeat verbatim much plan direction, there is little written to explain how the CFLRPlan is consistent with those relevant forest plan standards, guidelines, etc.

The Rim Country CFLRPlan would implement logging, prescribed burning, and road construction over a period of time longer than NFMA specifies for Forest Plans: "…over a period of 20 years or when activities can be funded or completed."

In this CFLRPlan process, members of the Stakeholder Group are not required to disclose their financial interest in the outcome of the CFLRPlan—which they will influence[2] after the Record of Decision is signed. In this process, the true costs to the taxpayer/owners are obfuscated and hidden from those same taxpayer/owners. So the CFLRPlan begins to essentially privatize public land and resources on the national forests of the Rim Country analysis area.

In this CFLRPlan process, there is no mechanism for the owners of the national forests to hold managers accountable if they fail to make forests "resilient" because there is no timely, scientifically supported way of measuring that major goal. In this CFLRPlan there is no mechanism for the owners of the Forests to hold the stakeholders accountable either. So there is no way for anyone to be held accountable when things go wrong, which is pretty much guaranteed when these second level decisionmakers are not accountable to the taxpayer/owners.

Perhaps the most important point that need be made is this: The FS does not explain how its CFLRPlan would sustain a restored landscape into perpetuity. In this CFLRPlan there are no details on how often or how extensive treatments must be, which kinds of treatments will be necessary, how many miles of roads will be needed (both permanent and temporary), etc. This

[2] "Considerations for implementing IT treatments and prescribed fire will be included in the implementation plan **as they continue to be developed with the 4FRI Stakeholder Group**." (DEIS at p. 30, emphasis added.)

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 impacts due to snag losses from dealing with logger safety or from public firewood cutting. Also missing from the CFLRPlan is an economic analysis, which would disclose how much this continuous active management, manipulate-and-control regime will cost on an annual basis—and therefore how likely such a regime could actually be implemented in order to achieve or maintain the "desired" vegetation conditions.

A central tenant of the CFLRPlan is to improve "Forest Resilience and Sustainability." From the DEIS:

> There is a need to restore the frequent low-severity fire regimes in which the forest in the Rim Country project area evolved. **Resilience** increases the ability of the ponderosa pine and mixed conifer-frequent fire forest types (target cover types) to survive natural disturbances and stressors such as fire, insect and disease outbreaks, and climate change (FSM 2020.5).
>
> There is a need to move tree group **pattern**, interspaces, and stand density toward the natural range of variation. There is a need to manage forest density, structure, and composition to improve **forest health** and reduce **adverse effects from bark beetles and dwarf mistletoe**, while also providing a diversity of habitat types and features. In the oak woodland and shrubland cover types, there is a need to stimulate **new growth**, maintain **vigor** in large-diameter trees, encourage **faster** growth in young smaller oaks, and provide for a **variety** of **shapes** and **sizes** of trees across the forest cover types.
>
> Where aspen is found in the frequent fire forest cover types, there is a need to stimulate **growth**, reduce conifer **encroachment**, and increase individual tree **recruitment**.
>
> In grassland cover types, there is a need to reduce or remove trees and other woody species that have **encroached**, which has decreased the **size** and **function** of these systems that were historically grasslands and functionally **connected** montane meadows.
>
> There is a need to improve the condition of native plant communities and the **resilience of rare species**. There is also a need to improve the **abundance**, **diversity**, **distribution**, and **vigor** of native understory vegetation to provide **food** and **cover** for wildlife where it is absent under dense forest stands where fire has been excluded. (Emphases added.)

Sprinkled throughout the above DEIS quotes on increasing resiliency and sustainability are terms (emphasized) that beg to have some sort of metric or measuring method attached to them, so that the FS can demonstrate at some later date that resiliency and sustainability has been improved. Attaching metrics to those terms is essential to the veracity of the CFLRPlan, yet there is little or nothing in the DEIS that would allow for objective, independent measurement of such terms.

"Resilience" is a term that can be useful to characterize aspects of forest ecosystems, if objectivity and scientific support is also present. However, mostly what is suggested about resilience is, it only happens when the forest is "treated", and the more the forest is "treated" the

more resilient it becomes. From the Narrative's perspective, resilience can only be engineered by management.

So it follows that—in the DEIS Monitoring Plan section, "Biophysical Monitoring for Function (or Process)" under "Relevant Desired Conditions" under "**Ecological Resilience**" the bullet points don't provide any way to monitor resilience.

Resilience is not the ***absence*** of natural disturbances such as wildland fire, insects, and diseases etc. rather, it is the opposite (DellaSala and Hanson, 2015, Chapter 1, pp. 12-13). What the FS is promoting is control of the forest ecosystem through mechanical means to maintain unnatural stasis and in the process, eliminating, suppressing or altering natural disturbances such as insect or disease effects or wildland fire. In other words, a lot of tree farming—its purpose being to maximize commercial exploitation. This is the antithesis of ecological resilience and conservation of native biodiversity. Ecological resilience is ultimately demonstrated by functioning natural processes, including fire. This is dynamic equilibrium, where a varied spectrum of succession stages is present across the larger landscape, which tends to maintain the full complement of native biodiversity on the landscape. (Thompson et al., 2009).

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 FS strives to achieve the "natural range of variability" (NRV). Frissell and Bayles (1996) ask:

> From the point of view of many aquatic species, the range of natural variability at any one site would doubtless include local extirpation. At the scale of a large river basin, management could remain well within such natural extremes and we would still face severe degradation of natural resource and possible extinction of species (Rhodes et al., 1994). The missing element in this concept is the landscape-scale *pattern* of occurrence of extreme conditions, and patterns over space and time of recovery from such stressed states. How long did ecosystems spend in extreme states vs. intermediate or mean states? Were

> extremes chronologically correlated among adjacent basins, or did asynchrony of landscape disturbances provide for large-scale refugia for persistence and recolonization of native species? These are critical questions that are not well addressed under the concept of range of natural variability as it has been framed to date by managers.
>
> …The concept of range of natural variability also suffers from its failure to provide defensible criteria about **which factors ranges should be measured**. Proponents of the concept assume that a finite set of variables can be used to define the range of ecosystem behaviors, when ecological science strongly indicates many diverse factors can control and limit biota and natural resource productivity, often in complex, interacting, surprising, and species-specific and time-variant ways. **Any simple index for measuring the range of variation will likely exclude some physical and biotic dimensions important for the maintenance of ecological integrity and native species diversity.** (Emphasis added.)

The CFLRPlan does not reduce ecological damage the way it intends for vegetative NRV. Other factors that have been heavily influenced by management along with their historical range of variability (HRV) include:

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

The CFLRPlan would not "move" those factors anywhere close to the NRV, and thus the adverse legacy impacts would continue. Holistic restoration would be impossible under the CFLRPlan.

The FS's apparent purpose for the CFLRPlan is to avoid doing site-specific NEPA at the project level. The public will never get a chance to review and comment on site-specific analyses as directed by "Flexible Toolbox Approach." Likewise there will be no opportunity for the public to become fully informed about site-specific actions in order to exercise the right to object. The CFLRPlan doesn't respect democratic processes established by Congress and written into the FS's own policies, regulations, and procedures.

The DEIS doesn't explain who the "4FRI Board of Supervisors" are and how are they delegated the authority to "drop one of the preliminary alternatives from consideration in the Rim Country DEIS" for example. Also, there is to be an "implementation team leader" who is not identified in the DEIS, and whose accountability to the public is not explicit.

In discussing an alternative not included for full analysis—one that would not utilize any prescribed fire—the DEIS explains the result would be a need for even more mechanical treatments:

> In order to avoid seedling re-growth that would support undesirable fire behavior and effects, much of the forested areas of the Rim country project area would need some kind of treatment every 10 years, roughly 90,000 acres annually.

This raises questions of the temporal effectiveness of proposed treatments claimed to ward off vegetation conditions that would lead to "catastrophic" fire. As discussed elsewhere in these comments, the CFLRPlan won't really achieve restored conditions since there is no coherent plan to end the ***causes*** of the vegetation imbalances—the ***symptoms***—described in the DEIS.

The DEIS admits the CFLRPlan would extend indefinitely into the future, not just for 20 years or so. In rejecting an alternative that would have been a more "aggressive strategy" than is already considered by treating the 953,130 acres already proposed, it states:

> The best model for industry sustainability is to provide flow of wood. There is concern this alternative would demand treatment of a large amount near term then there would be a small amount longer term (boom-bust model). This does not provide for long-term sustainability which is needed to maintain the forest over time.

Clearly, the CFLRPlan is to sustain industry "for long-term." The CFLRPlan is programmatic, not a project.

Much of the riparian restoration involves removing or mitigating the negative influences from human actions, but as we point out above, the DEIS doesn't specify the degree actions would actually be carried out under the CFLRPlan. This is due to the fact that many of those actions would only occur if mechanical treatments occur in the same vicinity. And there are also the uncertainties of funding. This makes it difficult to understand impacts of the alternatives, because the extent of these negative influences of human actions to be left on the landscape is highly uncertain.

As is the case for many other aspects of the CFLRPlan, design of many monitoring procedures comes later, after the public NEPA process is history. The Appendix E Monitoring Plan, required by the Omnibus Act, states, "As the project matures and baseline data is collected, thresholds can be refined to describe specific quantitative ranges that will trigger adaptive management actions." We note that *for eleven monitoring items*, it states, "Threshold/Trigger: **No threshold determined for this indicator**." (Emphasis added.)

There is also no mechanism in the CFLRPlan, the CLFLRA, or CFLRP holding anyone accountable if the Monitoring Plan is not properly implemented.[3] This is inherent since "collaborative partners are expected to support monitoring efforts by soliciting and contributing both in-kind and monetary funds from other sources" and "Financial support from stakeholders and other organizations will be required to adequately monitor these indicators."

[3] This accountability issue is typical of forest plan implementation monitoring and evaluation throughout the national forest system.

In fact unaccountability is built in to the Monitoring Plan: "There is an expectation that indicators, metrics, methods, thresholds, adaptive management actions, and monitoring priorities will change (adapt) over the course of the project as information is gained and new questions are revealed. The USFS will collaborate with the 4FRI Stakeholder Group as we make changes and assess monitoring priorities throughout the life of this document." Indeed, "…proposed methods represent examples of how monitoring could be accomplished rather than something set in stone."

The CFLRPlan's Implementation Plan (DEIS Appendix D) states, "Essentially, if the quantity of treatments in Tables D-1 are within the bounds of the treatments analyzed in Chapter 3 of the EIS and the specialist reports, the program of work is considered to be consistent with that effects analysis." There is no Tables D-1, and so there is no specified quantity of treatments.

Also, "Tables D-1 shows the compliance evaluation and documentation requirements to demonstrate this compliance." Where is this?

"Section A Implementation Checklist: …The checklist is designed to be used by the implementation team leader. Sources of data to populate row three are found in Chapter 3 and the specialists reports." There is no row three, there is no heading for any alleged data.

"Section B Management Direction, Desired Conditions and Treatment Design: This section includes existing forest plan management direction, desired conditions, and treatment-specific silvicultural design. It is designed to be used by the district implementation team." In other words, *programmatic direction*. Yet while some direction is attributed to the MSO Recovery Plan, none of section B direction is attributed to Forest Plans.

The DEIS is not clear as to *how the treatment units are to be delineated* on the ground, so that the public can know how and where actions are to be conducted, and within what geographic unit the design criteria can be verified, reviewed or monitored. The possible exception is for wildlife habitat delineations such as MSO PACs and such. Yet, since as the DEIS states, existing conditions can vary and so those actions could vary wildly within those habitat units.

THE NARRATIVE (Part 2)

As might be expected when something is flawed, cracks in the Narrative appear in the form of contradictions and inconsistencies in DEIS analyses. For example, "Many of the wildfires that burned within the project area in the last 10 years were managed primarily for resource objectives instead of primarily for suppression, and **they produced primarily low-severity fire effects**" (Emphasis added). In other words, working with natural processes as per the No Action Alternative can be restorative after all. In the Fire section later in these comments we describe several other ways the Narrative's depiction of fire is contradicted.

When some participating in the NEPA scoping process (one purpose being to solicit feedback from outside parties before proposal design goes in the wrong direction) cast doubt on the

Narrative while citing scientific evidence, the FS ignored their feedback. Case in point, the 8/11/2016 letter from the John Muir Project of Earth Island Institute. The letter's author, scientist Chad Hanson, states, "These Forests Do Not Have an Unnatural Excess of Fire, or High-Intensity Fire, and Future Trends May Be Downward" and "Large High-Intensity Fire Patches Did Sometimes Occur Historically in Ponderosa Pine and Dry Mixed-Conifer Forests of This Area." Hanson cited other scientists' work, attaching one of the cited documents to his comments. Instead of acknowledging the research, the FS didn't even include the attached document on the website where scoping comments appeared. And the DEIS failed to even acknowledge the scientifically controversial nature of the Narrative as Hanson points out, as if the agency's is the only perspective worth considering.

Hanson also cited research in supporting another statement: "Mexican Spotted Owls are Thriving in Large Mixed-Intensity Fires, in the Absence of Post-Fire Logging." Same result—ignored in the DEIS.

Scientist William Baker, who has done extensive research on the topic of fire regimes in western U.S. forests, also submitted scoping comments. Baker states, "The Proposed Action needs to revise the historical fire regime and forest structure." He notes the proposal's claimed need to restore the frequent low-severity fire regimes and the FS's desired conditions for "no more than 15% of the ponderosa pine (under conditions modeled) in the treatment area to be prone to crown fire or high-severity fire, with areas of potential high severity spatially distributed." Baker states, "The scientific basis for these numbers and this proposal of course are not provided in the document, but it is difficult to see how they can be supported by the available science." Baker goes on to cite scientific research as basis for his view (and even contrasting views, which reputable scientists acknowledge). He also writes:

> I hope that when you present the draft EIS you will have revised the historical fire regime description so it is "mixed severity" or "variable severity" and you will have accepted that this historical fire regime at times included substantial high-severity fire, so that the proposed goals of no more than 15% high severity in ponderosa and no more than 20% high severity fire in dry mixed conifer will not be used. Those numbers are too low relative to the evidence we presented (Williams and Baker 2012), and there is limited evidence about historical fire severity in other sources for the project area.

Baker also cites and presents scientific research that identifies limitations of the FS's fire modeling tool, FlamMap. The DEIS fails to acknowledge this in the slightest.

Why is the FS afraid of evaluating other views in the DEIS, where consideration of such dissenting views belongs? Perhaps the FS is all too aware the Narrative doesn't stand up to scrutiny.

And under this proposal, the search for validation of the Narrative is explicitly avoided: "Validation monitoring (which) assesses the degree to which underlying assumptions about ecosystem relationships are supported …is not integrated in this monitoring plan."

COLLABORATIVE FOREST LANDSCAPE RESTORATION PROGRAM REQUIREMENTS IGNORED

For actions proposed under the Collaborative Forest Landscape Restoration Program (CFLRP), the DEIS at pp. 19-20 lists some eligibility criteria.

The DEIS does not demonstrate the Rim Country proposal meets the eligibility criteria under Sec. 4003 (b)(1)(A) because the landscape restoration strategy is not complete or substantially complete. As we discuss below, the CFLRPlan's Flexible Toolbox Approach (FTA) leaves much of the activities' designs incomplete.

The DEIS does not demonstrate the Rim Country proposal meets the eligibility criteria under Sec. 4003 (b)(1)(B) because the "The project proposes to conduct restoration activities over a 20-year period or until proposed activities are completed" instead of prioritizing restoration for a 10-year period.

The DEIS does not demonstrate the Rim Country proposal meets the eligibility criteria under Sec. 4003 (b)(1)(B)(iv) because there is substantial doubt that the proposed wood-processing infrastructure is focused on woody biomass and small-diameter wood.

The DEIS does not demonstrate the Rim Country proposal meets the eligibility criteria under Sec. 4003 (b)(1)(C) because it fails to incorporate best available science, as discussed in later sections of these comments.

The DEIS does not demonstrate the Rim Country proposal meets the eligibility criteria under Sec. 4003 (b)(1)(D) and (E) because the proposal fails to retain the largest trees contributing to old growth structure, focus on small diameter trees, and maximize retention of large trees.

It also does not have a realistic chance of preventing, remediating, or controlling invasions of exotic species; [Sec. 4003 (b)(3)(D)].

Because the CFLRPlan is not consistent with the Endangered Species Act (ESA), and the DEIS does not conform to NEPA and the planning rule, it violates the CFLRA at Sec. 4003(a).

How does this CFLRPlan analyze anticipated cost savings [Sec. 4003 (b)(4)]?

Is there a link to a website publishing: the business plan for the original 4FRI project [Sec. 4003 (g)(1)(B)], the Annual Report for the original 4FRI project [Sec. 4003 (g)(3)], and the results of multi-party monitoring completed thus far for the original 4FRI project?

THE FLEXIBLE TOOLBOX APPROACH CIRCUMVENTS THE NATIONAL ENVIRONMENTAL POLICY ACT

As can be understood from the DEIS, the Flexible Toolbox Approach (FTA) is a set of procedures for assessing existing conditions in the analysis area, and then based upon those conditions deciding what active management actions to apply.

A big problem with this approach is, the public is left out of the process of making these small scale decisions. There are no legally mandated procedures for involving the public, since all this would happen after the NEPA process has been completed. The administrative review process known as the Objection process would also be in the rear view mirror. If the FS were to err in making these small scale decisions, such as by implementing management bias based upon the false Narrative, there would be no way to hold decisionmakers accountable.

If this were a normal planning process instead of a CFLRPlan process, these small scale decisions would be open for public review during the NEPA process, meaning the public (and decisionmaker) would be informed so the analysis of environmental impacts could be understood, and so an informed choice can be made among a reasonable range alternatives in the NEPA document. All this is precluded when these FTAs are the mechanism for implementing the CFLRPlan.

Under normal NEPA procedures the FS would do the field work; gathering the data on existing conditions so that a Purpose and Need can be properly formulated, then designing alternatives to serve the Purpose and Need. Only then can analysis of the impacts be accurately presented and an informed debate invoking best available science ensue. Other government agencies can be properly informed to play their oversight roles, e.g. U.S. Fish & Wildlife Service (USFWS) consultation under the Endangered Species Act. But by basing Rim Country activity design within an FTA paradigm, this is all flipped on its head. We have data-free analysis, so essentially analysis-free decisionmaking. The NEPA principle of "look before you leap" is subverted—the leap will come first.

The FTA procedures themselves, as written in the DEIS, are a good approximation on how data can be gathered, existing conditions assessed, and management actions proposed *during* the NEPA process, *informing* it along the way. We do not take issue with these procedures themselves. But with the CFLRPlan, the FS rejects a sensible, NEPA-consistent approach by delaying their timing until after the ROD, allegedly because of the necessity to "accelerate restoration" and "move into on-the-ground implementation as quickly as possible…"

The DEIS justifies this acceleration, stating: "With a delay of 10 to 20 years between fires or mechanical treatments, areas currently showing potential for passive crown fire are likely to transition to active crown fire, depending on geographic location and site conditions." Yet nothing in the DEIS proves such a critical time period exists. According to the DEIS, the landscape has been trending into present conditions for several decades, much of it due to FS management actions and inaction. And it's also clear the FS has been aware of this trend for decades. Now, all of a sudden there's a critical need to act quickly? Perhaps as a response to the political pressure created by the CFLRA—not because of sudden and rapid changes in conditions in these Forests.

So, to what degree, for example, are the Ponderosa Pine/Gambel Oak habitat types in the Rim Country analysis area really departed from "historic" conditions as claimed under the Narrative? That is yet to be determined. The public and other interested parties are unable to see what logging and burning techniques are to be applied in specific stands or other local landscape units, because none of that has been worked out—it awaits until after the ROD is signed. How are the

requirements of the CFLRA provisions to focus on small diameter trees being implemented? As we discuss later, due to lack of specific commitments in the DEIS it's now impossible to tell. How many miles of roads will actually be decommissioned or relocated? Same uncertainties. Where are new roads to be constructed, however "temporary" they may be? Stand by for details, and be prepared to wait until you have no influence within any established public process.

Even if one accepts the FS's definition of "restoration" as embodied in the CFLRPlan, would the use of this FTA really "accelerate" it?

The implementation of the FTA for even a single subwatershed would involve on-the-ground data gathering to document conditions, followed by data analysis, coordination among specialists, following FTA "Decision Matrices" while considering "land-use constraints" biological timing issues, "prioritization considerations" and finally after hundreds of hours—a decision. And this characterization is an oversimplification of the complexities of the FTAs as described in the DEIS. <u>All this is to occur before implementation begins</u>. The DEIS doesn't explain how procrastinating all these actions until after the ROD is signed speeds anything up. If they are reasonable and mandatory, it is arbitrary to alter the timing so drastically, to a time that is post-NEPA. If "acceleration" is indeed for accomplishment, we suspect there will be a lot of process shortcutting, arbitrary decisionmaking, and consequently unanalyzed negative environmental consequences.

The DEIS even admits that aquatic and watershed "Treatments …may cause effects potentially beyond the sideboards or limitations described in the original NEPA analysis" and therefore "would require subsequent NEPA analysis." Again, what's the rush, given that subsequent NEPA is foreseeable?

Implementation of the aquatic and watershed FTA would depend upon "Site reconnaissance: IDT, partners, stakeholders walk the potential project area to identify areas of concern and potential causes." However, the qualifications of partners and stakeholders to take on this important role are missing.

In the ever-changing (not subject to delineation under NEPA) boundaries of the wildland urban interface (WUI), the FTA is biased toward even "more open treatments that will result in up to 70 percent interspace" using vague "site-specific considerations identified with Community Wildfire Protection Plans and local FS ranger districts."

"The flexible toolbox approach is used to … Estimate the number of acres of each type of treatment proposed in each of the action alternatives. Proposed treatments, each with a defined range of openness, are analyzed at the higher end of openness or intensity, in order to analyze the maximum potential effects from these treatments." This makes no sense, because Table 10 includes no defined range of openness for the various treatments.

"Pre-project notification will be reported to all required regulatory agencies at least 60 days prior to implementation of the activity." What regulatory mechanisms require such pre-project notification?

CUMULATIVE EFFECTS OF LIVESTOCK GRAZING

There is an elephant in the CFLRPlan room, which looks a lot like a cow. It is not scientifically defensible to engage in "ecosystem restoration" in an area already significantly impacted by ongoing livestock grazing without including grazing in a comprehensive environmental assessment and analysis of a full range of ecological alternatives that accounts for the cumulative impacts to the degraded ecosystem from historic timber harvest, roads, fire suppression, climate change AND livestock grazing.

"Within the project area, approximately 1,129,490 acres are within grazing allotments and 109,170 acres are not grazed by livestock." Livestock grazing occurs in about half of the area the CFLRPlan proposes to conduct vegetation treatments.

The most immediate progress in healing damaged riparian areas is made under rest from livestock grazing (Platts, 1991), and studies of larger-sized livestock exclosures confirm that exclusion promotes more rapid recovery of damaged riparian areas (Duff, 1977; Belsky et al., 1999).

"The indirect effect of cutting trees in a groupy/clumpy arrangement would increase herbaceous vegetation because of the overall increase in sunlight reaching the soil. The increase in forage would have short-term (within three years) and long-term 10-year beneficial effects on livestock grazing." So the logging and prescribed fire will make more favorable forage vegetation for cattle, but the DEIS says nothing about how subsequent grazing affects "desired" tree composition, density, structure, soil conditions, noxious weed establishment and spreading, etc. The Forest Service must discuss how grazing will affect its ability to meet its desired future conditions.

Impacts of continued grazing in the analysis area will include continued degradation of riparian, upland, and aquatic species habitats; soil erosion; invasion of weedy species; loss of fish and wildlife habitat and numbers; altered fire cycles, fragmentation of habitat, and impairment of the aesthetic, recreational and scientific experiences of public lands users. Clearing trees and other wood through logging and burning creates openings and corridors for expanding and intensifying cattle impacts into previously less accessible areas of the streams, drainage arteries and watershed uplands.

We find it difficult to understand how increasing cattle access to streams, riparian areas and other areas of currently dense trees, while increasing forage in those opened areas via prescribed burning and "mechanical treatments" constitutes "restoration" when what would occur is spreading the weeds, soil damage, and other direct impacts of livestock into areas they don't currently access.

Although we appreciate the proposed actions to protect and mitigate livestock damage in springs and meadow areas, it won't counterbalance all the adverse impacts of livestock spreading further and eating the vegetation in areas they don't now graze.

Poessel, et al., 2020 found that restoring riparian ecosystems by removing livestock was beneficial to the conservation of many declining populations of migratory birds. They analyzed changes in vegetation and bird abundance at a wildlife refuge in southeastern Oregon over 24 years, following cessation of 120 years of livestock grazing. "Overall avian abundance increased 23% during the 12 years after removal and remained consistent from then through year 24. … Of the focal species, most riparian woodland-tree or shrub dependent, sagebrush obligate, and grassland or meadow taxa increased in abundance or remained stable locally. … Our data suggest that removal of cattle was correlated with increases in vegetation productivity and in local abundances of many regionally declining avian species of conservation concern in the arid western United States." (*Id*.)

The DEIS asks, "Would livestock grazing affect the restoration of understory species?" Where is the analysis supporting an answer to that question in the DEIS? USDA Forest Service, 2012c points out that "Cattle grazing has the potential to impact newly established regeneration from cattle trampling the seedlings or pulling them out of the ground with their teeth."

Whereas the Soil and Watershed Report discloses: "Grazing reduces herbaceous ground cover, allowing ponderosa pine seedlings to become established due to less vegetative competition while aggressive fire suppression prevented wildfires from reducing seedling and sapling densities" the DEIS doesn't explain such cumulative effects anywhere.

"Livestock trails make up a very small portion of the total project area and therefore have a negligible effect on soils or watershed condition. …Cumulative effects from livestock grazing when added to effects from restoration treatments would include minor, generally localized soil compaction, puddling, displacement and erosion from livestock trailing and in areas where animals congregate such as livestock waters and areas where mineral supplements are placed." However, livestock don't merely congregate in a few "localized" areas and stay on trails in between. The amount of damage cattle have caused, and continue to cause to soil integrity, and the resultant erosion is basically dismissed as "minor" without any genuine quantification of such impacts.

The DEIS totally ignores the damage to native microbiotic crusts, which potentially occur on much of the 1,000,000 or so acres where cattle graze. Microbiotic crusts are key protective components of soil surfaces, in not only arid systems but also in forest understories, acting to stabilize soil surfaces, slow runoff, prevent soil erosion and rilling, exclude weeds and fix nitrogen. Trampling by livestock destroys these vital and protective crusts, exposes soils to erosion and accelerates desertification processes. (Anderson et al., 1982; Johansen, 1993; Beymer and Klopatek, 1992; Belnap, 1995.) Burning destroys crusts, as will logging, skidding, bulldozing roads and vegetation clearing that exposes mosses to direct sun.

Belnap, 1995 explains:

> Normal nutrient cycles in these semiarid regions can also be disrupted by soil surface disturbance. Nitrogen is often limiting in desert systems (Zak and Whitford, 1988). Cyaonobacterial-lichen soil crusts have been shown to be the dominant source of nitrogen in a cold-desert pinyon-juniper and grassland ecosystem in southern Utah (Evans and Ehlringer, 1993; Evans and Belnap, unpublished data). Experiments have demonstrated that

> all types of surface disturbance tested dramatically decreased nitrogenase activity in these crusts (Belnap et al., 1994). Plants growing on undisturbed sites consistently show higher N content when compared to adjacent disturbed sites (Belnap and Harper, in press; Harper and Pendleton, 1993).
>
> Cyanobacterial-lichen soil crusts are an important source of fixed carbon for these sparsely vegetated areas (Beymer and Klopatek, 1991). In addition, soil disturbance can alter soil food webs and thereby affect nutrient availability in these systems (Ingham et al., 1989). Disruptions of soil food webs can reverberate throughout the ecosystem, affecting macro-floral and faunal components (Hendrix et al., 1992; Coleman et al., 1992). Soil surface disturbance can also affect plant community composition and architecture. Changes in these critical habitat components have been shown to affect invertebrate and vertebrate populations (MacMahon, 1987). Since preventing desertification depends on maintaining stability and fertility of soils, as well as diversity of processes and species in ecosystems, impacts to sensitive soil surfaces can accelerate the desertification process.

The DEIS says, "In grassland cover types, there is a need to reduce or remove trees and other woody species that have encroached, which has decreased the size and function of these systems that were historically grasslands and functionally connected montane meadows." The DEIS also states, "Stream and riparian area restoration would have a long-term benefit to livestock grazing management by increasing forage, by improving bank stability, and by decreasing the amount of sediment to downstream stock tanks. Excluding livestock from these restoration areas would be short term." Although the DEIS doesn't admit it, one purpose of the CFLRPlan is to improve forage for livestock. The goal of the Four Forests Restoration Initiative should be to improve ecological processes and forest health; goals should *not* include feeding livestock.

The Soil and Watershed Report discloses "Some areas currently have appreciable numbers of ponderosa pine invasion or encroachment especially along meadow edges due to either long term drought or conditions that have led to drainage of meadow soils such as channelized flow patterns that drain meadows or gully formation caused by historic livestock grazing and browsing by wildlife ungulates (i.e., elk)." The DEIS doesn't disclose such cause and effect relationships implicating livestock grazing in disturbing ecological processes.

"The Region 3 Soil Condition Field Evaluation Form and Soil Condition Rating Guide (FSH 2509.18) is the primary tool used to rate soils as satisfactory, impaired of unsatisfactory." Has Region 3 examined the correlation between impaired or unsatisfactory soils and livestock grazing?

"Annual monitoring typically includes an assessment of current conditions, a measure of livestock usage and actual use. Long-term monitoring usually consists of condition and trend monitoring every five to fifteen years measuring plant canopy cover, plant frequency, species composition, and/or ground cover." The DEIS presents no information from that monitoring, rendering its cumulative effects analyses much uninformed.

The DEIS fails to analyze and disclose the extent, degree, and significance of livestock grazing (and associated infrastructure and activities) impacts on most resources discussed in the DEIS.

"To stimulate growth, recruit younger age classes, and increase individual recruitment of aspen, protective barriers would be placed around sites to prevent browsing and other disturbance during regeneration. Protective barriers would also be placed around pockets of Bebb's willow and bigtooth maple…" With livestock grazing being ubiquitous in Rim Country, and lacking the effect of a top predator (Mexican wolf), please explain how we can *ever* get to a point where fencing—with its own brand of adverse impacts to scenery and native species movements and survival—would not be needed for those purposes. The Forest Service should not rely on fencing to protect vegetation and should instead focus on long term, sustainable, and proven solutions such as additional wolf reintroductions and recovery and the retirement of grazing allotments to restore ecosystem health.

Belsky and Gelbard, 2000 is a literature review of livestock as contributing to noxious weed spread. And Belsky et al., 1999 is a literature review of peer-reviewed studies concerning effects of livestock grazing on water resources:

> Livestock grazing was found to negatively affect water quality and seasonal quantity, stream channel morphology, hydrology, riparian zone soils, instream and streambank vegetation, and aquatic and riparian wildlife… through direct impacts of cattle on riparian areas and aquatic habitats, as well as indirect and cumulative effects from disturbance and impairment to the watershed uplands and drainage network. An extensive body of scientific literature has developed concerning the harmful effects of domestic livestock grazing on western public lands, on the environmental effects of deforestation, and climate change stress on ecosystems and ecosystem processes.

Livestock grazing would work hand in hand with other agency policies to interact with the adverse effects of fire suppression identified throughout the DEIS. Belsky and Blumenthal, 1997 investigate these impacts livestock grazing cause to stand dynamics and soils of upland forests of the Interior West. Such effects are virtually ignored in the DEIS.

Cumulatively, rilling, gullying, and soil erosion will accelerate due to logging, burning, and continued chronic grazing stress and overarching climate stress. Once disturbed, soils which may take millennia to form in arid lands such as Rim Country can wash away in a single thunderstorm or snowmelt runoff event, or be eroded by winds. Ephemeral and intermittent drainages, including those located in areas of very erodible or unprotected soils, may suffer significant harmful impacts from livestock grazing and trampling. During spring runoff or thunderstorm events, intermittent drainages carry large flows of water, sediments, and debris.

Protective vegetative cover in uplands is usually the most important management variable affecting surface runoff and erosion from uplands that deliver runoff, sediment, and bacteria to these drainages. (Van Haveren et al., 1985.) Extensive soil disturbance from logging, skidding, burning, bulldozing roads, and other CFLRPlan activities combine cumulatively with chronic grazing disturbance stressors by creating access for cattle to vacant allotment areas and previously inaccessible riparian zones.

Scientific studies have found significant reductions in runoff and sediment yield related to livestock grazing changes (Lusby, 1979).

Extensive deforestation and bulldozing roads exacerbate climate change effects—causing hotter, drier, windier local site conditions, changing local microclimate conditions. Cleared areas lose protective vegetation cover to buffer extreme rainfall or other weather events. With earlier snowmelt and runoff predicted under climate change, watersheds dry out earlier, lengthening the fire season, and perennial flows are reduced. Cattle cause soil and microbiotic crust disturbance, accelerating site drying and erosion, soil compaction, and other impacts. This reduces the capacity of the watershed and drainage networks to absorb and slowly release water in sustainable perennial flows. Soils disturbed by logging, skidding, road bulldozing, and burning, considered cumulatively with ongoing cattle grazing and trampling disturbances, will be prone to rapid snowmelt runoff and erosion into drainage networks. Drainages subject to these kinds of cumulative ecological stressors increasingly erode, downcut, suffer accelerated runoff, and lose water holding capacity.

With the advent of climate change, air temperature increases, altered precipitation patterns, and drought periods are expected to become more frequent. One effective means of ameliorating the effects of climate change on ecosystems is to reduce environmental stressors under management control, such as land and water uses (Beschta et al., 2012). Climate change and ungulates, singly and in concert, influence ecosystems at the most fundamental levels by affecting soils and hydrologic processes. These effects, in turn, influence many other ecosystem components and processes—nutrient and energy cycles; reproduction, survival, and abundance of terrestrial and aquatic species; and community structure and composition. Moreover, by altering so many factors crucial to ecosystem functioning, the combined effects of a changing climate and ungulate use can affect biodiversity at scales ranging from species to ecosystems and limit the capability of large areas to supply ecosystem services (Christensen and others, 1996; Millennium Ecosystem Assessment, 2005b; Beschta et al., 2012).

In rejecting an alternative that would not utilize prescribed fire, the DEIS states, "Grazers would remove the herbaceous vegetation that helps carry a fire across the majority of the project area." Yet the DEIS fails to include such cumulative effects in its analysis of fire.

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

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

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

Beschta et al., 2012 provide a scientific basis for expecting significant environmental damage from livestock grazing with the changing climate:

• Climate impacts are compounded from heavy use by livestock and other grazing ungulates, which cause soil erosion, compaction, and dust generation; stream degradation; higher water temperatures and pollution; loss of habitat for fish, birds and amphibians; and desertification.
• Encroachment of woody shrubs at the expense of native grasses and other plants can occur in grazed areas, affecting pollinators, birds, small mammals and other native wildlife.
• Livestock grazing and trampling degrades soil fertility, stability and hydrology, and makes it vulnerable to wind erosion. This in turn adds sediments, nutrients and pathogens to western streams.
• Water developments and diversion for livestock can reduce streamflows and increase water temperatures, degrading habitat for fish and aquatic invertebrates.
• The advent of climate change has significantly added to historic and contemporary problems that result from cattle and sheep ranching.

Beschta et al., 2012 believe the burden of proof should be shifted. Those using public lands for livestock production should have to justify the continuation of ungulate grazing. Some other key points the authors make include:

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

livestock have had numerous and widespread negative effects to western ecosystems (Love 1959; Blackburn 1984; Fleischner 1994; Belsky and others 1999; Kauffman and Pyke 2001; Asner and others 2004; Steinfeld and others 2006; Thornton and Herrero 2010). Moreover, public-land range conditions have generally worsened in recent decades (CWWR 1996, Donahue 2007), perhaps due to the reduced productivity of these lands caused by past grazing in conjunction with a changing climate (FWS 2010, p. 13,941, citing Knick and Hanser 2011).

- Livestock use effects, exacerbated by climate change, often have severe impacts on upland plant communities. For example, … areas severely affected include the northern Great Basin and interior Columbia River Basin (Middleton and Thomas 1997).
- Livestock grazing has numerous consequences for hydrologic processes and water resources. Livestock can have profound effects on soils, including their productivity, infiltration, and water storage, and these properties drive many other ecosystem changes. Soil compaction from livestock has been identified as an extensive problem on public lands (CWWR 1996; FS and BLM 1997). Such compaction is inevitable because the hoof of a 450-kg cow exerts more than five times the pressure of heavy earthmoving machinery (Cowley 2002). Soil compaction significantly reduces infiltration rates and the ability of soils to store water, both of which affect runoff processes (Branson and others 1981; Blackburn 1984). Compaction of wet meadow soils by livestock can significantly decrease soil water storage (Kauffman and others 2004), thus contributing to reduced summer base flows. Concomitantly, decreases in infiltration and soil water storage of compacted soils during periods of high-intensity rainfall contribute to increased surface runoff and soil erosion (Branson and others 1981). These fundamental alterations in hydrologic processes from livestock use are likely to be exacerbated by climate change.
- The combined effects of elevated soil loss and compaction caused by grazing reduce soil productivity, further compromising the capability of grazed areas to support native plant communities (CWWR 1996; FS and BLM 1997). Erosion triggered by livestock use continues to represent a major source of sediment, nutrients, and pathogens in western streams (WSWC 1989; EPA 2009).
- Historical and contemporary effects of livestock grazing and trampling along stream channels can destabilize streambanks, thus contributing to widened and/or incised channels (NRC 2002). Accelerated streambank erosion and channel incision are pervasive on western public lands used by livestock (Fig. 4). Stream incision contributes to desiccation of floodplains and wet meadows, loss of floodwater detention storage, and reductions in baseflow (Ponce and Lindquist 1990; Trimble and Mendel 1995). Grazing and trampling of riparian plant communities also contribute to elevated water temperatures—directly, by reducing stream shading and, indirectly, by damaging streambanks and increasing channel widths (NRC 2002). Livestock use of riparian plant communities can also decrease the availability of food and construction materials for keystone species such as beaver (Castor canadensis).
- Livestock production impacts energy and carbon cycles and globally contributes an estimated 18% to the total anthropogenic greenhouse gas (GHG) emissions (Steinfeld and others 2006). How public-land livestock contribute to these effects has received little study. Nevertheless, livestock grazing and trampling can reduce the capacity of rangeland vegetation and soils to sequester carbon and contribute to the loss of above- and below-ground carbon pools (e.g., Lal 2001b; Bowker and others 2012). Lal (2001a) indicated

that heavy grazing over the long-term may have adverse impacts on soil organic carbon content, especially for soils of low inherent fertility. Although Gill (2007) found that grazing over 100 years or longer in subalpine areas on the Wasatch Plateau in central Utah had no significant impacts on total soil carbon, results of the study suggest that ‘‘if temperatures warm and summer precipitation increases as is anticipated, [soils in grazed areas] may become net sources of CO2 to the atmosphere’’ (Gill 2007, p. 88). Furthermore, limited soil aeration in soils compacted by livestock can stimulate production of methane, and emissions of nitrous oxide under shrub canopies may be twice the levels in nearby grasslands (Asner and others 2004). Both of these are potent GHGs.

- Managing livestock on public lands also involves extensive fence systems. Between 1962 and 1997, over 51,000 km of fence were constructed on BLM lands with resident sage-grouse populations (FWS 2010). Such fences can significantly impact this wildlife species. For example, 146 sage-grouse died in less than three years from collisions with fences along a 7.6-km BLM range fence in Wyoming (FWS 2010). Fences can also restrict the movements of wild ungulates and increase the risk of injury and death by entanglement or impalement (Harrington and Conover 2006; FWS 2010). Fences and roads for livestock access can fragment and isolate segments of natural ecological mosaics thus influencing the capability of wildlife to adapt to a changing climate.
- (L)ivestock use (particularly cattle) on these lands exert disturbances without evolutionary parallel (Milchunas and Lauenroth 1993; MEA 2005a). …The combined effects of ungulates (domestic, wild, and feral) and a changing climate present a pervasive set of stressors on public lands, which are significantly different from those encountered during the evolutionary history of the region’s native species. The intersection of these stressors is setting the stage for fundamental and unprecedented changes to forest, arid, and semi-arid landscapes in the western US (Table 1) and increasing the likelihood of alternative states. Thus, public-land management needs to focus on restoring and maintaining structure, function, and integrity of ecosystems to improve their resilience to climate change (Rieman and Isaak 2010).
- Natural floods provide another illustration of how ungulates can alter the ecological role of disturbances. High flows are normally important for maintaining riparian plant communities through the deposition of nutrients, organic matter, and sediment on streambanks and floodplains, and for enhancing habitat diversity of aquatic and riparian ecosystems (CWWR 1996). Ungulate effects on the structure and composition of riparian plant communities (e.g., Platts 1991; Chadde and Kay 1996), however, can drastically alter the outcome of these hydrologic disturbances by diminishing streambank stability and severing linkages between high flows and the maintenance of streamside plant communities. As a result, accelerated erosion of streambanks and floodplains, channel incision, and the occurrence of high instream sediment loads may become increasingly common during periods of high flows (Trimble and Mendel 1995). Similar effects have been found in systems where large predators have been displaced or extirpated (Beschta and Ripple 2012). In general, high levels of ungulate use can essentially uncouple typical ecosystem responses to chronic or acute disturbances, thus greatly limiting the capacity of these systems to provide a full array of ecosystem services during a changing climate.
- (F)ederal grazing fees on BLM and FS lands cover only about one-sixth of the agencies’ administration costs (Vincent 2012).

We would like to reiterate, as stated in our 4FRI scoping comments which we incorporate by reference, our concerns about how grazing is perpetuating the problems 4FRI aims to fix. By removing the understory, grazing interrupts ground fire behavior and allows woody species such as ponderosa pine and juniper to sprout at high densities, both of which are identified in the DEIS as problematic in the Rim Country project area. Also, as mentioned elsewhere in these comments, grazing is contributing to unhealthy riparian, aquatic, and wet meadow ecosystems.

CUMULATIVE EFFECTS

The massive scale of the proposal complicates and frustrates cumulative effects analyses. The DEIS cannot properly analyze direct and indirect impacts of the proposal because of the use of the Flexible Toolbox Approach (as discussed in another section of these comments).

The DEIS states, "Approximately 192,000 acres already covered by NEPA decisions will be included in the Rim Country analysis in order to incorporate additional restoration activities such as road decommissioning, spring and stream channel restoration, and wildlife habitat restoration." How the changes proposed in this DEIS would affect conclusions in the NEPA documents of those already approved projects concerning cumulative impacts is not adequately analyzed and disclosed in this DEIS.

The DEIS also states: "Approximately 61,000 acres have been excluded because they are already covered by NEPA decisions, with treatments designed to meet restoration objectives. These past and ongoing projects will be addressed in cumulative effects."

However, cumulative effects of those actions are not adequately analyzed and disclosed in the Rim Country DEIS. The DEIS states, "A summary of past, present, and reasonably foreseeable projects with management activities proposed and completed (see Table 19), as well as past wildfires (see Table 20), in the Rim Country project area and in the 6th HUC watersheds is presented here." It goes on to state, "This summary represents the best available information made available to each resource specialist to determine relevancy to their specific resource." A mere list of projects and fires is not "the best available information" and analysis of how those projects and fires impacted, or will impact, the resources in the Rim Country area.

The DEIS fails to include analysis of monitoring of those past projects, which would inform cumulative effects analyses. This means including in the analysis:

- 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 Forest Plan monitoring and evaluation efforts.

This would include the first 4FRI project, of which there is no reporting of monitoring in the DEIS.

The DEIS lists several actions, but it includes no analysis of how well those past FS projects met the goals, objectives, desired conditions, etc. stated in those project NEPA documents, and how well the projects conformed to forest plan standards and guidelines. There is no analysis of how well the statements of Purpose and Need in those NEPA documents were served.

Such items are a critical part of a NEPA analysis. Without this critical link the validity of many FS assumptions are baseless. Without analyzing the accuracy and validity of the assumptions used in previous NEPA processes one has no way to judge the accuracy and validity of the current proposal. The predictions made in previous NEPA processes also need to be disclosed and analyzed because if these were inaccurate, and the agency is making similar predictions, then the process will fail. For instance, if for previous projects the FS said they were going to reduce fuels for similar reasons as expressed in the CFLRPlan, or implement some other type of management, and these were never effectively implemented or monitored, it is important for the public and the decision maker to know. If there have been problems with FS implementation or monitoring in the past, it is not logical to assume that implementation will now be appropriate. If prior logging, prescribed fire and other "forest health" or "fuel" treatments have not been monitored appropriately, then the basis for this latest proposal becomes highly questionable.

Such an analysis would provide an explanation of why, with "469,036 acres of mechanical vegetation management activities that mainly consisted of tree thinning involving heavy equipment and 567,935 acres of prescribed fire" from 1990 to 2017 plus tens of thousands of acres of other treatments—the forest lands of the analysis area are still quite out of whack as stated in the DEIS.

Of the ongoing or foreseeable projects encompassed within the 192,000 acres or 61,000 acres as mentioned above from the DEIS, did their NEPA documents analyze the cumulative effects of the 4FRI Rim Country proposal as a foreseeable action? For those that did not, has the FS performed changed conditions analyses as per the Forest Service Handbook at 1909.15 or otherwise reinitiated NEPA to consider cumulative effects of the 4FRI Rim Country proposal as a foreseeable action?

The DEIS states of Alternative 1 (No Action): "Ongoing vegetation treatments and fire management activities, as well as road maintenance, recreation, firewood gathering, authorized livestock grazing, and other activities already authorized in separate NEPA decisions would continue." However the DEIS fails to present a genuine analysis of the effects of those ongoing actions—not even mentioning them in some resource analyses.

FIRE

The Sierra Club's scoping comments stressed that there should be an unambiguous goal of restoring fire as a critical natural process rather than focusing on the negative goal of avoiding undesirable fires. The comments also referred the FS to the definition and description of Firescapes in the 4FRI Stakeholders' Landscape Strategy document.

Sierra Club comments posed questions that the EIS should answer:

- Where and under what conditions can natural ignitions be managed for resource benefit under current Fire Management Plans?
- Where can treatments be located to facilitate containment and management of planned or unplanned ignitions within firescapes or subsets thereof?
- How can treatments be positioned and sequenced to most efficiently reduce the potential for landscape-scale crown fire?

These concerns, however, were not adequately addressed in the DEIS.

Fire regimes

Despite representations to the contrary, the CFLRPlan as embodied in the 4FRI Rim Country DEIS perpetuates fire suppression. It lacks strong, nondiscretionary measures to restore the natural fire regimes said to have been lost or altered. This is evident in statements indicating logging and fire suppression are to be key components of the CFLRPlan indefinitely. Again, all these are implicated as factors leading to the need to ecologically restore the Rim Country CFLRPlan area in the DEIS, and also stated in Reynolds, et al., 2013—frequently cited by the DEIS as guiding principles of the 4FRI proposal.

Finney and Cohen (2003) begin to tease out the wildland fire issue:

> 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.

Under the DEIS's No Action alternative:

> (I)t is possible that one or more naturally caused wildfires would be managed to benefit forest resources. Depending on the ability to manage one or more naturally caused fires based on values at risk, fuel, and weather conditions under this alternative some wildfires could result in small openings that decrease areas of intermediate aged trees, which would then contribute to establishment of a new young cohort of trees. Management of naturally caused fires under this alternative may also have the effect of reducing basal area and SDI by killing small trees or groups of small and/or intermediate aged trees. These fires could also result in mortality of some large and old trees or large patches of high severity mortality. Based on those areas in recent wildfires that have been managed for resource benefits, this effect may be very limited across the landscape. The current condition of the Forest would limit the ability to manage naturally-occurring wildfires in the analysis area at low to moderate-intensity levels without potential unacceptable effects on values at risk.

The above paragraph provides a refreshing contrast to the Narrative, acknowledging that wildland fire could have some beneficial ecological effects even in the absence of the action alternatives' proposed heavy-handed manipulations. The implication in the DEIS is, under the action alternatives such resource benefits from natural fire would be even more likely because fire managers could feel more comfortable allowing natural ignitions to burn. The problem is, the DEIS is not at all convincing regarding naturally occurring fire management, since it makes several references to continuing widespread suppression under the CFLRPlan. There is no mechanism that rewards managers for taking the necessary risks, and many institutional mechanisms (politicians, industry propaganda, all-too-willing firefighting enterprises, etc.) that punish it. Because of the culture of wildfire control the agency has enabled for over a century, managers are generally only second-guessed for ***not*** taking suppression actions.

The Fire Ecology Report states, "In areas where it is not possible to allow fire to fully resume its natural role within an ecosystem, Prescribed Fire will be applied to meet management objectives…" Please provide a description (including areal extent) of these areas where fire is not allowed to "fully resume its natural role" in the analysis area.

Also, "Wildland Fires threatening the Wildland/Urban Interface will have high suppression priority…" (*Id.*). How will it be determined if a wildland fire is threatening the WUI? And to what extent could this suppression happen in areas other than those where it is not allowed to "fully resume its natural role" in the analysis area? Are there areas outside the WUI where fire will not be allowed to "fully resume its natural role"?

"Wildland Fire not meeting management objectives will receive an appropriate suppression response" (*Id.*). What criteria will be used—and when—to determine a wildland fire is "not meeting management objectives"?

"Wildland Fires or portions of fires will be suppressed when they adversely affect forest resources…" (*Id.*). Again, this piles on to the many reasons why wildland fire will continue to be suppressed practically everywhere in the analysis area.

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.

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. (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.

Fire suppression in the Rim Country CFLRPlan area has likely not, in reality, caused a significantly elevated risk of "catastrophic" fire in the analysis area. But under the Narrative, fostering a heavy dose of fear helps to justify logging as "restoration."

Churchill, 2011 describes the ongoing natural processes that will alleviate problems such as alleged in the DEIS—without invoking the expensive and ecologically risky logging, prescribed burning, and road building:

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

Much scientific research finds that drier forests did in fact experience stand-replacing fires (Baker and Williams 2015, Williams and Baker 2014, Baker et al. 2006, Pierce et al. 2004, Baker and Ehle 2001, Sherriff et al. 2014). The DEIS's representations that the proposed treatments will result in likely or predictable later wildland fire effects is of considerable scientific doubt (Rhodes and Baker, 2008).

Despite DEIS predictions of "catastrophic" fire under a no-action scenario, the DEIS itself suggests otherwise. "Of the annual acres burned by large fires since 1992, about 73 percent burned at low severity on average, and 27 percent burned at moderate to high severity." Also, "Wildfires from 1943 to 2017 (Table 28) have burned on approximately 509,447 acres in or adjacent to the project area. Of these acres, it is estimated that the overall average fire severity to the vegetation was 20 percent high severity, 30 percent mixed severity and 50 percent low severity. There is wide variability among these percentages from fire to fire." The DEIS' explanation is:

> The vast majority of the mechanical thinning projects in the area have decreased the potential for active crown fire and crown fire initiation on acres thinned (469,036 acres from Table 25 and 199,220 from Table 26), and the potential for crown fire initiation, and high severity effects from surface fire (567,935 acres from Table 25 and 257,014 acres from Table 26). Past mechanical and prescribed fire treatments decreased the potential for crown fire by breaking up the vertical and horizontal continuity of canopy fuels.

And this doesn't even take into account almost 278,000 acres of already authorized vegetation treatments that would continue under the No Action alternative, or the tens of thousands more acres of to be conducted under similar projects (DEIS at 192).

The Fire Ecology Report states, "Currently, the number of acres burning with high severity is much larger than historic data indicates was typical of ponderosa pine in the southwest…" What was, historically "typical of ponderosa pine in the SW" in terms of extent of percent burned at low severity, at moderate severity, and at high severity—and what is your scientific basis?

The Fire Ecology Report states, "the annual acres burned by large fires has increased since 1992…" How much of this can be attributable to managing fires for resource benefits?

"Currently, across much of the project area, surface fuels are dominated by needle litter and duff that has accumulated over years to decades and is more closely packed than herbaceous fuel." What are the sources of data/field survey results supporting this statement?

The DEIS at p. 218 uses the 2002 Rodeo/Chedeski Fire as an example of "an uncharacteristic fire." Apparently the DEIS doesn't consider that climate change was already affecting the landscape, or what seasonal weather variables might have been factors. And the DEIS doesn't even provide an analysis of the pre-Rodeo/Chedeski Fire landscape, which the Narrative implicates in these "uncharacteristic" effects.

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 and/or prescribed burning, halts blazes. And conditions for such fire activity will occur more frequently under likely climate change scenarios. 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.**

The DEIS doesn't provide a comprehensive enough analysis of the varying amounts and levels of effectiveness of "fuel" changes attributable to: foreseeable projects in the analysis area, the varying ages of the past cuts, the varying forest types, the past slash treatments, etc.

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 the DEIS 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.

Similarly, Bradley et al., 2016 studied the fundamental premise that mechanical fuel reduction will reduce fire risk. The 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" with "what we know about forest fires and beetle outbreaks in relation to climate change, limitations of thinning and other forms of logging in relation to wildfire and insect management" and makes "recommendations for moving forward based on best available science."

The DEIS's analyses which predict reduced fire severity don't consider that management actions would often result in "fuel" conditions leading to just the opposite. On one hand it admits that "Mechanical treatment alone …can also increase surface fuel loadings through the placement of slash on the ground (Carey and Schuman, 2003)." On the other hands, the risk of not-so-timely slash treatments and other prescribed fire applications are discounted:

> (I)mplementation depends on weather conditions, fuel conditions, other fires in the area, available resources, and multiple other variables that are impossible to predict weeks in advance. During the implementation period, untreated areas would be vulnerable to the effects as described in the Existing Condition and/or the Alternative 1 (no action), depending on the applicable time period.

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.)

Opening the forest canopy increases the rate of fire spread, which is not adequately addressed in the DEIS. Graham, et al., 1999a point out that fire modeling indicates:

> For example, the 20-foot wind speed[4] must exceed 50 miles per hour for midflame wind speeds to reach 5 miles per hour within a dense Stand (0.1 adjustment factor). In contrast, 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.

Attempts to control or resist the natural process of fire have been a contributor to deviations from historic conditions. The FS's analyses skew toward considering fire as a threat to the ecosystem

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

rather than a rejuvenating natural process. The Narrative needs 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 while being continuously maintained by such manipulative actions is entirely lacking.

The DEIS fails to disclose or acknowledge the science that indicates severe fires burning over large acreages may be less frequent than low severity fires, but are still not unusual; and that fire severity is dependent much more upon weather than fuels. If the purpose for a proposal is built upon false information about ecological functioning, then predictions of effects of the activities are not credible.

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: "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. Moritz and Odion 2004) or provide habitat for 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)."

The DEIS doesn't acknowledge the correlation between logging and subsequent severe fire effects. Many activity-generated "fuels" will not be removed or "treated" in timeframes that minimalize risk. 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.

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

The DEIS also fails to deal with the fuels issue on the appropriate temporal scale. How landscape-level fire behavior would be changed or improved at any period except for a limited time after treatment is not adequately analyzed.

"Alternative 2 is expected to reduce the potential for active and conditional crown fire to within desired conditions for all vegetation cover types... Over the rim country project area, 12 percent of the area burned under extreme weather conditions would be expected to be active or conditional crown fire, down from 31 percent given existing conditions. … Under less extreme wind conditions (5 MPH instead of 20 MPH), the majority of the landscape (95 percent) is expected to burn as a surface fire, and only 43,396 acres are expected to burn with passive crown fire, and 270 acres with active or conditional crown fire." Again, such fire modeling and associated analyses in much of the DEIS fail to provide sufficient *temporal* context, nuanced at various intervals post-treatment and tempered by the other timing and financing difficulties acknowledged in the DEIS.

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.)

With the DEIS being sprinkled liberally with warnings of "catastrophic" fire, "extreme fire behavior" and the like, how can incident commanders and other fire managers be expected to risk allowing fire for resource benefits? These words have meaning, and in the absence of a concerted campaign to educate landowners in firewise measures, they dominate decisions toward suppressing fire.

The discussions under "Facilitative Operations" DEIS p. 43 item 1) and Figures 10 and 11 show how the presence of roads and trails influences the choice of where to burn, which means we have prescribed fire for prescribed fire's sake rather than FTA decisions based upon existing vegetation conditions.

The CFLRPlan proposes "Severe Disturbance Area Treatments" for places where the effects of recent wildfire are said to be outside the NRV. Yet the two examples of effects are not direct effects of wildfire, they are indirect effects—regeneration of native species: "aggressive" sprouting of alligator juniper and oaks and "overly dense" regeneration of ponderosa pine. There are no metrics of "aggressive" or "overly dense" regeneration. There are no data sources cited as basis for concluding the wildfire effects are outside the NRV. There is no analysis of all potential factors resulting in this alleged non-NRV. And instead of providing locations where conditions are outside the NRV from fire, the DEIS simply lists the names of recent fires. There is no map showing the locations of the alleged 125,800 acres. There is no analysis of pre-fire conditions or their causes. In short, there is simply no analysis supporting the proposal to conduct "Severe Disturbance Area Treatments" and no way to ensure that the conditions that led to the "aggressive" sprouting and "overly dense" regeneration won't persist and cause the same species to resprout in the same densities post-treatment.

Since the Narrative depends upon the prediction of "catastrophic" fire if treatments aren't undertaken, one might expect the DEIS to provide an analysis citing data collected from recent burns in Rim Country, using scientifically derived metrics to support a conclusion the effects of those fires were "catastrophic." Yet what information the DEIS does provide on the topic tends to contradict the Narrative.

And it would be reasonable to inquire if the effects of climate change, seasonal weather variation or simply the temperature and wind had any influence on the extent, severity, and impacts of the recent fires as much or more than the alleged imbalance in vegetation. Lacking any mention in the DEIS, it appears the FS has not investigated such effects on recent fires in and around the analysis area.

The DEIS also fails to recognize the implications of how the fire regime is changing due to climate change. Reynolds et al., 2013 recognize "reference conditions and ranges of natural variability may not be sustainable in future climates" and "reference conditions in frequent-fire forest may become less relevant in changing climates." So their endorsement of approaches such as found in this CFLRPlan is weak at best, mainly "with respect to sustaining these forests through the near-term …while research and management develop options for whatever the future might bring." It's the recognition of this uncertainty that should have tempered the DEIS's overly authoritarian stance on "increasing resilience to wildland fire".

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

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

Again, the DEIS 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 impacts of invasive grasses associated with livestock grazing on fire regimes in the analysis area are poorly analyzed and undisclosed in the DEIS. Fusco, et al., 2019 note "significant differences in fire regimes, coupled with the importance of grass invasion in modeling these differences, suggest that invasive grasses alter US fire regimes at regional scales."

Alteration of fire regimes at a regional scale by cheatgrass has been quantified. (Balch et al., 2013; Bradley, et al., 2018.)

Please respond to the points made (and the scientific references cited) in the John Muir Project's August 11, 2016 scoping comments. These include:

- These Forests Do Not Have an Unnatural Excess of Fire, or High-Intensity Fire, and Future Trends May Be Downward
- Large High-Intensity Fire Patches Did Sometimes Occur Historically in Ponderosa Pine and Dry Mixed-Conifer Forests of This Area
- Mexican Spotted Owls are Thriving in Large Mixed-Intensity Fires, in the Absence of Post-Fire Logging
- Optimal Conditions for Forest Birds are Created by Mixed-Intensity Fires in Southwest Ponderosa Pine Forests, Not By Nearly Homogeneous Low-Intensity Fires
- Large Forest Fires in Arizona Over the Past Decade Are Heavily Dominated by Low/Moderate-Intensity Effects

Home Protection

The Rim Country CFLRPlan emphasizes actions that attempt to adapt a fire-prone ecosystem to the presence of human development. However we firmly believe the emphasis must be the opposite—assisting human communities to adapt to the fire-prone ecosystems into which they're built.

We are concerned the definition of Wildland-Urban Interface (WUI) implies that the amount of land encompassed will likely expand during the 20+ years of CFLRPlan implementation. With

development of new residential areas or infrastructure resulting in expansion of the WUI, areas receiving more intense treatment would also expand. This invokes NEPA issues.

The risks of fire are best dealt with in the immediate vicinity of homes, and by focusing on routes for egress during fire events—not by logging national forest lands well away from human occupied neighborhoods. The DEIS fails to disclose that, to prevent structure damage, managing the fuels in the immediate vicinity of those structures, and taking other Firewise steps, is mandatory.

Collins and Stephens (2007) understand that ***educating the public*** is a prerequisite for restoring the process of wildland fire. This means explaining and embracing the inevitability of wildland fire and teaching about fire ecology. Also, there is a proliferation of information on the worldwide web for property owners, who have the primary responsibility for protecting their homes. See this video by the National Fire Protection Association, for example.

See "A New Direction for California Wildfire Policy—Working from the Home Outward" dated February 11, 2019 from the Leonardo DiCaprio Foundation. It criticizes policies of the State of California, which are essentially the same policies as the CFLRPlan's. 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 town of Paradise.

See also, "Land Use Planning More Effective Than Logging to Reduce Wildfire Risk".

The DEIS states "approximately half of homes in the wildland-urban interface in the project area are second homes, the individuals with the highest exposure to wildfire risk are expected to be relatively affluent (Headwaters Economics 2017)." This reveals the economic inequity of government fire suppression policies. Taxpayers who struggle to get by, living far from any national forest or WUI, watch as their tax dollars subsidize the lifestyles of the more fortunate, who choose to live within fire prone ecosystems with the expectation that government will marshal massive firefighting resources when the inevitable occurs. Not everyone living in these interface areas is wealthy, of course, but the overall economic burden would be better distributed simply by spending far more on Firewise outreach and education concerning fire ecology, resulting in far less need (real and perceived) for active fire suppression, and having the homeowners shoulder more of their rightful burden.

In support of focusing on conditions near homes, Finney and Cohen, 2003, state:

> Research findings indicate that a home's characteristics and the characteristics of a home's immediate surroundings within 30 meters principally determine the potential for wildland-urban fire destruction. This area, which includes the home and its immediate surroundings, is termed the home ignition zone. The home ignition zone implies that activities to reduce the potential for wildland-urban fire destruction can address the necessary factors that

> determine ignitions and can be done sufficiently to reduce the likelihood of ignition. Wildland fuel reduction outside and adjacent to a home ignition zone might reduce the potential flame and firebrand exposure to the home ignition zone (i.e., within 30 m of the home). However, the factors contributing to home ignition within this zone have not been mitigated. Given a wildfire, wildland fuel management alone (i.e., outside the home ignition zone) is not sufficient nor does it substitute for mitigations within the home ignition zone. ...(I)t is questionable whether wildland fuel reduction activities are necessary and sufficient for mitigating structure loss in wildland urban fires.
>
> …(W)ildland fuel management changes the … probability of a fire reaching a given location. It also changes the distribution of fire behaviors and ecological effects experienced at each location because of the way fuel treatments alter local and spatial fire behaviors (Finney 2001). **The probability that a structure burns, however, has been shown to depend exclusively on the properties of the structure and its immediate surroundings (Cohen 2000a).** (Emphasis added.)

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). It is a product of the research done by the IBHS lab in South Carolina, covering a wide range of issues. It contrasts with the fire scare appearing in the DEIS. This Firewise approach also begs the question—why isn't the FS implementing an aggressive outreach and education program to assist homeowners living in and near the Rim Country—and elsewhere in the "WUI?"

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 on their property. The best available science supports such a prioritization. (Kulakowski, 2013; Cohen, 1999a) Also, see Firewise Landscaping[5] as recommended by Utah State University, and the Firewise USA website by the NFPA [6] for examples of educational materials.

The DEIS does not disclose the actions being taken to reduce fire risk on private lands in the vicinity of the CFLRPlan area, especially those on and adjacent to homes and other valued infrastructure; and the DEIS does not analyze how those activities (or lack of) will impact the efficacy of the activities proposed under the CFLRPlan.

Cumulative effects of Fire Suppression

As far as the "restoration" being alleged to address the impacts of long-term fire suppression, many statements in the DEIS indicating suppression would continue. For example there would be instituted a "½ mile buffer …to improve firefighter …effectiveness" by doing "Wildland-Urban Interface and Infrastructure Protection" treatments. Also:

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

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

> …a fire that remains on the surface beneath a timber stand is generally more controllable. Even under extreme fire weather, suppression tactics would be more effective than current conditions.
> …reduce firefighter exposure to risks encountered during fireline construction.
> …suppression efforts, where needed, are expected to be very effective

And in the Fire Ecology Report: "There may be enough fires burning that suppression on a new start is recommended to reduce cumulative smoke impacts **even though all other fire effects would be desirable**, and move the area towards desired conditions in the Forest Plan." (Emphasis added.)

The Fire Ecology Report states: "Alternative 2 would decrease the risk of undesirable wildfire behavior and effects that could threaten lives, resources, and infrastructure. After implementation, the Fire Hazard Index decreases resulting in 15% of the project area is within the moderate to extreme FHI, down from 37% in the existing conditions (Figure 34)." Under Alternative 2, what is the duration of that effect? In other words, when would the FHI return to a condition not significantly different than it is currently?

The FS has never conducted an adequate programmatic analysis of cumulative effects on all the affected forest resources from its suppression policies. The CFLRPlan would "treat" now, suppress fires continuously, and "treat" again in the future based on the very same "need" to address the ongoing results of fire suppression.

The Fire Ecology Report states: "While the primary focus of this cumulative effects analysis focusses on the previous 10 years of wildfires and activities, it is important to note the role that past management has had on influencing this landscape and creating undesirable and unnatural conditions." How can these earlier effects be "noted" if the cumulative effects analysis doesn't consider them?

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."

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

> Constructing firelines by handcrews or heavy equipment results in a number of direct environmental impacts: it kills and removes vegetation; displaces, compacts, and erodes soil; and degrades water quality. When dozerlines are cut into roadless areas they also create long-term visual scars that can ruin the wilderness experience of roadless area recreationists. Site-specific impacts of firelines may be highly significant, especially for interior-dwelling wildlife species sensitive to fragmentation and edge effects.
>
> ...Another component of fire suppression involves tree cutting and vegetation removal. Both small-diameter understory and large-diameter overstory trees are felled to construct

firelines, helispots, and safety zones.

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

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

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

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

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

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

Fire Ecology

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).

Kauffman (2004) acknowledges that fires are often beneficial, and identifies the often catastrophic effects of FS land use policies:

> 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.)

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

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

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

> Public land managers face significant challenges balancing the threats posed by severe fire with legal mandates to conserve wildlife habitat for plant and animal species that are positively associated with recently burned forests. Nevertheless, land managers who wish to maintain biodiversity must find a way to embrace a fire-use plan that allows for the presence of all fire severities in places where a historical mixed-severity fire regime creates conditions needed by native species while protecting homes and lives at the same time. This balancing act can be best performed by managing fire along a continuum that spans from aggressive prevention and suppression near designated human settlement areas to active "ecological fire management" (Ingalsbee 2015) in places farther removed from such areas. This could not only save considerable dollars in fire-fighting by restricting such activity to near settlements (Ingalsbee and Raja 2015), but it would serve to retain (in the absence of salvage logging, of course) the ecologically important disturbance process over most of our public land while at the same time reducing the potential for firefighter

> fatalities (Moritz et al. 2014). Severe fire is not ecologically appropriate everywhere, of course, but the potential ecological costs associated with prefire fuels reduction, fire suppression, and postfire harvest activity in forests born of mixed-severity fire need to considered much more seriously if we want to maintain those species and processes that occur only where dense, mature forests are periodically allowed to burn severely, as they have for millennia.

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.)

DESIRED CONDITIONS

Sierra Club comments urged the FS to focus on a goal of ecological restoration, including the return of natural fire processes to the landscape. The DEIS includes an objective to restore fire regimes, but those objectives are compromised by too much emphasis on commercial removal of trees and other biomass. That overly commercial emphasis is enabled by the FS's rigid bias derived from forest plan direction to "move toward" or "achieve" Desired Conditions.

The DEIS's Existing and Desired Conditions oversimplify the biological diversity and complexity found in the Rim Country.

DEIS Table 5 is exemplary. Regardless of the cover types, all of the areas proposed for mechanical thinning are desired to have the same structure, pattern, basal area, stand density, and level of tree diseases and insects.

The DEIS also doesn't cite sufficient data sources from long term surveys to accurately define the historic conditions upon which the NRV is based.

And since the CFLRPlan relies heavily on the Flexible Toolbox Approach where conditions are to be surveyed later, the existing data is far too sparse to accurately define Existing Conditions. So there is not enough verification of what is stated in the DEIS, for example: "The exclusion of fire has resulted in high canopy cover and high tree density which limits the amount of sunlight and precipitation reaching the ground. Consequently, understory vegetation is less diverse, sparse, and it provides poorer quality food and cover for wildlife."

DCs do not provide enough strong, binding direction as to compel managers to accomplish measurable outcomes in any specified timetable, nor could managers be held accountable for not accomplishing the DCs.

"Desired conditions are for no more than 15 percent of the ponderosa pine (under conditions modeled) in the treatment area to be prone to crown fire or high-severity fire…". What is the empirical basis for that 15% figure? And has the FS determined an acceptable *range* of percentages?

The DEIS's desired conditions approach is too static.

The DEIS reflects an overriding bias favoring vegetation manipulation and resource extraction via "management" needed to "move toward" its selected desired conditions, along the way deemphasizing the ecological processes driving these ecosystems. Essentially this rigs the game, as desired conditions would only be achievable by resource extraction activities. This is quite evident in DEIS Table 5, "Desired Conditions Compared to Existing Conditions…" Since these desired conditions must be maintained through repeated management/manipulation which the DEIS acknowledges is inherent to the CFLRPlan, the management paradigm conflicts with natural processes—the evolutionary drivers of the ecosystem.

Fire, insects & tree diseases are endemic to these forests and are natural processes resulting in a self-regulating forest. 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.

In any case, these processes also provide benefits. For example, cavity-nesting birds rely on insects in forests. Just as cavities excavated by woodpeckers provide benefits for other birds and wildlife, there are benefits from mistletoe or other pathogens. The DEIS provides too little information about benefits of insects and tree diseases.

The CFLRPlan strategy to strive towards the NRV 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 should be replaced by *desired future dynamics* to align with best available science. Hessburg and Agee, 2003 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.)

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.)

McClelland (undated) criticizes the aim to achieve 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.

Collins and Stephens (2007) suggest direction to implement *restoring the process* of wildland fire by educating the public, which means explaining the inevitability of wildland fire, teaching about fire ecology, and identifying landowners' primary responsibility for protecting their properties.

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:

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

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

> **Composition** includes the kinds of species present in an ecosystem and their relative abundances, as well as the composition of plant associations, floras and faunas, and

habitats at broader scales. We might describe the composition of a forest, from individual stands to watersheds and regions.

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

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

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

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

Noss and Cooperrider (1994) state:

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

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

Forest Service researcher Everett (1994) states:

To prevent loss of future options we need to simultaneously **reestablish ecosystem processes and disturbance effects that create and maintain desired sustainable ecosystems**, while conserving genetic, species, community, and landscape diversity and long-term site productivity.

…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.)

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

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

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 more intensive management:

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

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

The desired conditions approach fails to consider climate change.

The DEIS states, "climatic models for the southwestern U.S. predict continued warming, greater variability in precipitation, and increased drought. …A changing climate may lead to large shifts and contractions in the range of dominant trees throughout much of the region (Kane et al, 2014)." However the DEIS fails to consider that the effects of climate change likely means many of the vegetation desired conditions will not be achievable or sustainable, and therefore provide invalid and unwise direction for management actions.

The DEIS dismisses this key issue, stating "These climatic changes would likely contribute to some level of tree mortality; however, considerably less than the No Action Alternative." With no analysis to support it, that statement is disingenuous. The DEIS simply fails to provide any credible analysis as to how realistic and achievable its desired conditions are in the context of a rapidly changing climate, along an unpredictable but changing trajectory.

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."

FOREST PLAN AMENDMENTS

The DEIS states, "These amendments would be required under the current Tonto National Forest Plan if the Rim Country Record of Decision is signed prior to the revised Tonto National Forest Plan going into effect (anticipated in 2020)." This statement prejudges the outcome of the ongoing revision process for the Tonto NF. Perhaps the FS should first finish the Tonto forest plan revision process.

"Acknowledging changing conditions" as outlined in the description of proposed Amendment #1 would most likely be needed for any other vegetation manipulation project in the Tonto NF, so stating it affects only the 4FRI Rim Country activities is disingenuous. And the Mexican spotted owl is wide ranging on the Tonto, so the characterization of proposed Amendment #2 is misleading. Likewise, the conditions to be addressed by proposed Amendment #3 are not unique to the Rim Country landscape.

Stating that "Each amendment is a specific, one-time variance in the current Tonto Forest Plan direction for the Rim Country Project" is also misleading. The CFLRPlan affects 299,710 acres on the Payson and Pleasant Valley Ranger Districts of the Tonto National Forest, and the activities are scheduled to last for 20 years or longer—a period of time NFMA contemplates as being the entire lifetime of a forest plan.

The "Evaluation of Substantive Requirements" is presented in the DEIS as the "consideration of the applicable substantive requirements as described in 36 CFR 219.8 through 219.11 that are directly related to the plan direction being added, modified, or removed by the amendments (36 CFR 219.13)." The DEIS says only evaluation of 36 CFR 219.8 (Sustainability) and 219.9 (Diversity of Plant and Animal Communities) apply here. It fails to explain why 36 CFR 219.10 (Multiple use), 36 CFR 219.11 (Timber requirements based on the NFMA) and 36 CFR 219.12 (Monitoring) do not apply.

36 CFR 219.13(b) (Amendment process) states:

> The responsible official shall: (1) Base an amendment on a preliminary identification of the need to change the plan. The preliminary identification of the need to change the plan may be based on a new assessment; a monitoring report; or other documentation of new information, changed conditions, or changed circumstances.

In its overly cursory "Evaluation of Substantive Requirements" the DEIS fails to comply with 36 CFR 219.13(b). The DEIS states, "the respective resources and substantive requirements related to the amendments, and were informed using the best available scientific information…" but it fails to disclose what the FS considers to be the best available science as basis for the proposed Amendments. The FS ignores 36 CFR 219.3 (Role of science in planning) which requires:

> The responsible official shall use the best available scientific information to inform the planning process required by this subpart. In doing so, the responsible official shall determine what information is the most accurate, reliable, and relevant to the issues being considered. The responsible official shall document how the best available scientific information was used to inform the assessment, the plan decision, and the monitoring program as required in §§ 219.6(a)(3) and 219.14(a)(4). Such documentation must: Identify what information was determined to be the best available scientific information, explain the basis for that determination, and explain how the information was applied to the issues considered.

The DEIS's Evaluation of Substantive Requirements essentially just repeats the Narrative. Our (and others') comments during scoping and in this letter present a scientific perspective that differs significantly from that of the FS. The FS must explain the basis for determining the scientific information we and others present does or doesn't apply.

Amendment 1 is proposed to "Replace forest plan standards and guidelines for ponderosa pine/bunchgrass, ponderosa pine/Gambel oak, ponderosa pine/evergreen oak, dry mixed conifer and old growth with desired conditions and guidelines." Also, "The purpose of amendment 1 is to bring the Forest Plan into alignment with the best available science (Reynolds et al. 2013) that provides desired conditions for restoring fire-adapted ponderosa pine in the Southwest." The DEIS doesn't identify the forest plan standards and guidelines proposed for elimination. The DEIS doesn't contain the language of Amendment 1 including proposed desired conditions.

The Appendix B definition of "Uneven-aged management" contains mostly tree farming language which doesn't recognize natural processes as creating and maintaining uneven-aged forests. This is consistent with prioritization of sustained-yield timber production, not ecological restoration.

The Wildlife Report (and at least one other specialist report) calls proposed Amendment 1 the "goshawk amendment" and states it "would update guidance and direction in the Tonto Forest Plan so it is consistent with the Apache-Sitgreaves and Coconino NFs revised forest plan management direction." It is curious the DEIS doesn't present that perspective of Amendment 1.

The DEIS basically says Amendment 2 is needed to manage consistent with the Revised Recovery Plan (RRP) for the Mexican Spotted Owl (MSO), but it doesn't explain how the Tonto Forest Plan expressly prohibits management from being consistent with the RRP. The DEIS doesn't contain the language of Amendment 2. The DEIS also doesn't explain what the benefit to the MSO would be by updated survey information and removing population and habitat monitoring direction. It appears the FS merely wants to remove constraints on exploiting forest lands that happen to be MSO habitat. Reynolds, et al., 2013 doesn't indicate that's necessary.

The FS would need to undergo formal consultation on its amended forest plan, and we don't see a Biological Assessment or Biological Opinion.

Also, it would be incumbent upon the FS to conduct an independent peer review of Reynolds, et al., 2013 since it is being utilized to guide a forest plan amendment.

The DEIS states, "Prescribed fire is an appropriate and effective tool for improving habitat conditions within most PACs, including core areas." However the DEIS admits this is highly risky:

> Based upon the sheer number of acres proposed for burning each year, and because the intention is to apply prescribed fire to nearly all PACs and nest/roost recovery acres**, there is a likelihood that more key habitat components could be unintentionally lost to fire than modeling indicates.** (Emphasis added.)

The FS is essentially proposing to engineer MSO habitat, without any track record of carrying it out successfully in the manner proposed.

For proposed Amendment 3, the DEIS does not identify best available science in support. There is no analysis explaining why the risk is worth the alleged benefit. The Soil and Watershed Report states:

> Slopes exceeding 40 percent tend to have the highest runoff velocities and therefore highest erosion and sediment delivery rates. These also tend to be the areas where higher soil burn severities are more likely as wildfire tend to make runs as active crown fire on these steeper slopes. "

So, what is the empirical basis for claiming "the design of mechanized ground-based equipment has progressed to allow operations on steep slopes more effectively and without adverse effects on soil resources"?

LARGE TREE RETENTION AND OLD GROWTH

As expressed in scoping comments, the Sierra Club supports implementing the Large Tree Retention Strategy (LTRS), developed by the Stakeholder Group (SHG) for the first 4FRI EIS. However the DEIS does not include an alternative implementing this original Large Tree Retention Strategy.

In eliminating such an alternative from the EIS, the FS claims "the original LTRS would not meet various elements of the purpose and need." Instead, the FS "modified the original strategy, developing the Large Tree Implementation Plan (LTIP), which was included in (the first 4FRI) EIS and is brought forward with modifications into this EIS and is part of the Implementation Plan."

This DEIS major Issue (#3):

> … will be addressed in the effects analysis for all alternatives. Large tree retention will be addressed with treatment design and location, design features, mitigation measures, and BMPs to retain old growth and groups of large trees in all action alternatives. The Old

> Growth Protection and Large Tree Retention Strategy (OGP/LTRS) as developed by the 4FRI Stakeholder Group will be evaluated and considered **as fully as possible** in all action alternatives. (Emphasis added.)

However, the modified LTIP doesn't meet the spirit and intent—certainly not the letter—of the CLFRA. The design elements, FTAs, and other restrictions on logging fail to provide enough detail to clearly understand how requirements for retention of the largest trees contributing to old growth structure, focusing on small diameter trees, and maximizing the retention of large trees will be met, to comply with the Act.

In fact, given the Omnibus Act of 2009 expressed need to "offset treatment costs while benefitting local rural economies" there exists a bias toward cutting and selling a lot of timber—and this bias is clearly against protecting large and old trees. The DEIS fails to reconcile these potentially conflicting intentions stated in the Omnibus Act.

The DEIS fails to identify stands which as a whole generally exhibit old growth characteristics, and in fact the CFLRPlan risks destroying a lot of such habitat: "On the ground cutting prescriptions would follow the Old Tree Implementation Plan (OTIP) and **trees larger than 18" that do not meet the OTIP criteria may be cut** during implementation." (Emphasis added.)

The DEIS's descriptions and specifications of the proposed vegetation manipulations are so vague and lacking in detail that huge loopholes would allow cutting of very numerous large and old trees of all species throughout the Rim Country landscape. Table 10 exemplifies our concerns. It represents the "Treatment Description/Objective" for each proposed "Treatment Type."

Let's examine the "Uneven-aged" (UEA) treatment type, as an example. Table 10 says "Mechanical and fire treatments" would be carried out "retaining as many old or large trees as possible." Now, it's "possible" to just leave all large and old trees, but since the description also says the treatment "thins tree groups …and establishes non-forested grass/forb interspace/openings" obviously leaving all large and old trees is not the intent. Yet, how many large and old trees are "possible" to retain is not explained; it appears mostly arbitrary with a range of basal areas being the only specification quantified. This basal area can be achieved while LOGGING as many old or large trees as possible, with the specified basal area being made up in intermediate sized trees of medium age. That's the nature of the loophole here.

And the fact is, at the lower end of the basal area ranges to be applied (20 or 30), the results would resemble clearcuts with few trees remaining.

The DEIS is ambiguous about how "old trees" will be identified, for the purpose of complying with the CFLRA, implementing design feature FE004, and where the DEIS states, "Old trees would be retained, with few exceptions, regardless of their diameter, within the Rim Country analysis area. Removal of old trees would be rare." In the DEIS Old Tree Implementation Plan, it suggests that trees of age 150 years and older would all be retained, but at least four other characteristics are identified. It doesn't say if a tree must meet one, two, all, or any number of

characteristics to be retained as an old tree. It discloses Ponderosa Pine Age Class Descriptions but doesn't say how those supplement the other criteria, or otherwise apply.

Furthermore, the Old Tree Descriptions only apply to ponderosa pine, which creates a huge loophole for old trees of other species to be logged. This is neither ecologically sensible nor in compliance with the CFLRA. Large and old pinyon and juniper, which provide habitats for species not well represented by the forest plans, remain vulnerable.

Gillihan, 2006 recommends:

> Retain mature stands of pinyon-juniper because of their ecological value and the time required to create them. One definition of old-growth pinyon-juniper stands suggests that they contain scattered (30/acre; 35% canopy closure) large (12-inch diameter at root collar) live trees, some with dead or broken tops, and some large standing dead trees (1/acre, 10-inch diameter at root collar) and large downed trees (2/acre of 10-inch diameter and 10 feet long) (Miller et al. 1999). The numbers of individual birds and bird species generally increase with the age of pinyon-juniper stands (Golden Eagle Audubon Society 1997), partly as a result of the increasing structural diversity found in those stands, which provides more opportunities for nesting and foraging by species that fill different niches, and because only large trees can provide the cavities needed by cavity-nesting birds. Most of the pinyon-juniper obligates and species of conservation concern are tied to stands of mature trees.

Which MIS/focal species and Sensitive species are indicators for the pinyon-juniper cover type? Which MIS/focal species and Sensitive species are indicators for the oak cover type?

Also, the proposal to cut large aspen trees in an attempt to rejuvenate aspen stands risks important habitat for cavity nesting species and also the northern goshawk. And, since it has been difficult to keep aspen saplings alive without maintaining fencing to protect them from elk and cattle browsing, this strategy is risky and unlikely to succeed.

And as Sierra Club scoping comments stated, the treatments that react to mistletoe are unwarranted and counterproductive. They would end up removing the largest trees as a treatment method, and as a result damage and degrade the very habitat components mistletoe provides for so many species of wildlife.

The LTIP states, "During implementation (prescription development), if there is a condition where forest plan desired conditions conflict with the exception condition categories listed below, no large trees would be felled until the NEPA decision is reviewed by the District." In other words, under the CFLRPlan the "District" (?) is authorized to violate the forest plan and there would be no requirement for the public to be informed.

The DEIS proposes to deal with the Large Tree issue with "Indicators/Measures: being "Number of acres of stands meeting collaboratively established Stands with a Preponderance of Large Young Trees (SPLYT) criteria." Yet there doesn't seem to be an acre figure for SPLYT stands in the DEIS.

And at pp. 625-626, the exemptions for logging large trees in SPLYT read like all-encompassing loopholes.

The definitions of "interspace" and "openings" provide no more comfort. One difference between the two is that the latter "occur(s) naturally due to differences in soil types as compared to sites that support forests or woodlands" yet they "may also result from disturbances like severe fire or windthrow, or management activities" so that means the first definition needn't apply. Perhaps the most distinction between the two is that openings are "treeless areas having a fairly distinct shape or size" vs. interspace being "areas not currently under the vertical projection of the outermost perimeter of tree canopies (drip-line)." This is not an easy distinction to make, by any means.

We fail to see how logging most all the large, old trees in the treatment areas would be prohibited by the treatment descriptions in Table 10.

With UEA the FS also "Manages to enhance growing space for younger trees" which seems to conflict with the DEIS concern that there is a huge surplus of smaller trees fueling imminent catastrophic fire.

The DEIS does include things like Figure 26 which represents the *intent* for "Distribution of trees per acres across size classes across the analysis area." However, the DEIS doesn't say how that landscape level intent is applied within individual "treatment type" units.

In its Socio-Economics section, the DEIS projects timber volume from three different size classes:

Volume from trees < 5" = 278,440 CCF
Volume from trees 5" - 12" = 2,303,480 CCF
Volume from trees > 12" = 2,676,470 CCF

Nothing anywhere in the DEIS provides a basis for these numbers, which estimate half the volume would be from trees > 12" dbh. Since the FS is able to put numbers on these three size classes, it ought to be able to estimate facts such as the number of trees cut in each of the larger size classes, such as >18". Yet this is obscure.

The DEIS admits that old growth is below the NRV in the analysis area, but does not say what the NRV for old-growth habitat is on these Forests. And it provides no estimates on the amount of old growth destroyed or degraded. The FS has not analyzed the wildlife viability implications of managing these Forests well outside NRV for old growth.

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

> (T)here is the question of the appropriateness of management manipulation of old-growth stands… Opinions of well-qualified experts vary in this regard. As long term results from active management lie in the future – likely quite far in the future – considering such

> manipulation as appropriate and relatively certain to yield anticipated results is an informed guess at best and, therefore, encompasses some unknown level of risk. **In other words, producing "old-growth" habitat through active management is an untested hypothesis.** (Pp. 11, 15 emphasis added).

Below we compare modeled numbers of large trees under Alternative 2 (Figure 26) with numbers for the No Action Alternative (Figure 17). These figures are for "Distribution of trees per acres across size classes across the analysis area."

	0-5"	5-12"	12-18"	18-24"	24"+	0-5"	5-12"	12-18"	18-24"	24"+	0-5"	5-12"	12-18"	18-24"	24"+
	2019					2029					2039				
Alt 1	813	114	35	9	3	713	117	37	10	4	621	121	39	12	4
Alt 2	813	114	35	9	3	97	27	15	8	3	48	18	14	8	4

So, despite DEIS claims of making trees grow faster and thereby assisting in the development of old growth, under the FS's modeling in 10 years there would be 20% fewer trees in the 18-24" size class and 25% fewer trees in the 24"+ size class. In 20 years there would be 33% fewer trees in the 18-24" size class.

And DEIS doesn't say what species of trees this refers to.

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

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

Many of the ESA-listed, Sensitive, and Management Indicator Species rely heavily upon snags and other dead tree habitat structures. Since there is far less old growth (with its disproportionately more snags per definition), and considering decades of other snag loss from logging and firewood gathering, it doesn't make sense from an ecological perspective for the DEIS to be attributing a benefit for action alternatives because they would reduce the incidence of bark beetles—which cause tree mortality:

> Stands with lower tree densities and basal area are more resilient to drought and beetle attacks. Bark beetle population dynamics suggests that homogenous, dense stands are highly susceptible to beetle outbreaks. The proposed action would create heterogeneous, open, uneven-aged stands that would dramatically reduce susceptibility and maintain that reduced susceptibility over time.

Rhoades et al., 2012 state: "…beetles may impart a characteristic critically lacking in many pine forests today: structural complexity and species diversity."

The same can be said of the CFLRPlan's intent to reduce tree mortality by having fewer trees to be killed by fire.

TERRESTRIAL AND AQUATIC WILDLIFE

The Terrestrial Wildlife Specialist Report (Wildlife Report) lists "A diverse assemblage of wildlife were identified for analysis for the proposed Rim Country Project, including species listed under the ESA, Forest Service sensitive species, MIS, and migratory birds. Species that are evaluated here are ones known to occur within or have habitat within or adjacent to the project area." Terrestrial Species listed under the ESA are the Mexican spotted owl, Chiricahua Leopard Frog, Western yellow-billed cuckoo, and Mexican wolf. Aquatic listed species are the Gila trout, Little Colorado spinedace, Gila chub, Gila topminnow, razorback sucker, loach minnow, spikedace, narrow-headed gartersnake, and northern Mexican gartersnake.

The DEIS acknowledges Alternative 2 "is likely to adversely affect" listed species and their critical habitat. It is unclear whether the FS has completed the required programmatic USFWS consultation for ESA listed species.

The DEIS states Alternative 1 (No Action) adversely affects ESA listed species. Is this consistent with all existing *programmatic* Biological Assessments and Biological Opinions for these ESA listed species?

The Wildlife Report mentions Critical Habitat for the Mexican Spotted Owl and Chiricahua leopard frog and states critical habitat for the yellow-billed cuckoo has only been "proposed" in 2014. The Aquatic Specialist Report discusses Critical Habitat for Little Colorado spinedace, Gila chub, razorback sucker, loach minnow, spikedace, narrow-headed gartersnake, and northern Mexican gartersnake. Has Critical Habitat been designated or proposed for any of the other above ESA-listed species?

The Wildlife Report and Aquatic Specialist Report mentions a Recovery Plan for the Mexican Spotted Owl, Chiricahua leopard frog, Little Colorado spinedace, razorback sucker, and loach minnow. Has a recovery plan been written for any of the other above ESA-listed species?

Terrestrial Forest Service Sensitive Species include Northern leopard frog, Lowland leopard frog, bald eagle, golden eagle, northern goshawk, American peregrine falcon, burrowing owl, Navajo Mogollon vole, western red bat, spotted bat, Allen's Lappet-browed bat, and Pale Townsend's big-eared bat. Aquatic Sensitive species include desert sucker, Sonoran sucker, Little Colorado sucker, headwater chub, roundtail chub, netwing midge, *Fallceon eatoni* and *Moribaetis mimbresaurus* (mayflies), *Capnia caryi* (stonefly), *Lepidostoma apache, Lepidostoma knulli, Limnephillus granti and Wormaldia planae* (caddisflies), Parker's cylloepus riffle beetle, Ferris' copper and Nokomis fritillary (butterfles), Fossil springsnail, and California floater (mussel).

Terrestrial Management Indicator Species (MIS) include: Pronghorn antelope, Pygmy nuthatch, Turkey, Rocky Mountain elk, Hairy woodpecker, Abert's squirrel, Violet green swallow, Ash-throated flycatcher, Gray vireo, Townsend's solitaire, Juniper (Plain) titmouse, Northern (Common) Flicker, Arizona gray squirrel, Western bluebird, Western wood peewee, and Black hawk.

The DEIS doesn't acknowledge or analyze aquatic MIS, such as native fish. Macroinvertebrates in aquatic ecosystems are also well documented indicator species. Benthic macroinvertebrates should be utilized for overall indicators of watershed health, and should be included in monitoring protocols.

The Wildlife Report states, "The effects on (ESA-listed species) are also analyzed in a separate Biological Assessment for the purpose of ESA Section 7 consultation with the USFWS." The FS did not publish the Biological Assessment (BA) on the 4FRI Rim Country website by the time of the writing of these comments. This impedes the public from making informed comments on management actions likely to adversely affect listed species. The DEIS doesn't adequately analyze and disclose impacts of past management actions therefore no proper determination of baseline conditions has been completed, as required of a BA.

The Sierra Club's scoping comments stress that enough acres of closed canopy habitat must remain to ensure survival of species that rely on mature forest structure. However, with implementation of the FTA including design specifications for the northern goshawk and Mexican spotted owl, in combination with the Large Tree Implementation Plan and Old Tree Implementation Plan, assurance for retention of sufficient closed canopy habitat is lacking. We discuss the problems with these approaches in previous sections of our comments but to sum up, the lack of specificity inherent in the FTA risks degrading too much of this habitat using "mechanical treatments" and prescribed burning.

Population Viability

A viable population is one which has adequate numbers and distribution of reproductive individuals to ensure the continued existence of the species populations in the planning area.

The DEIS does not describe the quantity and quality of habitat that is needed to ensure viability of ESA-listed, Sensitive, Management Indicator Species (MIS), or any other special status species present or having historic range in the Rim Country CFLRPlan area. It doesn't explain its methodology for measuring the habitat for many of these species. It does not identify the best available scientific information the agency relies upon for complying with NFMA diversity requirements and planning processes. For Sensitive and MIS, it doesn't disclose or analyze the best available science on their population trends and habitat trends. The DEIS does not estimate wildlife species' populations. It does not present the results of population or habitat monitoring as directed in the forest plans regarding the MIS.

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

Traill et al., 2010 and Reed et al., 2003 are published, peer-reviewed scientific articles discussing what constitutes a "minimum viable population", and how it is typically underestimated. The

DEIS does not identify the best available science that provides scientifically sound, minimum viable populations of any special status species.

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 wide landscape makes it imperative that population viability be assessed at least at forestwide scales (Marcot and Murphy, 1992). Also, analysis of temporal considerations of the cumulative impacts on wildlife population viability while implementing over 20 years of actions, must be considered (*Id.)*. It is also of paramount importance to monitor populations during implementation in order to validate assumptions used about long-term species persistence i.e., population viability (Marcot and Murphy, 1992; Lacy and Clark, 1993).

In the absence of meaningful thresholds of habitat loss and monitoring of wildlife populations at the forestwide level, management actions will continue to degrade wildlife habitat over time. (See also Schultz 2012.).

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

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

The DEIS contains insufficient information to determine population numbers, distribution of individuals and subpopulations, and population trends of the species of concern.

The DEIS provides a list of 22 fires in the analysis area under the section, "Severe Disturbance Area Treatments." Where is the analysis of the effects of those fires, which examined and considered significant changes to wildlife habitat caused by those fires?

<u>*Cumulative effects*</u> of past, ongoing and other foreseeable management activities in the analysis area, with only cursory mention in the DEIS, are not properly analyzed and disclosed. The DEIS doesn't analyze how populations have fared under FS management nor how much of their habitat has degraded.

"The timeframe for long-term effects is 30 years after treatment, or 2049." This is biologically too short a time frame for understanding cumulative effects. Old-growth conditions take well over a century, which is what it takes for some species' suitable habitat to develop.

Under "cumulative effects" the DEIS discusses impacts of firewood gathering:

> Fuelwood gathering and travel management requirements together help determine where the public can legally collect fuelwood. Since off road travel is only allowed in fuelwood areas, this would limit how far the public can travel to collect fuelwood. This would likely leave more dead and down woody material in areas farther from roads. There would likely be less dead woody material available within fuelwood areas closer to roads. This could prevent achieving forest plan requirements for snags, logs, and dead and down woody material near some roads. This would also limit how much fuelwood is removed away from roads and increase fuelwood removal along roads. Proposed treatments should help limit the amount of area not meeting forest requirements. This would affect the Northern goshawk, Pygmy nuthatch, Hairy woodpecker, Violet-green swallow, Northern flicker, and Juniper titmouse by removing snags that are needed for nesting or prey species.

However, this doesn't disclose or estimate the number of acres in the analysis area which would be expected to be below the NRV in snag densities from fuelwood gathering; either alone or in combination with other human activities.

Mexican spotted owl

The Sierra Club scoping comments made several recommendations and observations pertinent to the issue of Rim Country proposed actions' risk to Mexican spotted owl (MSO) habitat and viability. Foremost are concerns about the implementation of unproven and controversial management approaches for MSO, as expressed in the appeal against the 2015 revised Forest Plan for the Apache-Sitgreaves National Forests, which we incorporate into these comments by reference.

The Upper Gila Mountain Recovery Unit (UGM) "supports over half the known population of MSOs" and is vital for connectivity to other populations, according to Ganey et al., 2011. Due to the scale of management actions proposed in both 4FRI EISs, our comments urged the FS to act conservatively within MSO habitat and consider all cautions identified in the 2012 revised Recovery Plan. Still, the DEIS states, "Under Alternative 2, 81,624 acres (73 percent) of protected MSO habitat are proposed for thinning and/or burning or other restoration activities." The Forest Service acknowledges that "the 4FRI Rim Country Project may affect, is likely to adversely affect the Mexican spotted owl."

Also, we are concerned the FS has not incorporated lessons learned during implementation of the first 4FRI Record of Decision. For example, there is not enough monitoring to understand how logging trees almost up to 18" dbh will affect Protected Activity Centers (PACs), given that this contrasts greatly with previous direction prohibiting removal of trees greater than 9" dbh. "Whether nesting and roosting habitat would benefit from selectively cutting trees greater than 9 inches diameter at breast height would be determined with the USFWS." The DEIS doesn't have a science-based analysis to support its assumption that such benefit would be realized.

Also, we note that trees up to 24" dbh would still be cut in protected MSO habitat. (WL004)

The risks of the CFLRPlan are substantial and the degree very uncertain. The DEIS admits:

> Based upon the sheer number of acres proposed for burning each year, and because the intention is to apply prescribed fire to nearly all PACs and nest/roost recovery acres, there is a likelihood that more key habitat components could be unintentionally lost to fire than modeling indicates. Some degree of unintended fire behavior could improve wildlife habitat by creating canopy gaps and enriching soils. However, effects on habitat could also create adverse effects.

The DEIS represents that the Rim Country analysis is "better meet(ing) the goal of providing continuous replacement nesting and roosting habitat over space and time" by "designation of recovery nest/roost and foraging habitat as described in the Recovery Plan." However Sierra Club comments stated—and we still maintain—the FS has not properly considered the scientific information in Ganey et al., 2011.

The FS has not determined if MSO populations are gaining towards recovery, and has not even measured improving trends in recovery habitat, PACs or other MSO habitats. The DEIS also does not assure proper surveys for MSOs have been, or would be undertaken. In fact, the FS record for monitoring MSO habitat does not support claims in the DEIS that agency will do so in the future. To date, the agency is failing to ensure completion of previous monitoring commitments under the first 4FRI ROD and per the associated Objection Resolution Agreement with WildEarth Guardians.[7] As such, assertions in the 4FRI Rim Country DEIS that the agency will conduct proper MSO monitoring is not supported. While we recognize implementation under the first 4FRI ROD may not be moving forward as anticipated, monitoring does not depend on vegetation management activities occurring. Rather, annual monitoring will provide a more complete assessment of MSO habitat and populations for when activities do occur. This is especially necessary given the difficulty making non-nesting determinations "due to limited owl responses and daylight constraints." (USDA Forest Service, 2016 at 4.) Further, the 4FRI Multi-Party Monitoring Board has yet to make any recommendations regarding management activities authorized under the first 4FRI ROD. As such it is premature for the FS to propose so much vegetation management action in the 4FRI Rim Country, especially given Alternative 2 will adversely affect the MSO.

We urge the FS to focus on its requisite monitoring obligations pursuant to the 2012 MSO Recovery Plan that direct, "[f]orest restoration and fuels-reduction treatments must be evaluated over time using appropriate modeling, rigorous monitoring, management experiments, and/or research to assess their effectiveness in maintaining or creating owl habitat and/or their effectiveness in reducing the threat of high severity or stand-replacing wildland fire." (U.S. Fish and Wildlife Service, 2012 at 250.) Accordingly, the FS cannot proceed with the proposed action until it has the results of past monitoring regarding the impacts of timber management activities,

[7] See Forest Service Four Forest Restoration Initiative website, https://www.fs.usda.gov/main/4fri/monitoring, providing only one monitoring report. Objection Resolution Agreement attached.

roads and motorized use on MSO and corresponding habitat. And, this EIS must account for monitoring challenges or uncertainties.

Sierra Club scoping comments also stated "The Forest Service should have a strong monitoring plan in place with clearly defined thresholds, trigger points for action, and a contingency plan in case those trigger points are met. The Forest Service must create a monitoring plan for MSO that includes a sufficient number of control and treatment sites to generate statistical power and usable data. The Forest Service should not construct roads within PACs."

Of the 196 PACs in the Rim Country area, how many are occupied according to most recent surveys?

The DEIS proposes to use various modeling exercises to determine existing MSO habitat conditions, and conditions as a result of CFLRPlan activities. The DEIS doesn't establish the validity of the variables it utilizes, nor does the DEIS disclose the accuracy of data, and therefore validity of the modeling and other model limitations. The FS has apparently not used field data to verify modeling predictions. This exemplifies the problems of DEIS analyses for most wildlife.

"The flexible toolbox approach is used to …Identify forest cover and habitat types that warrant special consideration and require additional management constraints before prescribing treatments are 'filtered' out of the decision matrix treatment considerations. These include MSO PACs, MSO Nest/Recovery Habitat…" It is hard to see how valid consultation with the USFWS can occur before locations of mechanical treatments are "filtered out."

If the FS needs to consult with other government agencies, as necessary because of potential harm to species listed or proposed for listing under the Endangered Species Act, then it must also involve the general public. This means in accordance with normal National Environmental Policy Act (NEPA) procedures, not finally conducting detailed project design work after a decision has been made.

As an adaptive management program, the FTA does not lead to monitoring of population responses to management or changes in population trends, it does not properly direct monitoring of habitat conditions, and does not provide adequate responses if protections and/or improvement in populations or habitat don't pan out as expected.

Also, the FS has not demonstrated that "designation of recovery nest/roost and foraging habitat as described in the Recovery Plan" is anything more than speculative recovery, or that it will boost populations enough to lead to recovery and delisting of the MSO. The USFWS has stated that it is not certain MSOs are nesting and roosting in areas outside of PACs.

The DEIS describes MSO habitat almost like it's something that doesn't belong in the landscape:

> Where there are nest cores, in particular, there is a need, legally and biologically, to manage those areas for denser vegetation than may have existed there historically. That means that, in most cases, fire will need to be less frequent than it would have been historically, and there is a desire to prevent high severity fire in those areas.

The most obvious question this raises (and not answered in the DEIS) is: How did this species happen to establish portions of its historic range here, if the historic fire regimes were constantly working against its habitat down through the centuries? Also, what sort of management moonscape must be maintained around these owl enclaves, if fire is to be staved off indefinitely?

It is of great concern that, whether we're talking about Protected Activity Centers (PACs), recovery nest/roost and foraging habitat or any important habitat classification, the CFLRPlan represents heavy treatments as "restoration" actions—without sufficient scientific support, monitoring backstops, and follow-up recommendations. This involves 24,875 acres of "mechanical treatments" inside PACs alone.

Current conditions within critical habitat and including the Primary Constituent Elements (PCEs) are not adequately analyzed and disclosed.

"Snags greater than 18 inches would be managed for two per acre in ponderosa pine and three per acre in mixed conifer. Averages are at the landscape scale…" In other words, as long as implementation personnel can draw a line around some arbitrary geographic unit that has 2 snags/acre of that size—all other snags can be sacrificed during management actions. This is not consistent with science, and the DEIS doesn't state any snag-related direction from existing forest plans for anyone to evaluate consistency.

"Decision of Rim Country EIS determines where MSO recovery habitat stratification in the project area." Where in the DEIS is this habitat stratification delineated on maps?

The CFLRPlan would result in "take" in designated critical habitat by the risky logging and prescribed burning.

Finally, the DEIS fails to consider cumulative effects on land of all ownership across the known or expected range of the MSO.

Northern goshawk

Like the MSO, the northern goshawk is another native species preferring habitat conditions which don't fit the Narrative. And as is the case for the MSO, the CFLRPlan proposes widespread habitat manipulations in categories of important goshawk habitat.

Sierra Club scoping comments identified concerns about the implementation of unproven and controversial management in goshawk habitat, as expressed in the appeal against the 2015 revised Forest Plan for the Apache-Sitgreaves National Forests—incorporated into these comments.

Also, Sierra Club scoping comments requested that the FS not experiment with new management protocols across the 4FRI Rim Country which are inconsistent with the 1996 northern goshawk plan amendments.

What is the best science supporting the statement, “prescriptions would promote habitat variables needed by this species”?

The analysis in the DEIS is insufficient to comply with the agency’s legal requirements under the National Forest Management Act to maintain viable populations and maintain biodiversity, and to take a hard look at potential impacts per NEPA.

We are concerned that the FS will fail to protect the goshawk’s habitat needs, including the retention of large trees, snags, and dense forest cover. Protections are required for nesting, foraging, and non-breeding season habitat.

Goshawks use a variety of coniferous and deciduous forests. Aspen is among the most important cover types for the species in some portions of the Southwest. Aspen trees are used for nesting, and lodgepole pine is also important (Graham et al., 1999). Any vegetation management activities have the potential to negatively impact goshawk habitat by destroying and degrading important forest nesting and foraging structural conditions and harming individuals by disturbing nests. The proposal presents a level of risk to northern goshawks and their habitat that may not be mitigated by design criteria.

The FS proposes to cut a lot of large aspen trees in efforts to restore stands, but the DEIS fails to consider these trees’ importance for goshawks.

Dominant tree species used by goshawks vary throughout their range in North America, but other habitat requirements are similar across regions. (U.S. Fish and Wildlife Service, 1998a). Nesting habitat tends to be characterized by mature to old forest conditions, with large trees and closed canopy (60-80%), and moderately dense to dense stands. (Graham et al., 1999; U.S. Fish and Wildlife Service, 1998a) Adults tend to select one of the largest trees within a forest stand for nesting. (U.S. Fish and Wildlife Service, 1998a). Goshawks likely prefer dense cover to protect chicks from inclement weather conditions and predators (Rodriguez et al., 2016). Thus, simply protecting snags in nesting habitat is inadequate. Goshawks will typically hunt on the edges of dense, closed forests, but often kill in more open areas (Graham et al., 1999). Woody debris is essential to provide habitat for prey species, particularly small mammals (U.S. Fish and Wildlife Service, 1998a). Wintering habitat tends to be more varied, for example, pinyon-juniper ecosystems may be used (Underwood, et al., 2006).

Goshawks have large home ranges surrounding nest sites, and the home range size of males in generally larger than females. The more food available, the smaller the home range (Moser and Garton, 2019). Based on research in the Southwest, home range sizes roughly average 6,000 acres. In Idaho, male home ranges were found to be as large as 15,000 acres. (*Id.*) Moser and Garton concluded that conservation of goshawk habitat at the home range scale is important and stated: “When managing for male and female goshawk foraging habitat, managers should seek to minimize the proportion of openings (VSS 1-2) and moderately closed forests (VSS 3) at the home-range scale.” (*Id.*)

In Utah, northern goshawks hunt a variety of prey species, including squirrels and lagomorphs, and a range of bird species (Graham et al., 1999). Woodpeckers, including northern flickers, three-toed woodpeckers, and others are on the menu.

The proposed action includes clearcutting (labeled, however as one kind of "treatment") which could occur just about anywhere and everywhere. Such clearcutting could effectively remove all goshawk habitat within aspen and other stands. Large, old aspen as characterized as barriers to regeneration of aspen clones.

The DEIS does not provide protections for nesting areas/stands (whether occupied or not, nor for alternative nest stands) which is inconsistent with best available science. In short, there are no real protections proposed for nests, even though goshawks are known to reuse breeding sites.

The proposal is unlikely to retain enough snags for goshawks, other raptors, and snag-dependent prey species, such as woodpeckers. These species as well as the red squirrel and mountain bluebird also depend on snags. Woodpeckers are not only prey for goshawks but primary cavity excavators, keystone species, on whom a host of secondary cavity users depend. Though goshawks are not known to depend on tree cavities for nesting, the presence of woodpeckers in goshawk habitat must be maintained.

Studying how woodpeckers select trees for excavating nests, Lorenz et al., 2015 concluded that most snag recommendations set density targets too low because they don't account for the snag requirements of primary cavity excavators. The paper concludes: "the felling or removal of snags for any purpose . . . should not be permitted where conservation and management of PCEs [primary cavity excavators] or SCUs [secondary cavity users] is a concern." Further, woodpecker studies indicate, "if one of every 20 snags (approximately 4 percent) has suitable wood, and there are five to seven species of woodpeckers nesting in a given patch, approximately 100 snags may be needed each year for nesting sites alone" (Vizcarra, 2017). Hutto, 2006 has suggested that snag retention post-disturbance should perhaps be 50% higher than Forest Service guidelines.

Further, because the CFLRPlan does not identify which of several treatments could occur where, and clearcutting is not sufficiently limited, it is foreseeable that the entirety of nesting areas in Post-fledging family areas (PFAs) could be logged. Such an action would clearly have the potential to significantly impact the northern goshawk (not to mention other wildlife and other aspects of the environment).

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

> 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).

The FS does not acknowledge or address existing monitoring data concerning the presence of goshawks within the analysis area.

Scientific studies indicate analysis must be conducted for adverse impacts in a roughly 6,000-acre to perhaps 14,000-acre northern goshawk home ranges or PFAs. 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, and 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 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. Under the CFLRPlan, there don't appear to be any distinct restrictions on openings in PFAs, which is inconsistent with Reynolds et al., 1992.

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. Given the FS proposes no analysis and provides no evidence supporting its FTA, any assertions that management activities will sustain the viability of the northern goshawk forest-wide or otherwise meet the biodiversity goals of the National Forest Management Act, or will avoid potentially significant impacts to the species, are arbitrary and capricious, and a violation of NFMA and NEPA.

Other raptors

"Protect active raptor nest sites from disturbance by project-related activities by restricting activities during nesting season…" (WL030). The DEIS fails to specify how surveys will be conducted consistent with best available science, so that disturbing raptor nests will be minimized and thus avoiding destruction or disturbance to the point that nests or young would be abandoned or lost.

Western yellow-billed cuckoo

The DEIS mentions a revised proposed rule, which may include additional critical habitat, is being developed. It doesn't explain why a revision is believed necessary.

The CFLRPlan "could have short-term adverse effects on western yellow-billed cuckoo habitat by reducing cover, affecting water quality, and reducing prey abundance."

The CFLRPlan does not represent an appropriately conservative approach to areas of mature riparian cottonwood-willow woodlands and dense mesquite associations; areas with a closed canopy and a sub-canopy layer, and dense understory foliage in potential nest sites close to water; and cottonwood trees important foraging.

Mexican wolf

The DEIS indicates that the known population of the Mexican wolf is well below what science would consider to be viable. Due to its unfortunate and illogical designation as "experimental" government actions risk pushing this nonviable population to extinction.

The DEIS mentions "Wording from the USFWS 2014 EIS for the proposed revision to the Regulations for the Non-essential experimental population of the Mexican Wolf." It then lists "activities …specifically excluded from" the category of actions that are called "disturbance-causing land-use activities." If the excluded actions were subject to consultation for "take" under the ESA, such actions would have to be quantified, and terms and conditions formulated. Given that "threats to the Mexican wolf have generally remained consistent over time, including human-caused mortality and related legal protections, extinction risk due to small population size, and loss of genetic diversity" it is clear that the scale of CFLRPlan activities is not consistent with maintaining a viable population.

Hairy woodpecker

According to the DEIS, snags in ponderosa pine, mixed conifer and spruce-fir are key habitat components for hairy woodpecker. USDA Forest Service, 2015b states:

> Hairy woodpeckers are year-round resident primary cavity nesters, which subsequently provide nest cavities for myriad small birds and mammals. They reside in many forest communities and use a variety of tree sizes. They feed on insects, primarily ants, wood borers, and grubs as well as fruits and berries (Birds of North America 2011). Hairy woodpeckers forage on a variety of substrates, including snags and down woody debris (DWD) They may concentrate in areas of insect outbreaks in response to the increased food source (Sousa 1987). Territory size ranges from about 2.5 acres to 37 acres (Sousa 1987).

As a primary cavity nester, the hairy woodpecker fills a keystone species functional role. Cherry (1997) explains this role in discussing two other woodpecker species:

> 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.

USDA Forest Service 2011c explains this keystone species functional role as played by the pileated woodpecker in the western U.S.:

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

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 the primary cavity excavators alone have the ability to decide if a tree is suitable for excavating, the implication being managers know little about how many snags per acre are needed to sustain populations of cavity nesting species. This must be considered best available science for snag retention.

Instead, the DEIS (WL039) only requires "In ponderosa pine, protect/provide snags and logs wherever possible through site prep, implementation planning, green tree selection, and ignition techniques to retain 1-2 snags per acre greater than or equal to 18 inches in diameter…"

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.

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."

Despite the fact that large snags are below the NRV in the analysis area, the DEIS and Forest Plan monitoring fail to disclose the abundance of such habitat components or population trends of such MIS.

Please disclose the results of monitoring primary excavator habitat at the Forest Level and disclose the snag densities in the analysis area, and the method used to determine those densities.

Pronghorn antelope
The DEIS does not state the forest plan direction relevant to MIS pronghorn habitat, nor explain how management under the CFLRPlan will be consistent with that direction and the biology of pronghorn.

Rocky Mountain elk
The analysis does not consider habitat security for the MIS elk. This includes changes in thermal, hiding and escape cover. The analysis completely ignores the indirect impacts of roads.

Abert's squirrel
The Wildlife Report describes the habitat for the Abert's squirrel: "…dense pole stands provide an important forage component for the species. The best squirrel habitat has some mature ponderosa pine trees with canopy cover exceeding 60 percent." This happens to be the kind of forest condition targeted for severe reduction under the CFLRPlan.

Burrowing owls
"Alternative 2 would have no effect on burrowing owls but would improve potential future habitat for the species." This is self-contradiction. It also ignores direct and indirect impacts on potential nesting sites and foraging areas.

As discussed above in **Viability**, adverse impacts on such sensitive species would be perpetrated and exacerbated without a known threshold triggering deeper viability concerns.

Aquatic species analysis
"The indicator for riparian/wetland vegetation was used as a surrogate for riparian condition. … Riparian Condition by aquatic species was determined averaging the Watershed Classification and Assessment Tracking Tool (WCATT) scores for the riparian vegetation indicator for all subwatersheds within a species action area. This provides an overview of the riparian condition as it relates to each species and their associated habitat. Averages from 1 to 1.4 are considered Good, 1.5-2.4 is Fair, and 2.5-3.0 is Poor (Table 82)." The DEIS does not explain how WCATTT scores correspond to specific habitat conditions needed by the wildlife and fish species of concern in the analysis area. There doesn't appear to be any field survey results cited to verify or confirm WCATTT ratings or to correlate with species' habitat conditions.

What data and what analysis supports the following statement: "Watershed Condition Framework assessments utilized for existing condition accurately reflect indicators for aquatic species and habitats"? What indicators are we talking about here, and how has correlation with WCF assessments been determined (i.e., field validated by survey data)?

Please explain why riparian vegetation conditions are said to be in such impaired condition [the cause(s)], as disclosed by the DEIS:

> …large percentage of native vegetation attributes along stream corridors, wetlands, and water bodies are not in proper functioning condition. Native vegetation is vigorous, healthy and diverse in age, structure, cover and composition on less than 75 percent of the riparian/wetland areas in the watershed. Native vegetation demonstrates a noticeable loss of vigor, reproduction and growth, and changes in composition as compared with site potential communities.

The DEIS has little in the way of analysis of impacts on habitat features needed by species. For example, for the Little Colorado spinedace, lots of metrics occur disclosing acres or miles of actions, but nothing about how the CFLRPlan affects key habitat features relied upon by the spinedace. Direct, indirect, and cumulative effects cannot be understood with this approach. So assumptions such as "Design Features, Best Management Practices, and Conservation Measures …are expected to minimize effects throughout the analysis" stand without any analytic support.

Therefore, statements such as "Analyses included the changes (such as, increase, decrease, or change from current conditions) for the indicators or measures, and how they can affect aquatic species and their habitats" stand without adequate justification or analysis.

"Riparian Condition is being used as a surrogate to indicate potential changes in multiple factors that directly influence aquatic and riparian habitat quality and quantity such as sediment load, streamside canopy cover and structure, large woody debris, stream temperature, and changes in peak flows." Again, how Riparian Condition correlates to the noted "factors" is not explained. The analytic methodology does not appear to be scientifically valid.

Does the establishment of a "buffer" on aquatic species' habitat prohibit vegetation treatments or other actions? What CFLRPlan actions would be allowed within these buffers? The CFLRPlan seems to allow for later, arbitrary decisionmaking in stating:

> "AMZs can be customized by an ID team of qualified specialists prior to project implementation…" (SW002)
>
> "Accepted activities within AMZs include mechanical and conventional tree felling, yarding, skidding, backing fire, and stream and springs restoration projects" (SW004)
>
> "(W)ithin ½ mile of private land boundary or designated WUI: Treatment measures necessary to reduce the risk of wildfire encroachment on adjacent private lands may take priority over other considerations in these AMZs. Entry and treatments in these reaches will be considered on a case-by-case basis by ID teams." (SW011).

The Aquatics Specialist Report states:

> While streams can process normal sediment levels, elevated levels can cause negative impacts. Most streams carry or move sediment and the amount varies seasonally. Sediment transport involves detachment and entrainment of particles, their transport, and their deposition. When additional fine sediments are transported, they can accumulate in relatively clean or porous substrate such as gravels and habitats such as pools. Increased

> levels of sedimentation can have adverse effects on aquatic species, habitats, and riparian ecosystems.

Yet the DEIS doesn't analyze and disclose the condition of analysis area streams in terms of their sediment levels, comparing normal to elevated. The same can be said for stream temperatures, large wood, alteration of flows from NRV, etc. Cumulative effects on aquatic species was not analyzed.

The Aquatics Specialist Report states:

> **Road density has been considered a useful index of several ecological effects of roads** in a landscape. Effects are evident for faunal movement, population fragmentation, human access, hydrology, aquatic ecosystems, and fire patterns. Hydrologic effects, such as altered groundwater conditions and altered drainage upslope, are sensitive to road densities. Increased peak flows in streams and macroinvertebrate diversity may be impacted with increasing road densities. Road density is an overall index that averages patterns over an area; its effects probably are sensitive to road type and width, traffic density, and network connectivity. (Emphasis added.)

Yet there is no analysis based upon quantified metrics of road density. Road densities will increase during the timeframe that proposed activities occur (*Id.*). Since the amount of road decommissioning isn't guaranteed, final measures of this "useful index" are not possible.

Since skid trail stream crossings can be approved during implementation (SW031, SW037), how does the DEIS analyze the amount of sedimentation this would cause in a given stream?

"Several of the aquatic invertebrate sensitive species were not quantitatively analyzed using the resource indicators and measures. This was not possible primarily due to the species limited or unknown distributions…" This doesn't make sense, given the species' status as "Sensitive." The EIS should explain why species are listed as Sensitive (or under the ESA for that matter).

"Opening ML-1 roads can cause negative short and mid-term impacts to riparian condition, habitat connectivity, individuals, and introduction of pollutants or aquatic invasive species that are similar to new road or trail construction. Direct impacts to riparian condition include reduced riparian vegetation cover or structure, and removal of vegetation. This would be a direct impact to gartersnake critical habitat as well as some aquatic macroinvertebrate species habitat. The number of stream crossings could also be increased causing a direct effect to fish as well as indirect impacts of increased sedimentation from streambank damage. Indirect impacts of increased stream temperature could also occur from reduction in canopy cover within riparian areas. Associated ground disturbance and increased sedimentation delivery to riparian areas and streams is expected to occur short to mid-term until the roads were closed." This provides basic, textbook style cause-and-effect information, but doesn't suffice for analyses of impacts on the species of concern.

Again, we have:

> When inputs of fine sediment are increased in watersheds, interstices between large particles become filled which reduces refugia from predators or high-flow events. Most

> aquatic invertebrates are strongly associated with substrate composition; therefore increased fine sediment can alter habitat availability. Increased sedimentation can also decrease the nutritional quality of periphyton (the film of attached algae, fungi, bacteria, organic matter, and sedimented material found on the surface of stones). Some caddisflies, stoneflies, and mayflies are particularly impacted by sedimentation (Harrison et al. 2007).

Yet there is no analysis ***quantifying*** such effects on, for example, the ESA-listed Gila trout.

Prescribed burning …would be a direct alteration of gartersnake critical habitat as well as potentially impacting some aquatic macroinvertebrate species." Adverse modification of critical habitat is "take" and violates the ESA.

The Aquatics Specialist Report states:

> Livestock grazing is continuing over most of the proposed project area, although some areas are excluded for resource recovery reasons. Infrastructure development and maintenance associated with livestock grazing allotments is substantial. Thousands of miles of fences and thousands of stock tanks occur throughout the proposed project area. Impacts to aquatic habitat and species, hydrologic conditions and processes, and riparian and upland conditions have occurred; and this will continue as long as livestock management and the associated infrastructure remains in place, and contributes cumulative effects to aquatic species and their habitats.

The degree and significance of these cumulative impacts on the species of concern are not analyzed or disclosed in the DEIS.

Aquatic macroinvertebrates are "Species not Covered by Resource Indicators and Measures." The Aquatics Specialist Report states:

> Stoneflies, caddisflies, mayflies, midges, and riffle beetles are strongly associated with streams and riparian areas. Based on the biology and ecology of these four groups of species, streams and riparian areas could have negative cumulative impacts from Alternative 3, but less than Alternative 2 given the reduced mechanical vegetation treatments, prescribed burning, and temporary roads. Mechanical vegetation treatments, prescribed burning, and roads can negatively impact riparian condition, aquatic habitat quality and quantity utilized by these sensitive species.

Yet there is no quantitative analysis of direct, indirect, or cumulative effects. Nothing addressing metrics relating to population viability appears in the DEIS.

The Aquatics Specialist Report discusses proposed Amendment 3:

> The slope restrictions amendment would remove language from the Tonto Forest Plan restricting mechanical equipment to slopes less than 40 percent as well as removing language that identifies those slopes as inoperable. Rim Country proposed the use of specialized mechanical equipment to restore steep slopes. The acreages of mechanical vegetation treatments analyzed in regards to aquatic species and habitats includes steep slopes for both action alternatives across all three Forests.

How the above analyzes impacts of Amendment 3's proposal to log on steep slopes remains a mystery. "Rim Country proposed the use of specialized mechanical equipment to restore steep slopes." Is the FS proposing to restore soils on steep slopes, where the Tonto Forest Plan has prohibited machines for logging?

Chiricahua Leopard Frog

The Wildlife Report states, "A recovery plan for the species was finalized in 2007 (USFWS 2007). Critical habitat was determined in March, 2012. The Rim Country Project Area occurs in Recovery Units 5 and 6." Despite recovery plan implementation, the DEIS notes "The number of populations in much of the species' range has declined drastically over the past 20 years." The DEIS doesn't indicate if the population of this species in the CFLRPlan area is of sufficient numbers, well distributed so that a science-based evaluation would consider it to be viable.

CFLRPlan actions which protect or restore riparian areas and springs would benefit these species, however there is no assurance such actions will occur given funding and FTA uncertainties. Furthermore, the indirect benefits claimed by the DEIS in preventing "catastrophic" fires are too speculative, as we discuss elsewhere. Any claimed benefits would be nullified anyway, with the vegetation manipulations within riparian areas both within and outside critical habitat.

There doesn't seem to be a survey protocol included, which would prevent "take." Some CFLRPlan activities that would cause take include:

> Leopard frogs dispersing overland could be directly affected if they are inadvertently run over by mechanical equipment or if they could not find refugia during prescribed fire activities. … cumulatively combine with other forest activities… (including) livestock grazing…

"Any effects that may occur as a result of the proposed action are anticipated to be insignificant given design features to reduce effects from implementation have been added to the proposed action (see Appendix C)." The DEIS is misleading to suggest proposed actions "reduce" effects since they really mitigate increased effects. Plus the DEIS doesn't analyze the effectiveness of the mitigations.

In PCE 2 (Dispersal and nonbreeding habitat) the DEIS states, "…short-term effects on organic debris and leaf litter would occur. …Thinning and prescribed fire would only occur in riparian areas or near important aquatic habitat **with consultation with a wildlife biologist**." (Emphasis added.) This FTA-type assurance does not prevent "take" or engender accountability. It does demonstrate how USFWS consultation is made complicated and ultimately, thwarted.

As is the case for the other species analyzed in the DEIS, factors causing cumulative effects are barely mentioned, and their impacts are not analyzed and disclosed.

Northern Leopard Frog

Wildlife Report: "The northern leopard frog is now considered uncommon in a large portion of its range in the western United States, and declines of the species have been documented in most western states. … The northern leopard frog is experiencing threats from habitat loss, disease, non-native species, pollution and climate change that individually and cumulatively have

resulted in population declines, local extinctions and disappearance from vast areas of its historical range in the western U.S. and Canada."

Cumulative impacts on the northern leopard frog include "Degradation of habitat facilitated by this alternative would cumulatively combine with other forest activities, high-impact recreational use, livestock grazing, and habitat loss and degradation on private lands. Synergistic effects from climate change would continue to fragment key aquatic and dispersal habitat."

As discussed above in **Viability**, such adverse impacts would be perpetrated and exacerbated without a known threshold triggering deeper viability concerns.

Habitat fragmentation and connectivity.
Assuring viability also means addressing the issue of fragmentation, road effects, and past management on wildlife species' habitat. Viability is only assured if individuals of a species can survive migration and dispersal for genetic diversity. The DEIS lacks meaningful direction maintaining landscape connectivity for wildlife. Lehmkuhl, et al. (1991) state:

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

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

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

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

> Linkages are mechanisms by which the principles of connectivity can be achieved. Although the definitions of linkages vary, all imply that there are connections or movement among habitat patches. Corridor is another term commonly used to refer to a tool for

> maintaining connectivity. …the successful functioning of a corridor or linkage should be judged in terms of the connectivity among subpopulations and the maintenance of potential metapopulation processes. (Internal citations omitted.)

Harris, 1984 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 islands 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.

Marble Mountain Audubon v. Rice (No. 90-15389, D.C. No. CV89-170-EJG, Sept. 13, 1990) interprets NEPA to require the FS to consider biological corridors and to ensure their functionality. The standard for such a review is the same "hard look" NEPA requires of other environmental effects. This means those corridors within the analysis area and linkages with areas adjacent to the analysis area need to be examined, plus the value of the entire analysis area, as part of a larger corridor within or between ecosystems. Friends of the Bitterroot v. USFS (900 F. Supp. 1368, 1372 (D. Mont 1994)), and Oregon Natural Resources Council v. John Lowe [109 F.3d 521, 526 (9th Cir. 1997)] also highlight the importance of including corridors as an element of consideration for an agency decision. Therefore, the agencies are required to evaluate connectivity which would normally function to promote genetic diversity and population stability among far flung populations.

WATER QUALITY AND RIPARIAN AREAS

In the Water and Riparian section of the DEIS, under "Water Quality" the DEIS includes about a page summarizing information from the Arizona Department of Environmental Quality (ADEQ, 2016). There are a lot of impaired streams, and for many data is lacking. The DEIS describes 4FRI analysis area waters:

> Within the Salt River and Verde River Basins, primarily on the Tonto National Forest, water quality is attaining all uses in 13.8 miles (12 percent), attaining some uses in 48 miles (42 percent), is inconclusive in 32.8 miles (29 percent) streams and is not attaining/impaired in 18.2 miles (16 percent) of assessed streams. Within the Little Colorado Basin, primarily on the Apache-Sitgreaves and Coconino National Forests, water quality is attaining some uses on 108 miles (67 percent) and inconclusive on 53.3 miles (33 percent) of assessed streams.

It concludes with the statement, "The completion of a total maximum daily load assessment on impaired water bodies may result in developing additional water quality improvement strategies and mitigation of effects within associated watersheds." To what degree is the FS responsible for filling in the blanks on these "inconclusive" waters? At what point is the FS responsible for

coordinating with ADEQ to make sure 4FRI activities would be consistent with TMDLs and other state of Arizona regulations and policies?

The DEIS discusses "Riparian and Stream Condition" based upon categorization using the "Proper Functioning Condition" protocol. It doesn't say how up-to-date or accurate the data is for classifying 876 miles of the total of 4,047 total miles of drainages occurring in the analysis area, using this protocol. It does say only 24 miles of riparian areas have been inventoried for an analysis completed in 2011, and mentions other unattributed information used to determine "remaining stream channel condition classes."

The DEIS on page 104 discloses that 83 percent of analysis area watersheds were rated as Functioning at Risk and 2 percent were rated as Impaired, which seems to refer to "Riparian/Wetland Condition" on the next page. It also says Water Quality Condition is "good" for 70% of something undefined, without defining what is meant by "Water Quality." Obviously it doesn't mean Riparian/Wetland Condition or overall Watershed conditions.

For the sum total of 4,047 miles of drainages occurring in the analysis area, there's not much more describing the existing stream conditions and riparian areas in the DEIS. There ARE numerous unattributed statements on how out-of-balance the riparian vegetation is.

Current "Water Quantity" (defined as "hydrologic regime, persistence of flow, peak flows, and discharge to waterbodies and springs" according to the Environmental Consequences section) is not disclosed for any analysis area streams.

Given the paucity of information on existing conditions and trends, one might hope that cumulative effects analyses might be of much better use for understanding the degree of impairment, the specific parameters of streams and riparian areas that have been measured, and the causes. Yet the Water and Riparian section also has very little.

This is not surprising, given the programmatic nature of the CFLRPlan. This is why it does not conform to NEPA—the public and the decisionmakers will not be informed.

Impacts on "Water Quantity" (again, "hydrologic regime, persistence of flow, peak flows, and discharge to waterbodies and springs") is not really analyzed. Instead the DEIS relies on "surrogates" of questionable utility, identified as "acres of vegetation treated by mechanical treatments and prescribed burning, miles of roads opened and temporary constructed roads, decommissioned roads and unauthorized routes, and acres of rock pits and in-woods processing areas."

Mostly it's under the analysis of the No Action alternative where some disclosure of current conditions is presented. For example, "Several stream reaches within the Rim Country Project area are experiencing increased water flows and sediment delivery from the effects of poor upland conditions" and "Open roads and unauthorized routes being used for motorized travel will continue to discharge runoff and sediment to project area streams, especially where the roads are poorly located in stream bottoms, have inadequate drainage structure, and are hydrologically

connected to the stream network." However such disclosures are not site-specific and not quantitative.

In analyzing action alternatives' effects, the DEIS includes cause-and-effect statements such as:

> (T)he primary short-term risk to water quality from prescribed fire and mechanical vegetation treatments is from increased sediment input to water bodies from where ground cover has been reduced or eliminated. This risk of is greatest where treatment activities result in soil disturbance or complete removal of vegetative ground cover in close proximity to drainages. Such areas would include designated stream crossings, skid trails, log landings, installed firelines, and areas with higher soil burn severity.

As much as these cause-and-effect statements disclose potential impacts, the DEIS still lacks sufficient site-specificity, lacking reference to specific locations along or in specific analysis area water bodies, and they lack quantification of the impacts. Again, this is symptomatic of the programmatic nature of the analysis. Numerical estimates for how much sediment would be released into any specific water body are not in the DEIS. Road construction and use cause some of the most adverse impacts on water quality. And while the DEIS recognizes this potential, it fails to quantify such effects on any given waterbody, instead resorting to general cause-and-effect statements, with conclusions to the effect that diluting effects makes them somehow acceptable:

> In the short-term, a greater number of temporary roads over the project area will remove more vegetation, exposing and compacting more bare soil, potentially leading to increased concentrated flows and sediment delivery to waterbodies. It should be noted that a potential increase in the magnitude or duration of effects from a greater number of temporary roads will likely be spread over a larger geographical area, including many additional watersheds, thus in essence spreading out potential effects.

Dumping a lot of sediment in a specific stream does not "spread out" effects—it pollutes the stream and damages aquatic habitat there. The DEIS fails to answer such important question as how much sediment, where it occurs, and what aquatic species of concern are found in those locations.

The DEIS has no basis for limiting the time period for analyzing cumulative effects no more than "20 years in the past and into the future." Damage to riparian and stream systems persists for many decades.

The Soil and Watershed Report states, "Many of the wet meadows, or slope wetlands in the project area exhibit erosion features such as gully erosion or development of channels in the meadows where they did not originally exist. Gullies and channels in wet meadows have resulted in drying of meadow systems since the channels tend to behave as drainage ditches." What causes this?

The Soil and Watershed Report states: Only minor, short term increases in water yield are expected." What are the numerical estimates that go with "minor, short term increases"?

"Upland treatments in watersheds may also improve water infiltration rates and increase subsurface flows higher in the stream system that provide cool perennial water to streams which helps to maintain stream temperatures." What research supports this statement?

DEIS Table 13 ("Considerations for Prioritizing Aquatics and Watershed Restoration Activities") is a clear signal that not all of the riparian area restoration will be completed. This raises a very legitimate question: How much aquatic and watershed restoration work is the FS guaranteeing, and where exactly would it be?

"Specific treatments for roads, trails, and unauthorized routes that are affecting water resources would be evaluated prior to mechanical and fire treatments in the vicinity, using the Flexible Toolbox Approach for Aquatic and Watershed Restoration Activities." This reveals the priority is vegetation treatment, with restoration for water quality being most likely to occur only near vegetation treatments.

Also, with "Partner Interest" and "Partner Implementation" being considerations for how aquatic restoration actions are prioritized (Table 13), there will be unavoidable conflicts of interest. Which management actions are considered best for the Rim Country is already heavily biased toward resource extraction on the vegetation "treatment" side, so it would be of no surprise if, for aquatics, the public interest would be subverted in favor of private financial interests.

Despite the large body of science that implicates livestock grazing for damage to streams and riparian areas in the arid western U.S., the DEIS dismisses the cumulative effects: "Cumulative effects from current livestock grazing …includes minor, generally localized soil compaction, puddling, displacement and erosion from livestock trailing and in areas where animals congregate." What are the results of monitoring of water and riparian conditions in livestock allotments in the analysis area, as directed by grazing NEPA documents? Has the monitoring been funded and carried out as spelled out in NEPA documents? Why isn't any of that information cited in the DEIS?

"It is estimated there are up to 10 times the number of unmapped springs that are not developed in the Rim Country project area." How do the allotment management plans comply with forest plan and AMP direction, if all those springs are subject to cattle trampling?

"The miles of unauthorized routes (roads or trails) within the project area are unknown, but their effects on these systems can easily be generalized. Based on current mapping, it is estimated that there are over 800 road and stream crossings in the project area. It is assumed that road crossings are generally stable on maintenance level 3 thru 5 roads (suitable for passenger cars to high degree of user comfort)…" This is a highly unreasonable assumption, given the fact that maintenance funds are acknowledged to be insufficient. What is the empirical basis of the "generally stable" conclusion?

Also, there are no estimates of sediment for road and stream crossings of any particular stream reach.

"It is assumed that road crossings range from …stable to unstable on maintenance level 1 and 2 roads (basic custodial care, i.e., closed, to open to high clearance vehicles). What is the empirical basis of the "stable" conclusion?

At the end of the DEIS's Water and Riparian section, the Summary contains two sentences, the first being: "The WCF water quality, water quantity, and riparian indicator scores are expected to be maintained or improved with the of past, present, and reasonably foreseeable actions combined with the activities proposed in the action alternatives." What an "indicator score" is goes unexplained—word searching the analysis turns up nothing. Regardless, restoration goals here should not be to "maintain" current poor conditions; and promising to improve "indicators" is not demonstrating a benefit to any specific stream or water body that needs restoration.

The Summary's other sentence is:

> Although future watershed restoration activities are expected to have long-term benefits to watershed condition, the intensity of coincidental watershed activities (**too large a proportion of a given HUC12 subwatershed over too short a time) could potentially lead to negative effects, including unstable hydrologic and sediment delivery regimes, and subsequent impacts to riparian vegetation.** (Emphasis added.)

Finally, we have the DEIS beginning to zero in on smaller (even if still not site-specific) locations. To the degree it does, the DEIS admits high risks. If the FS were to actually analyze and disclose direct, indirect, and cumulative impacts on specific water bodies, an informed public (and decision) could be possible.

In sum: The DEIS does not take a hard look at the condition of the streams and water bodies in the affected watersheds, and explain how those conditions contribute to fish or other aquatic species' population and trends. The DEIS does not disclose populations and population trends of Sensitive and ESA-listed aquatic species in specific analysis area streams, and compare those numbers to viable populations. The DEIS doesn't disclose the existing conditions of site specific stream reaches and activity effects on water quality, fish and other aquatic resources. The DEIS doesn't disclose information regarding the existence and effects of bedload and accumulated sediment. The DEIS doesn't analyze and disclose channel stability for specific stream reaches. The DEIS doesn't disclose the amount of existing accumulated fine and bedload sediment that remains from the previous logging, road construction, livestock grazing, and other human activities.

Best Management Practices and unfunded or underfunded road work

DEIS commitments to implement Best Management Practices are generally used to bolster assumptions that impacts would be minimized: "Implementation of site-specific Best Management Practices (BMPs) have been shown to be effective in mitigating impacts to water quality…"

However, the DEIS does not truly consider the overall effectiveness of BMPs. Without the sufficient funding to maintain its road system in a timely manner, all the BMP implantation that can be mustered in the context of a "project" such as this will only be a short-term fix, and the

road system will remain an ecological liability. The FS admits such problems in a non-NEPA context (USDA Forest Service, 2010t):

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

Also in a non-NEPA context, a forest supervisor (Lolo National Forest, 1999) frankly admits that timber sales 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 DEIS admits that "existing levels (of road improvements) …are currently insufficient to maintain road infrastructure adequately" and "(e)xisting open roads and unauthorized routes (are) chronic sources of pollution including sediment to stream channels throughout the Rim Country area, especially where the roads are poorly located in stream bottoms or hydrologically connected to streamcourses or have inadequate stormwater control or drainage." A big problem, as we note throughout these comments, is that these locations are not identified. How would anyone be able to tell if the worst sites are being restored, lacking such essential components of analysis and disclosure?

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 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. 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 DEIS makes no commitments to bring all the roads up to BMP standards or otherwise fix the damage. The DEIS 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 (Rhodes et al., 1994; Espinosa et al., 1997).

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

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

We appreciate that so much road decommissioning is proposed. This is a step towards a sustainable road system—if the FS actually carries it out, which is uncertain as we explain above. The DEIS neglects to fully analyze and disclose all the ongoing damage where funding cannot address the full scope of insufficient maintenance issues.

Fires and water quality

The Narrative is in play in the DEIS's Water and Riparian section:

> Current conditions are dominated by overly dense forests that lead to high fuel loads with the potential of uncharacteristic wildfires. Uncharacteristic wildfires in many cases result in soils with high burn severities that pose risk to watershed function, soil productivity, and water quality following storm events. High burn severity results in water-repellent soils, loss of protective vegetative ground cover and, following storm events, accelerated erosion and sediment delivery to connected stream courses that may degrade water quality.

There are other perspectives on fire. 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."

Sediment from road use

"Vehicle traffic associated with project implementation, particularly trucks, tend to pulverize road surface aggregates, resulting in more fine particles that are easily transported in runoff. Road proximity and connectivity to drainages can strongly influence sediment delivery to watercourses and alter flow regimes in streams." Please estimate the tons of sediment that would be introduced to streams via the vehicle traffic expected on 5,682 miles of roads expected to be used by management actions.

Log hauling activities adds sediment to streams, especially along unpaved roads. USDA Forest Service, 2016b states, "Increased heavy-truck traffic related to log hauling can increase rutting and displacement of road-bed material, creating conditions conducive to higher sediment delivery rates (Reid and Dunne, 1984)." The abstract from Reid and Dunne, 1984 states:

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

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

TRANSPORTATION

"Currently there are approximately 5,682 miles of Forest Service roads within the project area on Forest Service lands" and the same number "would be needed to implement the Action Alternatives." DEIS at 304.

"(R)oads and trails …are responsible for considerable landscape scale changes to the functioning and maintaining of ecological processes and values." DEIS at 445.

Flawed statement of purpose and need

Guardians provided the Forest Service detailed scoping comments (incorporated here by reference) which explained the need for the Forest Service to consider its Travel Analysis Reports (TARs) for the three national forests, and more importantly, identify the Minimum Road System (MRS).[8] See Guardians Scoping Comments (hereafter, "G. Scoping") at 1.

The 4FRI Rim Country DEIS identifies the "need to decommission unneeded routes identified during the forest Travel Management Rule planning processes as part of the restoration of the landscape in the project area." DEIS at 23. Further, the proposed action includes direction to "[d]ecommission up to 200 miles of existing system roads on the Coconino and Apache-Sitgreaves National Forests, and up to 290 miles on the Tonto National Forest." Id. at 31. Yet, the Forest Service does not state roads identified for decommissioning reflects the MRS or that identification of the MRS is a primary purpose or outcome of this proposal. DEIS at 21. The omission is a huge missed opportunity for the Forest Service to finally comply with regulatory direction that has been in effect since 2001 when the agency finalized its "Roads Rule" under 36 C.F.R. 212.5(b). See 66 FR 3217, Jan. 12, 2001. Further, we note the Forest Service qualifies its proposed road decommissioning describing the action as "up to," meaning the action may not ever occur. Given the overall purpose of this proposal is to "...restore and maintain the structure, pattern, health, function, and vegetation composition and diversity in ponderosa pine ecosystems…" the Forest Service should commit to the decommissioning actions by replacing "up to" with "shall." Such action is necessary given the travel planning processes on the Tonto and Apache-Sitgreaves NFs cited in the DEIS fail to fully comply with the agency's duty to identify a MRS. DEIS at 116. Further, the Forest Service incorrectly states that "[o]n the Tonto National Forest, decommissioning of system roads is being analyzed as part of the Tonto Travel Management EIS and roads for decommissioning are identified." DEIS at 308. To correct the record, the Tonto TMP draft ROD designates 1,288 miles of roads for decommissioning, but "[t]he on-the-ground actions associated with decommissioning a road, along with the effects, are not part of this analysis. All activities associated with decommissioning will be covered by additional environmental analysis in compliance with the National Environmental Policy Act." Tonto TMP Draft ROD at 6.

[8] 36 C.F.R. § 212.5(b)(1) ("For each national forest . . . 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.").

We urge the Forest Service to include identification of the MRS as a purpose and a decision to be made, and fully commit to decommissioning system and unauthorized roads independent of vegetative management actions.

Failure to take a "hard look" at the direct, indirect, and cumulative impacts.

Roads & Transportation

The Forest Service improperly ignores many direct, indirect, and cumulative impacts of this proposal that will result from construction, reconstruction, opening and use of the forest road system and temporary roads. The DEIS asserts that no long-term negative effects would occur on the existing system and that short-term consequences would be minimized through the use of best management practices or design features. This ignores many relevant factors, including that the Forest Service is unable to afford or maintain the existing system as evidenced by a national forest road maintenance backlog of $5.5 billion dollars. USDA 2019 at 83. Further, each of the National Forests in the analysis area produced travel analysis reports acknowledging that road maintenance needs exceed their annual budgets. Yet, the Forest Service fails to discuss or analyze its ability to perform the necessary maintenance promised in the design features. Specifically, the agency directs that "existing and newly constructed roads are maintained throughout the life of the proposal. Proper maintenance of roads throughout the life of the proposal will ensure that drainage structures are functioning correctly and that concentrated surface run-off does not occur." Transportation Specialist Report at 13. This is an incredible statement, since it suggests that the Forest Service will perform maintenance on all its roads—regardless of whether or not they are being utilized for vegetative management. At the same time, the Forest Service provides no evidence it will have adequate funding to perform this maintenance.

The agency also fails to disclose site-specific information regarding the existing forest road system within the analysis area. DEIS at 304-308 (describing the affected environment and results of the No Action Alternative that fails to quantify or adequately describe ongoing harmful effects to forest resources from forest roads). *See also* Transportation Specialist Report (largely incomplete). This precludes meaningful public comment and prevents the agency from taking the required "hard look" at impacts from the road system.

In addition, though the Forest Service recognizes roads as a significant issue for the action alternatives to address, the agency arbitrarily constrains its impacts focus to just temporary roads rather than including use of the broader road system. DEIS at 28, 306. This is a major failing considering "[a]pproximately 5,682 miles of roads currently in the forest system road network would be needed for the activities proposed in the action alternatives. Of this total mileage, 2,076 would be included from the re-opening of maintenance level 1 (ML1) roads." *Id.* at 110. Opening closed roads or reconstructing those in storage is a significant issue, especially if the ML 1 status was meant to address specific resource concerns such as sedimentation, erosion or wildlife security. The agency claims, "[t]his analysis addresses temporarily opening existing closed roads (ML 1) to utilize them for the time period they are needed to provide access for restoration work." *Id.* at 307. Yet, the roads indicator/measure only pertains to temporary roads. *Id.* 306. The

DEIS fails to disclose any analysis, description or measure of ML 1 roads closed due to resource concerns.

As we previously explained, the best available science shows that roads cause significant adverse impacts to National Forest resources. G. Scoping at 5. The Forest Service recognizes some of the harmful environmental consequences from its road system in the analysis in specific resource sections of the DEIS, yet it fails to adequately measure or quantify those resource risks sufficiently to satisfy the hard look NEPA requires, which is a systemic flaw in the agency's "condition-based management strategy." DEIS at 42.

Roads and Invasive Plants

Forest roads facilitate increased human intrusion into sensitive areas, resulting in poaching of rare plants and animals, human-ignited wildfires, introduction of exotic species, and damage to archaeological resources. Roads contribute to the spread of invasive species. Roads themselves—regardless of whether they are open or closed to the public—split apart the forest landscape, creating more buffers where invasive species are likely to grow. Here, the Forest Service largely relies on design features that are hypothetical (because they may, or may not apply to each accounting unit) to reduce the risk of ground disturbance and prescribed burns increasing invasive plant species in the analysis area.

Temporary Roads

Guardians noted in scoping comments a particular concern about the proposal to construct temporary roads. G. Scoping 7-8. The proposed action would "[c]onstruct or improve approximately 330 miles of temporary roads (new and/or occurring on existing unauthorized roads)..." DEIS at 31. The DEIS fails to fully discuss the effects of the construction of temporary roads (many impacts identified in our scoping comments), including disclosing the specific location of each road. For example, temporary roads will continue to allow for harassment of wildlife, littering, fires, invasive plant distribution, and negative impacts to aquatic and riparian habitat, as well as the fish that depend on that habitat. The use of unauthorized roads is particularly concerning since these are typically created by off-road vehicle use and not properly located, designed or constructed to any standard. The Forest Service should identify where it will construct new temporary roads, and prohibit the use of unauthorized roads. The Forest Service should not authorize the construction, reconstruction or use of temporary roads in areas with moderate or high erosion potential, within 300 feet of streams, within any aquatic management zone, or in habitat for species of conservation concern.

The Forest Service provides conflicting assurances that the 330 miles of temporary roads will be properly removed after use. The agency states, "[w]hen no longer required for treatments, temporary roads are to be decommissioned through obliteration, and road footprints rehabilitated as to be returned to as natural condition as possible." DEIS at 115. Yet, the design features explains, "[a]s a condition of approval for use of a temporary road under any contract involving mechanical thinning, temporary roads will be decommissioned, using any one or combination of appropriate methods, by the purchaser/contractor when mechanical treatments are finished." Transportation Specialist Report at 13-14. Further, the design features clarify that

"[d]ecommissioned roads ***should*** have the roadbed removed and natural contours and gradients restored ***as much as possible***." Emphasis added, *Id.* at 13. In other words, decommissioning methods do not require full obliteration of the road template and it is likely the purchaser will leave remnants of the road in place, which become targets for unauthorized use. The agency also fails to provide definitive direction that unauthorized roads be fully removed after use as temporary roads. DEIS at 309. The Forest Service must clarify that all decommissioning must result in the full removal of the roadbed and road features so as to preclude any future rediscovery where the agency would reconstruct the road under a future project or add the road to the system. This is especially pertinent given the Forest Service proposed new Categorical Exclusion at (e)(25) that allows the conversion of an unauthorized or non-National Forest System (non-NFS) road to an NFS road. 84 FR 27548.

Currently, the Forest Service does not track temporary roads and has no system to enforce closure of temporary roads. The Forest Service must ensure that the temporary roads will in fact be temporary by including monitoring and enforcement during implementation, and then tracking the temporary roads following completion to ensure the road will be removed from the landscape within, at most, 3 years. The Forest Service must provide in this DEIS a detailed monitoring plan to assess how the selected alternative addresses impact concerns and to ensure effectiveness of the specified design features, such direction to avoid removal of "...old and large trees, as well as oaks and aspens where feasible," when constructing temporary roads in AMZs (which the agency should not allow in the first place). Transportation Specialist Report at 14. The Forest Service must provide a schedule of monitoring to show how, by whom, and when monitoring will be conducted. It must also require some type of monetary assurance from the users of the temporary roads to guarantee that the user will reclaim them within 3 years after a project. Otherwise, the burden falls on the Forest Service and the public. Without some assurances, it is possible the temporary roads could remain on the landscape well beyond the 10-year limit.[9] At a minimum, the Forest Service must provide adequate responses to the following questions:

- What assurances does the Forest Service provide that all temporary roads will in fact be decommissioned once logging activities are complete?

- How will this information be tracked, and will it be available to the public?

- For any old non-system (temporary) roads proposed to be re-used, what management actions did the original decision documents authorizing the creation of these roads call for?

The agency must consider the effects of its proposal to use temporary roads when combined with the effects of its existing, official road system. It must also consider how construction or re-opening of temporary roads will detract from the purpose of subpart A of the agency's own rules, to "identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of the National Forest System lands." 36 C.F.R. § 212.5(b). This is

[9] The National Forest Management Act requires reestablishment of vegetative cover on the roadway of temporary roads within 10 years after the termination of contract, permit, or lease. 16 U.S.C. 1608(a).

especially true if the Forest Service fails to provide assurances that the proposed temporary roads will in fact be closed within 10 years of completion of the relevant proposal.

Over-reliance on design features is a violation of NEPA

For all actions considered in this proposal the Forest Service has a duty to "[u]se all practicable means . . . to restore and enhance the quality of the human environment and to avoid or minimize any possible adverse effects of [its] actions upon the quality of the human environment." 40 C.F.R. § 1500.2(f). Here, the Forest Service's approach relies too heavily on its menu of potential design features to mitigate a range of harmful environmental consequences, many of which rely on uncertain future monitoring, lack adequate specificity and clear triggers for implementation, are unenforceable, and lack demonstrated effectiveness in reducing impacts. The agency also fails to assess the effectiveness of these mitigation measures, in violation of NEPA. *See* 40 C.F.R. §§ 1502.14(f), 1502.16(h), 1508.25(b).

For example, the Forest Service states "[i]mplementation of site-specific Best Management Practices (BMPs) have been shown to be effective in mitigating impacts to water quality, and the development, implementation and monitoring of BMPs are Forest Service responsibility as described within the Memorandum of Understanding between the State of Arizona, Department of Environmental Quality and USFS Southwestern Region (USFS, 2013)." DEIS at 103. Yet, the Forest Service fails to provide any evidence or monitoring data demonstrating BMP effectiveness.

When considering how effective BMPs are at controlling non-point pollution on roads, both the rate of implementation of the practice, and the effectiveness of the practice should both be considered. The Forest Service 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 Forest Service entitled, *Effectiveness of Best Management Practices that Have Application to Forest Roads: A Literature Synthesis* summarized research and monitoring on the effectiveness of different BMP treatments (Edwards et al., 2016). They 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 (*Id*). Few road BMPS have been evaluated under a variety of conditions, and much more research is

needed to determine the site-specific suitability of different BMPs (*Id.*, also see Anderson et al. 2011).

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

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

Climate Change and Forest Roads

Guardians' scoping comments urged the Forest Service—and again we reiterate the need—to consider the cumulative impacts of climate change and forest roads. G. Scoping at 5-6. Climate change intensifies the impacts associated with roads. For example, as the warming climate alters species distribution and forces wildlife migration, landscape connectivity becomes even more critical to species survival and ecosystem resilience.[10] 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.[11] Many National Forest roads are poorly located and designed to be temporarily on the landscape, making them particularly vulnerable to these climate alterations.[12] 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.[13] At

[10] *See* G. Scoping Exhibit A at 9-14.

[11] *See,* e.g., Halofsky, J.E. et al. eds., USDA, Forest Service, Pacific Northwest Research Station, Adapting to Climate Change at Olympic National Forest and Olympic National Park, PNW-GTR-844 (2011), pages 21-27.

[12] *See, e.g., Id.* at 36-38.

[13] *See, e.g.*, Strauch, R.L. et al., *Adapting transportation to climate change on federal lands in Washington State,* Climate Change 130(2), 185-199 (2015) (noting the biggest impacts to roads and trails

bottom, climate change predictions affect all aspects of road management, including planning and prioritization, operations and maintenance, and design.[14]

The Forest Service must 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 Forest Service 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.[15]

Risk of Landslide

The analysis fails to provide an adequate assessment of landslide risks throughout the analysis area relative to the current road system or temporary roads under the proposed action. The analysis states that the analysis area has moderate or severe erosion hazards on "452,500 acres or about 37 percent of the analysis area or 43% of ponderosa pine or mixed conifer vegetation types)." Soils and Watersheds Specialist Report at 58-59. Yet, the Forest Service fails to disclose the miles of road by maintenance level located in areas of moderate and high erosion hazards, which is especially problematic for ML 1 roads that would be utilized under the proposed action. The analysis must identify the roads proposed for use, including temporary and unauthorized according to their potential landslide risk areas by determining, at a minimum, the following: pre- and post-proposed harvest canopy cover, increase in ground water saturation, slope, and soil type. The analysis must also identify the construction of any new roads and reconstruction of skid trails or previously obliterated roads, and identify the level of reconstruction necessary. Road construction and reconstruction should not be permitted in areas of landslide-prone soils.

Sedimentation/Erosion

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are expected from temperature-induced changes in hydrologic regimes that enhance autumn flooding and reduce spring snowpack).

[14] Halofsky, J.E. et al. eds., USDA, Forest Service, Pacific Northwest Research Station, *Adapting to Climate Change at Olympic National Forest and Olympic National Park*, PNW-GTR-844 (2011) at 35.

[15] *See* Schmitz, O.J. and A.M. Trainor, *Adaptation Approaches for Conserving Ecosystem Services and Biodiversity in Dynamic Landscapes Caused by Climate Change*, USDA Forest Service RMRS-P-71 (2014), pages 301-303.

The Forest Service predicted potential sediment delivery using a model explaining the "WEPP FuME interface is designed to predict sediment delivery from a variety of conditions, including undisturbed forest, wildfire, prescribed fire, thinning, and forest access roads." Soils and Watershed Specialist Report at 161. The analysis provided a table displaying, "[p]redicted sediment delivery rates for each TES stratum under conditions expected to occur within the project area." *Id.* at 59-63, Table 14. We question the data generated from this model regarding sedimentation from roads given the buffer distance was only 50 feet. The Forest Service explains, "[t]he range of values given for road sedimentation represent the amount of sediment delivered across the buffer, and the amount delivered to a stream crossing. Roads with buffers greater than 50 ft will generate less sediment." *Id.* at 163. Yet, the analysis fails to support the use of a 50 foot buffer with any evidence or analysis, or even monitoring data to support this position, the absence of which is significant given the buffer distance the agency uses to measure effects to aquatic species. Here, "[a] 250-foot buffer on fish species habitat was used for analyzing acreage of direct effects on habitat, as this includes the stream and the adjacent riparian and upland areas that directly influence aquatic habitat and species." DEIS at 421. The sedimentation analysis should have used buffer distances consistent with the aquatic species and habitat analysis. Further, though the Forest Service provides tables and model result summaries showing potential sedimentation for each TES Strata, the analysis fails to adequately synthesize this information into any clear analysis of the potential environmental consequences under each alternative. Soil and Watershed Specialist Report at 161-252. For example, the analysis fails to disclose how much sedimentation may result from the construction, reconstruction or use of forest roads, which is a major omission especially for temporary, unauthorized or those roads in ML 1 status.

Watersheds

The Forest Service utilizes the Watershed Condition Framework (WCF) to assess current watershed conditions under each alternative. "The result of the analysis of all watersheds in the project area indicate 20 (15 percent) were rated as Functioning Properly, 111 (83 percent) were rated as Functioning at Risk, and 2 (2 percent) were rated as Impaired. This information is presented in appendix B of the Water and Riparian Specialist Report (Brown 2019)." DEIS at 104. Yet, the Forest Service arbitrarily constrained the analysis by focusing only on three indicators (Riparian/Wetland, Water Quality, Water Quantity), showing the riparian/wetland areas are most impaired or functioning at risk. *Id.* at 105. The Forest Service states that "[o]ther Watershed Condition Framework indicators are addressed in the Soils and Watershed specialist report (MacDonald 2019)." *Id.* at 106. Yet, that report fails to include any other indicator rankings, rather it only lists aggregate scores. Soil and Watershed Specialist Report at Appendix D. As such, the analysis fails to disclose the range of indicator and attribute rankings for each of the watersheds functioning at risk or impaired, and does so without justification. The lack of detail is an inherent flaw in the agency's use of the WCF because it precludes our ability to determine if the action alternatives will improve the road and trail indicator, and more generally if watershed condition class scores will actually improve as a result of decommissioning actions. For example, will the proposed action change any of the 111 watersheds functioning at risk to a condition where they are functioning properly? The analysis fails to provide any predicted changes to WCF scores for those indicators the Forest Service did include.

VEGETATION

Much of the concern we have about the Vegetation section of the DEIS is discussed in other sections of our comments.

The Sierra Club's scoping comments recognized that pinyon -juniper woodlands support high abundance and diversity of bird species, with many obligate and semi -obligate species. We remain concerned that protection of these habitats, providing unique habitats for so many wildlife species, is not sufficiently stressed in the CFLRPlan's FTA. As we discuss in the Large Tree Retention and Old Growth section of these comments, large and old pinyon and juniper remain vulnerable.

Gillihan, 2006 notes the importance of pinyon-juniper woodlands for diversity of avian species:

> The pinyon-juniper bird community, especially in mature stands, contains a high number and variety of birds --- more than 70 species are known to breed in pinyon-juniper woodland… Pinyon-juniper woodlands support one of the highest proportions of obligate or semi-obligate bird species among forest types in the West (Paulin et al. 1999). Species closely tied to pinyon-juniper …include Black-chinned Hummingbird, Ash-throated Flycatcher, Cassin's Kingbird, Gray Flycatcher, Western Scrub-Jay, Pinyon Jay, Juniper Titmouse, Bushtit, Bewick's Wren, Northern Mockingbird, Blue-gray Gnatcatcher, Gray Vireo, Black-throated Gray Warbler, Lark Sparrow, and Black-chinned Sparrow (Balda and Masters 1980).

"(B)ecause mature (pinyon-juniper) stands offer unique biological benefits that take tens to hundreds of years to develop, and because most of the bird species of conservation concern rely on mature stands, the emphasis should be on retaining those stands whenever possible." (*Id*.)

Our comments also stressed that the implementation of "regeneration" gaps within mixed conifer types for the purpose of creating openings to recruit ponderosa pine seedlings would remove too many large trees.

The accuracy and reliability of stand exam data is suspect. "Comprehensive tree data has been collected on a subset of the stands within the analysis area over the last 25 years." How large and representative of the entire analysis area this data subset is—is not disclosed in the DEIS. Along with the seemingly limited acreage extent of the survey data, the age of the data creates inaccuracy and uncertainty. As we discuss in the Scientific Integrity part of these comments, this raises questions the DEIS should be addressing in each of its resource analyses—but doesn't.

It would help if, prior to modeling, the FS would field-check the input data. The DEIS doesn't indicate such verification has occurred.

In addition, the conditions the DEIS presents as representing the Natural Range of Variation (NRV)—upon which Desired Conditions and therefore proposed management actions are based—are themselves not presented with the proper acknowledgment of uncertainty.

Logically, then, the DEIS's use of various "Stand Metrics" (defined at pp. 142-143) appears as conceptualization of the forest from an overly narrow tree farming perspective, lacking proper grounding in ecology. For example, "control of growing stock." The DEIS fails to acknowledge how little humans understand of the complexity of forest ecosystems. Managers should demonstrate humility and properly attribute "control" (if that term is even appropriate) to the natural processes that have created and maintained these forests for centuries.

Whereas use of the term NRV acknowledges a *range* of conditions managers might see as "desirable", the FS doesn't actually describe desired conditions for stand metrics in terms of acceptable ranges. So for example Figures 18-20, 27-29, and 36-38 express "desired" as a single number—furthering our skepticism.

"Approximately 50 percent of the project area that received some type of regeneration or shelterwood harvest has regenerated." Apparently, NFMA's requirement to restock within 5 years after "regeneration" has not been met half the time.

The Silviculture Report states, "The Cragin Watershed Protection Project on the Coconino National Forest was decided in 2018 and will mechanically treat 41,046 acres and use prescribed fire on 63,656 to move stands in that project area towards the desired condition. **In most cases, fuels reduction treatments do not necessarily provide adequate change in stand structure and do little to move towards desired conditions.** (Emphasis added.) That's either a very striking indictment of a recent FS decision, or a statement on the fleeting nature of the validity of FS objectives. The FS should re-initiate the NEPA for Cragin Watershed Protection Project to bring it in alignment with legitimate plan direction.

"Bebb's willows and bigtooth maples …are declining in health, vigor, and number in the project area." Please cite the source(s) of the survey data.

"The grasslands have impaired soil conditions due to inadequate protective ground cover, compacted soil surfaces, and encroaching pines and junipers." How do encroaching pines and junipers impair soil conditions? What caused the inadequate protective ground cover? What caused the compacted soil surfaces?

FLAWED METHODOLOGY DUE TO RELIANCE ON ECOLOGICAL RESPONSE UNITS

The Forest Service explains in its analysis assumptions and methodology that "[t]o facilitate landscape analysis and strategic planning in the Southwest, the Forest Service has developed a framework of ecosystem types referred to as Ecological Response Units (ERUs)." DEIS at 86.

The Ecosystem Response Unit does not account for our current ecological understanding of ecosystems, making it insufficient for determining the seral-stage proportions for different vegetation types.

The Ecosystem Response Unit (ERU) system is based on Potential Natural Vegetation (PNV) and runs counter to the idea that ecosystems are dynamic and change over time. This outdated concept is not supported by the best available and most recent science. The PNV concept,

introduced by Tüxen (1956), is focused on past and present conditions and is the imagined vegetation community at a location if human influence were removed (Zerbe 1998). Ecosystems are dynamic, as noted in FS1909.12, and the ecosystems of the southwestern US have been heavily impacted by human land use for centuries (Liebmann et al 2016). Thus, it is unlikely that we can even imagine a vegetation community in the absence of human influence, let alone model PNV (Chiarucci et al. 2010).

Further, the ERU and PNV concepts do not account for the fact that we are currently experiencing a period of rapid climate change driven by human-caused greenhouse gas emissions (IPCC 2014). Actual evapotranspiration and deficit (unmet evaporative demand) have direct physiological importance for plants and are well-correlated with vegetation type distributions (Stephenson 1990). As temperature increases, deficits will increase, with potentially large effects on forest ecosystems in the Southwest (Williams et al. 2013). Thus, while site characteristics, such as soil type, remain relatively stable over time, the climate space a site experiences is changing and will continue to change as the climate warms. This negates the validity of using ERU/PNV as a management target. Natural range of variation, as defined in FSH 1909.12, provides a more flexible framework for management planning because it acknowledges that ecosystems "are dynamic and change over time" (Synonymous, or slight variations of this concept, are called "Historical Range of Variation" in peer-reviewed publications, e.g., Keane et al. 2009). Implementation of the natural range of variation concept in a forest plan provides a more robust and scientifically up-to-date approach to management. The ERU/PNV approach attempts to push the ecosystem in a particular location toward some idealized condition, reduces variability and equates to a loss of resilience (Holling and Meffe 1996). The ERU/PNV concept should be replaced with the natural range of variation concept, which is scientifically-supported and is in compliance with FSH 1909.12. This change will acknowledge that just because a particular patch of ground was previously grassland and is now a juniper savanna does not mean that converting it back to grassland should be the objective.

Using Terrestrial Ecosystem Unit Inventory data to determine the location of ERUs is not grounded in our current scientific understanding of the factors that determine the distribution of vegetation types across landscapes.

The Forest Service explains that the 2018 Coconino Revised Forest Plan used ERUs, and that "...the 1996 amended Tonto Forest Plan incorporated the earlier Terrestrial Ecological Unit Inventory (TEUI)." DEIS at 86. Further, the agency explains, "ERUs have been built from plant associations and ecosystem units that have been identified through Terrestrial Ecological Unit Inventory (Wahlberg et. al. 2013)." DEIS at 103. Yet, the analysis fails to account for or address the fact that the TEUI Technical Guide (Winthers et al., 2005) states a number of abiotic attributes are related to PNV to derive the TEUI classification. As a result, the TEUI is likely to have substantial uncertainty with respect to ecosystem classification and will dictate that a particular unit should be a specific vegetation type when it may not be possible to support that vegetation type at that location, particularly under changing climate. The Forest should be basing vegetation classification on actual vegetation data, and include mechanisms that adequately address unknown factors. Yet, uncertainty quantification is absent from the TEUI making it less scientifically-valid for vegetation classification because it is treated as truth rather than a model.

The desired conditions for each forest vegetation type are based on ERU classification and this does not provide scientifically-supported targets for the distribution of seral stages within a particular vegetation type. The desired condition of seral stage distributions should be developed using data on what is actually present on the landscape and not what hypothetically occurs at a given location in the absence of human-caused disturbance and climate change. This should be replaced with an imputation approach to classifying the landscape into different vegetation types and then develop a distribution of seral stages based on where different vegetation types actually occur on the landscape. Forest Service needs to adjust its analysis in the Final Environmental Impact Statement to reflect these comments.

BIOMASS UTILIZATION WORSENS CLIMATE CHANGE

Before we get into the other details of why the Rim Country CFLRPlan is a threat to the atmosphere and incongruent with likely scenarios of climate change (next comment section), we specifically critique its biomass utilization aspect.

A news article ("Study warns wood bioenergy supporters can't see carbon emissions for the trees"), concerning research by Sterman et al. (2018), puts it this way: "(B)urning wood pellets for power is worse for the climate than burning coal, because of the short-term effects and the 'potentially irreversible impacts that may arise before the long-run benefits are realized.'"

Sterman et al. (2018) state:

> First, yet contrary to the policies of the EU and other nations, biomass used to displace fossil fuels injects CO_2 into the atmosphere at the point of combustion and during harvest, processing and transport. Reductions in atmospheric CO_2 come only later, and only if the harvested land is allowed to regrow.
>
> Second, the combustion and processing efficiencies of wood in electricity generation are lower than for coal …Consequently, the first impact of displacing coal with wood is an increase in atmospheric CO_2 relative to continued coal use, creating an initial carbon debt.
>
> Third, after the carbon debt is repaid, atmospheric CO_2 is lower, showing the potential long-run benefits of bioenergy. However, before breakeven, atmospheric CO_2 is higher than it would have been without the use of bioenergy, increasing radiative forcing and global aver-age temperatures, worsening climate change, including potentially irreversible impacts that may arise before the long-run benefits are realized.
>
> Fourth, biofuels are only beneficial in the long run if the harvested land is allowed to regrow to its pre-harvest biomass and maintained there. Natural forests have high carbon density compared to pasture, crop-land, developed land and managed tree plantations. The carbon debt incurred when wood displaces coal may never be repaid if development, unplanned logging, erosion or increases in extreme temperatures, fire, and disease (all worsened by global warming) limit regrowth or accelerate the flux of carbon from soils to the atmosphere. Further, lower coal prices caused by the drop in power sector demand may stimulate coal use elsewhere, offsetting even the potential long-run benefits of bioenergy (e.g. York 2012).

> Fifth, counter to intuition, harvesting existing forests and replanting with fast-growing species in managed plantations can worsen the climate impact of wood biofuel. Although managed loblolly pine grows faster than hardwood, speeding the initial recovery of forest biomass, the equilibrium carbon density of managed plantations is lower than unmanaged forest, so carbon sequestered in plantations never offsets the carbon taken from the original forest. This is true even if the managed plantation is never reharvested, and worse if the plantation is periodically reharvested.
>
> Sixth, growth in wood harvest for bioenergy causes a steady increase in atmospheric CO_2 because the initial carbon debt incurred each year exceeds what is repaid. With the US forest parameters used here, growth in the wood pellet industry to displace coal aggravates global warming at least through the end of this century, even if the industry stops growing by 2050.
>
> Seventh, using wood in electricity generation worsens climate change for decades or more even though many of our assumptions favor wood, including: wood displaces coal (the most carbon intensive fossil fuel); all harvested land is allowed to regrow as forest with no subsequent conversion to pasture, cropland, development or other uses; no subsequent harvest, fire or disease; no increase in coal demand resulting from lower prices induced by the decline in coal use for electric power; no increase in N_2O from fertilization of managed plantations; and no increase in CO_2 emissions or methanogenesis from disturbed land. Relaxing any of these assumptions worsens the climate impact of wood bioenergy.

An analysis by Partnership for Policy Integrity (Carbon emissions from burning biomass for energy) says much the same thing: "Worse than coal"? Yes, if you're interested in reducing carbon dioxide emissions anytime in the next 40 years. …Biomass burning: a major carbon polluter." Clean Air Task Force and Conservation Law Foundation, (2016) arrive at essentially the same conclusion.

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

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

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.

Finally, see the film, "BURNED: Are Trees the New Coal?" by independent filmmakers Marlboro Films, LLC: Alan Dater, Lisa Merton, and Chris Hardee.

CLIMATE CHANGE AND CARBON SEQUESTRATION

Despite the magnitude of the climate change problem, the DEIS provides practically no analysis on the subject. And as with its analyses for most other resources, science that disagrees with FS conclusions are ignored or misrepresented.

The DEIS suggests the CFLRPlan would help the climate situation by storing more carbon over in the long term even though implementation results in increased carbon dioxide emissions. However, this is consistent with the claims that actions would head off widespread catastrophic fire, which doesn't square with the facts as we point out in other sections of our comments.

Furthermore, there's absolutely no cumulative effects analysis in this DEIS section.

The DEIS's all too cursory analysis is supposedly supported with scientific references, which do not appear in the DEIS's Reference section.

The DEIS includes no cumulative effects analysis of Rim Country carbon sequestration over time. We request the FS create line graphs with carbon storage on the vertical axis, time on the horizontal access—one graph for each combination of forest type, biophysical setting, age class, size class etc. and also for the entire analysis area, for each alternative, extending out for 100 years or so—based upon best available science.

The DEIS Natural Range of Variability analysis ignores climate change effects.
There is scientific certainty that climate change has reset the deck for future ecological conditions. For example, Sallabanks, et al., 2001:

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

The DEIS provides inadequate information and analysis on climate change effects on analysis area vegetation. Reynolds, et al., 2013 acknowledge "reference conditions and ranges of natural variability may not be sustainable in future climates…" Although this calls into question The Narrative and therefore Rim Country proposal Purpose and Need, the DEIS fails to adequately analyze and disclose this fact. The DEIS 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 fact of climate change calls into question the FS's manipulate-and-control paradigm (Hayward, 1994).

In the recent revised Forest Plan Draft EIS for the Custer-Gallatin National Forest, the FS states, "Climate change is expected to continue and have profound effects on the Earth's ecosystems in the coming decades (IPCC 2007)." As alarming as that might sound, the Rim Country IDT members should familiarize themselves with the most recent report from the Intergovernmental Panel on Climate Change, which makes that 2007 report seem optimistic.

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

Issued late 2018 by the Intergovernmental Panel on Climate Change, a group of scientists convened by the United Nations to guide world leaders, the 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 I.P.C.C. reports and a physicist with Climate Analytics, a nonprofit organization. "We were not aware of this just a few years ago." The report was the first to be commissioned by world leaders under the Paris agreement, the 2015 pact by nations to fight global warming.

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

In the context of ongoing climate change the notion of chasing "historical conditions" makes no sense. The effects of climate change have already been significant. 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.

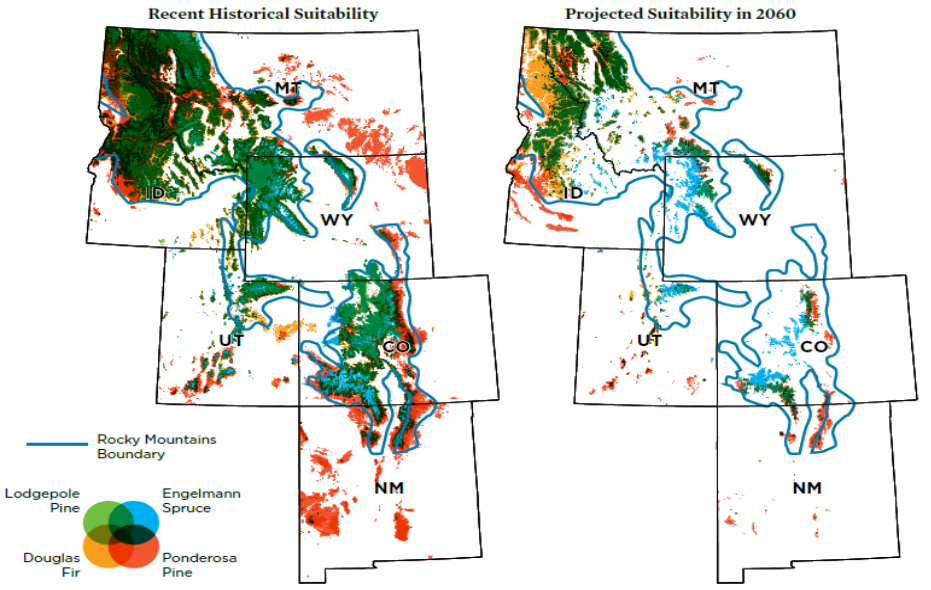
Running, 2006 cites model runs of future climate scenarios from the 4th Assessment of the Intergovernmental Panel on Climate Change, stating:

> (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."

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

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



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

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

> Much of the current range of these four widespread Rocky Mountain conifer species is projected to become climatically unsuitable for them by 2060 if emissions of heat-trapping

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

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 Southwest states: "Climate changes will increase stress on the region's rich diversity of plant and animal species. Widespread tree death and fires, which already have caused billions of dollars in economic losses, are projected to increase, forcing wholesale changes to forest types, landscapes, and the communities that depend on them." (Garfin et al., 2014.)

This doesn't mean 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 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.)

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."

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.

Past conditions will not predict the future in the wake of climate change. What are the expected changes for the Rim Country in Arizona? The DEIS hardly raises the topic. We refer to an assessment for the state of Montana for another example of details on how climate change scenarios could play out in a part of the U.S. The Montana Climate Assessment (MCA) (Found at http://montanaclimate.org/) is an effort to synthesize, evaluate, and share credible and relevant scientific information about climate change in the State of Montana. Following are key messages and conclusions:

KEY MESSAGES

- Annual average temperatures, including daily minimums, maximums, and averages, have risen across the state between 1950 and 2015. The increases range between 2.0-3.0°F (1.1-1.7°C) during this period. [high agreement, robust evidence]

- Winter and spring in Montana have experienced the most warming. Average temperatures during these seasons have risen by 3.9°F (2.2°C) between 1950 and 2015. [high agreement, robust evidence]

- Montana's growing season length is increasing due to the earlier onset of spring and more extended summers; we are also experiencing more warm days and fewer cool nights. From 1951-2010, the growing season increased by 12 days. In addition, the annual number of warm days has increased by 2.0% and the annual number of cool nights has decreased by 4.6% over this period. [high agreement, robust evidence]

- Despite no historical changes in average annual precipitation between 1950 and 2015, there have been changes in average seasonal precipitation over the same period. Average winter precipitation has decreased by 0.9 inches (2.3 cm), which can mostly be attributed to natural variability and an increase in El Niño events, especially in the western and central parts of the state. A significant increase in spring precipitation (1.3-2.0 inches [3.3-5.1 cm]) has also occurred during this period for the eastern portion of the state. [moderate agreement, robust evidence]

- The state of Montana is projected to continue to warm in all geographic locations, seasons, and under all emission scenarios throughout the 21st century. By mid century, Montana temperatures are projected to increase by approximately 4.5-6.0°F (2.5-3.3°C) depending on the emission scenario. By the end-of-century, Montana temperatures are projected to increase 5.6-9.8°F (3.1-5.4°C) depending on the emission scenario. These state-level changes are larger than the average changes projected globally and nationally. [high agreement, robust evidence]

- The number of days in a year when daily temperature exceeds 90°F (32°C) and the number of frost-free days are expected to increase across the state and in both emission scenarios studied. Increases in the number of days above 90°F (32°C) are expected to be greatest in the eastern part of the state. Increases in the number of frost-free days are expected to be greatest in the western part of the state. [high agreement, robust evidence]

- Across the state, precipitation is projected to increase in winter, spring, and fall; precipitation is projected to decrease in summer. The largest increases are expected to occur during spring in the southern part of the state. The largest decreases are expected to occur during summer in the central and southern parts of the state. [moderate agreement, moderate evidence]

USDA Forest Service, 2017b discusses some effects of climate change on forests, including "In many areas, it will no longer be possible to maintain vegetation within the historical range of variability. Land management approaches based on current or historical conditions will need to be adjusted."

In a literature review, Simons (2008) states, "Restoration efforts aimed at the maintenance of historic ecosystem structures of the pre-settlement era would most likely reduce the resilient characteristics of ecosystems facing climate change (Millar 1999)." The Rim Country area has

been fundamentally changed, so the agency must consider how much native forest it has fundamentally altered compared to historic conditions forestwide before pursuing "treatments" here. And that includes considering the effects of human-induced climate change. Essentially, this means considering new scientific information on all kinds of changes away from historic conditions.

Cumulative greenhouse gas emissions impacts and carbon sequestration.

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

The DEIS 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 these management and other authorized or allowed activities.

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

> Off-road vehicles in California currently emit more than 230,000 metric tons — or 5000 million pounds — of carbon dioxide into the atmosphere each year. This is equivalent to the emissions created by burning 500,000 barrels of oil. The 26 million gallons of gasoline consumed by off-road vehicles each year in California is equivalent to the amount of gasoline used by 1.5 million car trips from San Francisco to Los Angeles.
>
> . . . Off-road vehicles emit considerably more pollution than automobiles. According to the California Air Resources Board, off-road motorcycles and all-terrain vehicles produce 118 times as much smog-forming pollutants as do modern automobiles on a per-mile basis.
>
> . . . Emissions from current off-road vehicle use statewide are equivalent to the carbon dioxide emissions from 42,000 passenger vehicles driven for an entire year or the electricity used to power 30,500 homes for one year.

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

192 million pounds (96 thousand tons) of climate-warming CO_2 per year into the atmosphere. Can we really afford this?

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

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

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

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

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

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."

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

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

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

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

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

biodiversity through a wide range of processes such as forest loss and degradation, land-use intensification, exotic plant invasions, soil erosion, persecution of large predators and competition with wildlife for resources.

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

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

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

Keith et al., 2009 state:

> Both net primary production and net ecosystem production in many old forest stands have been found to be positive; they were lower than the carbon fluxes in young and mature

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

Hanson, 2010 addresses some of the false notions often misrepresented as best science by agencies, extractive industries and many politicians:

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

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

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

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

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.

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.

Global warming 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 land management represent "irretrievable and irreversible commitments of resources."

Carbon sequestration is the process by which atmospheric carbon dioxide is taken up by trees, grasses, and other plants through photosynthesis and stored as carbon in biomass (trunks, branches, foliage, and roots) and soils. The Battle Creek Alliance et al., 2017 comments on the January 20, 2017 Draft California Forest Carbon Plan contains headings such as "The …assertion that increased thinning/logging will increase carbon storage in forests is unsupported by the best available science."

The DEIS ignores scientific opinion on forest management's negative effects on carbon sequestration. Best available science supports the proposition that forest policies must shift away from logging if a priority is carbon sequestration. Forests should be preserved indefinitely for their carbon storage value.

We incorporate the following March 11, 2019 article from the *Missoulian* ("Fire study shows landscapes such as Bitterroot's Sapphire Range too hot, dry to restore trees") reporting on results of new research (Davis et al., 2019):

> Burned landscapes like this drainage in the Sapphire Mountains hasn't been able to grow new trees since the Valley Complex fire of 2000, due to lack of soil moisture, humidity and seed trees, as well as excess heat during the growing season. University of Montana students Erika Berglund and Lacey Hankin helped gather samples for a study showing tree stands are getting replaced by grass and shrubs after fire across the western United States due to climate change.

Courtesy Kim Davis

Fire-scarred forests like the Sapphire Range of the Bitterroot Valley may become grasslands because the growing seasons have become too hot and dry, according to new research from the University of Montana.

“The drier aspects aren’t coming back, especially on north-facing slopes,” said Kim Davis, a UM landscape ecologist and lead investigator on the study. “It’s not soil sterilization. Other vegetation like grasses are re-sprouting. It’s too warm. There’s not enough moisture for the trees.”

Davis worked with landscape ecologist Solomon Dobrowski, fire paleoecologist Philip Higuera, biologist Anna Sala and geoscientist Marco Maneta at UM along with colleagues at the U.S. Forest Service and University of Colorado-Boulder to produce the study, which was released Monday in the Proceedings of the National Academy of Sciences journal.

“What’s striking is if you asked scientists two decades ago how climate warming would play out, this is what they expected we’d see,” Higuera said. “And now we’re starting to see those predictions on the impact to ecosystems play out.”

The study concentrated on regrowth of Ponderosa pine and Douglas fir seedlings in Montana, Idaho, Colorado, New Mexico, Arizona and northern California. Field workers collected trees from 90 sites, including 40 in the northern Rocky Mountains, scattered within 33 wildfires that had occurred within the past 20 years.

“We did over 4,000 miles of road-tripping across the West, as well as lots of miles hiking and backpacking,” Davis said. The survey crews brought back everything from dead seedlings to 4-inch-diameter tree rings; nearly 3,000 samples in total. Then they analyzed how long each tree had been growing and what conditions had been when it sprouted. Before the 1990s, the test sites had enough soil moisture, humidity and other factors to recruit new seedlings after forest fires, Dobrowski said.

“There used to be enough variability in seasonal conditions that seedlings could make it across these fixed thresholds,” Dobrowski said. “After the mid-‘90s, those windows have been closing more often. We’re worried we’ll lose these low-elevation forests to shrubs or grasslands. That’s what the evidence points to.”

After a fire, all kinds of grasses, shrubs and trees have a blank slate to recover. But trees, especially low-elevation species, need more soil moisture and humidity than their smaller plant cousins. Before the mid-90s, those good growing seasons rolled around every three to five years. The study shows such conditions have evaporated on virtually all sites since 2000.

“The six sites we looked at in the Bitterroots haven’t been above the summer humidity threshold since 1997,” Higuera said. “Soil moisture hasn’t crossed the threshold since 2009.”

The study overturns some common assumptions of post-fire recovery. Many historic analyses of mountain forests show the hillsides used to hold far fewer trees a century ago, and have become overstocked due to the efforts humans put at controlling fire in the woods. Higuera explained that some higher elevation forests are returning to their more sparse historical look due to increased fires.

“But at the lower fringes, those burn areas may transition to non-forest types,” Higuera said, “especially where climate conditions at the end of this century are different than what we had in the early 20th Century.”

The study also found that soil sterilization wasn’t a factor in tree regrowth, even in the most severely burned areas. For example, the 2000 Sula Complex of fires stripped forest cover in the southern end of the Bitterroot Valley. While the lodgepole pine stands near

> Lost Trail Pass have recovered, the lower- elevation Ponderosa pine and Douglas firs haven't.
>
> Another factor driving regeneration is the availability of surviving seed trees that can repopulate a burn zone. If one remains within 100 meters of the burned landscape, the area can at least start the process of reseeding. Unfortunately, the trend toward high-severity fires has reduced the once-common mosaic patterns that left some undamaged groves mixed into the burned areas.
>
> Higuera said he hoped land managers could use small or prescribed fires to make landscapes more resilient, as well as restructure tree-planting efforts to boost the chances of heavily burned places.

The Resources Planning Act of 1974 (RPA) and National Forest Management Act of 1976 (NFMA) mandate long-range planning which impose numerous limitations on timber extraction practices and the amount of timber sold annually. These long range plans are based on assumptions, which are based on data, expert opinion, public participation and other factors which mostly view from a historical perspective. So it's time to peer into the future to examine closely (NEPA: "take a hard look at") those assumptions.

Clearly, the FS is not considering best available science on this topic.

The FS has not reexamined assumptions in the relating to timber suitability, resilience and sustainability as a result of recent fires, past regeneration success/failures, and climate-risk science.

Conventional wisdom dictates that forests regenerate and recover from wildfire. If that's true, then it's logical to conclude that forests can regenerate and recover from logging. And these days, "resilience" is a core tenant of FS planning. Unfortunately, assumptions of the DEIS 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 DEIS does not include a legitimate climate-risk analysis.

Scientific research indicates that increasing CO_2 and other greenhouse gas concentrations may preclude maintaining and attaining the anticipated forest conditions in the analysis area and across the region.

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 cause disturbance to forests that cannot be restored or retrieved—the assumed resilience no longer exists. It is way too late in the game to ignore this elephant in the room.

The FS ignores best available science indicating prescribed fire, thinning and logging are actually cumulative with the dominant forces of increased heat, drought, and wildfire.

NEPA requires analysis of an alternative that reflects our common understanding of climate risk. A considerable amount of data and scientific research repeatedly confirms that we may be looking in the wrong direction (back into history, e.g., "NRV") for answers to better understand our forest future.

The FS fails to analyze an alternative projecting climate science into the future. It fails to adequately consider that the effects of climate risk represent a significant and eminent loss of forest resilience already, and growing risk into the "foreseeable future."

Funk et al., 2014 indicate that at least five common tree species, including aspens and four conifers, are at great risk unless atmospheric greenhouse gases and associated temperatures can be contained at today's levels of concentration in the atmosphere. It is indeed time to speak honestly about unrealistic expectations relating to desired conditions.

And according to scientific literature it seems highly unlikely that greenhouse gas concentrations and the heat they trap in the atmosphere will be held at current levels.

The FS fails to analyze and disclose conditions we can realistically expect as heat trapped by increasing greenhouse gas concentrations steadily tightens its grip—and impacts on forests accrue locally, regionally, nationally, and globally.

The DEIS fails to assess and disclose all risks associated with vegetative-manipulation as proposed.

NEPA requires disclosure of impact on "the human environment." Climate risk presents overarching adverse impacts on cultural, economic, environmental, and social aspects of the human environment—people, jobs, and the economy—adjacent to and near the Forests. Challenges in predicting responses of individual tree species to climate are a result of species competing under a never-before-seen climate regime that we have not seen before—one forests may not have experienced before either.

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. 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 36 CFR 219.27(c)(3) implements the NFMA statute, and requires restocking in five years.

The DEIS doesn't address the question of if lands are actually suitable for the type of management ongoing or proposed. This has become an open question, due to ongoing and expected climate change impacts.

It's time to analyze and disclose the fact that the FS can no longer "insure that timber will be harvested from the National Forest system lands only where…there is assurance that such lands can be restocked within five years of harvest." [NFMA §6(g)(3)(E)(ii)].

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 DEIS does not disclose restocking monitoring data and analysis.

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.)

The Forest Plans and Rim Country DEIS are based on assumptions largely drawn from the past. These assumptions must be rejected where overwhelming evidence demonstrates a change of course is critical. It is time to take a step back, assess the future and make the necessary adjustments, all in full public disclosure to the Congress and the public. The FS must finally accept scientific research and opinion that recognizes the critical challenge posed by climate change to global ecosystems and these national forests.

The DEIS fails to analyze how proposed management actions would be affected by likely climate change scenarios. The FS doesn't quantify all human-caused CO_2 emissions for all management activities. The FS doesn't quantify carbon sequestration for each alternative. The FS doesn't disclose how climate change has affected ecological conditions in the analysis area, and include an analysis of these conditions under climate change scenarios.

Some politicians, bureaucrats, and industry profiteers pretend there's nothing to do about climate change because it isn't real. The FS acknowledges it's real, provides an extremely limited focus on its symptoms and—like those politicians and profiteers—ignores and distracts from the causes of climate change they enable.

Global climate change is a massive, unprecedented threat to humanity and forests. Climate change is caused by excess CO_2 and other greenhouse gases transferred to the atmosphere from other pools. All temperate and tropical forests, including those in this analysis area, are an important part of the global carbon cycle. There is significant new information reinforcing the need to conserve all existing large stores of carbon in forests, in order to keep carbon out of the atmosphere and mitigate climate change. The agency must do its part by managing forests to maintain and increase carbon storage. Logging would add to cumulative total carbon emissions so is clearly part of the problem, so it must be minimized and mitigated. Logging would not only transfer carbon from storage to the atmosphere but future regrowth is unlikely to ever make up for the effects of logging, because carbon storage in logged forests lags far behind carbon storage in unlogged forests for decades or centuries. And before recovery, the agency plans even more activities causing greenhouse gas emissions.

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

Respected experts say that the atmosphere might be able to safely hold 350 ppm of CO_2.[16] 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.[17] How? By allowing forest to grow. Logging moves us away from our objective while conservation moves us toward our objective.

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

Pecl, et al. 2017 conclude:

> The breadth and complexity of the issues associated with the global redistribution of species driven by changing climate are creating profound challenges, with species movements already affecting societies and regional economies from the tropics to polar regions. Despite mounting evidence for these impacts, current global goals, policies, and international

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

[17] "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)

> agreements do not sufficiently consider species range shifts in their formulation or targets. Enhanced awareness, supported by appropriate governance, will provide the best chance of minimizing negative consequences while maximizing opportunities arising from species movements—movements that, with or without effective emission reduction, will continue for the foreseeable future, owing to the inertia in the climate system.

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

> Global climate change is caused by excess CO_2 and other greenhouse gases transferred to the atmosphere from other pools. Human activities, including combustion of fossil fuels and bioenergy, forest loss and degradation, other land use changes, and industrial processes, have contributed to increasing atmospheric CO_2, the largest contributor to global warming, which will cause temperatures to rise and stay high into the next millennium or longer.
>
> The most recent measurements show the level of atmospheric carbon dioxide has reached 400 parts per million and will likely to remain at that level for millennia to come. Even if all fossil fuel emissions were to cease and all other heat-trapping gases were no longer emitted to the atmosphere, temperatures close to those achieved at the emissions peak would persist for the next millennium or longer.
>
> Meeting the goals of the Paris Agreement now requires the implementation of strategies that result in negative emissions, i.e., extraction of carbon dioxide from the atmosphere. In other words, we need to annually remove more carbon dioxide from the atmosphere than we are emitting and store it long-term. Forests and soils are the only proven techniques that can pull vast amounts of carbon dioxide out of the atmosphere and store it at the scale necessary to meet the Paris goal. Failure to reduce biospheric emissions and to restore Earth's natural climate stabilization systems will doom any attempt to meet the Paris (COP21) global temperature stabilization goals.
>
> The most recent U.S. report of greenhouse gas emissions states that our forests currently "offset" 11 to 13 percent of total U.S. annual emissions. That figure is half that of the global average of 25% and only a fraction of what is needed to avoid climate catastrophe. And while the U.S. government and industry continue to argue that we need to increase markets for wood, paper, and biofuel as climate solutions, the rate, scale, and methods of logging in the United States are having significant, negative climate impacts, which are largely being ignored in climate policies at the international, national, state, and local levels.
>
> The actual carbon stored long-term in harvested wood products represents less than 10 percent of that originally stored in the standing trees and other forest biomass. If the trees had been left to grow, the amount of carbon stored would have been even greater than it was 100 years prior. Therefore, from a climate perspective, the atmosphere would be better off if the forest had not been harvested at all. In addition, when wood losses and fossil fuels

for processing and transportation are accounted for, carbon emissions can actually exceed carbon stored in wood products.

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

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

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

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

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

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 can best address climate change through minimizing development of forest stands, especially stands that have not been previously logged, by allowing natural processes to function.

Furthermore, any supposedly carbon sequestration from logging are usually more than offset by carbon release from ground disturbing activities and from the burning of fossil fuels to accomplish the timber sale, even when couched in the language of restoration. Reducing fossil fuel use is vital. Everything from travel planning to monitoring would have an impact in that realm.

SOILS

Lacy, 2001 asserts: "Because soils are essential building blocks at the core of nearly every ecosystem on earth, and because soils are critical to the health of so many other natural resources—including, at the broadest level, water, air, and vegetation—they should be protected at a level at least as significant as other natural resources. Federal soil law (such as it is) is woefully inadequate as it currently stands. It is a missing link in the effort to protect the natural world at a meaningful and effective ecosystem level." Lacy, 2001 concludes "the lack of a public lands soil law leaves the soil resource under-protected and exposed to significant harm, and emasculates the environmental protections afforded to other natural resources." The problems Lacy identifies are evident in the CFLRPlan, resulting in inadequate assurances of long-term soil productivity in the DEIS.

The National Forest Management Act requires that soil conditions will not be irreversibly damaged. Vegetative conditions are directly related to soil productivity, which has been highly altered on these national forest lands by past management activities. Is there some research or monitoring on the Forests which has quantified the overall reductions of soil productivity due to past management activities?

The Soils analysis relies in part on the "Terrestrial Ecosystem Survey (TES) map unit stratification and soil interpretations." It doesn't seem like TES-based analyses take into account past impacts on soil productivity due to management actions.

The Soil and Watershed Report explains TES:

> The TES defines erosion hazard (USDA 1984) as the probability of soil loss resulting from the complete removal of vegetation and litter. Three classes are used. A slight rating indicates that all vegetative ground cover could be removed from the site and the resulting soil loss will not exceed "tolerance" soil loss rates. A moderate rate indicates that predicted rates of soil loss will result in a reduction of site productivity if left unchecked. Conditions in moderate erosion hazard sites are such that reasonable and economically feasible mitigation measures can be applied to reduce or eliminate soil loss. A severe rating indicates that predicted rates of soil loss have a high probability of reducing site productivity before mitigating measures can be applied.

Has the FS validated these TES erosion hazard ratings based upon monitoring or measuring on the ground? Has the FS compared WEPP or other modeling results to the ratings (i.e., in recent wildland fire areas, or areas disturbed by management)? This also raises the issue of definitions of terms, and their measurability. What is the threshold for exceeding "tolerance" soil loss rates leading to classification as moderate instead of slight? How does the FS measure soil loss rates?

What is the definition of "soil loss"? What is the definition of "site productivity" and how does the FS measure it?

The Soil and Watershed Report states, "The models show that, in general, soil productivity is maintained as long as no uncharacteristic, high severity wildfire or other extreme disturbances occur." Has the FS performed validation studies comparing measures of soil productivity with model predictions?

"Where uncharacteristic, or high severity wildfires have occurred, eleven of the TES strata (strata numbers 2, 4, 7, 9, 12, 14, 16, 17, 19, 20, and 29), or 36 percent tend to exhibit erosion and sediment delivery rates above soil loss tolerance thresholds." (*Id*.) The Report isn't citing specific surveys, so is this just a modeling prediction? If there is field data, please present details on the locations of the surveys the sample size, the amount of erosion in tons, and the reliability of the data.

"Personal observations indicate where PJ Woodland canopy cover exceeds 40 percent, there is little to no herbaceous understory (regardless of grazing intensity) and soil condition is impaired due to erosion rates that exceed the rates of soil formation." (*Id*.) So, what is the root cause of this excessive erosion? Would this be happening without grazing impacts from exotic ungulates?

Please display a map showing the locations of each TES Stratum plus the treatment unit boundaries.

The Soil and Watershed Report states "Soils and watershed issues include:

- Percent of soil exposure across treatment areas
- Percent of soil disturbance across the treatment areas
- Severity of soil disturbance across treatment areas
- Construction of new roads could increase surface runoff, erosion, and sediment delivery to ephemeral drainages.
- The amount of sediment that reaches ephemeral streams or drainages (displayed as embeddedness) could increase."

Why doesn't the DEIS present estimates or measures of the above analysis indicators?

The Soil and Watershed Report states: "Approximately 15 percent (142,969 acres) are estimated to exhibit varying degrees of soil compaction. …It is assumed that between harvest and fuel reduction treatment activities, every acre in each proposed treatment unit would be affected. Therefore, the total project acreage is assumed to be at risk for some level of soil disturbance." Has the FS estimated total reductions in tree growth, other vegetation growth, and site productivity due to this large areal extent of soil damage?

"The greatest risk of increased areas of hydrophobic soils would be where prescribed burning is conducted prior to forest thinning." (*Id*.) What is the predicted areal extent of hydrophobic soils in the analysis area?

"Livestock grazing is not expected to increase the area of soils characterized as unsatisfactory within the project area." (*Id.*) What is the areal extent of these soils "characterized as unsatisfactory" in the analysis area, for each management activity cause?

"Erosion potential is expected to increase on 10 to 15 percent of areas treated mechanically due to removal or displacement of ground cover. This erosion would be short term (1 to 5 years), localized, and mitigated with implementation of Resource Protection Measures and BMPs." (*Id.*) Why doesn't the DEIS present estimates of tons of soil eroded into water bodies?

"Skid trails and log landings would likely exhibit soil compaction which can be mitigated through implementation of Resource Protection Measures and BMPs." (*Id.*) How long does it take for these mitigations to return the soil to natural, non-compacted conditions with full site productivity? How long would it take without the mitigations?

"Soil organism populations are expected to decline for short periods (1 to 3 years) in areas of soil disturbance, compaction and where fire is introduced. Soil organism populations are expected to recover rapidly under this alternative as greater sunlight would reach the forest floor, increasing soil biological activity." (*Id.*) Has the FS measured soil organism populations and trends on these Forests, especially in relation to management impacts?

"Soil Interpretations are based on models used to predict soil behavior for specified soil uses and under specified soil management practices." (*Id.*) Has the FS validated these models? What are their limitations?

"For soil resources, the units of measure of effects to soil resources will be the acres and severity of ground disturbance from equipment use and acres subjected to high soil burn severity." Which "past studies and relevant literature" (which the DEIS says support it soil analyses) demonstrate a correlation between measures of soil productivity and "acres and severity of ground disturbance from equipment use"? Which studies and literature demonstrate a correlation between measures of soil productivity and "acres subjected to high soil burn severity"?

That sentence of the DEIS seems to indicate that the only units used to measure current soil conditions and management impacts are acres of ground disturbance and acres of severe burns. But the DEIS doesn't define any threshold of ground disturbance or burn severity so that something about soils can be measured. It really is that vague. Perhaps this is why for existing conditions, no numbers are presented as estimates of soil disturbance or burns—not overall in the analysis area, and not site-specifically.

Then, the DEIS also indicates that erosion has been modeled using FSWEPP "with site specific data …to determine upland erosion and sedimentation into stream channels." Yet the DEIS presents no site specific analysis disclosing erosion problems currently found in the analysis area, and fails to present any estimates of any measure of erosion or sedimentation into stream channels.

The Fire Ecology Report states, "…surface layers of soil are essential to natural vegetative communities and, when removed from the site (by erosion), can take hundreds or thousands of

years to recover, effectively changing the site potential." How many acres of the analysis area has experienced site potential alteration, because erosion of soils there will take hundreds or thousands of years to recover?

Regarding predicted direct impacts of action alternatives, the DEIS is also lacking in numbers of acres to be disturbed by machines or from burning. It also fails to present FSWEPP model numbers representing erosion or sediment. As with the water quality analysis, the soils analysis contains a lot of general cause and effect statements without site specificity. The best it does is the following statement:

> The greater number of acres that would be treated mechanically also means there would be a corresponding increase in short term adverse effects to soils, water quality and watershed condition. With the higher number of acres to be treated mechanically, adverse effects such as soil compaction, puddling, displacement, erosion, loss of soil organic matter, short-term changes in soil moisture content or retention, changes in nutrient cycles, changes in soil fauna, and risk of introduction of invasive and noxious weeds are likely.

Again, these are cause-and-effect statements as can be found in a textbook. However, textbook recitations are not enough to satisfy NEPA. The next DEIS sentence is, "The extent and locations of such effects cannot be predicted with accuracy, although some generalizations can be made." Following that, only the miles of temporary roads are quantified.

"Potential effects of the Action Alternatives on soil productivity would include localized soil compaction, puddling, displacement, erosion, loss of soil organic matter, short-term changes in soil moisture content or retention, changes in nutrient cycles, changes in soil fauna, and introduction of invasive and noxious weeds." If the FS were to do it, how would "soil compaction, puddling, displacement erosion, loss of soil organic matter, short-term changes in soil moisture content or retention, changes in nutrient cycles, changes in soil fauna, and introduction of invasive and noxious weeds" be measured?

"In general, proposed restoration treatments are expected to result in improvement in overall soils and watershed condition in proportion to the areal extent of the restoration treatments within each watershed." How would this improvement be measured, in terms of soil or site productivity and/or its correlates? And please explain how that "improvement" claim consistent with the following DEIS statements suggesting just the opposite:

> The amount of disturbance as a percentage of a typical harvest unit (such as, area included in a thinning contract) affected by compaction, rutting, and/or exposure of bare mineral soil from this type of harvesting has been estimated to be roughly 15 percent associated with feller-buncher and skidding operations, three percent associated with machine piling of slash, three percent associated with landings, and three percent associated with temporary roads (MacDonald 2013). … 5,223 acres (21 percent) could be affected by compaction, rutting, and/or exposure of bare mineral soil from mechanical thinning operations.

Also, regarding the above DEIS statements, how much total reduction in forest and site productivity would that soil disturbance cause?

How many acres of soils which "constitute an irretrievable commitment of soils and vegetation resources" would exist for Alternatives 1, 2, and 3? (Roads, rock pits, processing facilities, landings, etc.)

"(T)emporary roads are not an irreversible commitment of these resources, since soils eventually return to productive status after the road has been decommissioned and vegetation, including trees, typically returns to the road corridor." Does this mean the FS will likely never need these sites for temporary roads in the future? If the FS does anticipate future use of some decommissioned roads, please disclose the estimated road miles.

What is the basis for analyzing cumulative effects on only 137,153 acres for soils (p. 132)?

What is the empirical basis for the statement, "Surface disturbing activities that are older than 20 years are assumed to be contributing negligible or no measurable cumulative effect within the analysis area"?

What are the scientific and regulatory bases for SW041: "Heavy ground disturbance activity areas (landings, major skid trails, unsurfaced haul roads, etc.) and excessive ground disturbance in any location (i.e., exceeding the rutting guidelines) should aim to **not exceed 15 percent - areal extent of a treatment unit within a timber sale area**" and SW051 "Allow up 6 inches of rutting over no more than 15 percent areal extent along a skid trail (two or more drags being considered a skid trail)…"? (Emphases added.)

Alternative 3 – Focused Restoration
"Cumulative effects … Add a one or two sentences that clarify the substantially reduced areal extent blurb." We add the following:

> Alternative 3 would add untold thousands of acres more "localized soil compaction, puddling, displacement, erosion, loss of soil organic matter, short-term changes in soil moisture content or retention, changes in nutrient cycles, changes in soil fauna, and introduction of invasive and noxious weeds" above and beyond the unquantified but substantial amounts of those damages past management has already inflicted upon the analysis area, but at least it wouldn't add as much as Alternative 2.

USDA Forest Service, 2016a states:

> **Without maintaining land productivity, neither multiple use nor sustained (yield) can be supported by our National Forests**. Direct references to maintaining productivity are made in the Sustained Yield Act "…coordinated management of resources without impairment of the productivity of the land" and in the Forest and Rangeland Renewable Resources Act "…substantial and permanent impairment of productivity must be avoided".
>
> Soil quality is a more recent addition to Forest Service Standards. The Forest and Rangeland Renewable Resources Act (1974) appears to be the first legal reference made to protecting the "quality of the soil" in Forest Service directives. **Although the fundamental laws that directly govern policies of the U.S. Forest Service clearly indicate that land productivity must be preserved, increasingly references to land or soil productivity in Forest Service directives were being replaced by references to soil quality as though**

> **soil quality was a surrogate for maintaining land productivity. This was unfortunate, since although the two concepts are certainly related, they are not synonymous.**
>
> Our understanding of the relationship between soil productivity and soil quality has continued to evolve since 1974. Amendments to the Forest Service Manual, Chapter 2550 – Soil Management in 2009 and again to 2010 have helped provide some degree of clarity on this issue and acknowledged that **the relationship is not as simple as originally thought**. The 2009 (2500-2009-1) amendment to Chapter 2550 of the Forest Service Manual states in section 2550.43-5, directs the Washington Office Director of Watershed, Fish, Wildlife, Air and Rare plants to "Coordinate validation studies of soil quality criteria and indicators with Forest Service Research and Development staff to ensure soil quality measurements are appropriate to protect soil productivity" (USFS-FSM 2009). **Inadvertently this directive concedes that the relationship between soil productivity and soil quality is not completely understood.** In the end, the primary objective provided by National Laws and Directives relative to the management of Forest Service Lands continues to be to maintain and where possible potentially improve soil productivity. (Emphases added.)

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

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

Soil compaction cannot be determined by mere visual observations. Kuennen, et al., 1979 discovered that although "the most significant increase in compaction occurred at a depth of 4 inches… some sites showed that maximum compaction occurred at a depth of 8 inches…

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

NEPA requires the FS to specify the effectiveness of its mitigations. (40 C.F.R. 1502.16.) The DEIS fails to specify the effectiveness of its soil and water mitigations.

Subwatersheds which have high levels of existing soil damage could indicate a potential for hydrologic and silviculture concerns. (USDA Forest Service, 2005b, p. 3.5-11, 12.) USDA

Forest Service, 2007c also discloses that soil conditions affect the overall hydrology of a watershed:

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

USDA Forest Service, 2009c states:

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

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

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

USDA Forest Service 2014a states:

> Management activities can result in both direct and indirect effects on soil resources. Direct and indirect effects may include alterations to **physical, chemical, and/or biological properties.** Physical properties of concern include structure, density, porosity, infiltration, permeability, water holding capacity, depth to water table, surface horizon thickness, and organic matter size, quantity, and distribution. Chemical properties include

> changes in nutrient cycling and availability. Biological concerns commonly include abundance, distribution, and productivity of the many plants, animals, microorganisms that live in and on the soil and organic detritus.

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.)

Castello et al. (1995) state:

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

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

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

"The big trees were subsidizing the young ones through the fungal networks. Without this helping hand, most of the seedlings wouldn't make it." (Suzanne Simard: http://www.ecology.com/2012/10/08/trees-communicate)

Simard et al., 2013 state: "Disrupting network links by reducing diversity of mycorrhizal fungi… can reduce tree seedling survivorship or growth (Simard et al, 1997a; Teste et al., 2009), ultimately affecting recruitment of old-growth trees that provide habitat for cavity nesting birds and mammals and thus dispersed seed for future generations of trees."

Also see the YouTube video "Mother Tree" embedded within the Suzanne Simard "Trees Communicate" webpage at: https://www.youtube.com/watch?v=-8SORM4dYG8&feature=youtu.be) and also this one on the "Wood Wide Web" on Facebook: https://www.facebook.com/BBCRadio4/videos/2037295016289614/.

Gorzelak et al., 2015:

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

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

The scientists involved in research on ectomycorrhizal networks have discovered connectedness, communication, and cooperation between what we traditionally consider to be separate organisms. Such a phenomenon is usually studied within single organisms, such as the interconnections in humans among neurons, sense organs, glands, muscles, other organs, etc. so necessary for individual survival. The DEIS states, "treatments would also expose more of the forest floor to direct sunlight which could remove the microsite habitat for mycorrhizal fungi production" but the significance on the ectomycorrhizal networks is not analyzed or disclosed.

Fires and soil productivity

"The primary effect of high severity wildfire on soil productivity is the … loss of protective cover and nutrient stores, exposure of soil surfaces to erosion by wind and water, and exposure of soils to solar radiation, which increases soil temperatures and reduces soil moisture." The DEIS cites no studies or monitoring of these very effects from recent fires in the analysis area, which by the FS's logic must have been "catastrophic."

"In areas of high stand densities …soils in these areas have reduced moisture storage and infiltration capacity." How have these changes in moisture storage and infiltration been measured in such stands? This is an extremely important question, because the analysis assumes that 953,130 acres (at least) need improvement (p. 122).

And of the 21,280 acres of riparian areas, wet meadows, and stream channels needing improvement (p. 122), what units of measure have been used to determine they are not meeting desired conditions?

Livestock grazing

"(L)ivestock grazing is not expected to increase the area of soils characterized as unsatisfactory within the cumulative effects area." How many acres in the analysis area may currently be characterized as unsatisfactory due only to livestock grazing? With the increased amount and accessibility of forage due to the logging and burning, how much will this acreage increase with action alternatives?

The DEIS also fails to quantify the cumulative damage to biotic soil crusts, as we discuss in the section on livestock grazing.

Noxious weeds

Further compromising soil productivity in the analysis area is the failure to adequately address the spread of noxious weeds, which have the potential effect of reducing site productivity by replacing natural vegetation and competing with same for soil nutrients, moisture, etc. The impacts of invasive plants and/or noxious weeds represent potential cumulative impact on the productivity of a site that is not accounted for by the programmatic direction. From an ecological standpoint this is absurd, since soil disturbance often provides the opportunity invasive plant species take advantage of to first become established on a site, with the effect of displacing native plant species important to ecological functioning. These unwelcome plants divert the productive potential of the soil at a given site to the production of vegetative biomass that native wildlife may not be able to utilize.

USDA Forest Service, 2016a states, "Soil erosion or weed infestations are adverse indirect effects that can occur as a result any the above direct impacts. In both instances, serious land degradation can occur." The forest plans do not set any limitations on the total area that is infested by invasive plants in an analysis area at any given time, nor do they require disclosure of the extent of such weed invasions in an analysis area and the impacts such losses may have cumulatively on the FS'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**. (Emphases added.)

The FS has no estimate of how the productivity of the land been affected in the Rim Country area and forestwide due to noxious weed infestations, nor how that situation is expected to change.

USDA Forest Service, 2005c states:

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

The very concept of "sustained yield" is based on the ability of the land to sustain tree growth in perpetuity. Since the FS has not quantified impairment of the soil from weeds, any assumption of "sustained yield" is unfounded and management is inconsistent with NFMA requirements that

National Forest System lands will be managed under the principles of multiple use and sustained yield without permanent impairment of land productivity.

RARE PLANTS

The DEIS does not indicate how surveys of rare plants would be conducted. It has no analysis of population trends. And analysis of the cumulative effects of past management actions is missing.

Design features includes:

> **When planning for implementation,** identify species of concern (such as Southwestern Region sensitive plants), and determine potential habitat based on past occurrences and the known ranges of the species. If there are no documented surveys, the appropriate specialist (e.g., forest botanist, wildlife biologist) should be consulted to determine the need for, and extent of, new surveys. If the appropriate specialist is unavailable, the area to be treated should be surveyed prior to implementation and implementation plans should be adjusted if/as needed, based on survey results. Surveys should focus on areas most likely to contain plants or potential habitat for the targeted species, based on conditions such as soil or vegetation type, rather than covering the entire area. Habitat modeling, or the use of habitat descriptions of species from past documentation, etc. will be used to help define survey areas. Narrow endemics should receive more attention than more widespread species because the loss of individuals would have greater impact on the overall population of the species than in more widely distributed species. (Emphasis added.)

What is the landscape unit to which this "when planning for implementation" design feature applies? This design feature doesn't specifically identify the "when" or the where.

NOXIOUS AND INVASIVE WEEDS

Noxious weeds are the proverbial Pandora's Box loosed upon the ecosystem. For most weed species, there's no evidence that herbicides and other treatments reverses their spread for long. The financial costs of noxious weeds are another elephant in the room. The DEIS does not have an estimate of the economic impacts of increased weed treatments due to the proposed management actions, nor of the loss of ecosystem services attributed to noxious weeds being increased by management activities.

"Each of the three forests has separate noxious or invasive weed treatment analyses." The DEIS lacks analysis of the cumulative effects of those programs. Monitoring? Effectiveness? Annual costs? Additional costs from the action alternatives?

The impacts of noxious weeds are exacerbated by every action that disturbs soil or otherwise upsets the balance of native vegetation. Weeds, spread from management activities such as logging burning, livestock grazing, and use of mechanized equipment, are a chronic symptom of infection by resource extraction. Controlling noxious weeds and preventing their spread is a huge issue that the FS does not have a grip on. If current methods are working, the DEIS doesn't say.

Weeds spread on forest roads, in "treatment" units, landings, burn piles, and onto private property. The best way to minimize weed spreading is to not disturb the soil and native vegetation.

The action alternatives would increase the risk of weed introduction, spread, establishment, and persistence due to more soil disturbance, as well as travel through infestations, proximity to known infestations and increasing available direct sunlight in the road corridors.

The DEIS has no estimates of noxious weed infestations in the analysis area. There appears to be no on-the-ground survey data. The FS apparently does not know the landscape trend in noxious weed infestation, in acres or any meaningful metric.

There is no cumulative effects analysis of how the spread of noxious weeds impacts land and soil productivity.

The DEIS does not analyze and disclose adverse ecological impacts of herbicide treatments on native species.

What is the empirical basis for "Most prescribed burning would be of low severity with low soil heating, retention on most ground litter and little or no change in mineral soil"?

The DEIS provides no discussion on how particular weed species are spread. It doesn't have any discussion of the prospects for weed species to come under any natural controls, or if under "No Action" the weed species could be expected to increase to epidemic proportions.

Under No Action, "Weed infestations that would have been detected and treated would go unnoticed and continue to expand unless detected by other surveys or independent observations." Does this mean the Forests' weed programs have no value in the absence of this CFLRPlan? And, "The guidance of past analyses that would allow treatment of noxious or invasive weeds on the forests …would not apply." Is that really what those three weed program NEPA documents say?

"(S)urveys may not be needed in areas scheduled for prescribed burning if the treatments are scheduled to be of low intensity." This doesn't make sense, because every vegetation treatment disturbs the soil and thus increases the chances of weed spread. It also conflicts with design feature NW001, needed for "forest plan compliance."

The DEIS says vegetation treatments can "provide favorable conditions for noxious or invasive weeds and could increase the size and density of existing populations, especially in areas where weed infestations already exist." Then it says, "These effects are reduced to a non-significant level by incorporating the mitigation measures and design features and by incorporating survey and treatment in the project." If there exists any empirical basis for that statement, please cite it so we understand what is meant by "non-significant."

"There are numerous grazing allotments in the project boundary. The past effects of grazing and the associated activities are not completely known but may include temporary reduction of the

native plant community in certain areas (especially near water sources) which would allow for plants such as the noxious or invasive weeds to enter the plant community through feed or manure." That's the sum total of the analysis of cumulative effects of livestock grazing and weeds. There has been a lot of research on the subject, and the DEIS greatly downplays these cumulative effects.

The interactions between the invasive grass cheatgrass and fire regimes is a positive feedback system which has led to very extensive infestation in the western US. Wildfire and this flammable grass feed off each other. The plant grows well in areas that have been disturbed, so fire generally results in more cheatgrass, which results in more fire, which again results in more cheatgrass. Livestock grazing corresponds with increased cheatgrass occurrence and prevalence regardless of variation in climate, topography, or community composition (Williamson et al., 2019). Cheatgrass is a non-issue in the DEIS until the following is finally disclosed in the Monitoring Plan:

> Cheatgrass invasion of ponderosa pine systems after restoration-based treatments is a burgeoning issue of significant concern (Keeley and McGinnis 2007, McGlone et al. 2009a and b). **Widespread invasion of cheatgrass often shifts invaded ecosystems into irreversible alternate stable states where cheatgrass-mediated fire intervals exclude native understory plants** (Brandt and Rickard 1994, D'Antonio and Vitousek 1992, Brooks et al. 2004). (Emphasis added.)

Also, "Preventative actions pre-treatment will be just as critical as adaptive management responses post-treatment, and will require identification of areas at risk for cheatgrass invasion prior to project implementation, such as areas where cheatgrass is already present or ecotonal areas adjacent to existing cheatgrass populations." This is not a part of the Design Features, which is where it belongs.

The DEIS says firewood cutters are the only sanctioned general public activity allowed off motorized routes. How many acres of potential soil disturbance, and how many acres of potential weed spread does that represent?

WILD AND SCENIC RIVERS

The DEIS lists eligible wild and scenic river segments occurring in the analysis area. It discloses that nearly 33,000 total acres of these river corridors could be treated with vegetation management. It fails to present an analysis which demonstrates these actions would with maintain the outstandingly remarkable values which make them eligible. In fact the DEIS analysis for scenic integrity, which would be changes to outstandingly remarkable values, is strongly biased toward conclusions of minimum impacts. We don't think people out for recreations who encounter an industrialized landscape would agree.

ROADLESS AND WILDERNESS

The DEIS doesn't contain the word "roadless" but the Recreation Report states, "Temporary roads will not be constructed within inventoried roadless areas (IRAs)."

The Recreation Report indicates the Mazatzal Wilderness and Hellsgate Wilderness are in Rim Country. The DEIS doesn't include an analysis of CFLRPlan impacts on visitor experience within these wildernesses.

A Desired Condition is "DC: Inventoried roadless areas (IRAs) maintain their overall roadless character." The DEIS has no analysis demonstrating consistency with this DC.

The DEIS also doesn't consider impacts on uninventoried roadless areas. There must be public procedures to evaluate unroaded areas contiguous with IRAs and existing Wilderness.

The FS is required to discuss management impacts on areas of "sufficient size" for future wilderness designation. *Lands Council*, 529 F.3d at 1231, citing 16 U.S.C. § 1131(c).

The Kootenai National Forest's Lower Yaak, O'Brien, Sheep Draft Environmental Impact Statement explains the concept of Roadless Expanse, citing 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 that "projects on lands contiguous to roadless areas must analyze the environmental consequences, including irreversible and irretrievable commitment of resources on roadless area attributes, and the effects for potential designation as wilderness under the Wilderness Act of 1964. **This analysis must consider the effects to the entire roadless expanse; that is both the roadless area and the unroaded lands contiguous to the roadless area.**

(Emphasis added.) The FS must analyze and disclose impacts on the Roadless Characteristics and Wilderness Attributes of any Rim Country analysis area roadless expanse. The public must be able to understand if management activities would cause irreversible and irretrievable impacts on the suitability of any portion of roadless expanse for future consideration for Recommended Wilderness or for Wilderness designation.

The FS must acknowledge the best scientific information that recognizes the high ecological integrity and functioning of roadless and unmanaged areas. Management activities have damaged the streams and other natural features found in the Rim Country watersheds. The FS has yet to demonstrate it can conduct large scale resource extraction sustainably in roaded areas.

Unroaded areas greater than about 1,000 acres, whether they have been inventoried or not, provide valuable natural resource attributes that are better left protected from logging and other management activities. Scientific research on roadless area size and relative importance is ongoing. Such research acknowledges variables based upon localized ecosystem types, naturally occurring geographical and watershed boundaries, and the overall conditions within surrounding ecosystems. In areas where considerable past logging and management alterations have occurred, protecting relatively ecologically intact roadless areas even as small as 500 - 1,000 acres has been shown to be of significant ecological importance. These valuable and increasingly rare roadless area attributes include: water quality; healthy soils; fish and wildlife refugia; centers for

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

ECONOMICS

The DEIS claims the economics of restoring the Rim Country landscape are such that the sale of logs and biomass is necessary, implying restoration can't happen otherwise. The DEIS simply doesn't present enough financial analysis of the alternatives to support that premise.

The DEIS promotes "the cumulative effects from both Alternative 2 and Alternative 3 would be to improve the financial viability of locating forest product industries - including logging firms, sawmills, and biomass facilities – in the project area." The DEIS fails to disclose a huge indirect effect of having all these industries with its newly expanded infrastructure, which is to create an expectation that the FS would continue to maintain such opportunities indefinitely, after the CFLRPlan is completed. Elsewhere the DEIS states the CFLRPlan would not be a boom followed by a bust. An analysis performed in the vacuum of foreseeable political forces and private interests lobbying for more resource extraction from national forest lands is misleading.

Some of the "Indicators/Measures for the Analysis" used for the DEIS are "Unit and overall project net treatment costs", "Mill delivered value of wood products from restoration activities" and "Economic efficiency (project benefits/value less project costs)." Yet if anything, the economics analysis in the DEIS omits analysis of those Indicators.

Please disclose an itemized cost estimate for each of the following activities with Alternatives 2 and 3, plus for other foreseeable actions of these alternative which we've left off this list:

- Per acre cost of each type of mechanical treatment
- Per acre cost of prescribed fire application
- Construction and decommissioning of temporary roads
- Decommissioning of existing system roads
- Decommissioning of unauthorized routes
- Opening and re-closing roads used for alternative activities
- Road relocation
- Project-related road maintenance
- NEPA and associated pre-decisional costs such as environmental analyses and reports, responding to comments, etc.
- Responding to Objections
- Surveys for weeds
- Weed treatment
- Prescribed fire application
- Post-project monitoring
- Public meetings and field trips, publicity,
- Consultation with other government agencies,

- Collaborative meetings and other Stakeholder Group activities which incur costs from FS participation
- Aspen exclosure
- Other fences
- Spring Restoration
- Ensuring easements
- Surveying and marking boundary lines
- Permitting
- Implementing each of the design features, best management practices, mitigation, and conservation measures listed in Table 106, if not included in this list above.

The DEIS states, "Arizona Game and Fish Department (AZGD) …specialists attended interdisciplinary team meetings, held workshops to gather aquatics and terrestrial wildlife data, and provided existing condition and location information (tabular and spatial) for priority species." The EIS should disclose the amount of financial resources the state of Arizona has invested, and likewise disclose its monetary interests in the CFLRPlan outcome.

The DEIS omits an analysis of costs that would be picked up by the counties and other governments, due to increased road maintenance and improvement costs.

A troubling feature of the CFLRPlan is the proposal to construct "In-woods Processing and Storage Sites (Processing Sites)." The premise is, there are not enough lumber mills in the area to process all the logs in a timely manner. However, the DEIS fails to present enough economic analysis to support this aspect of the CFLRPlan.

The DEIS says "Processing sites serve many purposes":

> Tasks accomplished at processing sites would include drying, debarking, chipping stems and bark, cutting logs, manufacturing and sorting logs to size, scaling and weighing logs, and creating poles from suitable sized logs. Equipment commonly used at processing sites would include circular or band saws, various sizes and types of front-end loaders, log loaders, and several types of chippers. Equipment may include timber processors, planers and mechanized cut to length systems, associated conveyers, and log sorting bunks for accumulation and storage of logs. Electric motors and gas or diesel generators would also be used to provide power.

The DEIS presents no numbers for the costs of those actions and infrastructure, so we are wondering how the FS accounts for them in its analyses.

The construction of processing sites represents a significant taxpayer subsidy to support private industry. This includes the costs relating to siting, environmental analysis, possibly even construction and processing costs themselves. Since these facilities are said to be only temporary in nature, other costs to be incurred include those related to "site rehabilitation …including but not limited to removal of aggregate, restoration of pre-disturbance site grades, de-compaction of soil for seedbed preparation, tree planting, and seeding and mulching of the site with native grasses and forbs."

The DEIS fails to present enough economic analysis to demonstrate this huge subsidy would be, on balance, a good investment of taxpayer dollars.[18]

Furthermore, we are concerned these processing sites would become essentially permanent, not just "for 20 years, or until implementation is completed." This concern is founded on the fact that the CFLRPlan does not explain how the restored vegetation would be maintained over the long term, given that the FS is not proposing to remove by far the biggest contributors to long-term vegetative imbalances described in the DEIS—those contributors being fire suppression, livestock grazing, and logging.

Please disclose the financial interests relating to outcomes of the 4FRI Rim Country proposal for each of the entities making up the Stakeholder Group.

The DEIS does not disclose estimated costs of actions that don't themselves generate funds, which would therefore require appropriated taxpayer dollars to carry out. Without itemized costs, the feasibility of these actions is in doubt. The following list is only partial:

- Decommission up to 200 miles of existing system roads on the Coconino and Apache-Sitgreaves National Forests, and up to 290 miles on the Tonto National Forest.
- Decommission up to 800 miles of unauthorized roads on the Apache-Sitgreaves, Coconino, and Tonto National Forests.
- Construct or improve approximately 330 miles of temporary roads (new and/or occurring on existing unauthorized roads) to facilitate mechanical treatments; decommission all temporary roads when restoration treatments are completed.
- Construct up to 200 miles of protective barriers around springs, aspen, native willows, and big-tooth maples, as needed for restoration.
- Approximately 58,730 acres of prescribed fire only
- Facilitative Operations (FO) – Prescribed Fire Only
- Severe Disturbance Area Treatment
- Restore function and habitat in up to 777 miles of streams, including stream reaches with habitat for threatened, endangered, and sensitive aquatic species.
- Relocate and reconstruct existing open roads adversely affecting water quality and natural resources, or of concern to human safety.
- Re-plumbing the spring improvements to conserve water
- Upland soil stabilization
- Noxious/invasive weed treatments

In its Socio-Economics section, the DEIS states, "Reasonably foreseeable actions on private, state, and other federally-managed lands include mechanical treatments, fuels treatments, and prescribed fire." Yet it provides no details on the economic contributions or costs associated with those actions.

[18] Other considerations missing from the DEIS related to the processing sites include greenhouse gas emissions, noxious weed treatments, long-term monitoring, traffic safety from all the truck traffic, and impacts on roads themselves from increased road use.

SCIENTIFIC INTEGRITY

The text of the DEIS includes many dozen scientific citations, however a large number of them do not appear in the References section, impeding efforts of reviewers to check for proper interpretation.

The DEIS does not disclose the statistical reliability of the data the FS relies upon for the Rim Country CFLRPlan 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 National Forest (CV-02-200-M-LBE, Federal Defendants Response to Motion for Preliminary Injunction), the FS criticized a report provided by plaintiffs, stating "(Its) purported 'statistical analysis' reports no confidence intervals, standard deviations or standard errors in association with its conclusions."

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

The analysis methodology rely heavily upon the assumption that the FS knows the Natural Range of Variability (NRV). Yet the reliability of the data sources used to construct the NRV is not disclosed. The data sources themselves are not identified or obscure.

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 has not disclosed the limitations of all models the FS relies upon for the Rim Country analyses, which begins to address model validity.

Model results can be no better than as the data fed into them, which is why data reliability is important. 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 DEIS fails to disclose these limitations. 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 Nez Perce-Clearwater NF 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 G-14.) From www.thefreedictionary.com:

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

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

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

As Huck, (2000) explains, the degree of "content validity," or accuracy of the model or methodology is established by utilizing other experts. This, in turn, demonstrates the necessity for utilizing the peer review process. The validity of the various models utilized in the DEIS's analyses have, by and large, not been established for how agency utilizes them. No studies are cited which establishes their content validity, and no independent expert peer review process of the models has occurred.

Larson et al. 2011 state:

> Habitat models are developed to satisfy a variety of objectives. ...A basic objective of most habitat models is to predict some aspect of a wildlife population (e.g., presence, density, survival), so assessing predictive ability is a critical component of model validation. **This**

> **requires wildlife-use data that are independent of those from which the model was developed.** ...It is informative not only to evaluate model predictions with new observations from the original study site but also to evaluate predictions in new geographic areas. (Internal citations omitted, emphasis added).

A FS forest plan monitoring and evaluation report (USDA Forest Service, 2000c) provides an example of the agency itself acknowledging the problems of data that is old and incomplete, leading to the limitation of models the FS typically uses for wildlife analyses for old-growth wildlife habitats:

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

In that case, the FS expert believed the data were unreliable, so the usefulness or applicability of the model—its validity—is limited.

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

Beck and Suring, 2011 state:

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

Larson et al. 2011 state:

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

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

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

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

Ruggiero, 2007 (a scientist from the research branch of the FS) recognizes a fundamental need to demonstrate the proper use of scientific information, in order to overcome issues of decisionmaking integrity that arise from bureaucratic inertia and political influence. Ruggiero, 2007 and Sullivan et al., 2006 provide a commentary on the scientific integrity and agency use and misuse of science. And the Committee of Scientists (1999) recommend "independent scientific review of proposed conservation strategies…" The interpretation of scientific information the analyses do cite is problematic as we discuss throughout this objection. A big problem is that scientific information we cited in our comments on the PA was ignored or dismissed without discussion.

A Science Consistency Review for the CFLRPlan, which would treat up to 953,000 acres of national forest land, is very much warranted. (See Guldin et al., 2003, 2003b). The FS prepared Guldin et al. (2003) which:

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

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

> Increased scrutiny could pressure governments to present wildlife data and policies crafted by incorporating key components of science: transparent methods, reliable estimates (and their associated uncertainties), and intelligible decisions emerging from both of them. Minimally, **if it is accepted that governments may always draw on politics, new**

> **oversight by scientists would allow clearer demarcation between where the population data begin and end in policy formation** (Creel et al. 2016*b*; Mitchell et al. 2016). Undeniably, social dimensions of management (i.e., impacts on livelihoods and human–wildlife conflict) will remain important. (Emphasis added.)

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

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

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.

In conclusion, we thank you for the opportunity to provide input. It is our intention that you review the literature and other documents cited and incorporated, and include them in the official record of the 4FRI Rim Country EIS. Please contact us if you can't find a copy of any of the references or documents. Please keep both groups as listed below on the mailing list to receive all future communications about the 4FRI Rim Country proposal.

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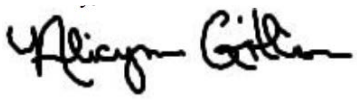

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References

Adams, P.W and H.A. Froehlich. 1981. Compaction of forest soils. Extension Publication PNW 217. 13 pp.

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

Anderson, Jay E. and Karl E. Holte, 1981. Vegetation Development over 25 Years without Grazing on Sagebrush-dominated Rangeland in Southeastern Idaho. Journal of Range Management Vol. 34, No.1, January 1981, p 25-29

Anderson, C.J. and Lockaby, B.G. 2011. Research gaps related to forest management and stream sediment in the United States. Environmental Management. 47: 303-313.

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

Baker, William L. and Donna Ehle, 2001. Uncertainty in surface-fire history: the case of ponderosa pine forests in the western United States. Can. J. For. Res. 31: 1205–1226 (2001)

Baker, William L. and Mark A. Williams, 2015. Bet-hedging dry-forest resilience to climate-change threats in the western USA based on historical forest structure. Frontiers in Ecology and Evolution *2:88. doi:10.3389/fevo.2014.00088*

Baker, William L., Thomas T. Veblen and Rosemary L. Sherriff; 2006. Fire, fuels and restoration of ponderosa pine–Douglas fir forests in the Rocky Mountains, USA. Journal of Biogeography (J. Biogeogr.) (2006)

Baker, William L. 2015. Are High-Severity Fires Burning at Much Higher Rates Recently than Historically in Dry-Forest Landscapes of the Western USA? PLoS ONE 10(9): e0136147. Doi:10.1371/ journal.pone.0136147

Balch, J. K., B. A. Bradley, C. M. D'Antonio, J. Gómez-Dans, 2013. Introduced annual grass increases regional fire activity across the arid western USA (1980-2009). Glob. Change Biol. 19, 173–183.

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

Beck, Jeffrey L., and Lowell H. Suring. 2011. Wildlife-Habitat Relationships Models: Description and Evaluation of Existing Frameworks. Chapter 10 in Millspaugh, Joshua & Frank

R. Thompson (Editors), 2011**.** Models for Planning Wildlife Conservation in Large Landscapes. Academic Press.

Belnap, Jayne, 1995. Surface disturbances: Their role in accelerating desertification. Environmental Monitoring and Assessment, January 1995, Volume 37, Issue 1–3, pp 39–57 https://doi.org/10.1007/BF00546879

Belsky, A.J. and D.M. Blumenthal. 1997. Effects of livestock grazing on stand dynamics and soils of upland forests of the Interior West. Conservation Biology 11:315-327.

Belsky, A.J., A. Matzke, and S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. J. Soil and Water Cons. 54:419-431

Belsky, A.J. and J.L. Gelbard. 2000. Livestock Grazing and Weed Invasions in the Arid West. Oregon Natural Desert Association, Bend, OR.

Beschta, Robert L., Jonathan J. Rhodes, J. Boone Kauffman, Robert E. Gresswell, G. Wayne Minshall, James R. Karr, David A. Perry, F. Richard Hauer and Christopher A. Frissell. 2004. Postfire Management on Forested Public Lands of the Western United States. Conservation Biology, Vol. 18, No. 4, August 2004, Pages 957-967.

Beschta, Robert L., Debra L. Donahue, Dominick A. DellaSala, Jonathan J. Rhodes, James R. Karr, Mary H. O'Brien, Thomas L. Fleischner, Cindy Deacon Williams. 2012. Adapting to Climate Change on Western Public Lands: Addressing the Ecological Effects of Domestic, Wild, and Feral Ungulates. Environmental Management, DOI 10.1007/s00267-012-9964-9 2012. http://www.springerlink.com/content/e239161819g0l117/fulltext.pdf

Beymer, Renee J. and Jeffrey M. Klopatek, 1992. Effects of Grazing on Cryptogamic Crusts in Pinyon-juniper Woodlands in Grand Canyon National Park. American Midland Naturalist, Vol. 127, No. 1 (Jan., 1992), pp. 139-148

Bradley, C. M., C. T. Hanson, *and* D. A. DellaSala. 2016. Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western United States? Ecosphere 7*(*10*): e01492*. 10.1002/ecs2.1492

Bradley, Bethany A Caroline A. Curtis, Emily J. Fusco, John T. Abatzoglou, and Jennifer K. Balch; 2018. Cheatgrass (Bromus tectorum) distribution in the intermountain western United States and its relationship to fire frequency, seasonality, and ignitions. Biol. Invasions 20, 1493–1506. https://doi.org/10.1007/s10530-017-1641-8

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

Breshears, David D., Neil S. Cobb, Paul M. Rich, Kevin P. Price, Craig D. Allen, Randy G. Balice, William H. Rommei, Jude H. Kastens, M. Lisa Floyd, Jayne Belnap, Jesse J. Anderson, Orrin B. Myers, and Clifton W. Meyer; 2005. Regional vegetation die-off in response to global-

change-type drought. Proceedings of the National Academy of Sciences of the United States of America, October 10, 2005.

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

Carlson, J. P. Edwards, T. Ellsworth, and M. Eberle. 2015. National best management practices monitoring summary report. Program Phase-In Period Fiscal Years 2013-2014. USDA Forest Service. Washington, D.C.

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

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

Christensen, Norman L, Ann M. Bartuska, James H. Brown, Stephen Carpenter, Carla D'Antonio, Robert Francis, Jerry F. Franklin, James A. MacMahon, Reed F. Noss, David J. Parsons, Charles H. Peterson, Monica G. Turner and Robert G Woodmansee, 1996. The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management. Ecological Applications Vol. 6, No. 3 (Aug., 1996), pp. 665-691.

Churchill, Derek, 2011. Colville National Forest, Mesic Forest Ecology and Management. Derek Churchill, University of Washington, April 2011

Clean Air Task Force and Conservation Law Foundation, 2016. Comments on "Federal Plan Requirements for Greenhouse Gas Emissions from Electric Utility Generating Units Constructed on or before January 8, 2014; Model Trading Rules; Amendments to Framework Regulations; Proposed Rule," 80 Fed. Reg. 64,966 (October 23, 2015). January 21, 2016.

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

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

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

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

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

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

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

Darimont, Chris T., Paul C. Paquet, Adrian Treves, Kyle A. Artelle, and Guillaume Chapron; 2018. Political populations of large carnivores. Conservation Biology, Volume 32, No. 1. JAN 2018, DOI: 10.1111/cobi.13065

Davis Kimberley T., Solomon Z. Dobrowski, Philip E. Higuera, Zachary A. Holden, Thomas T. Veblen, Monica T. Rother, Sean A. Parks, Anna Sala, Marco P. Maneta; 2019. Wildfires and climate change push low-elevation forests across a critical climate threshold for tree regeneration. *Proceedings of the National Academy of Sciences*, 2019; 201815107 DOI: 10.1073/pnas.1815107116

DellaSala, Dominick A. and Chad Hanson, 2019. Are Wildland Fires Increasing Large Patches of Complex Early Seral Forest Habitat? *Diversity* (2019). DOI: 10.3390/d11090157

DellaSala, Dominick 2017. Testimony before the U.S. House of Representatives Natural Resources Committee, Subcommittee on Oversight and Investigations, September 27, 2017. Oversight Hearing "Exploring Solutions to Reduce Risks of Catastrophic Wildfire and Improve Resilience of National Forests." Dr. Dominick A. DellaSala, Chief Scientist, Geos Institute, Ashland Oregon.

DellaSala, Dominick A. and Chad T. Hanson, 2015. The Ecological Importance of Mixed-Severity Fires: Nature's Phoenix. Published by Elsevier Inc.
DellaSala, Dominick A., D. M. Olson, S. E. Barth, S. L. Crane, and S. A. Primm, 1995. Forest health: moving beyond rhetoric to restore healthy landscapes in the inland Northwest. Wildlife Society Bulletin 1995, 23(3): 346-356.

DellaSala, Dominick A., Timothy Ingalsbee and Chad T. Hanson, 2018. Everything you wanted to know about wildland fires in forests but were afraid to ask: Lessons learned, ways forward. March 30, 2018.

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

Duff, Donald A, 1977. Livestock Grazing Impacts on Aquatic Habitat in Big Creek, Utah. In: Proceedings of the Workshop on Livestock and Wildlife – Fisheries Relationships in the Great Basin.

Edwards, P.J., F. Wood, and R. L. Quinlivan. 2016. Effectiveness of best management practices that have application to forest roads: a literature synthesis. General Technical Report NRS-163. Parsons, WV: U.S. Department of Agriculture, Forest Service, Northern Research Station. 171 p.

Endicott, D. 2008. National Level Assessment of Water Quality Impairments Related to Forest Roads and Their Prevention by Best Management Practices – Final Report (Prepared for the U.S. Environmental Protection Agency, Office of Water, Office of Wastewater Management Permits Division) (Contract No. EP-C-05-066, Task Order 002).

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

Espinosa, F. A., Jr., J. Rhodes, and D. McCullough. 1997. The Failure of Existing Plans to Protect Salmon Habitat in the Clearwater National Forest in Idaho. Journal of Environmental Management 49, 205-230p.

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

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

Frissell, C.A. and D. Bayles, 1996. Ecosystem Management and the Conservation of Aquatic Biodiversity and Ecological Integrity. Water Resources Bulletin, Vol. 32, No. 2, pp. 229-240. April, 1996

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

Furniss, M.J.; Staab, B.P.; Hazelhurst, S.; Clifton, C.F.; Roby, K.B.; Ilhardt, B.L.; Larry, E.B.; Todd, A.H.; Reid, L.M.; Hines, S.J.; Bennett, K.A.; Luce, C.H.; Edwards, P.J. 2010. Water, climate change, and forests: watershed stewardship for a changing climate. Gen. Tech. Rep. PNW-812. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 75 p.

Fusco, Emily J., John T. Finn, Jennifer K. Balch, R. Chelsea Nagy, and Bethany A. Bradley, 2019. Invasive grasses increase fire occurrence and frequency across US ecoregions. Proceedings of the National Academy of Sciences, 2019. https://doi.org/10.1073/pnas.1908253116

Ganey, Joseph L.; Ward, James P. Jr.; Willey, David W. 2011. Status and ecology of Mexican spotted owls in the Upper Gila Mountains recovery unit, Arizona and New Mexico. Gen. Tech. Rep. RMRS-GTR-256WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 94 p.

Garfin, G., G. Franco, H. Blanco, A. Comrie, P. Gonzalez, T. Piechota, R. Smyth, and R. Waskom, 2014: Ch. 20: Southwest. *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 462-486. doi:10.7930/J08G8HMN.

Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A. & Tempio, G. 2013. Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities. Food and Agriculture Organization of the United Nations (FAO), Rome.

Gillihan, Scott W. 2006. Sharing the land with pinyon-juniper birds. Partners in Flight Western Working Group. Salt Lake City, Utah.

Golladay, S.W.; K.L. Martin , J.M. Vose, D.N. Wear, A.P. Covich, R.J. Hobbs, K.D. Klepzig, G.E. Likens, R.J. Naiman, A.W. Shearer 2016. Achievable future conditions as a framework for guiding forest conservation and management. Forest Ecology and Management 360 (2016) 80–96

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

Graham, Russell T.; Rodriguez, Ronald L.; Paulin, Kathleen M.; Player, Rodney L.; Heap, Arlene P.; Williams, Richard. 1999. The northern goshawk in Utah: habitat assessment and management recommendations. Gen. Tech. Rep. RMRS-GTR-22. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 48 p.

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

Graham, Russell T., technical editor, 2003. Hayman Fire Case Study. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-114 (Revision) September 2003.

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

Gucinski, Hermann; Furniss, Michael J.; Ziemer, Robert R.; Brookes, Martha H. 2001. Forest roads: a synthesis of scientific information. Gen. Tech. Rep. PNW-GTR- 509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 103 p.

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

Guldin, James M., David Cawrse, Russell Graham, Miles Hemstrom, Linda Joyce, Steve Kessler, Ranotta McNair, George Peterson, Charles G. Shaw, Peter Stine, Mark Twery, Jeffrey Walter. 2003b. Science Consistency Reviews: A Primer for Application. United States Department of Agriculture Forest Service FS-771, September 2003.

Halofsky, J.E. et al. eds., USDA, Forest Service, Pacific Northwest Research Station, Adapting to Climate Change at Olympic National Forest and Olympic National Park, PNW-GTR-844 (2011). Available at https://www.fs.fed.us/pnw/pubs/pnw_gtr844.pdf

Hanson, Chad 2010. The Myth of "Catastrophic" Wildfire: A New Ecological Paradigm of Forest Health. John Muir Project Technical Report 1 • Winter 2010 • www.johnmuirproject.org

Harmon, Mark E, William K. Ferrell, and Jerry F. Franklin. 1990. Effects on carbon storage of conversion of old-growth forest to young forests. Science 247: 4943: 699-702

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

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

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

Harmon, M. E. & Law, B. E. Concern about language in congressional bills. (2016). Available at: https://www.pfpi.net/wp-content/uploads/2016/06/Concern-about-language-in-congressional-bills-on-forest-biomass-from-Harmon-and-Law.pdf

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

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

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

Hayward, Gregory D., 1994. Information Needs: Great Gray Owls. Chapter 17 *In:* Hayward, Gregory D., and Jon Verner, 1994. Flammulated, Boreal, and Great Gray Owls in the United States: A Technical Conservation Assessment. USDA Forest Service General Technical Report RM-253, pp. 207-211.

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

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

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

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

Huff, Mark H., Roger D. Ottmar, Ernesto Alvarado, Robert E. Vihnanek, John F. Lehmkuhl, Paul F. Hessburg, and Richard L. Everett, 1995. Historical and Current Forest Landscapes in Eastern Oregon and Washington. Part II: Linking Vegetation Characteristics to Potential Fire Behavior and Related Smoke Production. General Technical Report (PNW-GTR-355). Portland, OR: USDA Forest Service Pacific Northwest Research Station, 43 pp.

Hutto, R. L., R. E. Keane, R. L. Sherriff, C. T. Rota, L. A. Eby, and V. A. Saab. 2016. Toward a more ecologically informed view of severe forest fires. Ecosphere 7(2):e01255. 10.1002/ecs2.1255

Hutto, Richard L. and David A. Patterson, 2016. Positive effects of fire on birds may appear only under narrow combinations of fire severity and time-since-fire. International Journal of Wildland Fire, published online 11 July 2016.

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

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

Hutto, Richard L. Aaron D. Flesch, Megan A Fylling 2014. A bird's-eye view of forest restoration: Do changes reflect success? Forest Ecology and Management 327 (2014) 1–9.

Ingalsbee, Timothy; 2004. Collateral Damage: The Environmental Effects of Firefighting. The 2002 Biscuit Fire Suppression Actions and Impacts. Western Fire Ecology Center and American Lands Alliance, May 2004. http://www.fire-ecology.org/research/biscuit_suppression.html

IPCC, 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Johansen, Jeffrey R. 1993. Cryptogamic Crusts of Semiarid and Arid Lands of North America. Journal of Phycology 29, 140-147. April 1993. https://doi.org/10.1111/j.0022-3646.1993.00140.x

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

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

Kassar, Chris and Paul Spitler, 2008. Fuel to Burn: The Climate and Public Health Implications of Off-road Vehicle Pollution in California. A Center for Biological Diversity report, May 2008.

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

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

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

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

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

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

Kulakowski, Dominik 2013. Testimony before the Subcommittee on Public Lands and Environmental Regulation of the Committee on Natural Resources of the United States House of Representatives on the Depleting Risk from Insect Infestation, Soil Erosion, and Catastrophic Fire Act of 2013. Dr. Dominik Kulakowski, Assistant Professor, Clark University. April 11, 2013

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

Lacy, Robert C., and Tim W. Clark. 1993. Simulation Modeling of American Marten (Martes Americana) Populations: Vulnerability to Extinction. Great Basin Naturalist; v. 53, no. 3, pp. 282-292.

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

Larson, Michael A., Joshua J. Millspaugh, and Frank R. Thompson. 2011. A Review of Methods for Quantifying, Wildlife Habitat in Large Landscapes. Chapter 9 in Millspaugh, Joshua & Frank R. Thompson (Editors), 2011**.** Models for Planning Wildlife Conservation in Large Landscapes. Academic Press.

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

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

Lehmkuhl, John F., Leonard F. Ruggiero, and Patricia A. Hall; 1991. Landscape-level patterns of forest fragmentation and wildlife richness and abundance in the southern Washington Cascades. *IN:* Ruggiero, Leonard F., Keith B. Aubry, Andrew B. Carey, and Mark H. Huff, technical

editors, 1991. Wildlife and vegetation of unmanaged Douglas-fir forests. USDA Forest Service PNW Gen. Tech. Report. 285 Olympia, WA 474 pp. plus appendix.

Liebmann, Matthew J., Joshua Farella, Christopher I. Roosc, Adam Stack, Sarah Martini, and Thomas W. Swetnam, 2016. Native American depopulation, reforestation, and fire regimes in the Southwest United States, 1492–1900 CE. PNAS; Published online January 25, 2016 www.pnas.org/cgi/doi/10.1073/pnas.1521744113 E696–E704

Lolo National Forest, 1999. Memo to District Rangers and Program Officers from Lolo National Forest Supervisor Deborah Austin, Subject: Best Management Practices. August 6, 1999.

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

Lusby, Gregg C., 1979. Effects of Grazing on Runoff and Sediment Yield from Desert Rangeland at Badger Wash in Western Colorado, 1953-73. GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1532-1

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

Marcot BG and Murphy DD. 1992. Population viability analysis and management. In Szaro, R., ed. Biodiversity in Managed Landscapes: Theory and Practice. Proceedings of: Conference on Biodiversity in Managed Landscapes: Theory and Practice, 13-17 July, 1992, Sacramento, CA.

McClelland, B. Riley (undated). Influences of Harvesting and Residue Management on Cavity-Nesting Birds.

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

Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.
https://www.millenniumassessment.org/documents/document.356.aspx.pdf

Mitchell, Stephen R., Mark E. Harmon, and Kari E. B. O'Connell. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems. Ecological Applications 19:643–655. http://dx.doi.org/10.1890/08-0501.1

Moomaw, Bill and Janna Smith, 2017. The Great American Stand: US Forests and the Climate Emergency. Why the United States needs an aggressive forest protection agenda focused in its

own backyard. March 2017. Dogwood Alliance, PO Box 7645 Asheville, NC 28802. info@dogwoodalliance.org

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

Moser, B.W. and Garton, E.O., 2019. Northern goshawk space use and resource selection. The Journal of Wildlife Management, 83(3): 705-713.

Naficy, Cameron, Anna Sala, Eric G. Keeling, Jon Graham, and Thomas H. Deluca 2010. Interactive effects of historical logging and fire exclusion on ponderosa pine forest structure in the northern Rockies. Ecological Applications, 20(7), 2010, pp. 1851–1864.

Noon, B.R, D.D. Murphy, S.R. Beissinger, M.L. Shaffer and D. DellaSala. 2003. Conservation planning for US National Forests: Conducting comprehensive biodiversity assessments. Bioscience. December 2003.

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

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

Noss, Reed F., Jerry F. Franklin, William L. Baker, Tania Schoennagel, and Peter B. Moyle. 2006. Managing fire-prone forests in the western United States. *Front Ecol Environ* 2006; 4(9): 481–487.

Odion, Dennis and Dominick DellaSala, 2011. Backcountry thinning is not the way to healthy forests. *Guest Opinion.* The Medford Mail Tribune. November 20, 2011 http://www.mailtribune.com/apps/pbcs.dll/article?AID=/20111120/OPINION/111200316/-1/OPINION04

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

Partnership for Policy Integrity. Carbon emissions from burning biomass for energy.

Payne, Roger 1995. *Among Whales*. A Delta book published by Dell Publishing, New York, NY.

Pecl, G.T. et al., 2017. Biodiversity redistribution under climate change: Impacts on ecosystems and human well-being. Science 355, eaai9214 (2017) 31 March 2017.

Perry, D. A.; R. Meurisse, B. Thomas, R. Miller, J. Boyle, J. Means, C. R. Perry, and R. F. Powers *Eds*; 1989a. Productivity of Pacific Northwest Forest Ecosystems. Timber Press, Portland, Oregon in cooperation with College of Forestry, Oregon State University.

Pfister, R.D., W.L. Baker, C.E. Fiedler, and J.W. Thomas. 2000. Contract Review of Old-Growth Management on School Trust Lands: Supplemental Biodiversity Guidance 8/02/00.

Pierce, Jennifer L., Grant A. Meyer & A. J. Timothy Jull; 2004. Fire-induced erosion and millennial-scale climate change in northern ponderosa pine forests. Nature Vol. 432 | 4 November 2004.

Platts, William S., Ed Chaney and Wayne Elmore, 1991. Livestock Grazing on Western Riparian Areas. Produced for the U.S. Environmental Protection Agency by the Northwest Resource Information Center, Inc., Eagle, Idaho.

Poessel, Sharon A., Joan C. Hagar, Patricia K. Haggerty, Todd E. Katzner 2020. Removal of cattle grazing correlates with increases in vegetation productivity and in abundance of imperiled breeding birds. Biological Conservation 241 (2020) 108378

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

Reed, David H., Julian J. O'Grady, Barry W. Brook, Jonathan D. Ballou, and Richard Frankham; 2003. Estimates of minimum viable population sizes for vertebrates and factors influencing those estimates. Biological Conservation 113 (2003) 23–34

Reid, Leslie M. and Thomas Dunne 1984. Sediment Production from Forest Road Surfaces. Water Resource Research, Vol. 20, No. 11, Pp. 1753-1761, November 1984.

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

Rhoades, Chuck; Rob Hubbard, Byron Collins, Kelly Elder, Mike Battaglia, and Paula Fornwalt, 2012. From Death Comes Life: Recovery and Revolution in the Wake of Epidemic Outbreaks of Mountain Pine Beetle. Science Bulletin, US Forest Service Rocky Mountain Research Station, October 2012. http://www.fs.fed.us/rm/science-application-integration/docs/science-you-can-use/2012-10.pdf

Rhodes, J. J., D. A. McCullough, and F. A. Espinosa, Jr., 1994. A Coarse Screening Process for Evaluation of the effects of Land Management Activities on Salmon Spawning and Rearing Habitat in ESA Consultations. Columbia River Inter-tribal Fish Commission Technical Report 94-4, Portland, Oregon.

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

Rhodes, Jonathan 2007. The Watershed Impacts Of Forest Treatments To Reduce Fuels And Modify Fire Behavior. P*repared for* Pacific Rivers Council, P.O. Box 10798, Eugene, OR

97440. 541-345-0119. www.pacrivers.org. February, 2007.

Rhodes, J. J., and W. L. Baker. 2008. Fire probability, fuel treatment effectiveness and ecological tradeoffs in western U.S. public forests. Open Forest Science Journal, 1: 1-7

Riggers, Brian; Rob Brassfield; Jim Brammer; John Carlson; Jo Christensen; Steve Phillips; Len Walch; Kate Walker; 2001. Reducing Fire Risks to Save Fish – A Question of Identifying Risk. A Position Paper by the Western Montana Level I Bull Trout Team, 2001.

Ripple William J., Pete Smith, Helmut Haberl, Stephen A. Montzka, Clive McAlpine and Douglas H. Boucher, 2014. Ruminants, climate change and climate policy. Nature Climate Change, Vol. 4, January 2014.

Rodriguez, Sabrina A., Patricia L. Kennedy, and Timothy H. Parker. 2016. "Timber harvest and tree size near nests explains variation in nest site occupancy but not productivity in northern goshawks (Accipiter gentilis)." Forest Ecology and Management 374: 220-229.

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

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

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

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

Saunois M., R. B. Jackson, P. Bousquet, B. Poulter and J. G. Canadell; 2016a. The growing role of methane in anthropogenic climate change. EDITORIAL Environ. Res. Lett. v11 (2016) 120207.

Saunois, et al., 2016b. The global methane budget 2000–2012. Earth Syst. Sci. Data, 8, 697–751, 2016

Schmitz, O.J. and A.M. Trainor, *Adaptation Approaches for Conserving Ecosystem Services and Biodiversity in Dynamic Landscapes Caused by Climate Change*, USDA Forest Service RMRS-P-71 (2014).

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

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

Sherriff, R. L., R.V. Platt, T. T. Veblen, T. L. Schoennagel, and M.H. Gartner. 2014. Historical, observed, and modeled wildfire severity in montane forests of the Colorado front range. PLOS ONE: 9: 9 17 pages.

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

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

Simons, Rachel; 2008. Historic range of variability-based forest management and climate change: understanding causes of disturbances in a changing climate. Unpublished literature review.

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

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

Stephenson, N. L., A. J. Das, R. Condit, S. E. Russo, P. J. Baker, N. G. Beckman, D. A. Coomes, E. R. Lines, W. K. Morris, N. Ruger, E. Alvarez, C. Blundo, S. Bunyavejchewin, G. Chuyong, S. J. Davies, A. Duque, C. N. Ewango, O. Flores, J. F. Franklin, H. R. Grau, Z. Hao, M. E. Harmon, S. P. Hubbell, D. Kenfack, Y. Lin, J.-R. Makana, A. Malizia, L. R. Malizia, R. J. Pabst, N. Pongpattananurak, S.-H. Su, I-F. Sun, S. Tan, D. Thomas, P. J. van Mantgem, X. Wang, S. K. Wiser & M. A. Zavala; 2014. Rate of tree carbon accumulation increases continuously with tree size. *Nature*. 2014.

Sterman, John D, Lori Siegel and Juliette N. Rooney-Varga. 2018. Does replacing coal with wood lower CO_2 emissions? Dynamic lifecycle analysis of wood bioenergy. Environmental Research Letters 13 015007.

Stevens-Rumann, Camille S., Kerry B. Kemp, Philip E. Higuera, Brian J. Harvey, Monica T. Rother, Daniel C. Donato, Penelope Morgan and Thomas T. Veblen, 2017. Evidence for declining forest resilience to wildfires under climate change. Ecology Letters, (2018) 21: 243–252 doi: 10.1111/ele.12889

Strauch, R.L. et al., *Adapting transportation to climate change on federal lands in Washington State*, Climate Change 130(2), 185-199 (2015).

Sullivan, Patrick J.; James M. Acheson; Paul L. Angermeier; Tony Faast; Jean Flemma; Cynthia M. Jones; E. Eric Knudsen; Thomas J. Minello; David H. Secor; Robert Wunderlich; Brooke A. Zanetell; 2006. Defining and Implementing Best Available Science for Fisheries and Environmental Policy, and Management. American Fisheries Society, Bethesda, Maryland; Estuarine Research Federation, Port Republic, Maryland. September 2006

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

Sylvester, James T., 2014. Montana Recreational Off-Highway Vehicles Fuel-Use and Spending Patterns 2013. Prepared for Montana State Parks by Bureau of Business and Economic Research, University of Montana. July 2014.

Thompson, I., Mackey, B., McNulty, S., Mosseler, A. (2009). Forest Resilience, Biodiversity, and Climate Change. A Synthesis of the Biodiversity/Resilience/Stability Relationship in Forest Ecosystems. Secretariat of the Convention on Biological Diversity, Montreal. Technical Series no. 43, 67 pages.

Tingley MW, Ruiz-Gutiérrez V, Wilkerson RL, Howell CA, Siegel RB. 2016 Pyrodiversity promotes avian diversity over the decade following forest fire. Proc. R. Soc. B 283: 20161703. http://dx.doi.org/10.1098/rspb.2016.1703

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

Turner, David P., William K. Ferrell & Mark E. Harmon, 1997. Letter to the Editor, The Carbon Crop: Continued, 277 Sci. 1591, 1592 (Sept. 1997).

Turner, David P.; Greg J. Koerper; Mark E. Harmon; Jeffrey J. Lee; 1995. A Carbon Budget for the Forests of the Coterminous United States, 5:2 Ecological Applications 421 (1995).

Underwood, Jared, White, C.M. and Rodriguez, R., 2006. Winter movement and habitat use of northern goshawks breeding in Utah. Studies in Avian Biology, 31: 228.

U.S. Fish and Wildlife Service, 1998a (corrected 1999, 2000). Northern Goshawk Status Review. Status Review of the northern goshawk in the forested west. Office of Technical Support - Forest Resources, Portland, OR. Unpublished Report, 250 pages, June 1998

U.S. Fish and Wildlife Service, 2012. Mexican Spotted Owl Recovery Plan, First Revision (Strix occidentalis lucida). Mexican Spotted Owl Recovery Team, U.S. Fish and Wildlife Service, Southwest Region. Albuquerque, NM.

USDA Forest Service, 1994b. Savant Sage Final Environmental Impact Statement, Idaho Panhandle National Forests

USDA Forest Service, 2000b. Expert interview summary for the Black Hills National Forest Land and Resource Management Plan Amendment. USDA Forest Service, Black Hills National Forest, Hwy 385 North – R.R. 2, Box 200 Custer, South Dakota 57730 (605-673-9200). October, 2000.

USDA Forest Service, 2000c. Forest Plan Monitoring and Evaluation Report for 1998. Idaho Panhandle National Forests**.**

USDA Forest Service, 2001a. Silverbird Post-Fire Harvest Environmental Analysis. Salmon-Cobalt Ranger District, Salmon-Challis National Forest, May 2001.

USDA Forest Service, 2005b. Middle East Fork Hazardous Fuel Reduction Draft Environmental Impact Statement. Bitterroot National Forest.

USDA Forest Service, 2005c. Northeast Yaak Final Environmental Impact Statement, Three Rivers Ranger District, Kootenai National Forest.

USDA Forest Service, 2007c. Myrtle Creek HFRA Healthy Forests Restoration Act Project Final Environmental Impact Statement. Soil Resources. March 2007. Bonners Ferry Ranger District, Idaho Panhandle National Forests

USDA Forest Service, 2009a. Lakeview-Reeder Fuels Reduction Project Draft Environmental Impact Statement, Priest Lake Ranger District, Idaho Panhandle National Forests.

USDA Forest Service, 2009c. Excerpt from Lakeview-Reeder Fuels Reduction Project Draft Environmental Impact Statement. Priest Lake Ranger District, Idaho Panhandle National Forests. January 2009.

USDA Forest Service, 2010e. Our Approach to Roadless Area Analysis of Unroaded Lands Contiguous to Roadless Areas. USDA Forest Service R-1, 2010.

USDA Forest Service, 2010t. Travel Analysis Report, Spring Gulch Travel Analysis, Cabinet Ranger District, Kootenai National Forest, 2010.

USDA Forest Service, 2011c. Griffin Creek Resource Management Project Environmental Assessment. Tally Lake Ranger District, Flathead National Forest, December 2011.

USDA Forest Service, 2012c. Power Lake Vegetation Management Projects Environmental Assessment, Newport-Sullivan Lake Ranger Districts, Colville National Forest.

USDA Forest Service, 2014a. Como Forest Health Project Draft Environmental Impact Statement, Darby Ranger District, Bitterroot National Forest, August 2014.

USDA Forest Service, 2015a. Deer Creek Soil Resource Report. Prepared by: Chandra Neils, Forest Soil Scientist for: Bonners Ferry Ranger District, Idaho Panhandle National Forests, August 2015.

USDA Forest Service, 2015b. Stonewall Vegetation Project Final Environmental Impact Statement - Volume 1. Helena National Forest, August 2015.

USDA Forest Service, 2016. Four Forest Restoration Initiative Mexican Spotted Owl (Strix occidentalis lucida) Monitoring Report. Coconino National Forest, Flagstaff RD

USDA Forest Service, 2016a. Categorical Exclusion Worksheet: Resource Considerations-Soils. Smith Shields Forest Health Project, Yellowstone Ranger District, Custer Gallatin National Forest.

USDA Forest Service, 2017b. Draft Environmental Impact Statement. Pine Mountain Late-Successional Reserve Habitat Protection and Enhancement Project. Pacific Southwest Region April 28, 2017

USDA Forest Service, 2019. Fiscal Year 2020 Forest Service Budget Justification. March 2019. https://www.obpa.usda.gov/27forest2020notes.pdf

USDA-Objectivity of Regulatory Information. https://www.ocio.usda.gov/policy-directives-records-forms/guidelines-quality-information/regulatory

USDA-Objectivity of Scientific Research Information. *https://www.ocio.usda.gov/policy-directives-records-forms/guidelines-quality-information/scientific-research*

USDA-Objectivity of Statistical and Financial Information. https://www.ocio.usda.gov/policy-directives-records-forms/guidelines-quality-information/statistical-and-financial

Van der Werf, G. R.; D. C. Morton, R. S. DeFries, J. G. J. Olivier, P. S. Kasibhatla, R. B. Jackson, G. J. Collatz and J. T. Randerson; 2009. CO2 emissions from forest loss. Nature Geoscience vol. 2, November 2009.

Van Haveren, B. P., E. B. Janes and W. L. Jackson. 1985. Nonpoint pollution control on public lands. Journal of Soil and Water Conservation. 92-95.
http://www.jswconline.org/content/40/1/92.short

Veblen, Thomas T. 2003. Key Issues in Fire Regime Research for Fuels Management and Ecological Restoration. USDA Forest Service Proceedings RMRS-P-29.

Verbyla, D.L. & Litaitis, J.A. (1989) Resampling methods for evaluating classification accuracy of wildlife habitat models. Environmental Management 13: 783–7.

Vizcarra, Natasha 2017. Woodpecker Woes: The Right Tree Can Be Hard to Find. Science Findings, USDA Forest Service, Pacific Northwest Research Station, Issue 199, August 2017.

Wales, Barbara C; Lowell H. Suring; Miles A. Hemstrom, 2007. Modeling potential outcomes of fire and fuel management scenarios on the structure of forested habitats in northeast Oregon, USA. Landscape and Urban Planning 80 (2007) 223-236

Westerling, A. L., H. G. Hidalgo, D. R. Cayan, T. W. Swetnam; 2006. Warming and Earlier Spring Increases Western U.S. Forest Wildfire Activity. Science Express, Research Article, July 6, 2006, www.sciencexpress.org.

Williams, M. A. and W. L. Baker. 2014. High-severity fire corroborated in historical dry forests of the western United States: response to Fulé et al. Global Ecol. Biogeogr. (2014)

Williams, A. Park, Craig D. Allen, Alison K. Macalady, Daniel Griffin, Connie A. Woodhouse, David M. Meko, Thomas W. Swetnam, Sara A. Rauscher, Richard Seager, Henri D. Grissino-Mayer, Jeffrey S. Dean, Edward R. Cook, Chandana Gangodagamage, Michael Cai and Nate G. McDowell; 2012. Temperature as a potent driver of regional forest drought stress and tree mortality. *Nature Climate Change,* PUBLISHED ONLINE: 30 SEPTEMBER 2012 | DOI: 10.1038/NCLIMATE1693

Williamson, J.R. and W.A. Neilsen. 2000. The influence of forest site and rate and extent of soil compaction and profile disturbance of skid trails during ground-based harvesting. Can. J. For. Res. 30:119

Williamson, Matthew A., Erica Fleishman, Ralph C. MacNally, Jeanne C. Chambers, Bethany A. Bradley, David S. Dobkin, David I. Board, Frank A. Fogarty, Ned Horning, Matthias Leu, Martha Wohlfeil Zillig; 2019. Fire, livestock grazing, topography, and precipitation affect occurrence and prevalence of cheatgrass (Bromus tectorum) in the central Great Basin, USA. Biol Invasions https://doi.org/10.1007/s10530-019-02120-8

Woodbridge, B. and C.D. Hargis, 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

Woodbury, Peter B., James E. Smith & Linda S. Heath, 2007. Carbon sequestration in the U.S. forest sector from 1990 to 2010, 241 Forest Ecology and Management 14, 24 (2007).
Zald, Harold S. J. and Christopher J. Dunn, 2018. Severe fire weather and intensive forest management increase fire severity in a multi-ownership landscape. Ecological Applications, 2018; DOI: 10.1002/eap.1710

Ziemer, R. R., J. Lewis, T. E. Lisle, and R. M. Rice. 1991b. Long-term sedimentation effects of different patterns of timber harvesting. In: Proceedings Symposium on Sediment and Stream Water Quality in a Changing Environment: Trends and Explanation, pp. 143-150. International Association of Hydrological Sciences Publication no. 203. Wallingford, UK.

Ziemer, Robert R. and Thomas E. Lisle, 1993. Evaluating Sediment Production by Activities Related to Forest Uses - A Pacific Northwest Perspective. U.S. Department of Agriculture, Forest Service Pacific Southwest Research Station, Arcata, California.

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August 11, 2016

Laura Jo West
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USDA Forest Service
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Submitted via email to: 4FRI_comments@fs.fed.us

Dear Ms. West, Mr. Best, and Mr. Bosworth:

This letter provides scoping comments from Sierra Club – Grand Canyon Chapter on the "Rim Country Proposed Action" (PA) for the Four Forests Restoration Initiative (4FRI). This comment is timely because the Notice of Intent was published in the Federal Register on June 27, 2016, with a 45 day comment period ending August 11, 2016.

The Sierra Club's mission is "to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; and to educate and enlist humanity to protect and restore the quality of the natural and human environments." Inspired by nature, the Sierra Club's more than 1.3 million members and supporters work together to protect our communities and the planet. Sierra Club has regularly participated in stakeholder meetings since 2010 and protection of the region's forests and wildlife is a high priority for our membership in Arizona. Our members have a significant interest in this proposed action as we have been very involved in protection of Arizona's public lands and the wildlife that depend on them.
We support the need for forest restoration to protect wildlife habitat, watersheds, forest resiliency, and ecosystem function. Our members believe that ecological values should always take priority over economic gain when treating our forests.

Bad logging practices during the last century removed most of the large trees and old growth from Arizona's landscape, while overgrazing eliminated much of the dense grasses and forbs from the understory. These factors along with fire suppression resulted in a crop of small, overly dense trees with an increased fire hazard across the landscape. While it is important to thin these dense stands, it is of paramount importance that we protect the limited remaining large and old growth trees to protect the wildlife that depend on them, including species such as the northern goshawk.

Because most trees remaining in the project area are small, we want to make sure that large and old trees are protected, and that enough acres of closed canopy habitat remain to ensure survival of species that rely on mature forest structure.

The goal of 4FRI must be ecological restoration above all else, including retaining old growth and large trees, and the return of natural fire processes to the landscape. Only through careful implementation and proper monitoring will we be able to achieve that goal.

In preparation of the 4FRI Rim Country Environmental Impact Statement (EIS), the Forest Service should take into consideration the following:

ALL EXISTING OLD GROWTH AND "PRE-SETTLEMENT" TREES SHOULD BE PROTECTED

The proposed action should prohibit old growth logging consistent with the stakeholders' Old Growth Protection and Large Tree Retention Strategy, developed for the first 4FRI EIS. The proposed action should not allow for logging old growth and "presettlement" trees—trees that established prior to the disruption of natural fire regimes. Old growth patches and presettlement trees should be retained in all cases, regardless of tree size.

The only way to restore and develop old growth as a natural process at the landscape scale is to preserve the old growth components that currently exist. This can best be accomplished by retaining old growth components such as yellow pines and large trees at the individual and group levels while identifying stands that as a whole generally exhibit old growth characteristics. The goal is to provide as much old growth as can be sustained in patterns that provide for a flow of functions and interactions at multiple scales across the landscape through time. While old growth is a term generally used to describe ecosystem function, it is also increasingly used by the public, academics and even some land managers to describe individual trees with the characteristics described below in "A."

(A) Retain old growth trees regardless of size, as old growth is a function of age, not size. Old growth is not a definitive age. Ponderosa pines begin to develop the thick yellow bark characteristic of an old growth tree between 120 and 150 years of age. As they age, the yellow-red bark also develops wide, large plates. In addition to bark characteristics, an old growth ponderosa pine tree typically exhibits complex structural attributes such as full crowns, flattened tops and large limbs. These trees are sometimes referred to as yellow pines, presettlement trees or mature trees. (Note that "The Path Forward" dated March 19, 2010, a document guiding the Four Forests Restoration Initiative uses the following language: "**8.No old growth trees (predating Euro-American settlement) shall be cut.")**

(B)When creating openings, protect old growth trees by removing excess competition from small, young trees. Initially, removal should focus on, but not be restricted to, trees 12 inches in diameter and smaller. Such a focus is warranted given the high density and high percentage of the forest landscape these trees occupy. According to the USDA, more than 82 percent of ponderosa pine trees in Region Three are smaller than 11 inches in diameter[12]. Thinning should occur within groups, as well as in identified openings between groups.

(C) Reduce the fire risk to old growth trees by removing small, younger trees, as well as some mid-aged trees, (VSS 4: 12 to 18 dbh) from within the drip lines of individual trees. Given the lack of trees larger than 16 inches in diameter, thinning should focus on trees smaller than 16 inches in diameter. Approximately 96 percent of the trees in Region Three are smaller than 15 inches in diameter[34]. This would reduce ladder fuels, lowering the potential for crown fires. It would also encourage the growth of an understory community.

(D)When developing future old growth stands and managing for mature age classes, larger diameter trees, in VSS 4, 5 and 6 should be retained to replace the structure and function of old growth trees that were

[1] USDA Forest Service. 1999. Forest Inventory and Analysis National Program—Forest Inventory Data Online (FIDO). http://www.fia.fs.fed.us/tools-data/

[2] USDA Forest Service. 2007. Forest Inventory and Analysis National Program—Forest Inventory Data Online (FIDO). http://www.fia.fs.fed.us/tools-data/

[3] USDA 1999.

[4] USDA 2007.

removed by logging.

(E) To provide for an uneven age structure, within old growth stands, retain groups of young and mid-aged trees to provide for multiple age classes and enhance structural diversity. Thin variably within retained groups, removing ladder fuels and avoiding even spacing.

(F) Identify and retain areas that would be best left unthinned as wildlife cover and for travel corridors.

(G) Preserve all snags. Downed logs with a diameter greater than **10**" will be preserved.

(H) Use prescribed fire and the management of natural ignitions to reduce ground fuels and to reintroduce fire to the ecosystem.

(I) Defer Livestock grazing, after the initial fire treatment to allow for understory recovery and change grazing management to allow for function of natural processes.

(J) Decrease road densities to enhance stand integrity by reclaiming old skid trails and log landings.

THE STAKEHOLDER LARGE-TREE RETENTION STRATEGY SHOULD FORM THE BASIS OF THE PREFERRED ALTERNATIVE

The Forest Service should include the Large Tree Retention Strategy, developed for the first 4FRI EIS, as a basis for the proposed action; the Forest Service has the authority to include the Large Tree Retention Strategy as a basis of a preferred alternative in the EIS. The Large Tree Retention Strategy should be implemented and honored in the Rim Country EIS.

THE EIS SHOULD DESCRIBE THE AFFIRMATIVE GOAL OF SAFELY RESTORING NATURAL FIRE REGIMES AND HOW STRATEGICALLY PLACED TREATMENTS DEPLOYED WITHIN FIRESCAPES WILL FACILITATE THE MANAGEMENT OF PLANNED AND UNPLANNED IGNITIONS

The proposed action should describe the project in the context of Federal Wildland Fire Policy and its goals of facilitating public and firefighter safety and maximizing fire's natural role in wildland ecosystems.

> "Fire, as a critical natural process, will be integrated into land and resource management plans and activities on a landscape scale, and across agency boundaries. Response to wildland fire is based on ecological, social, and legal consequences of fire. The circumstances under which a fire occurs, and the likely consequences on firefighter and public safety and welfare, natural and cultural resources, and values to be protected dictate the appropriate management response to fire." 1995/2001 Federal Wildland Fire Management Policy.

The EIS should discuss the affirmative goal of restoring fire as a critical natural process rather than focusing on the negative goal of avoiding undesirable fires. The EIS should discuss and present the idea of firescapes and strategically placed treatments in the context of safely managing planned and unplanned ignitions, including restoring fire as a critical natural process.

In the former case, the EIS should describe Firescapes as a geographic context within which to plan and deploy strategically placed treatments that can facilitate safely managing planned and unplanned ignitions. We refer the Forest Service to the definition and description of Firescapes in the 4FRI Stakeholders' Landscape Strategy document; we suggest the Forest Service use this definition and description to provide additional clarity and specificity to the purpose of Firescapes as an geographic context for planning and deploying strategically placed treatments in a way that serves fire management goals.

In the latter case, the EIS should provide additional detail on the relationship between strategically placed treatments and fire management. Specifically, the EIS should describe how restoration treatments can be strategically designed, located and sequenced to efficiently and safely facilitate operational fire management, community protection, and landscape-scale restoration of ecologically beneficial fire regimes at landscape scales. Toward that end, some key questions that the Forest Service should be seeking to answer in the EIS and subsequent analyses are:

- Where and under what conditions can natural ignitions be managed for resource benefit under current Fire Management Plans?
- Where can treatments be located to facilitate containment and management of planned or unplanned ignitions within firescapes or subsets thereof?
- How can treatments be positioned and sequenced to most efficiently reduce the potential for landscape-scale crown fire?

Treatment units should be distributed in the project area with spatial patterns of crown fire spread in mind. Overlapping patterns of fuel treatment that reduce horizontal fuel continuity can fragment severe fire behavior and effects into smaller patches if they disrupt heading fire behavior and increase the area burned by fires exhibiting flanking behavior as they move upslope[5]. Slope aspects facing away from frontal or diurnal winds are a lesser priority for treatments because backing fires likely to occur on those sites are the most likely to exhibit mild intensity and cause low-severity effects to vegetation and soil with attendant benefits to ecosystem resources and fire worker safety.

The direction of fire spread (backing, flanking, heading) is an important aspect of fire behavior because fire interacts with weather, topography and vegetation to "back" and "flank" around certain fuel and topographic conditions or "head" through others as it moves across the landscape[6]. Steep slopes can facilitate wind-driven convection currents that drive radiant heat upward and bring flames nearer to adjacent unburned vegetation, pre-heating fuels and amplifying fire intensity as it moves upslope[7]. As a result, severe fire effects typically concentrate at upper slope positions and on ridges, whereas such effects are relatively rare on the lee side of slopes that do not directly receive frontal wind[8].
For starters, we suggest the Forest Service consider targeting treatments in fire suppressed VSS 3 stands that are (1) within ¼ mile of roads, (2) that exhibit active or passive crown fire behavior under 95th percentile conditions, and that (3) occur in patches of 50 acres or larger. We also urge the Forest Service to carefully review rationale and analyses employed in the 4FRI Landscape Strategy; the analyses unpinning that document reflect careful thinking about linking restoration and fire management goals in a landscape context. The Forest Service should explicitly include thinning with fire, either in single or multiple, repeated events, within the range of treatment options. Acres precluded from mechanical treatment should not automatically be excluded from fire use; rather, the planning document should consider thinned and non-thinned areas together within a landscape matrix that can safely accommodate natural fires with beneficial ecological effects.

Another approach to strategic location of fuel treatments is to identify landscape features that are currently resilient to fire disturbance and use those sites as anchor points for compartmentalization of the project area for long-term fire management oriented to use of unplanned ignitions for resource benefits. Such sites may include natural openings, meadows, relatively open ridges, riparian areas, patches of mature forest with relatively shaded and cool microclimates, and sites where fuel reduction work already has been completed. Such locations can facilitate appropriate fire management responses including confinement and containment strategies as alternatives to full control, as well as provide safe areas for workers to ignite prescribed fires for hazardous fuel reduction and ecological process restoration. Identification of such sites does not necessarily equate to actively treating them. Landscape features that are currently fire resilient, as well as proposed fuel treatment areas, should be spatially mapped and distinguished in analysis of the proposed action.

The Forest Service also can prioritize active fuel management in areas where relatively little resource investment

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[5] Finney, M.A. 2001. Design of regular landscape fuel treatment patterns for modifying fire growth and behavior. Forest Science 47:219-228. *Available at:* http://www.fs.fed.us/rm/pubs/rmrs_gtr292/2001_finney.pdf, *accessed 8/11/16.*
[6] Graham, R.T., S. McCaffrey, and T.B Jain. 2004. Science basis for changing forest structure to modify wildfire behavior and severity. General Technical Report RMRSGTR-120. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 43 p.
[7] Whelan, R. J. (1995). The ecology of fire. Cambridge University Press, Cambridge, UK.
[88] Finney 2001.

may create relatively fire resilient stand conditions. This may include low-productivity sites with little encroachment of small trees (e.g., dry southerly aspects) and relatively open stands that are currently dominated by large conifers. Targeting work in these areas will maximize the area treated and the effectiveness of treatments with available funds and personnel, and thereby provide the greatest opportunity to quickly reduce fuels and restore ecosystem function at larger spatial scales.

TREE-MORTALITY AND OTHER STRUCTURAL CHANGES RESULTING FROM FIRE USE

The EIS must describe tree mortality and other structural changes resulting from restoration treatments and from fire management following treatments on an ongoing basis. That is, the forest structure resulting from thinning, or the forest structure today in areas that will go unthinned, will change over time by virtue of fire effects. The EIS needs to characterize those ongoing changes and incorporate them into forest modeling. Losses of canopy, large trees, small trees and resulting recruitment of logs and snags will affect long-term forest dynamics, stand development and wildlife habitat suitability. We urge the Forest Service to exhibit caution in so doing: Post-treatment large tree mortality have exceeded planning targets at several restoration sites in northern Arizona.

THE FOREST SERVICE MUST PROTECT MEXICAN SPOTTED OWL (MSO) HABITAT AND VIABILITY WITHIN THE PROJECT AREA

Due to the scale of 4FRI, the Forest Service's actions will cause great changes to the forest during a short timeframe. Decisions made under this plan can have rapid and long-term consequences. Unfortunately, the Forest Service will not have a chance to incorporate lessons learned during implementation of the first 4FRI EIS and Record of Decision (ROD) into this Rim Country EIS. Because of this, the Forest Service risks incidental "take" of MSO as this project proceeds.

We are very concerned about the implementation of new management approaches for MSO, and that is one of the points on record as part of an unresolved appeal against the 2015 revised Apache-Sitgreaves National Forests Land and Resource Management Plan, which we filed in partnership with the Center for Biological Diversity, Grand Canyon Wildlands Council, Western Watersheds Project, and White Mountain Conservation League (Letter from Center for Biological Diversity et al. to USDA Forest Service dated December 24, 2015, p.21).

The Forest Service must disclose all sources of uncertainty about the impact to MSO from its actions related to this project, and detail how it will reduce uncertainty and learn from its actions. The Forest Service should act conservatively to protect MSO habitat and consider all cautions identified in the revised Recovery Plan for Mexican spotted owl (USDI 2012).

The Forest Service is proposing to cut trees up to 17.9 inches d.b.h. within MSO Protected Activity Centers (PACs). Since 1996, the Forest Service has only removed trees up to 9 inches in PACs, and there is not enough monitoring data to know how MSO are responding to this new treatment, which allows trees of double the size previously allowed to be removed. The Forest Service must report on how they will detect and respond to negative impacts on this threatened species' population.

According to a report prepared for the 4FRI team, median canopy cover for Mexican spotted owls foraging and roosting in mixed conifer forests is greater than 60 percent. Note, "75% of stands used for roosting had canopy cover >60%."[9]. The

[9] Ganey, J.L., J.P. Ward, and D.W. Willey. 2011. Status and ecology of Mexican spotted owls in the Upper Gila Mountains Recovery Unity, Arizona and New Mexico. USDA Rocky Mountain Research Station General Technical Report RMRS-GTR-256WWW., figure 3.

Upper Gila Mountains Recovery Unit is an important unit for MSO populations, where management decisions can affect MSOs outside the Recovery Unit[10]. Further:

> "Current data indicate that owls within the UGM RU are most common in mixed-conifer and ponderosa pine–Gambel oak stands with high basal area and canopy cover. These stands frequently have a prominent hardwood component and numerous large trees and snags. Most are uneven-aged, with variable age-and size-classes of trees and snags and considerable volumes of down logs. These are not the kinds of stand structures that forest managers typically try to create in restoration activities in ponderosa pine and mixed-conifer forests that evolved with relatively frequent fire (for example, Cooper 1960, Dieterich 1983, Covington and Moore 1994, Fulé and others 1997, 2002, 2003, 2004, 2009, Cocke and others 2005, Kaufmann and others 2007; see also Beier and Maschinski 2003). The conditions typical of owl nesting and roosting habitat therefore are frequently viewed as "unsustainable" and unnatural in these systems (Johnson 1994). How then did Mexican spotted owls, which apparently occurred historically in these forest types (for example, Ligon 1926, Steele 1927, Bailey 1928, Huey 1930), come to specialize on these types of forest stands (for example, Hutto and others 2008)? Were such stands (or perhaps patches smaller than stands) present historically in these landscapes, for example in fire refugia (Camp and others 1997) such as north-facing slopes or rocky canyon slopes? If so, is there a minimum size to suitable patches for nesting and/or roosting owls? Or were spotted owls able to exist and persist in stands with lower basal area, canopy cover, and fuel loads?… **The problem is that we do not know where potential thresholds may lie, or how far we can reduce stand conditions before those stands no longer provide habitat for spotted owls.**"[11] (bold emphasis added)

In light of the fact that thresholds for Mexican spotted owl-occupied stand density have not been determined, the Forest Service should not risk destroying the habitat for this threatened species. The Forest Service should have a strong monitoring plan in place with clearly defined thresholds, trigger points for action, and a contingency plan in case those trigger points are met. The Forest Service must create a monitoring plan for MSO that includes a sufficient number of control and treatment sites to generate statistical power and usable data. The Forest Service should not construct roads within PACs.

THE FOREST SERVICE MUST PROTECT NORTHERN GOSHAWK AND CANOPY-DEPENDENT SPECIES

We are also concerned about the implementation of new management approaches for the sensitive northern goshawk, which is another of the points on record as part of an unresolved appeal against the 2015 revised Apache-Sitgreaves National Forests Land and Resource Management Plan, which we filed in partnership with the Center for Biological Diversity, Grand Canyon Wildlands Council, Western Watersheds Project, and White Mountain Conservation League (Letter from Center for Biological Diversity et al. to USDA Forest Service dated December 24, 2015, pp. 21-25). We incorporate our concerns about northern goshawk by reference to the letter from Center for Biological Diversity et al. to USDA Forest Service dated December 24, 2015, pp. 21-25, and it is attached with our email.

According to the 1996 Record of Decision for the northern goshawk plan amendments, which set forth the mandatory standards and guidelines for ecosystem management within Northern goshawk habitats, "it is important to maintain a diversity of cover types and vegetation structural stages across landscapes to sustain healthy wildlife populations and communities,"[12] and the Forest Service should, "Sustain a mosaic of vegetation densities (overstory

[10] Ganey et al. 2011.
[11] Ganey et al. 2011, pp. 81-82.
[12] USDA 1995. *Final Environmental Impact Statement for Amendment of Forest Plans*. Southwestern Region: Albuquerque, NM.

and understory), age classes and species composition across the landscape. Provide foods and cover for goshawk prey."[13] The Forest Service should not implement a 'once size fits all' approach to treating forests, but instead should leave a mix of densities and cover types, including patches with high density. Later seral stages should be protected intact where possible. Dense understory habitats and coarse woody debris, which are important to goshawk prey species, should also be kept intact or enhanced where possible. Old growth patches with interlocking tree crowns should remain.

Appendix C to the 1996 Record of Decision for the northern goshawk plan amendments set forth mandatory standards and guidelines for ecosystem management within Northern goshawk habitats, including, but not limited to the following. We suggest adhering to these policies rather than experimentally applying new management protocols across a large part of the landscape, with unforeseen outcomes:

(1) The Forest Service must survey the management analysis area prior to any habitat modifying activities, including a ½ mile beyond the proposed project boundary. The Forest Service must use the R3 survey protocol in order to get complete coverage of the management analysis area, and must complete at least one year of surveys.

(2) The Forest Service must establish and delineate on a map, a post-fledgling family area that includes 6 nesting areas per pair of nesting goshawks for known nest sites, old nest sites, areas where there is historic data of past nest sites, and where there have been repeated sightings. A post-fledgling family area (PFA) must be approximately 600 acres in size, and must include the nest sites and habitat most likely to be used by the fledglings during their early development. The 6 identified nest sites should each be approximately 30 acres in size, requiring a minimum total of 180 acres of nest areas within each PFA.

(3) The Forest Service must manage for uneven-age stand conditions for live trees and retain live reserve trees, snags, downed logs, and woody debris levels;

(4) The Forest Service must manage for old age trees such that as much old forest structure as possible is sustained over time across the landscape;

(5) The Forest Service must sustain a mosaic of vegetation densities, age classes and species composition across the landscape;

(6) The Forest Service must provide foods and cover for goshawk prey;

(7) The Forest Service must limit human activity in nesting areas and near PFAs during the breeding season, which extends from March 1 to September 30;

(8) The Forest Service must manage the ground surface layer to maintain satisfactory soil conditions i.e., minimize soil compaction and maintain hydrologic and nutrient cycles;

(9) The required habitat structures, such as tree size, snags, dead and down material, etc., are to be evaluated at (a) the ecosystem management area level, (b) the mid-scale such as drainage, *and* (c) the small scale of site.

(10) For areas outside of PFAs, the required distribution of vegetation structural stages is 10% VSS1, 10% VSS2, 20% VSS3, 20% VSS4, 20% VSS5, and 20% VSS6. (Actual percentages may vary + or – up to 3%).

(11) Snags are to be 18 inches or larger dbh and 30 feet or larger in height, downed logs are to be 12 inches in diameter and at least 8 feet long, and woody debris must be 3 inches or larger on the forest floor.

(12) For areas outside PFAs, canopy cover for Ponderosa pine forest is to average 40+% for VSS4, 5, and 6.

October, pp. 28-29.

[13] USDA 1996. *Record of Decision for Amendment of Forest Plans in Arizona and New Mexico*. Southwestern Region: Albuquerque, NM. May. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_021447.pdf

(13) Within PFAs, the canopy cover for Ponderosa pine forest is to average 50+% for VSS4, 5, and 6.

(14) Within nesting areas, the area must contain only mature to old forest (VSS5 and 6) having a canopy cover between 50-70% and with mid-aged VSS6 trees 200-300 years old.

(15) Road densities are to be managed at the lowest level possible, and where timber harvesting is prescribed to achieve desired forest conditions, the Forest Service is to use small, skid trails in lieu of roads.

RESTORATION OF SPRINGS AND STREAMS

We support the effort to improve the condition and function of streams and springs throughout the project area by reducing road density, improving road crossings, maintaining natural flow regimes, and providing habitat connectivity. (PA p. 5) Because of the high density of streams and wet meadows in the project area, efforts to protect soils, reduce erosion and sedimentation, and prevent noxious weed introductions are extremely important. A thorough scientific inventory of the springs within the project area has never been completed, and as part of this project, the Forest Service should document the location, condition, and type of all springs encountered during treatment. The Forest Service should work with university or US Geological Survey scientists to create a spring database (or augment an existing database) that will be useful into the future.

THE FOREST SERVICE MUST PROTECT ECOTONES AND DIVERSE HABITAT TYPES

According to the PA, "The Rim Country Project includes extensive areas where the ponderosa pine and mixed conifer cover types interface with the pinyon-juniper and oak woodland types. Because of this close association, some facilitative operations may be needed in these other, non-target cover types (such as pinyon-juniper) to support, increase the safety and effectiveness of, and minimize surface disturbance of treatments to restore the frequent-fire forest structure in the target cover types (ponderosa pine types)."

Pinyon pines in particular provide important wildlife habitat and cultural values, grow slowly, and are susceptible to drought[14][15][16][17]. These slow growing trees need to be protected, but there is no standard for prioritizing their retention on the landscape, and measurements applied to other trees such as diameter at breast height are not as useful for determining whether pinyon and juniper are old growth or newly established.

Pinyon-juniper woodlands support high avian abundance and diversity, with many obligate and semi-obligate species, and with a low level of avian community similarity to other forest habitats[18]. Sieg (1991)[19]

[14] Whitham, T.G., M.P. Young, G.D. Martinsen, C.A. Gehring, J.A. Schweitzer, G.M. Wimp, D.G. Fischer, J.K. Bailey, and R.L. Lindroth. 2003. Community and ecosystem genetics: a consequence of the extended phenotype. *Ecology* 84:1171–1178.

[15] Mueller, R.C., C.M. Scudder, M.E. Porter, R.T. Trotter, C.A. Gehring, and T.G. Whitham. 2005. Differential tree mortality in response to severe drought: evidence for long-term vegetation shifts. Journal of Ecology, 93: 1085–1093. doi: 10.1111/j.1365-2745.2005.01042.x

[16] Breshears, D.D., N.S. Cobb, P.M. Rich, K.P. Price, C.D. Allen, R.G. Balice, W.H. Romme, J.H. Kastens, M.L. Floyd, J. Belnap, J.J. Anderson, O.B. Myers, and C.W. Meyer. 2005. Regional vegetation die-off in response to global-change type drought. Proceedings National Academy of Science USA 102: 15144-15148.

[17] Breshears, D.D., O.B. Myers, C.W. Meyer, F.J. Barnes, C.B.Zou, C.D. Allen, N.G. McDowell, and W.T. Pockman. 2009. Tree die-off in response to global change-type drought: mortality insights from a decade of plant water potential measurements. *Frontiers in Ecology and Environment* 7:185-189.

[18] USDA. 1999. Forest Service Proceedings RMRS-P-9. Paulin, K.M., J.J. Cook, and S.R. Dewey. Pinyon-juniper woodlands as sources of avian diversity.

[19] Sieg, Carolyn H. 1991. Rocky Mountain juniper woodlands: yearround avian habitat. Research paper RM-296. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 7 p.

found higher bird abundance in pinyon-juniper woodlands in Utah during every season than were found in adjacent grasslands. An estimated 1,000 species are associated with pinyon pines in the southwest[20], and pinyon pines hold cultural significance (i.e., pine nut gathering). Slow-growing pinyons are extremely drought sensitive, unlike their juniper counterparts[2122]. Within the last 15 years, pinyon mortality has occurred throughout the southwest, exceeding 90% in some places[23]. Therefore, even though the two trees often coexist, pinyon and juniper may require separate management strategies to maintain biodiversity. After the massive die-offs of pinyon pine that have occurred over the last 15 years[24], we should not gratuitously remove them from the landscape. Pinyon pine should not be intentionally removed from the landscape when habitat restoration is a project goal.

No tree species should be unilaterally removed to create homogenous ponderosa pine stands. Ecotones can be areas of higher biodiversity, novel genotypes and adaptive variations[2526] and therefore may provide refugia for species in a changing climate. They can also be places of rapid landscape response to climate, and a diverse forest will be more resilient than a monoculture[27].

Also, the Forest Service should acknowledge the role of grazing in juniper expansion. On page 8 of the PA, the Forest Service reports:

> In the meadows and grasslands of the Rim Country project area, conifers and junipers have encroached into these once open grassland habitats, decreasing the size and function of landscapes that were historically grasslands. As tree canopy increases, understory productivity decreases. The grasslands have impaired soil conditions due to inadequate protective ground cover, compacted soil surfaces, and encroaching pines and junipers. In many meadows, vegetative ground cover is low, hydrologic soil function is reduced from compaction, groundwater levels have dropped below root zones due to gully formation, and encroaching upland tree species are competing with desired species. (PA, p. 8)

The Forest Service must disclose the ways that livestock grazing led to these changes in soil compaction, ground cover, and hydrologic function.

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[20] Whitham, T.G., M.P. Young, G.D. Martinsen, C.A. Gehring, J.A. Schweitzer, G.M. Wimp, D.G. Fischer, J.K. Bailey, and R.L. Lindroth. 2003. Community and ecosystem genetics: a consequence of the extended phenotype. Ecology 84:1171–1178.

[21] Mueller, R.C., C.M. Scudder, M.E. Porter, R.T. Trotter, C.A. Gehring, and T.G. Whitham. 2005. Differential tree mortality in response to severe drought: evidence for long-term vegetation shifts. Journal of Ecology, 93: 1085–1093. doi: 10.1111/j.1365-2745.2005.01042.x

[22] Breshears, D.D., O.B. Myers, C.W. Meyer, F.J. Barnes, C.B.Zou, C.D. Allen, N.G. McDowell, and W.T. Pockman. 2009. Tree die-off in response to global change-type drought: mortality insights from a decade of plant water potential measurements. *Frontiers in Ecology and Environment* 7:185-189.

[23] Breshears, D.D., N.S. Cobb, P.M. Rich, K.P. Price, C.D. Allen, R.G. Balice, W.H. Romme, J.H. Kastens, M.L. Floyd, J. Belnap, J.J. Anderson, O.B. Myers, and C.W. Meyer. 2005. Regional vegetation die-off in response to global-change type drought. Proceedings National Academy of Science USA 102: 15144-15148.

[24] Breshears, D.D., N.S. Cobb, P.M. Rich, K.P. Price, C.D. Allen, R.G. Balice, W.H. Romme, J.H. Kastens, M.L. Floyd, J. Belnap, J.J. Anderson, O.B. Myers, and C.W. Meyer. 2005. Regional vegetation die-off in response to global-change type drought. Proceedings National Academy of Science USA 102: 15144-15148.

[25] Smith, T.B., S. Kark, C.J. Schneider, and C. Moritz. 2001. Biodiversity hotspots and beyond: the need for preserving environmental transitions. Trends in Ecology and Evolution 16. *Available at* https://www.researchgate.net/publication/280780689_Biodiversity_hotspots_and_beyond_The_need_for_preserving_environmental_transitions_1?el=1_x_8&enrichId=rgreq-8bc4e930561bd09e72eb53554bf79f5c-XXX&enrichSource=Y292ZXJQYWdlOzY3OTEzNDc7QVM6OTk3MDM0NDIxMTY2MjBAMTQwMDc4MjU2MTg3OA==, *accessed 8/10/16.*

[26] Lightfoot, D.C., S.L. Brantley, and C.D. Allen. 2008. Geographic patterns of ground-dwelling arthropods across an ecoregional transition in the North American Southwest. Western North American Naturalist 68:83-102.

[27] Allen, C.D., and D.D. Breshears. 1998. Drought-induced shift of a forest-woodland ecotone: rapid landscape response to climate variation. Proceedings of the National Academy of Sciences 95:14839-14842.

"REGENERATION" CUTS SHOULD NOT BE USED TO ENHANCE PONDEROSA SEEDLING RECRUITMENT IN NON-PONDEROSA DOMINATED FOREST TYPES

We support the restoration of a more natural forest structure that includes fine-scale openings (generally 0.05 to 1.0 acres) interspersing groups of trees. We do not support the use of "regeneration" gaps cut into mixed conifer types to create openings with the intention of drying out the forest floor and recruiting ponderosa pine seedlings. The Forest Service should focus on creating the next generation of old growth and the goal of these cuts runs counter to the goal of reducing the excess of small trees from the forest. Large trees should not be cut to create regeneration openings.

We agree that prescribed fire should be the preferred method for reducing tree density within ecotones and mixed forest types. (PA p. 4)

ROAD DENSITIES SHOULD BE KEPT TO A MINIMUM AND LOGGING ROADS SHOULD BE OBLITERATED AFTER USE

Road densities should be kept to the lowest density possible and all roads created for this project should be immediately closed, obliterated, and obscured when they are no longer needed. Small skid trails should be used in lieu of roads wherever possible. Roads should not be built in MSO PACs.

MONITORING

In order to ensure that wildlife is protected and the Forest Service is accountable for its actions, we want to see a carefully crafted and fully-funded monitoring plan. Without monitoring, there is no accountability. Without funding, there will be no monitoring. We are eager to see the final monitoring plan and its funding sources. All monitoring plans should be designed with appropriate statistical power to detect changes across the project area.

FOREST SERVICE MUST ACKNOWLEDGE CUMULATIVE EFFECTS OF 4FRI AND GRAZING

Livestock grazing and fire suppression continue to encourage unnaturally dense stands of small trees, resulting in elevated competition for available sunlight, water and soil nutrients, decreased abundance and diversity of understory grasses and forbs, and increased density of hazardous fuels.

Significant cumulative effects to the environment may result from the proposed action in combination with past, ongoing and foreseeable management activities within and around the project area. The Forest Service is required to take a hard look at such impacts rather than merely list potential causes or mention that some risk may result from a catalogue of activities. The Forest Service is about to engage in the largest forest "restoration" project ever undertaken, and it must address a root cause of the problem.

Livestock grazing may cause significant cumulative effects for several reasons. First, grazing directly contributes to fire hazard by impairing soil productivity and altering plant composition, which indirectly contributes to delayed fire rotations, increased forest density, and reduced forage for herbivorous species. In addition, livestock grazing combined with proposed mechanical thinning and prescribed fire treatments may spread exotic plants and reduce the competitive and reproductive capacities of native species. Once established, exotic species may displace natives, in part, because natives are not adapted to ungulate grazing in combination with fire. Grazing must be considered within the Cumulative Effects of this project.

Historically, grazing reduced understory vegetation and inhibited the spread of low intensity, low severity fire, creating conditions prime for natural regeneration of ponderosa pine. Livestock grazing decreases understory biomass and density, reducing competition with conifer seedlings and also reducing the ability of the understory

to carry low-intensity, low-severity fire, thereby contributing to dense forests with altered species composition[28]. The increase in small tree density has led to the amount of forest acres burned in recent history. Simultaneously, grazing increases the presence of exotic plant species[29]. Livestock also compact soils, decreasing the soils' ability to absorb water and increasing erosion[30].

Restrictions in grazing of livestock after fires, cutting treatments, seeding, plantings, mulching, and aspen treatments may be required as mitigation to reduce impact to forage species. Release from grazing before fire may be required to enable sufficient fuels to accumulate. Post-treatment release from grazing could be required for several years. USDA research has found that excluding cattle from a landscape for five growing seasons "significantly increased: (1) total vegetative cover, (2) native perennial forb cover, (3) grass stature, (4) grass flowering stem density, and (5) the cover of some shrub species and functional groups."[31]. Livestock and wildlife tend to concentrate in seeding treatments, which leads to soil compaction, soil surface disturbance and erosion, and overuse of vegetation.

Frequent grazing has in part facilitated invasion by grazing-tolerant, less palatable weedy species by reducing native perennial grass cover. These exotic weedy species have displaced native perennial grasses in parts of the intermountain west because the native plants are not adapted to frequent and close grazing[32]. Also, many native species are not adapted to frequent ungulate grazing in combination with fire. Grazing is not an effective means of reducing exotic plant cover, and instead can drive non-native plants to compensate and increase growth and reproductive potential in ways that native species cannot[33].

In the cumulative effects section, the Forest Service should specifically:

a) Link tree density to historic grazing and associated removal of understory.
b) Mention interaction of grazing with fire suppression to degrade forests, including old growth forests.
c) Mention reduced competitive and reproductive capacities of native species in grazed areas, and that actions associated with grazing can spread exotic plant seed such as cheatgrass.
d) Acknowledge that grazing and browsing contributes to aspen decline and is detrimental to aspen recruitment and survival.
e) Discuss how grazing impacts springs and riparian areas, and has a negative interaction with off highway vehicle use
f) Explain how future livestock management would differ from the past practices that helped lead to unhealthy forests in the first place
g) Explain how monitoring will detect problems and what changes might be made to grazing

[28] Belsky, A.J., and D.M. Blumenthal. 1997. Effects of livestock grazing on stand dynamics and soils in upland forests of the Interior West. Conservation Biology 11:315-327. *Available at* http://onlinelibrary.wiley.com/doi/10.1046/j.1523-1739.1997.95405.x/abstract, *accessed 8/10/16.*
[29] Bakker, J.D., F. Rudebusch, and M.M. Moore. 2010. Effects of long-term livestock grazing and habitat on understory vegetation. Western North American Naturalist 70:334-344.
[30] Belsky and Blumenthal 1997.
[31] Kerns, B.K., M. Buonopane, W.G. Thies, and C. Niwa. 2011. Reintroducing fire into a ponderosa pine forest with and without cattle grazing: understory vegetation response. Ecosphere 2:1-23. *Available at* https://www.firescience.gov/projects/06-2-1-10/project/06-2-1-10_Kerns_et_al_2011_Ecosphere.pdf, *accessed 8/10/16.*
[32] Belsky and Bluementhal 1997.
[33] Kimball, S. and P.M. Schiffman. 2003. Differing effects of cattle grazing on native and alien plants. Conservation Biology 17:1681-1693. *Available at* https://eplanning.blm.gov/epl-front-office/projects/lup/36511/45862/49563/Western%20Watersheds/Kimball_%26_Schiffman_(2003)_Effects_grazing_native_alien_plants.pdf, *accessed 8/11/16.*

practices in the future, including changes to timing, duration, stocking rates, or availability of pastures

h) Acknowledge that removal of livestock after treatment (fire, cutting, or seeding/planting/mulching) may be necessary for a period of years. Only fire is mentioned as potentially impacting the availability of pastures to livestock, but if forests are returning to an unhealthy state (i.e., reduced understory, dense regeneration, altered fire regimes, noxious weeds) then livestock utilization may have to be altered.

i) Take a strong position suggesting *what* changes to grazing might be necessary to achieve a fully restored forest.

j) Cite the following sources. The science establishing an interaction between grazing, fire, understory health, and pine recruitment is well established and goes back over half a century. The following peer-reviewed literature contributes to the knowledge that cattle grazing can create effects counter to forest restoration efforts: Kerns et al. 2011[34] (which describes USDA research: "understory release from a long history of cattle grazing caused a greater degree of change than the initial reintroduction of fire."), Bakker et al. 2010[35], Kimball and Schiffman 2003[36], Allen et al. 2002[37], Belsky and Blumenthal 1997[38], Cooper 1960[39], Madany and West 1983[40], Savage and Swetnam 1990[41], Arnold 1950[42].

Use the 4FRI project as an opportunity to study the interactions between forest treatments and livestock grazing. The effects of grazing should be monitored as a learning opportunity. As part of the monitoring plan, the following measurements should be taken and analyzed in relation to presence of grazing and/or time since pasture was grazed: soil moisture, woody species regeneration in meadows, woody species regeneration in within-stand openings; understory density and composition, understory ability to carry fire, noxious weeds.

In the affected Environment section for Range in the EIS, the Forest Service should include the actual grazing numbers (annual operating instructions) going back over a period of time. This will help everyone understand what the current state of grazing on the landscape is, and provide a record for future comparisons.

THE FOREST SERVICE SHOULD ACKNOWLEDGE ALL CAUSES OF ASPEN DECLINE

The Forest Service intends to build and maintain "up to 200 miles of protective barriers springs, aspen, Bebb's willows, and big-tooth maples, as needed for restoration." (PA, p. 14). It is true that "Aspen are dying or rapidly declining in the Rim Country project area," (PA p. 8) and the causes of decline include browsing and grazing. Aspen has gradually declined in part due to browsing by livestock and introduced and native wild ungulates. Wolf reintroductions have improved aspen recruitment and survival

[34] Kerns et al. 2011.
[35] Bakker et al. 2010.
[36] Kimball and Schiffman 2003.
[37] Allen, C.D., M. Savage, D.A. Falk, K.F. Suckling, T.W. Swetnam, and T. Schulke. 2002. Ecological restoration of southwestern ponderosa pine ecosystems: a broad perspective. Ecological Applications 12:1418-1433. *Available at* http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1293&context=barkbeetles, *accessed 8/11/16.*
[38] Belsky and Blumenthal 1997.
[39] Cooper, C. F. 1960. Changes in vegetation, structure, and growth of southwestern pine forests since white settlement. Ecological Monographs 30(2): 129-164.
[40] Madany, M. H., and N. E. West. 1983. Livestock grazing-fire regime interactions within montane forests of Zion National Park, Utah. Ecology 64(4): 661-667.
[41] Savage, M. and T. W. Swetnam. 1990. Early 19th-century fire decline following sheep pasturing in a Navajo ponderosa pine forest. Ecology 71(6): 2374-2378.
[42] Arnold, J. F. 1950. Changes in ponderosa pine bunchgrass ranges in northern Arizona resulting from pine regeneration and grazing. Journal of Forestry 48: 118-126.

where elk were the limiting factor[43][44]. When large predators, particularly wolves, were reintroduced to Yellowstone National Park, USA, and Banff National Park, Canada, the wolves brought elk populations to levels that resulted in decreased grazing pressure, allowing aspen populations to rebound[45]. Elk populations consist of larger numbers than historically existed in the project area.

FENCING SHOULD ONLY BE USED WHERE ABSOLUTELY NECESSARY

Fencing is expensive, difficult to maintain, unsightly, and blocks movement of many wildlife species that aren't responsible for overgrazing and overbrowsing on aspen and wetland habitat types. The Forest Service must acknowledge that the lack of – or severely reduced populations of – top predators including wolves exacerbates the problem of overgrazing and overbrowsing on aspen, as does elk overpopulation. Suggested language, approved by stakeholders while developing the Large Tree Retention Strategy for the first 4FRI EIS: "Other factors contributing to gradual aspen decline over the past 140 years include reduced regeneration due to browsing by livestock and introduced and native wild ungulates in the absence of natural predators like wolves."

Fencing should only be used as a last resort to protect values at risk from grazing and browsing. The Forest Service instead should use jackstrawing or move stock tanks to deter grazing and browsing of aspen and riparian habitats. No water sources should be provided within a mile of aspen stands. Instead of providing new constructed waters, the focus should be on restoring and protecting natural water sources such as springs and seeps.

INVASIVE PLANTS

Domestic livestock, as well as logging, prescribed fire, and other practices that disturb soils, can spread alien weedy species in ponderosa forests. Livestock act as vectors for seed travel, disturb the soil, and reduce the competitive and reproductive capacities of native species. Exotic weeds can displace native species, in part, because native grasses are not adapted to frequent and close grazing[46][47]. In some portions of the planning area, although the locations relative to active grazing allotments is not disclosed, aggressive alien weeds such as cheatgrass (*Bromus tectorum*) and spotted knapweed (*Centaurea maculosa*) have displaced native species. The potential for significant cumulative impacts of noxious weed spread in the project area is high because McGlone and others (2009)[48] showed that cheatgrass abundance and distribution increased 90-fold above a pre-treatment baseline as a result of forest treatments similar to the proposed action.

The presence of cheatgrass has important long-term implications for native plant communities. Melgoza and co-workers (1990)[49] studied cheatgrass soil resource acquisition after fire and note its competitive success owing to its ability suppress the water uptake and productivity of native species for extended periods of time. They further note that cheatgrass dominance is enhanced by its high tolerance to grazing (also see Mack 1981[50]).

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[43] Ripple, W.J., and R.L. Beschta. 2007. Restoring Yellowstone's aspen with wolves. *Biological Conservation* 138: 514-19.

[44] Ripple, W.J., and R.L. Beschta. 2011. Trophic cascades in Yellowstone: The first 15 years after wolf reintroduction. *Biological Conservation* 145: 205-13.

[45] Hebblewhite, M., C.A. White, C.G. Nietvelt, J.A. McKenzie, T.E. Hurd, J.M. Fryxell, S.E. Bayley, and P.C. Paquet. 2005. Human activity mediates a trophic cascade caused by wolves. *Ecology* 86: 2135-44.

[46] Mack, R., & Thompson, J. (1982). Evolution in Steppe with Few Large, Hooved Mammals. *The American Naturalist, 119*(6), 757-773. Retrieved from http://www.jstor.org/stable/2460961

[47] Belsky and Blumenthal 1997.

[48] McGlone, C. M., Springer, J. D., & Covington, W. W. (2009). Cheatgrass encroachment on a ponderosa pine forest ecological restoration project in northern Arizona. *Ecological Restoration, 27*(1), 37-46.

[49] Melgoza, G., Nowak, R. S., & Tausch, R. J. (1990). Soil water exploitation after fire: competition between Bromus tectorum (cheatgrass) and two native species. *Oecologia, 83*(1), 7-13.

[50] Mack, R. N. (1981). Invasion of Bromus tectorum L. into western North America: an ecological chronicle. *Agro-ecosystems, 7*(2), 145-165.

Cheatgrass is well adapted to fire and often dominates plant communities after disturbance[51]. Its annual life-form coupled with the abilities to germinate readily over a wide range of moisture and temperature conditions, to quickly establish an extensive root system, and to grow early in the spring contribute to its successful colonization[52]. Some native species also exhibit this trait, but greenhouse and field studies show that cheatgrass effectively competes with seedlings of perennial species[535455]. In addition, cheatgrass successfully competes with the native species that survive fire, despite these plants being well-established adult individuals able to reach deeper levels in the soil[56]. This competitive ability of cheatgrass contributes to its post-fire dominance.

SOILS

The EIS should identify soil types on which mechanical treatments, piling and pile burning should be prohibited owing to vulnerability to soil disturbance. It should also include mandatory procedures for preventing soil erosion during mechanical treatments. We are not at all convinced that best management practices will prevent unacceptably detrimental soil conditions where ground-based log skidding occurs. The EIS should relate slope steepness to soil erosion hazard or soil structure throughout the project area; it should disclose exactly where ground-based skidding and mechanical treatments may and should not occur. The Forest Service should evaluate soil erosion hazard at multiple scales, using watersheds and sub-watersheds to delineate between those scales.

We have seen extensive soil damage occur within the Flagstaff Watershed Protection Project area, resulting from operations occurring during wet and muddy conditions. Every effort should be taken to stop operations during wet conditions to prevent rutting and gullying.

MISTLETOE TREATMENTS

Because this project is intended to improve and restore forest and ecosystem health, structure, functioning, and resilience, and not for timber production, mistletoe treatments are unwarranted and counterproductive, especially if they focus on removing the largest trees as a treatment method. Research repeatedly shows that mistletoe is an important component of healthy forest habitats, and large trees with mistletoe brooms provide essential food and occupancy needs to wildlife.

Worldwide, species in 97 vertebrate families consume mistletoe and species in 50 vertebrate families use mistletoe for nesting; therefore mistletoe can be considered a keystone species in forest ecosystems[57]. Mistletoe brooms provide essential wildlife nesting, foraging, caching, resting, and roosting habitat for sites for Abert squirrel, porcupine, and passerine birds; managers should retain some broomed trees as wildlife habitat[5859]. Bird species richness in southwestern ponderosa pine forest positively correlates with level of dwarf mistletoe, and no bird species appear to have a negative correlation with dwarf mistletoe[60]. Mistletoe provides a

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[51] Young, J. A., Evans, R. A., & Eckert Jr, R. E. (1969). Population dynamics of downy brome. *Weed Science*, 20-26.
[52] Melgoza et al. 1990.
[53] Hull, A. C. (1963). Competition and water requirements of cheatgrass and wheatgrasses in the greenhouse. *Journal of Range Management*, *16*(4), 199-204.
[54] Harris, G. A. (1977). Root phenology as a factor of competition among grass seedlings. *Journal of Range Management*, 172-177.
[55] Harris, G. A., & Wilson, A. M. (1970). Competition for moisture among seedlings of annual and perennial grasses as influenced by root elongation at low temperature. *Ecology*, *51*(3), 530-534.
[56] Melgoza et al. 1990.
[57] Watson, D.M. 2001. Mistletoe – A keystone resource in forests and woodlands worldwide. Annual Review of Ecology, Evolution, and Systematics 32:219-249.
[58] Parks, C.G., E.L. Bull, R.O. Tinnin, J.F. Shepherd, and A.K. Blumton. 1999. Wildlife use of dwarf mistletoe brooms in Douglas-fir in northeast Oregon. Western Journal of Applied Forestry. 14:100-105.
[59] Mathiasen, R.L., G.N. Garnett, and C.L. Chambers. 2004. A Comparison of Wildlife Use in Broomed and Unbroomed Ponderosa Pine Trees in Northern Arizona. Western Journal of Applied Forestry 19:42-46.
[60] Bennetts, R.E., G.C. White, F.G. Hawksworth, and S.E. Severs. 1996. The influence of dwarf mistletoe on bird communities in Colorado ponderosa pine forests. Ecological Applications 6:899-909.

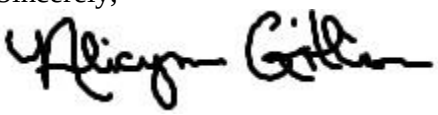
consistent food-based moisture source for squirrels[61]. Deer use was significantly higher in tree clusters with dwarf mistletoe in the Wet Beaver Creek watershed[62]. Mistletoes provide a climatically stable food resource for avian frugivores, even when other tree-based foods are unavailable due to drought. Plants that rely on birds to disperse seeds benefit from mistletoe, which correlates with bird presence through a range of climatic conditions[63]. Red squirrels rely on specific types of mistletoe brooms for nesting in mixed-conifer forests in northern Arizona and New Mexico[64]).

Mistletoe provides inclement weather protection to porcupines in Douglas-fir[65] and pine-juniper forests[66]. Number of branches within a mistletoe broom and tree height correlate with probability of Abert squirrel caching, foraging, and nesting. Taller trees with mistletoe are most important. Forest managers should keep trees $\geq$ 18 m and with brooms having > 7 branches[67].

Besides, since fire causes more scorch and there is higher fire mortality in medium scorch classes with mistletoe, if these areas are expected to burn in the future, mistletoe populations exposed to managed fire will be kept in check without intervention[68].

Thank you for considering our comments on the Rim Country 4FRI PA.

Sincerely,



Alicyn Gitlin
Sierra Club Grand Canyon Chapter

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[61] Pederson, J.; Farentinos, R.; Littlefield, V. 1987. Effects of logging on habitat quality and feeding patterns of Abert squirrels. Western North American Naturalist, North America, 4730 04 1987.

[62] Clary, W.P., and Larson, F.R. 1971. Elk and deer use are related to food sources in Arizona ponderosa pine. USDA Forest Service Research Note RM 202, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

[63] van Ommeren, R.J., T.G. Whitham. 2002. Changes in interactions between juniper and mistletoe mediated by shared avian frugivores: parasitism to potential mutualism. Oecologia 130:281-288.

[64] Hedwall, S.J., C.L. Chambers, and S.S. Rosenstock. 2006. Red squirrel use of dwarf mistletoe-induced witches' brooms in Douglas-fir. Journal of Wildlife Management 70:1142-1147.

[65] Smith, G.W. 1975. An ecological study of the porcupine (*Erethizon dorsatum*) in the Umatilla National Forest, Northeastern Oregon. Washington State University M.S. thesis.

[66] Hoffer, M.C. 1967. Radio-telemetry: a key tool in porcupine control-methods research. Trans. California-Nevada Section of the Wildlife Society.

[67] Garnett, G.N., C.L. Chambers, R.L. Mathiasen. 2006. Use of Witches' Brooms by Abert Squirrels in Ponderosa Pine Forests. Wildlife Society Bulletin 34:467-472.

[68] Harrington, M.G. and F.G. Hawksworth. 1990. Interactions of fire and dwarf mistletoe on mortality of southwestern ponderosa pine. Poster paper presented at the conference, Effects of Fire in Management of Southwestern Natural Resources (Tucson, Al., November 14-17, 1988). U.S. Forest Service publication, Available at http://www.fs.fed.us/rm/pubs_rm/rm_gtr191/rm_gtr191_234_240.pdf, accessed 6/1/12.

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Submitted via e-mail: 4FRI_comments@fs.fed.us

August 11, 2016

Re: 4FRI Rim Country Scoping Comments

Dear Ms. Fredette and the 4FRI Rim Country Planning Team:

Thank you for the opportunity to provide scoping comments on the 4FRI Rim Country Project. WildEarth Guardians is a nonprofit conservation organization with offices in Tucson, Arizona, Santa Fe, New Mexico, and five other states. WildEarth Guardians has more than 160,000 members and activists across the United States and the world. We protect and restore wildlife, wild places, wild rivers, and the health of the American West.

The issues we would recommend you incorporate into your Draft EIS fall under two primary issues: roads and Mexican spotted owl.

Minimum Road System

The Forest Service faces many challenges with its vastly oversized, under-maintained, and unaffordable road system. The impacts from roads to water, fish, wildlife, and ecosystems are tremendous and well documented in scientific literature. Given that the 4FRI Rim Country Project is considering changes to a large number of miles of roads, and given its large geographic scale, this is precisely the type of project where the Forest Service must consider its Travel Analysis Reports (TARs) for the three national forests, and more importantly, it must identify the Minimum Road System (MRS).[1] We urge the Forest Service to carefully evaluate the proposed 4FRI Rim Country Project and its alternatives through this lens. This type of large-scale project is the perfect opportunity to begin making on-the-ground progress towards an economically and environmentally sustainable road network.

We are very encouraged to see this project considering ecosystem restoration on a large scale to address many of the factors that continue to degrade ecosystems. We fully support ecosystem

[1] 36 C.F.R. § 212.5(b)(1) ("For each national forest . . . 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.").

restoration, especially the project components that address water quality and aquatic habitats and improve watersheds and forest resiliency by returning expensive and deteriorating forest roads to the wild.

To address its sustainable and deteriorating road system, the Forest Service promulgated the Roads Rule (referred to as "subpart A") in 2001. 66 Fed. Reg. 3206 (Jan. 12, 2001); 36 C.F.R. part 212, subpart A. The Roads Rule created two important obligations for the agency. One obligation is to identify unneeded roads to prioritize for decommissioning or to be considered for other uses. 36 C.F.R. § 212.5(b)(2). Another obligation is to identify the MRS needed for safe and efficient travel and for the protection, management, and use of National Forest system lands. *Id.* § 212.5(b)(1).[2] The MRS is the road system, determined by the Forest Service, as needed to:

- Meet resource and other management objectives adopted in the relevant land and resource management plan,
- Meet applicable statutory and regulatory requirements,
- Reflect long-term funding expectations, and
- Ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance.

Id. (hereafter, MRS factors). *See also* Memorandum from Leslie Weldon to Regional Foresters *et al.* on Travel Management, Implementation of 36 CFR, Part 212, Subpart A (Mar. 29, 2012) (hereafter, 2012 Weldon Memo). The goal of subpart A is "to maintain an appropriately sized and environmentally sustainable road system that is responsive to ecological, economic, and social concerns."[3]

The Forest Service's Washington Office has issued a series of directive memoranda that outline how the agency expects forests to comply with subpart A.[4] Pursuant to its own regulations and directive memoranda, the Forest Service must consider the valid portions of its TARs and begin to determine the MRS in its analysis of site-specific projects of the appropriate geographic size under NEPA. *See* 2012 Weldon Memo at 2 (directing forests to "analyze the proposed action and alternatives in terms of whether, per 36 CFR 212.5(b)(1), the resulting [road] system is needed"). By analyzing whether a proposed project is consistent with the relevant portions of the TAR, and considering the MRS factors under 36 CFR 212.5(b)(1), the Forest Service expects each forest to identify the MRS for particular forest segments. *Id.* ("The resulting decision [in a site-specific project] identifies the MRS and unneeded roads for each subwatershed or larger scale").

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[2] In promulgating its rules, the Forest Service indicated that "[t]he requirement to identify roads for decommissioning is '[e]qually important' as the overall identification of the minimum road system." *Center for Sierra Nevada v. U.S. Forest Service*, 832 F. Supp. 2d 1138 (E.D. Cal. 2011) (quoting 66 Fed. Reg. at 3207).

[3] *See* 2012 Weldon Memo at 1 ("The national forest road system of the future must continue to provide needed access for recreation and resource management, as well as support watershed restoration and resource protection to sustain healthy ecosystems."). *See also* Memorandum from Joel Holtrop, U.S. Forest Service Washington Office, to Regional Foresters *et al.* (Nov. 10, 2010) (hereafter, 2010 Holtrop Memo) ("Though this process points to a smaller road system than our current one, the national forest road system of the future must provide needed access for recreation and resource management and support watershed restoration and resource protection to sustain healthy ecosystems and ecological connectivity.").

[4] 2010 Holtrop Memo; 2012 Weldon Memo; Memorandum from Leslie Weldon, U.S. Forest Service Washington Office, to Regional Foresters *et al.* (Dec. 17, 2013) (hereafter, 2013 Weldon Memo) (supplementing and reaffirming the 2012 Weldon Memo).

It is now time for the Forest Service to take the next step under subpart A: identify the MRS through site-specific projects subject to NEPA.[5]

This project provides the appropriate geographic scale for the Forest Service to identify the MRS. The Forest Service's Washington Office has directed forests to use the TAR to identify the MRS for proposed actions at the scale of a 6th code subwatershed or larger. 2012 Weldon Memo at 2. *See also* 2012 FAQs (noting that "travel analysis and identification of the MRS could be done at the same scale, if that scale is at the ranger district or unit level."). Plus, consideration of the MRS factors at 36 C.F.R. § 212.5(b)(1) only makes sense on a larger geographic scale.

Pursuant to the plain language of the agency's own regulations and directive memoranda interpreting those regulations, the Forest Service must identify the MRS when analyzing the 4FRI Rim Country Project under NEPA. *See, e.g.*, 2012 Weldon Memo at 2 ("Travel analysis should be used to inform the environmental analysis.")

Subpart A directs the agency to "identify the roads on lands under Forest Service jurisdiction that are no longer needed."[6] It refers to all roads, not just National Forest System roads. The rules define a road as "[a] motor vehicle travelway over 50 inches wide, unless designated and managed as a trail."[7]

The Forest Service must ensure that the actions proposed under the 4FRI Rim Country Project are consistent with subpart A. Here, this project proposes to decommission approximately 230 miles of system and unauthorized roads on the Coconino and Apache-Sitgreaves and 20 miles of unauthorized roads on the Tonto, and improve 150 miles of road, and build 350 miles of temporary roads. The forest must assess these proposed actions in relation to the TARs as well as the factors for an MRS, with the goal of minimizing adverse environmental impacts. Specifically, the decisions to close, decommission, or maintain certain roads should reflect the results from the risks and benefits analysis in the TARs. Routes identified for decommissioning through the TARs or other processes within the project area must be closed, decommissioned, and reclaimed to a stable and more natural condition during the life of the project. To the extent that the final decision in this project differs from what is recommended in the TARs, the Forest Service must provide an explanation for that inconsistency.

The Forest Service should prioritize road decommissioning in this project to enhance landscape connectivity and ecological integrity based on:

- Effectiveness in reducing fragmentation, connecting un-roaded and lightly-roaded areas, and improving stream segments, with a focus on inventoried roadless areas, important watersheds, and other sensitive ecological and conservation areas and corridors;

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[5] *See* 2012 Weldon Memo ("The next step in identification of the MRS is to use the travel analysis report to develop proposed actions to identify the MRS . . . at the scale of a 6th code subwatershed or larger. Proposed actions and alternatives are subject to environmental analysis under NEPA. Travel analysis should be used to inform the environmental analysis.").

[6] 36 C.F.R. § 212.5(b)(2). *See also Center for Sierra Nevada*, 832 F. Supp. 2d at 1155 ("The court agrees that during the Subpart A analysis the Forest Service will need to evaluate all roads, including any roads previously designated as open under subpart B, for decommissioning.").

[7] 36 C.F.R. § 212.1.

- Benefit to species and habitats, including restoring aquatic and terrestrial habitats and habitat connections;
- Addressing impaired or at-risk watersheds;
- Achieving motorized route density standards; and
- Enhancement of quite recreation experiences.

The Forest Service should use the National Best Management Practices for Water Quality Management on National Forest System Lands (Volume 1, April 2012) (*available at* http://www.fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf) to guide road management in determining the MRS. The BMP program "was developed to improve agency performance and accountability in managing water quality consistent with the Federal Clean Water Act (CWA) and State water quality programs" and "[c]urrent Forest Service policy directs compliance with required CWA permits and State regulations and requires the use of BMPs to control nonpoint source pollution to meet applicable water quality standards and other CWA requirements." National Best Management Practices. It directs forests to:

- Design the transportation system to meet long-term land management plan desired conditions, goals, and objectives for access rather than to access individual sites.
- Limit roads to the minimum practicable number, width, and total length consistent with the purpose of specific operations, local topography, geology, and climate to achieve land management plan desired conditions, goals, and objectives for access and water quality management.

Id. at 104.

We urge the Coconino, Apache-Sitgreaves and Tonto National Forests to limit their road networks to those roads that are necessary for access and management, and which can be adequately maintained within agency budgets and capabilities. While it appears the Coconino and Apache-Sitgreaves are taking this responsibility serious, it also appears the Tonto is not. We encourage road decommissioning and reductions in road density to improve watershed conditions and aquatic health in streams, as well as to protect and enhance wildlife habitat and connectivity. The Forest Service should continue working to reduce sediment delivery from roads, improve or remove road crossings, and close or decommission roads that cannot be adequately maintained.

National Forests provide a range of significant environmental and societal benefits, including clean air and water, habitat for myriad wildlife species, and outdoor recreation opportunities for millions of visitors and local residents each year. *See* 66 Fed. Reg. 3244, 3245-47 (Jan. 12, 2001) (Preamble to Roadless Area Conservation Rule describing key ecosystem and other services of roadless National Forest lands). The Forest Service's extensive and decaying road system, however, poses a growing liability to the future ability of the National Forests to provide critical environmental, ecosystem, and recreation services. Collectively, the National Forest System contains over 370,000 miles of roads (not even counting the tens of thousands of additional miles of unclassified, non-system, temporary, and user-created roads). That is nearly eight times the length of the entire U.S. Interstate Highway System. The National Forest road system is primarily a byproduct of the big timber era. The system is often convoluted, unmanageable, and ineffective at meeting 21st century transportation needs. Much of the system is in serious disrepair: as of the end of Fiscal Year 2015, the National Forest

road system had a 3 billion dollar maintenance backlog. USDA, Forest Service, National Forest System Statistics 2015.

Well-sited and maintained roads provide important services to society. But the adverse ecological and environmental impacts associated with the Forest Service's massive and deteriorating road system are well documented. Those adverse impacts are long-term, occur at multiple scales, and often extend far beyond the actual "footprint" of the road. Included in these comments is a 2014 literature review from The Wilderness Society that surveys the extensive and best available scientific literature—including the Forest Service's General Technical Report synthesizing the scientific information on forest roads (Gucinski 2001)—on a wide range of road-related impacts to ecosystem processes and integrity on National Forest lands. *See* The Wilderness Society, *Transportation Infrastructure and Access on National Forests and Grasslands: A Literature Review* (May 2014) (attached as Exhibit A).

Erosion, compaction, and other alterations in forest geomorphology and hydrology associated with roads seriously impair water quality and aquatic species viability. *See* Exhibit B at 2-4. Roads disturb and fragment wildlife habitat, altering species distribution, interfering with critical life functions such as feeding, breeding, and nesting, and resulting in loss of biodiversity. *Id.* at 4-6. Roads facilitate increased human intrusion into sensitive areas, resulting in poaching of rare plants and animals, human-ignited wildfires, introduction of exotic species, and damage to archaeological resources. *Id.* at 6, 9. Roads are also major vectors for spreading weeds.

A robust analysis under NEPA of the forest road system and its environmental and social impacts is especially critical in the context of climate change. As the CEQ's recent draft guidance on addressing climate change in NEPA analyses recognizes, "[c]limate change can increase the vulnerability of a resource, ecosystem, human community, or structure, which would then be more susceptible to climate change and other effects and result in a proposed action's effects being more environmentally damaging." CEQ, *Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts* (Dec. 18, 2014), at 22. The draft CEQ guidance makes clear that "[s]uch considerations are squarely within the realm of NEPA, informing decisions on whether to proceed with and how to design the proposed action so as to minimize impacts on the environment, as well as informing possible adaptation measures to address these impacts, ultimately enabling the selection of smarter, more resilient actions." *Id.*

Climate change intensifies the adverse impacts associated with roads. The Forest Service should consider the risk of increased disturbance when analyzing this proposed project. For example, as the warming climate alters species distribution and forces wildlife migration, landscape connectivity becomes even more critical to species survival and ecosystem resilience. *Id.* at 9-14. *See also* USDA, Forest Service, *National Roadmap for Responding to Climate Change* at 26 (2011), *available at* http://www.fs.fed.us/climatechange/pdf/Roadmapfinal.pdf (recognizing importance of reducing fragmentation and increasing connectivity to facilitate climate change adaptation).

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. Many National Forest roads are poorly located and designed to be temporarily on the landscape, making them particularly vulnerable to these climate alterations. 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. The Forest Service should analyze in detail the impact of climate change on forest roads and forest resources.

The President's Executive Order 13,653 (Nov. 2013) provides direction on "Preparing the United States for the Impacts of Climate Change." The Order recognizes that "[t]he impacts of climate change – including an increase in prolonged periods of excessively high temperatures, more heavy downpours, an increase in wildfires, [and] more severe droughts . . . – are already affecting communities, natural resources, ecosystems, economies, and public health across the Nation," and that "managing th[o]se risks requires deliberate preparation, close cooperation, and coordinated planning . . . to improve climate preparedness and resilience; help safeguard our economy, infrastructure, environment, and natural resources; and provide for the continuity of . . . agency operations, services, and programs." Exec. Order 13,653, § 1. To that end, the Order requires agencies to take various actions aimed at making "watersheds, natural resources, and ecosystems, and the communities and economies that depend on them, more resilient in the face of a changing climate." *Id.* § 3. For example, "recognizing the many benefits the Nation's natural infrastructure provides, agencies shall, where possible, focus on program and policy adjustments that promote the dual goals of greater climate resilience and carbon sequestration." *Id.* Agencies also must develop and implement adaptation plans that "evaluate the most significant climate change related risks to, and vulnerabilities in, agency operations and missions in both the short and long term, and outline actions . . . to manage these risks and vulnerabilities." *Id.* § 5(a).

The Forest Service's 2014 adaptation plan recognizes that the wide range of environmental and societal benefits provided by our national forests "are connected and sustained through the integrity of the ecosystems on these lands." *See* USDA Forest Service, *Climate Change Adaptation Plan*, page 58 (2014). The plan highlights USDA's 2010-2015 Strategic Plan Goal 2 of "[e]nsur[ing] our national forests . . . are conserved, restored, and made more resilient to climate change, while enhancing our water resources." *Id.* at 58. And consistent with section 5(a) of Executive Order 13,653, the plan identifies numerous climate change risks – including increased wildfire, invasive species, increasing water temperatures, extreme weather events, and fluctuating precipitation and temperature – that "pose challenges to sustaining forests and grasslands and the supply of goods and services upon which society depends, such as clean drinking water, forest products, outdoor recreation opportunities, and habitat." *Id.* at 60-64. With respect to transportation infrastructure specifically, the adaptation plan recognizes that, "[w]ith increasing heavy rain events, the extensive road system on NFS lands will require increased maintenance and/or modification of infrastructure (e.g. larger culverts or replacement of culverts with bridges)." *Id.* at 62.

The Forest Service's Climate Change Adaptation Plan points to a number of actions to address the risks of climate change to our forests, and in particular to forest roads. For example, the plan highlights the 2012 Planning Rule as a mechanism to ensure that "National Forest System . . . land management planning policy and procedures include consideration of climate change." *Id.* at 73. The final directives to the planning rule echo the importance of designing plan components "to sustain functional ecosystems based on a future viewpoint" and "to adapt to the effects of climate change." FSH 1909.12, ch. 20, § 23.11. The adaptation plan also points to Forest Service Manual 2020, which provides "Ecological Restoration and Resilience" directives designed "to restore and maintain resilient ecosystems that will have greater capacity to withstand stressors and recover from disturbances, especially those under changing and uncertain environmental conditions, including climate change and extreme weather events." Exhibit D at 73.

For all these reasons, the Forest Service must include the MRS as one of the alternatives in its analysis. Subpart A defines the MRS as that "needed for safe and efficient travel[;] for administration, utilization, and protection of [forest] lands[; and] to meet resource and other management objectives adopted in the relevant . . . plan." 36 C.F.R. § 212.5(b)(1).

Temporary Roads

Under NEPA, the Forest Service has a duty to consider the effects of its proposed action when added to the existing road and trail network. *Wilderness Society v. U.S. Forest Service*, 850 F. Supp. 2d 1144, 1157-58 (D. Idaho 2012) (holding the Forest Service was arbitrary and capricious to conclude that designating 94 miles of user-created routes as non-system routes would have no significant impact).

Here, the agency is proposing to construct an alarming amount – 350 miles – of temporary roads. Temporary roads must be closed within 10 years of completion of a project, per 16 U.S.C. 1608(a), unless the Forest Service re-evaluates the road and determines it to be necessary for the minimum road system. The Forest Service must ensure that the temporary roads will in fact be temporary by including monitoring and enforcement of the projects and 10 years following completion of the projects. The most obvious way to do this would be through a thorough tracking system for the temporary roads. Therefore, we specifically request that this project incorporates a tracking system for the huge volume of temporary roads in this project so that at any time the agency and the public can see which roads were built (including date and mileage), if the roads have been reclaimed, and when they were reclaimed.

During the project and for an additional 10 years after completion of the project, the temporary roads will continue to have very real impacts on the landscape. For example, temporary roads will continue to allow for harassment of wildlife, littering, fires, invasive plant distribution, and negative impacts to aquatic and riparian habitat, as well as the fish that depend on that habitat.

The agency must consider the effects of its proposal to construct temporary roads when combined with the effects of its minimum road system. It must also consider how construction of the proposed temporary roads will detract from the purpose of subpart A of the agency's own rules, to "identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of the National Forest System lands." 36 C.F.R. § 212.5(b). This is especially true if the Forest Service fails to provide assurances that the proposed temporary roads will in fact be closed within 10 years of completion of the relevant project.

We request that the DEIS addresses these effects from so-called temporary roads. To address these concerns regarding temporary roads, we request an alternative that dramatically reduces the temporary road mileage and requires the temporary roads to be limited to the absolute minimum existence, with a default time-frame of 3 months barring exceptional circumstances that call for a longer timeframe. Seasonal restrictions might also be appropriate, especially in important wildlife habitat (*see* MSO section, below).

The Forest Service must seriously analyze temporary roads, as seen in the United States District Court of Montana case, *Native Ecosystems Council v. Krueger,* 946 F.Supp.2d 1060 (2013). In that case, environmental groups challenged a timber sale project posed in the Beaverhead-Deerlodge National

Forest. The thinning and restoration project was set to involve construction of a large number of temporary roads. The Forest Service, after an Environmental Assessment and Wildlife Report were completed, stated that there would be no significant impact on grizzly bears. The Forest Service based this determination on road density statistics that failed to include temporary roads. Because the Forest Service entirely "[failed] to consider an important aspect of the problem", the case was remanded to the Forest Service to perform a new biological assessment to resolve the question of whether the Project "may affect" grizzly bears in the area.

Mexican Spotted Owl

The 4FRI Rim Country Project proposes mechanical thinning and/or prescribed fire on about 68,630 acres of Mexican spotted owl (MSO) protected activity centers (PACs) and over 128,800 acres of recovery habitat. In reference to these proposed actions, we make the following comments and considerations, all based on the 2012 MSO Recovery Plan[8]:

- We would like to see a better distinction between management actions and habitat needs in riparian habitat versus upland habitat. *See id.* at 271.
- "Ongoing climate change will result in unpredictable changes in habitat distribution and quality, and this creates considerable uncertainty in developing strategies to recover the owl. Again, this argues for preserving options where possible, as well as for attempting to account for potential changes in habitat distribution and quality." *Id.* at 250.
- "Given our lack of experience and demonstrated expertise in purposely creating the forest structure used by owls, the recommendations for PACs focus on minimizing management." *Id.* at 257.
- "In many cases, strategic treatments on surrounding and/or adjoining lands will reduce fire risk sufficiently so that, in the short term, treatments are not needed within PACs (Ager et al. 2007, Finney et al. 2007, Ager et al. 2010)." *Id.* at 258.
- "No mechanical or prescribed fire treatments should occur within PACs during the breeding season unless non-breeding is inferred or confirmed that year per the accepted protocol." *Id.* at 261.
- There is reference in the scoping letter to a vague diameter limit within PACs. We request that limit be set at no more than 18 inches dbh, as per the 2102 MSO Recovery Plan at 268.
- Mechanical treatment should be limited to 20% of non-core PAC area within an EMU. *Id.* at 262.
- Seasonal restrictions should be implemented. *Id.*
- A robust monitoring program should be established. *Id.*
- Prescribed fire should be allowed to enter core areas only if it is expected to burn with low fire severity and intensity. *Id.* at 263.
- Within recovery foraging/non-breeding habitats, strive to retain trees greater than 24 inches dbh. *Id.* at 269.

[8] U.S. Fish and Wildlife Service. 2012. Final Recovery Plan for the Mexican Spotted Owl (*Strix occidentalis lucida*), First Revision. U.S. Fish and Wildlife Service. Albuquerque, New Mexico, USA. 413 pp.

Thank you for your consideration of these scoping comments. Please keep me apprised of any developments on the 4FRI Rim Country Project.

Sincerely,

Greg Dyson
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503-730-9242

CENTER for BIOLOGICAL DIVERSITY Because life is good.

Via Web

December 24, 2015

USDA Forest Service
Attn: Appeal Reviewing Officer
1400 Independence Ave., SW
EMC-JAR, Mailstop 1104
Washington, DC 20250
Email: appeals-chief@fs.fed.us

Notice of Appeal
Apache-Sitgreaves National Forests Land and Resource Management Plan

Pursuant to 36 C.F.R. § 219.35 Appendix A, the Center for Biological Diversity, the Grand Canyon Wildlands Council, the Sierra Club Grand Canyon Chapter, Western Watersheds Project, and the White Mountains Conservation League (collectively, "appellants") hereby file this notice of appeal regarding the Record of Decision ("ROD") and Final Environmental Impact Statement ("FEIS") for the Apache-Sitgreaves National Forests Land and Resource Management Plan ("Forest Plan") under the "Optional Appeal Procedures Available During the Planning Rule Transition Period." On September 25, 2015, legal notice of the ROD and opportunity to appeal published in *The White Mountain Independent* newspaper, making this notice of appeal timely. Appellants supplied the Forest Service with specific written comment at various stages of the planning process and may appeal.

DECISION DOCUMENT: *Record of Decision for the Apache-Sitgreaves National Forests Land and Resource Management Plan*.

DATE DECISION SIGNED: July 30, 2015.

RESPONSIBLE OFFICIAL: Calvin N. Joyner, Southwestern Regional Forester.

DATE DECISION PUBLISHED: September 25, 2015.

PUBLICATION VENUE: *The White Mountain Independent*, Show Low, Arizona.

LOCATION: The Apache-Sitgreaves National Forests comprise approximately 2.1 million acres in the White Mountains of east-central Arizona. *See* ROD at 1-2 (forest setting).

APPELLANTS

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APPELLANTS' INTERESTS

The Center for Biological Diversity ("Center") is a non-profit public interest organization with offices in Tucson and Flagstaff, Arizona. Its mission is to conserve and recover imperiled fauna and flora and their habitats through science, education, policy and law. The Center has over 50,000 members, many of whom live in Arizona and maintain long-standing interests in management of the Apache-Sitgreaves National Forests. Members of the Center, including the undersigned, regularly use and enjoy, and will continue to use and enjoy the alpine, forest, woodland, shrubland, grassland and riparian environments found in those national forests for observation, research, aesthetic enjoyment and other recreational, scientific and educational activities. Members of the Center also have and shall continue to research, study, observe and

seek protection for at-risk species occurring in their natural habitats on the Apache-Sitgreaves National Forests for scientific, recreational, conservation and aesthetic benefits including appreciation of the existence of a full complement of native biological diversity found in wild places of Arizona. Forest Service violations of law and policy in its revision of the Forest Plan may indirectly or cumulatively cause significant adverse effects to species that are endangered, threatened or sensitive, and may contribute to the degradation of habitats, food resources and populations of species whose viability or recovery the Forest Service is obligated to realize. Effects to the environment that will result from implementation of management direction contained in the forest plan will harm the interests of the Center and its members in the conservation of nature and the recovery of imperiled biota. The Center demonstrated its interests with specific written comment at every opportunity in the plan revision process and may appeal.

The Grand Canyon Wildlands Council ("Council") is a non-profit regional conservation organization consisting of 500 supporters dedicated to protecting and preserving wild nature on the Colorado Plateau. The Council has a long history on involvement with the Apache-Sitgreaves National Forests plan revision process, and consistently advocates protection and restoration of the old growth ponderosa pine ecosystem its full spectrum of native species in natural patterns of abundance and distribution. The Council's supporters and staff routinely visit, and will continue to visit, the Apache-Sitgreaves National Forests in pursuit of their aesthetic, recreational and scientific interest in these forest resources. The Council supplied the Forest Service with specific written comments on this forest plan revision and may appeal.

The Sierra Club is one of the nation's oldest and most influential grassroots organizations in the United States. Its mission is "to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; and to educate and enlist humanity to protect and restore the quality of the natural and human environments." The Sierra Club has more than 2.4 million members and supporters, including 35,000 members and supporters in Arizona as part of the Grand Canyon Chapter. Members of the Sierra Club have long been committed to protecting and enjoying our national forests, including the Apache-Sitgreaves National Forests, through various types of recreation including hiking, backpacking, wildlife viewing, and more. Members of the Sierra Club, including the undersigned, have a substantial interest in continuing to use the Apache-Sitgreaves National Forests, and are adversely affected and aggrieved by Forest Service failure to protect the land and comply with the law in the decision at appeal. The Sierra Club offered specific written comment in the forest plan revision process and may appeal.

Western Watersheds Project is a non-profit conservation organization dedicated to protecting wildlife habitat, soil productivity, range and water quality, riparian areas, and archaeological resources on the public lands of Arizona and the West. It supplied the Forest Service with specific written comment in response to the Draft Environmental Impact Statement for the Forest Plan and may appeal.

The White Mountain Conservation League ("League") is a local, regional and statewide action group with over 250 members dedicated to sustaining and enhancing Arizona's White Mountain ecosystems and communities. League members embrace and encourage sound stewardship of our diverse ecosystems, and recognize their value to our economic vitality and

quality of life. The League communicated its interests to the Forest Service with specific written comment regarding threatened and endangered species, indicator species, riparian habitat, old growth, livestock grazing and wilderness, and may appeal.

REASONS

I. Inadequate plan components to meet minimum management requirements for riparian areas, and failure to identify reasons for change of management approach.

The National Forest Management Act ("NFMA") states that the Secretary of Agriculture "shall … incorporate the standards and guidelines required by this section in plans for units of the National Forest System…" 16 U.S.C. § 1604(c). The 1982 planning regulations implementing the NFMA state, "Plans guide all natural resource management activities and establish management standards and guidelines for the National Forest System. They determine resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management." 36 C.F.R. § 219.1(b) (1982). Forest plans must establish "standards and requirements by which planning and management activities will be monitored and evaluated." *Id*. § 219.5(a)(7) (1982). Standards and guidelines must be "qualitative and quantitative." *Id*. at § 219.1(b)(12) (1982). Additionally, forest plans must define reasons for management practices chosen for each vegetation type and circumstance. *See id*. § 219.15 (1982).

Further, the NFMA implementing regulations establish "minimum specific requirements to be met" in forest management plans, including the Apache-Sitgreaves Forest Plan. 36 C.F.R. § 219.27 (1982). One of the requirements is, "Special attention shall be given to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water," otherwise known as riparian areas. *Id*. § 219.27(e) (1982). In order to establish management practices within riparian areas, the Forest Service must consider "[t]opography, vegetation type, soil, [and] climatic conditions." *Id.* Another requirement of the 1982 Planning Rule is that management prescriptions "preserve and enhance the diversity of plant and animal communities." *Id*. § 219.27(g) (1982). Additionally, the Forest Service must meet "[m]onitoring and evaluation requirements that will provide a basis for periodic determination and evaluation of the effects of management practices." *Id*. § 219.11(d) (1982).

Management direction contained in the prior Forest Plan (USDA 1987a) was not adequate to meet NFMA requirements for riparian areas. *See* USDA (2008b: 52) ("In many cases forest plan objectives for watershed and riparian areas are being met; nevertheless, many watershed and riparian areas still remain in unsatisfactory condition"); *id*. 75 (existing plan direction is not adequate to forestall widespread declines in riparian ecosystem health and aquatic species viability). Riparian habitats in the Apache-Sitgreaves National Forests are severely degraded from past conditions. *See* FEIS at 93 (Table 14 showing riparian vegetation and soil conditions trends "away" from desired conditions); 94 (Table 15 showing 68 percent of riparian areas along streams are "functioning at-risk," and eight percent (8%) are "nonfunctioning"); *id*. (riparian systems "may take decades to reach [properly functioning condition]"); 103 ("Most streams and aquatic and riparian habitats have experienced

considerable degradation and alteration from a variety of human and management related activities; their ability to recovery and improve has been affected, especially as ongoing and new impacts occur"); *also see* USDA (2008b: 75) ("Three species—the Chiricahua leopard frog, the Little Colorado spinedace, and the loach minnow—are currently in danger of being extirpated from the forests").

> Several sensitive species continue to decline on the landscape, such as the longfin dace, Sonora sucker, desert sucker, speckled dace, montane vole, New Mexican meadow jumping mouse, water shrew, northern leopard frog, Arizona toad, narrow-headed gartersnake, Mexican gartersnake, and many invertebrates, especially aquatic invertebrates. All fish species are declining in numbers and populations on the forests and throughout their respective ranges.

USDA (2008b: 75). The revised Forest Plan itself acknowledges the generally degraded condition of riparian areas in the Apache-Sitgreaves National Forests:

> All of the riparian PNVTs, except for the cottonwood-willow riparian forested PNVT, are considered departed from reference conditions. Most of this departure has occurred in response to past grazing and water diversions for agriculture. Changes in watershed conditions have resulted in altered canopy cover, including a loss of mature trees and saplings; a change in vegetation species composition, including a shift toward increasing conifer dominance; and a reduction in the amount and composition of herbaceous vegetation. In addition, riparian tree species are not successfully reproducing in many areas.

Forest Plan at 33. However, the revised Forest Plan contains no new management direction to remedy the situation and assure viability of species associated with riparian areas. The only relevant standards would require preservation of "minimum levels of waterflow that maintain aquatic life," and that water withdrawals from streams prevent "entrapment of fish and aquatic organisms and the spread of parasites or disease." *Id*. 23, 26 (standards). Proposed standards for livestock grazing do not address the degraded condition of riparian areas. *See id*. 97. Water use standards may help to prevent further degradation of stream flow regimes, but would not restore them to proper functioning condition. *See id*. 104. Indeed, no standards apply to management of riparian areas that than what is recited here. That fact is highly significant because the desired conditions, objectives and guidelines in the revised Forest Plan are discretionary and may be ignored in project-level decisions.

Indeed, the revised Forest Plan repeals, deletes and weakens many standards and guidelines that governed management of riparian areas under the 1987 Forest Plan (USDA 1987a). The Center listed those standards and guidelines in comments, and repeats them here because the Forest Service has systematically disregarded the comment:

- Riparian areas will be mapped as separate areas when they are at least 10 acres; otherwise, they will be considered as areas which require special consideration even though they are part of a larger stand. 1987 Forest Plan at 80.

- Implement best management practices to prevent water quality degradation. *Id*. 81.

- Implement improvement action where water quality degradation does occur, except for special cases where temporary or short term degradation is occurring from road crossing construction or similar situations. *Id*.

- Provide adequate drainage to prevent concentrated flow and sediment laden runoff from entering water courses. *Id*.

- Designate stream courses to receive protection during projects. Those streams shown on 7.5' quads as a stream course should be considered for designated stream courses. *Id*.

- Roads will be located away from stream bottoms to minimize sediment delivery to the streamcourse whenever possible. *Id*.

- Maintain suitable filter/buffer strips between stream courses and disturbed areas and/or road locations to: (a) Maintain suitable stream temperature, and (b) Maintain water quality standards. *Id*. 83.

- Maintain and enhance riparian vegetation along streams to maintain suitable water temperature and other conditions for streamflow. *Id*.

- Effectively close or obliterate roads causing intolerable resource damage (relocate roads as needed). *Id*.

- Limit use of herbicides, insecticides, rodenticides, or other chemical agents as part of management activities to times and places where possible transport to or by surface or groundwater has a low probability of occurrence. Limit the use of certain facilities in floodplains to nonflood seasons or daylight hours only. *Id*.

- Maintain water resource improvement projects where improvement and downstream values will be jeopardized if work is not accomplished. *Id*.

- Control surface uses in mineral operations through plans of operations and permits which provide for: preservation of water quality, protection of watershed values, reforestation or revegetation to attain soil stability and protect threatened, endangered, and sensitive species. *Id*. 88.

- No streambed alteration or removal of material is allowed if it significantly affects riparian-dependent resources, channel morphology, or streambank stability. *Id*. 90.

- Road Maintenance and Management - Erosion control measures will be included in road plans. Construct roads to keep sediment out of riparian and aquatic habitats. Minimize clearing widths and vegetative clearing. *Id*. 104-05.

- Seasonally or permanently close existing roads, prohibit off-road vehicle use or manage use when conflicts occur with wildlife and soil resource objectives. Generally limit closures to local roads in erosive soil areas, riparian areas, or wildlife areas that require specific management practices. *Id*. 106.

- Total road density should average 3.5 miles/sq. mile or less. Open road densities should average 2.0 miles/sq. mile or less. *Id*. 106.

The planning record contains no explanation why the Forest Service abandoned the standards and guidelines of the 1987 Forest Plan listed above. The agency does not revise its Forest Plan on a blank slate. Rather, it has significantly departed from the prior Forest Plan (USDA 1987a) which was in effect for almost three decades based on a Record of Decision that passed through notice, comment and appeal procedures.

The Forest Service is required to explain why it changed course by deleting standards and guidelines of the 1987 Forest Plan, and to give a hard look at effects of those changes to the environment. *See* USDA (2008c: 57) ("Riparian areas with a [functioning at-risk] rating will remain static or show downward trend where activities are not managed to existing forest plan standards …") [emphasis added]. The agency may not defer the required hard look to project-level analysis. *See Citizens for Better Forestry v. U.S. Dept. of Agriculture*, 341 F.3d 961, 973 (9th Cir. 2003) (forest plans have actual, physical effects on the environment). Reducing or repealing environmental standards in a forest plan will result in lesser or no environmental standards at the site-specific level. *Id*. at 975. "[A]n agency changing its course must supply a reasoned analysis." *Motor Vehicles Manufacturers Assoc. v. State Farm*, 463 U.S. 29, 57 (1983); also see *Lands Council v. Martin*¸ 529 F.3d 1219, 1225 (9th Cir. 2008) (agency action is arbitrary and capricious when an agency provides "no explanation at all" for a change in policy).

Evidence in the record plainly shows that failure to implement the 1987 Forest Plan standards and guidelines listed above will result in continued degradation of aquatic ecosystems with attendant – and as yet unquantified – risks to viability of species associated with riparian areas in the Apache-Sitgreaves National Forests. See USDA (2015: 13) ("The current trend of areas functioning at risk will remain static or show downward trend in areas where activities are not managed to existing forest plan standards"). Assertions in the record that revised Forest Plan will "improve" riparian conditions and species viability are not supported by evidence, and therefore are arbitrary, capricious, and in violation of the APA.

In comment dated March 8, 2010, the Center proposed a detailed strategy to maintain and restore degraded riparian areas and aquatic habitats in the Apache-Sitgreaves National Forests, which the Forest Service summarily ignored. The Center stated on page 18 of its comment,

> An ecosystem approach is warranted to stop habitat degradation, maintain habitat and ecosystems that are currently in good condition, and to aid recovery of at-risk aquatic species and their habitat. Although federal land management cannot arrest all sources of fisheries decline and degradation of aquatic habitat, such as artificial stocking and non-native species invasions, the Forest Service can implement standards and guidelines to

> maintain and restore aquatic and riparian habitats on ASNF lands. This approach is both prudent and necessary given the current perilous state of most native fish populations and other aquatic organisms, such as Chiricahua leopard frog.

The Center further noted on page 19 of its comment letter that the Forest Service had previously amended land management plans in the Pacific Northwest Region (Oregon and Washington) to enact an aquatic conservation strategy ("ACS"), and the comment discussed elements of the ACS in detail. On May 30, 2013, the Center reiterated its comment in response to the programmatic draft environmental impact statement ("DEIS") for revision of the Apache-Sitgreaves Forest Plan because "riparian areas present a significant issue for analysis because they are severely degraded on the Apache-Sitgreaves National Forests, and the Forest Service is required by NFMA to ensure viability of species that depend on aquatic habitats, including six fishes and an amphibian listed as threatened or endangered under the ESA." In the latter comment, the Center noted that the Forest Service failed to address the reasonable ACS planning alternative, and explained that the proposed ACS includes discrete land allocations and binding plan components including standards and guidelines for project-level management. Therefore, the ACS as proposed by the Center is entirely distinct from the alternatives advanced by the Forest Service because the latter are based almost exclusively on discretionary plan components that are effectively meaningless in project-level management.

In response to comment on the DEIS, the Forest Service offered ineffective defenses of its new and significantly less rigorous management approach to riparian areas. Indeed, only three responses to comment in the FEIS are remotely on point. The first relevant response states:

> **<u>Concern Statement:</u> The proposed plan acknowledges the generally degraded condition of riparian areas, explain why it proposes no new management direction to restore conditions. (26.60, 162.182)**
>
> **<u>Response</u>:** There are desired conditions, objectives, and guidelines within the "Riparian Areas" section of the plan that provide direction to protect and improve conditions. Specifically, an objective to move 200 to 500 acres per year towards desired riparian condition and removal of a minimum of 2 miles of unauthorized roads and trails can be found in this section.

FEIS at 629. As stated above, plan components in the revised Forest Plan effectively repeal standards and guidelines of the 1987 Forest Plan that presumably met the minimum management requirements for riparian areas under the NFMA, even if they failed to maintain or improve riparian habitats in the national forests or provide for species viability. The response contains no explanation for the change of management approach or its environmental effect. Moreover, the response names two objectives that address improvement of <u>currently degraded</u> riparian areas, and fails to identify components in the revised Forest Plan that would maintain, or "protect," intact and functional riparian habitats from degradation in the future – this fact alone demonstrates failure of the plan to meet the minimum management requirements of the NFMA.

Furthermore, the plan objectives specified by the Forest Service in the response to comment cited above are not binding on the agency, and they <u>may or may not</u> be implemented

depending on agency funding and priorities from year to year. On May 13, 2013, the Center explained in comment on the DEIS that the Forest Plan itself defines "objectives" in a way that does not carry the same force and effect on decision-making as plan standards.[1] *See* FEIS at 46 (Table 4); *also see* Forest Plan at 6-7 ("The objectives represent just some of the expected outcomes or actions required to accomplish movement toward desired conditions. Not every action the Apache-Sitgreaves NFs may initiate is identified in the plan, just the primary ones. Objectives are strongly influenced by recent trends, past experiences and anticipated staffing levels, and short-term budgets"). Given the conditional nature of the plan objectives, the Forest Service's reliance on them in response to comment only highlights the need for explanation of its change in management approach from the 1987 Forest Plan with regard to riparian areas.

In addition, even if the revised plan objectives cited by the Forest Service in response to comment were assured of implementation, the riparian areas that may be affected by action to move "200 to 500 acres per year towards desired riparian condition and removal of a minimum of 2 miles of unauthorized roads and trails," is miniscule compared to the forest-wide need to maintain and improve ecosystem health. Potential natural vegetation types comprising "riparian areas" exist on approximately 47,281 acres on the Apache-Sitgreaves National Forests (USDA 2014: 52, 56, 59, 63) (wetland/cienega (17,900 acres), cottonwood willow riparian (15,876), mixed broadleaf deciduous (8,697), montane willow riparian (4,808)). That includes riparian areas along approximately 2,822 linear miles of lotic streams, and 7,000 acres of lentic wetlands (USDA 2015: 13). Current vegetation and soil conditions are "away" from desired conditions in all riparian area types on the national forests (USDA 2015: 13) (Table 1). Among the lotic stream riparian forests (~40,281 acres), just 24 percent are in "proper functioning condition," 68 percent are "functioning-at-risk," and 8 percent are "non-functioning." *Id*. The revised Forest Plan contains no specific objectives or other plan components that address maintenance or improvement of the 68 percent of lotic stream riparian forests that are "functioning at-risk." That fact is significant because, according to Forest Service analysis, riparian areas attained impaired or degraded conditions due, in part, to past forest management:

> Past effects of grazing, logging and roads, flooding and periods of drought have degraded riparian conditions (US Forest Service 2008). In general, the current trend (actual and apparent) of areas that are properly functioning are expected to remain in that condition based on BMP implementation for road, timber, and grazing management. The current trend of areas functioning at risk will remain static or show downward trend in areas where activities are not managed to existing forest plan standards, or upward, where BMPs and other mitigations are effectively protecting riparian values.

USDA (2015: 13) [emphasis added]. The agency specialist recognized that riparian areas functioning at-risk will trend "downward" if "existing forest plan standards" are not implemented. The revised Forest Plan repeals the standards and guidelines of the 1987 Forest Plan without explanation of need or effect. The specialist holds out the possibility that "BMPs

[1] The NFMA implementing regulations applicable to this plan revision define "objective" as, "A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals." 36 C.F.R. § 219.3 (1982).

and other mitigations" may help with an "upward" trend, but it does not identify any specific management practices or mitigation measures that will produce such a result where current riparian conditions are "functioning at-risk." Desired conditions and objectives in the revised Forest Plan are not themselves BMPs or mitigation measures, and no standards require their application in project-level management in any case. There is simply no mechanism in the revised plan that assures maintenance or improvement of riparian conditions on between 2,000 and 5,000 acres forest-wide over 10 years. *See* FEIS at 629 (citing "objective to move 200 to 500 acres per year towards desired riparian condition and removal of a minimum of 2 miles of unauthorized roads and trails"); *compare* USDA (2015: 13-15) (approximately 27,391 acres, or 1,808 miles of stream, or 68 percent of lotic streams are functioning at risk). More, evidence in the record strongly suggests that failure to implement standards in the 1987 Forest Plan may cause riparian conditions to trend downward, contrary to the need for change.

The second relevant response of the Forest Service to public comment in defense regarding the adequacy of the revised Forest Plan components in meeting minimum management requirements of the NFMA for riparian areas states:

> **Concern Statement: There should be a standard(s) to manage riparian areas for proper functioning condition. (112.43, 127.42)**
>
> **Response:** The Forest Service has chosen not to frame riparian condition as a standard, but it has described many elements of properly functioning condition (PFC) as desired conditions in the plan. (BLM, 1998; BLM, 1999). Chapter 1 of the plan explains that desired conditions and guidelines are not discretionary; projects must either maintain resources in desired conditions or move them toward desired conditions. Any project documentation should explain how the project is consistent with desired conditions and describe any short or negligible long term effects the project may have concerning the maintenance or attainment of any desired condition.

FEIS at 630. The response is notable because it admits that no management standards in the revised Forest Plan address the maintenance or improvement of riparian conditions where they are impaired or degraded by past management. *See* USDA (2015: 13) (riparian conditions will trend downward if "existing forest plan standards" are not implemented). More importantly, the response to comment distorts —to the point of gross misrepresentation—the effect of desired condition statements in the revised Forest Plan on project-level management. *See* FEIS at 630 ("desired conditions and guidelines are not discretionary; projects must either maintain resources in desired conditions or move them toward desired conditions"). The response is factually incorrect and it is contradicted by agency analysis. As the Center explained in DEIS comment on May 13, 2013, the Forest Service itself defines "desired conditions" as, "goals." FEIS at 9.[2] *Also see* Forest Plan at 6 ("Desired conditions may only be achievable over a long timeframe (in some cases, several hundred years […] Desired conditions are aspirations and are not

[2] The NFMA implementing regulations define a "goal" as, "A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed." 36 C.F.R. § 219.3 (1982).

commitments or final decisions approving projects"); *compare id.* 7 (standards are constraints upon project and activity decision making). As explained *infra*, the Forest Service enjoys infinite discretion to interpret the meaning and force of plan components (*e.g.*, desired conditions and objectives) that are cast in suggestive language, and it is only accountable to implement standards framed in mandatory language (*e.g.*, "will" or "shall"). Therefore, the response to comment quoted above errs—and, in fact, misleads—regarding the effect of desired conditions for riparian areas under the revised Forest Plan. Again, no mechanism in the plan assures that riparian conditions will be maintained or improved, contrary to the need for change.

Finally, in response to public comment regarding the adequacy of plan components to meet minimum management requirements for riparian areas under the NFMA, the Forest Service addresses the "aquatic conservation strategy" alternative proposed by the Center as follows:

> **<u>Concern Statement:</u> The Forest Service should adopt an ecosystem-scale aquatic conservation strategy for management of aquatic habitat and at-risk fisheries similar to the one adopted in the Pacific Northwest: (1) Designate "key watersheds" in large drainage basins that offer the highest quality aquatic habitat, (2) establish "riparian reserves" to maintain and restore aquatic habitat, (3) enacts standards and guidelines for management in riparian reserves that require project-level actions to meet objectives related to physical, chemical and biological aspects of aquatic ecosystems, (4) require watershed analysis at the scale of large drainage basins to account for such factors as road density, vegetation cover and ecological processes that contribute to aquatic habitat quality, (5) compel active restoration of aquatic ecosystems in compliance with standards and guidelines for riparian reserves, and (6) prohibits use of site specific mitigation measures or planned restoration activities as a substitute for preventing degradation of existing high-quality aquatic habitat. (26.181, 162.183, 26.18, 26.73, 26.130)**
>
> **<u>Response</u>:** The plan recognizes the need to maintain, improve, and restore watersheds, riparian areas, and aquatic habitat and their associated species on the Apache-Sitgreaves NFs. The primary approaches of the plan to address these issues are through ecosystem restoration of the various PNVTs across the landscape, addressing degraded watershed conditions, and improving conditions within riparian areas and their associated aquatic habitats and species. Numerous objectives, desired conditions, standards, and guidelines have been developed for each of these for improving conditions by reducing historical, ongoing, and potential impacts through restoration activities and moving towards desired conditions through project implementation. Two examples of specific plan decisions (objectives) are:
>
> > *(1) "During the planning period improve the condition class on at least 10 priority 6th level HUC watersheds by removing or mitigating degrading factors."*
> >
> > *(2) "Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species."*

FEIS at 636. Once again, the Forest Service points to objectives, not standards, to support its claim that the revised Forest Plan meets the minimum requirements of the NFMA. The agency itself admits elsewhere in the record that plan objectives are not binding on project-level activities because they are subject to uncertainty regarding agency funding, staffing and other priorities.

Moreover, the last response to comment quoted above contradicts a prior response to comment, also quoted above, stating that the Forest Service elected not to apply binding standards to management of riparian conditions. *See id*. at 630 ("The Forest Service has chosen not to frame riparian condition as a standard, but it has described many elements of properly functioning condition (PFC) as desired conditions in the plan"). All components of the revised Forest Plan affecting management of riparian conditions are discretionary and fail to meet the minimum requirements under the NFMA. *See* 36 C.F.R. § 219.5(a)(7) (1982) (forest plans must establish "standards and requirements by which planning and management activities will be monitored and evaluated"). Additionally, forest plans must define reasons for management practices chosen for each vegetation type and circumstance. *See id*. § 219.15 (1982). In response to comment, the Forest Service merely asserts that it chose specific plan components regarding management of riparian areas; it does not supply any reason for repeal of standards adopted by the 1987 Forest Plan.

The Forest Service failed to advance plan components (*i.e.*, standards) to assure maintenance and improvement of riparian conditions and to constrain project-level management in riparian areas. The revised Forest Plan repeals prior standards and guidelines that presumably met the minimum requirements of the NFMA, insofar as they were approved in a Record of Decision, even if evidence in the record shows that those standards and guidelines did not maintain riparian conditions in the national forests or ensure species viability. The Ninth Circuit has held that an agency decision is arbitrary and capricious under the APA if it "entirely failed to consider an important aspect of [a] problem." *Lands Council v. McNair*, 537 F.3d 981, 987 (9th Cir. 2008 *en banc*). Further, "when an agency provides no explanation at all for a change in policy," its action is arbitrary and capricious. *Lands Council v. Martin*¸ 529 F.3d 1219, 1225 (9th Cir. 2008). Nowhere in the planning record does the Forest Service provide a rationale for eliminating the standards and guidelines affecting riparian areas that were contained in the 1987 Forest Plan. Therefore, the Forest Service's planning decision is arbitrary and capricious, and in violation of the NFMA and the APA.

Changes Sought:

- Withdraw the ROD and remand the EIS for further analysis of management direction and plan components applicable to riparian areas.

- Ensure that the revised Forest Plan contains adequate management direction and plan components to meet minimum management requirements of the NFMA.

II. Failure to consider or adequately respond to reasonable planning alternatives.

The National Environmental Policy Act ("NEPA") requires the Forest Service to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." 42 U.S.C. § 4332(2)(E). Regulations implementing the NEPA obligate the agency to "[r]igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." 40 C.F.R. § 1502.14(a). The alternatives considered are the "heart" of an environmental impact statement. 40 C.F.R. § 1502.14. Even as it considers and analyzes foreseeable impacts of the proposed action, the Forest Service must "[r]igorously explore and objectively evaluate all reasonable alternatives." *Id*. at § 1502.14(a); *see also* 36 C.F.R § 219.12(f) (1982). The EIS must present environmental impacts of the proposed action and reasonable alternatives "in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision-maker and the public." 40 C.F.R. § 1502.14. The NEPA process must "identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment." *Id*. at § 1500.2(f).

Additionally, regulations implementing the NFMA require the Forest Service to consider planning alternatives during the NEPA process that are "distributed between the minimum resource potential and the maximum resource potential to reflect . . . the full range of . . . environmental resource uses and values." 36 C.F.R. § 219.2(f)(1) (1982). The alternatives considered must "facilitate analysis of opportunity costs and of resource use and environmental trade-offs among alternatives." *Id.*

Standards of the APA control review of agency compliance with requirements of the NEPA and the NFMA. *Southeast Alaska Conservation Council v. Fed. Highway Admin.*, 649 F.3d 1050, 1056 (9th Cir. 2011). An agency's decision will be set aside if it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). Review under the "arbitrary and capricious" standard is based on "a consideration of the relevant factors and whether there has been a clear error of judgment." *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 416 (1971).

On March 18, 2010, the Center supplied the Forest Service with specific written comment asking the agency to fully consider and compare impacts of an action alternative that would <u>increase</u> protection of forest resources, including species viability, in response to climate change. On page 18 of that comment, the Center stated,

> An ecosystem approach is warranted to stop habitat degradation, maintain habitat and ecosystems that are currently in good condition, and to aid recovery of at-risk aquatic species and their habitat. Although federal land management cannot arrest all sources of fisheries decline and degradation of aquatic habitat, such as artificial stocking and non-native species invasions, the Forest Service can implement standards and guidelines to

maintain and restore aquatic and riparian habitats on ASNF lands. This approach is both prudent and necessary given the current perilous state of most native fish populations and other aquatic organisms, such as Chiricahua leopard frog.

Further, on page 19 of its March 18, 2010 comment, the Center noted that the Forest Service previously amended land management plans in the Pacific Northwest Region to enact an aquatic conservation strategy ("ACS") that:

- Designates "key watersheds" in large drainage basins that offer the highest quality aquatic habitat, which tend to be free of dams or host large areas of upland terrestrial habitat without roads, where recovery of at-risk aquatic organisms has the greatest likelihood of success. Key watersheds are withdrawn from programmed timber harvest and increases of road density are prohibited.

- Establishes "riparian reserves" as discrete land management areas on lands generally parallel to streams, in proximity to wetlands, and including high-risk landslide terrain where the emphasis is to maintain and restore aquatic habitat.

- Enacts standards and guidelines for management in riparian reserves that require project-level actions to meet objectives related to physical, chemical and biological aspects of aquatic ecosystems.

- Requires watershed analysis at the scale of large drainage basins to account for such factors as road density, vegetation cover and ecological processes that contribute to aquatic habitat quality. Land management in key watersheds and riparian reserves must be preceded and informed by watershed analysis.

- Compels active restoration of aquatic ecosystems in compliance with standards and guidelines for riparian reserves. Examples of restoration activities include road density reduction, removal of developments and grazing from floodplains and wetlands.

- Prohibits use of site-specific mitigation measures or planned restoration activities as a substitute for preventing degradation of existing high-quality aquatic habitat.

On May 13, 2013, the Center commented in response to the DEIS that the Forest Service never considered the reasonable planning alternative to increase protective management standards for aquatic ecosystems in the Apache-Sitgreaves National Forests. On pages 27-28 of that comment letter, the Center reiterated its request for consideration of the ACS alternative noting, "It is the only proposal that meets NFMA requirements for management of riparian areas, and it is consistent with the need for change (Revision Topic 1 – *see* PDEIS at 4-5)." Further, on page 38, the Center cited the Forest Service planning record stating,

> Existing direction is not adequate to forestall widespread declines in riparian ecosystem health and aquatic species viability (USDA 2008b: 52, 75). A no-regrets alternative would implement the aquatic conservation strategy ("ACS") described above to maintain and restore riparian areas and ensure aquatic species viability. On March 18, 2010, the

> Center asked the Forest Service in scoping comments to fully consider and compare impacts of an action alternative that would increase protection of forest resources, including species viability, in response to climate change. The agency has not considered such an alternative, and the range presented in the PDEIS is unreasonably narrow.

Further, on pages 48-49 of its DEIS comment letter, the Center presented reasons why aquatic ecosystems in the Apache-Sitgreaves National Forests require specific planning attention, and it developed the "no-regrets" ACS alternative with reference to planning documents prepared by the Forest Service. On page 49 of that comment, the Center stated that it "strongly recommends that the Forest Service adopt an ecosystem approach to management of aquatic habitats in this forest plan revision. It is clear that existing standards and guidelines and best management practices, even if fully funded, implemented and monitored, are inadequate to meet statutory and regulatory requirements to provide for viable fish and wildlife populations that depend on aquatic habitats."

Center comments on the forest plan revision advanced a consistent and plainly reasonable planning alternative that the Forest Service failed to consider in detail, or to reasonably eliminate from detailed study, in violation of the NEPA, the NFMA and the APA. Responses to comment do not address the detailed and reasonable ACS alternative proposed by the Center in specific written comment at all stages of the planning process. *See* FEIS at 601-608 (alternatives). The alternatives considered but eliminated from study in the FEIS speak for themselves. *See id.* at 16-22. None of them consider an increase of management protection for aquatic ecosystems to address the revision topic of maintaining and improving ecosystem health.

The only remotely relevant alternative that the Forest Service considered but eliminated is cast as, "Alternative to Manage Forests as a Refuge for Fish and Wildlife." That alternative glances upon general concerns stated in public comments, and clearly ignores specific and reasonable policy proposals that were advanced in comment:

> Comments received on the proposed plan and DEIS recommended an alternative that focuses on managing for biological diversity and at-risk species to address scientific uncertainty and controversy regarding climate change impacts and creates a safe harbor and refuge for fish and wildlife, even at the expense of competing multiple use activities, such as livestock grazing, timber production, and motorized recreation.
>
> The alternative was not considered in detail because, by focusing solely on fish and wildlife habitat over other uses, it would not meet the legal direction of the National Forest Management Act or Multiple Use-Sustained Yield Act, which direct that forests will be managed using multiple use, sustained yield principles. Also, in light of changes predicted by current climate models (e.g., increased wildfires, greater vulnerability to invasive species, changes in timing of precipitation), there is a need to reduce vulnerability by maintaining and restoring resilient native ecosystems which would be an outcome in alternatives B, D, C, and A (in order from greatest resilience to least). Management practices that sustain healthy plant and animal communities (e.g., thinning for age class diversity and structure, reclaiming and restoring native grasslands) promote resilience and reduce opportunities for disturbance and damage.

FEIS at 21; *also see id*. 607 (same). The Forest Service set up a straw man and knocked it down claiming that it is contrary to the statutes governing national forest management because it excludes multiple uses. The eliminated alternative does not address the ACS concept or its specific proposals for discrete land allocations and management standards for riparian areas to ensure species viability.

At a different location in the record, the Forest Service makes one attempt to directly address the ACS alternative proposed by the Center. *See* FEIS at 636 (quoted above). That response asserts that components of the revised Forest Plan meet "the need to maintain, improve, and restore watersheds, riparian areas, and aquatic habitat and their associated species…" *Id*. However, it clearly fails to articulate a reason why the ACS alternative itself is not reasonable and did not merit detailed study. The alternative is reasonable and plainly distinguishable from those advanced by the Forest Service because it is based on: (1) a similar planning decision of the same agency at a different location; (2) discrete land allocations including key watersheds and riparian reserve that were not considered in the analysis; and (3) binding standards to constrain project-level management in those land allocations.

If an alternative meets the purpose and need then it is reasonable, and it must be considered in an environmental impact statement. *Native Ecosystems Council*, 428 F.3d at 1247-48 ("In judging whether the Forest Service considered appropriate and reasonable alternatives, [the] focus [is] on the stated purpose"); *also see* 40 C.F.R. § 1502.14(a) ("Rigorously explore and objectively evaluate all reasonable alternatives…"). The Center's proposed ACS alternative is reasonable because it provides a framework for management of riparian areas that would meet the revision topic of maintaining and improving ecosystem health. Moreover, because the Forest Plan does not meet minimum management requirements for riparian habitats, as explained *infra*, the ACS alternative reasonably tests the "minimal resource potential" of aquatic ecosystems for comparison of environmental trade-offs in management planning, per the requirements of the NFMA. The agency's failure to state a reason for eliminating the reasonable alternative from detailed consideration is arbitrary and capricious, and violates the NEPA, the NFMA and the APA.

Change Sought:

- Withdraw the ROD and remand the EIS for detailed study of an action alternative that incorporates an aquatic conservation strategy, as described in the planning record.

III. Failure to ensure viability and recovery of threatened Mexican spotted owl, and failure to explain change of management approach.

The NFMA planning regulations state, "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area." 36 C.F.R. § 219.19 (1982). "For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area." *Id*.

Threatened Mexican spotted owl ("MSO") and its designated critical habitat exist in the Apache-Sitgreaves National Forests. *See* USDI (2015: 28). Management of MSO habitat and populations is centrally important in forest planning in the Southwestern Region (USDA 1995, 1996) and it was the subject of a "jeopardy" biological opinion of the U.S. Fish and Wildlife Service ("FWS") regarding implementation of forest plans, including the Apache-Sitgreaves Forest Plan (USDI 1996).

There is a long history of Forest Service negligence regarding MSO populations and tracking of management effects to the bird and its critical habitat. In October 2008, the Southwestern Regional Office of the Forest Service produced an "Annual Report" to the FWS regarding implementation of forest management plans, including the Apache-Sitgreaves Forest Plan (USDA 1987a), as amended (USDA 1996), and effects to MSO and other species listed as threatened or endangered under the ESA, for the period of June 10, 2005, through June 10, 2007.[3] In it, the Forest Service acknowledged failure to comply with mandatory terms and conditions established in the June 10, 2005, biological opinion and incidental take statement of the FWS that required monitoring of MSO populations and habitat trends (USDI 2005). The Forest Service admitted that it monitored only 20-to-25 percent of protected activity centers ("PAC") for owl occupancy, and it monitored no PAC for owl reproduction or juvenile dispersal. In addition, the Forest Service stated in the Annual Report that it "likely" exceeded the permitted number of incidental takes of MSO resulting in harassment and harm to the species.

On April 17, 2009, the Forest Service asked the FWS to reinitiate consultation regarding effects of continued implementation of forest plans in the Southwestern Region, including the Apache-Sitgreaves Forest Plan, to federally listed species, as required by the ESA. In that letter, the Southwestern Regional Forester stated, "It has now become apparent that the Forest Service will likely soon exceed the amount of take issued for at least one species, the Mexican spotted owl."[4] More, "[I]t has become apparent that the Forest Service is unable to fully implement and

[3] USDA Forest Service. 2008. *Annual Report Covering the Period June 10, 2005 – June 10, 2007, Programmatic Biological Opinion on the Land and Resource Management Plans for the 11 National Forests in the USDA Forest Service Southwestern Region*. Albuquerque, NM. October. 110 pages.

[4] Corbin Newman, Southwestern Regional Forester, letter to Benjamin Tuggle, Director, FWS Southwestern Region, requesting re-initiation of Consultation #2-22-03-F-366. April 17, 2009. 2 pages. Attached for convenience.

comply with the monitoring requirements associated with the Reasonable and Prudent Measures for several species (including MSO) in the [biological opinion]."

According to the Forest Service and the FWS, there is no reliable information about the population status of MSO in the Apache-Sitgreaves National Forests. *See* FEIS at 260; USDI (2015). Moreover, the 2011 Wallow fire affected nearly half of the ~150 PAC in the national forests with unknown results to MSO habitat use, fecundity or population trend. *Id*.; *also see* FEIS at 252 ("All MSO protected and restricted habitat on the forests is considered occupied or potentially occupied, especially after the Wallow Fire because it is unknown how MSO would adjust habitat use after this landscape scale fire").

A. Plan components are inadequate to ensure MSO viability and recovery

Regulations implementing the NFMA state, "Plans guide all natural resource management activities and establish management standards and guidelines for the National Forest System. They determine resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management." 36 C.F.R. § 219.1(b) (1982). Standards and guidelines in forest plans must be "qualitative and quantitative." *Id*. at § 219.1(b)(12) (1982). Plans must establish "standards and requirements by which planning and management activities will be monitored and evaluated." *Id*. § 219.5(a)(7) (1982). Additionally, plans must define reasons for management practices chosen for each vegetation type and circumstance. *See id*. § 219.15 (1982). The Forest Service has a mandatory duty to ensure that "[f]ish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area." *Id*. § 219.19. A "viable" wildlife population is defined by the 1982 Planning Rule as one "which has the estimated numbers and distribution of *reproductive* individuals to insure its continued existence is well distributed in the planning area." *Id*.

Forest planning decisions, such as the Apache-Sitgreaves Forest Plan, directly affect the design and implementation of project-level activities. *See* 36 C.F.R. § 219.3(b) (1982); Forest Service Handbook ("FSH") 1909.12.11.13 and 1909.12.11.16 (W.O. Interim Directive No. 1909.12-2008-2, Nov. 17, 2008). Forest management plans result in actual, physical effects to the environment. *See Citizens for Better Forestry*, 341 F.3d 961, 973 (9th Cir. 2003). Repeal of environmental standards in a forest plan results in lesser or no environmental standards at the site-specific project level. *Id*. at 975. Plans governing subsequent forest management actions are environmentally meaningful decisions and result in effects that must be considered and disclosed under the NEPA. *See Idaho Conservation*, 956 F.2d at 1516; *Salmon River Concerned Citizens v. Robertson*, 32 F.3d 1346, 1355 (9th Cir. 1994); *Resources Ltd. v. Robertson*, 35 F.3d 1300, 1303 (9th Cir. 1994).

The revised Apache-Sitgreaves Forest Plan repeals environmental safeguards affecting management of forest resources including wildlife habitat and populations. It replaces prior standards and guidelines in the 1987 Forest Plan, as amended (USDA 1996), with vaguely worded "desired conditions" and "objectives" that are designed to maximize agency discretion

and evade accountability in project-level management activities. The Forest Service clearly intends that desired conditions will drive site-specific project development and decision-making, even if they have no force or effect. *See* FEIS at 630 ("projects must either maintain resources in desired conditions or move them toward desired conditions"); Forest Plan at 6 ("Desired conditions are aspirations and are not commitments or final decisions approving projects"). Only standards are enforceable in project-level decisions. *See* Forest Plan at 7. Guidelines afford some level of accountability insofar as they require acknowledgement in project decisions, even if the Forest Service is not required to follow guidelines to the letter, and may amend them at any time. *Id*.

"Fine filter" plan decisions, including standards and guidelines, are essential to the continued viability of MSO precisely because its viability is in doubt. *See* FEIS at 116-117 ("For those species at some risk to their viability, additional 'fine filter' plan decisions were developed (e.g., standards and guidelines) to contribute and provide for viability to a low risk"). To this end, the Forest Plan advances guidelines that forest managers "should" consider in project-level decisions affecting MSO and its critical habitat. *See* Forest Plan at 62-63 ("Guidelines for Wildlife and Rare Plants"); FEIS at 286-287 (plan components relevant to MSO habitat). In other words, the Forest Service stakes the viability of MSO in the Apache-Sitgreaves National Forests on discretionary plan components that may be altered at any time with a little paperwork.

Reliance on guidelines in lieu of binding standards is inadequate to ensure MSO viability and recovery because only the Forest Service can interpret the "original intent" of guidelines. *See* Forest Plan at 7 ("Guidelines must be followed, but they may be modified for a specific project if the intent of the guideline is followed and the deviation is addressed in a decision document with supporting rationale"). The Forest Service is "entitled to deference to their interpretation of their own regulations, including Forest Plans." *Hapner v. Tidwell*, 621 F.3d 1239, 1251 (9th Cir. 2010) (internal quotation omitted). All proposed guidelines contain the discretionary word "should," not mandatory terms such as "will" or "shall." *See U.S. v. UPS Customhouse Brokerage, Inc.*, 575 F.3d 1376, 1382 (Fed. Cir. 2009) ("'Will' is a mandatory term, not a discretionary one."); *New England Tank Indus. of N.H., Inc. v. United States*, 861 F.2d 685, 694 (Fed. Cir. 1988) (noting difference between mandatory term "will" and discretionary term "should"). The Ninth Circuit has held that forest plan guidelines are not equivalent to mandatory standards, and that forest plan language stating that old growth forest stands "should" be at least 25 acres in size was "a guide for planning purposes, but does not prohibit counting stands less than 25-acres as old growth." *Lands Council v. McNair* (537 F.3d 981 (9th Cir. 2010 *en banc*). More, in *Ecology Center v. Castaneda*, 574 F.3d 652, 660-61 (9th Cir. 2009), the Ninth Circuit held that the language of guidelines incorporated into a forest plan did not "create a mandatory standard." The guidelines were not enforceable under NFMA because they were cast in "suggestive" language using the word "should," and "merely recommended" a particular practice "when possible." *Id.* at 661 (internal quotation omitted).

Courts have invalidated Forest Service reliance on non-binding and hopeful statements of desired conditions, objectives and guidelines in lieu of enforceable standards that constrain project-level decisions and site-specific management to meet NFMA requirements including species viability. *See, e.g., Citizens for Better Forestry v. U.S. Department of Agriculture*, 632 F.Supp.2d 980-81 (N.D. Cal., 2009). The absence of enforceable standards in the revised Forest

Plan affecting management of MSO habitat contradicts NFMA and its planning regulations. *See* 16 U.S.C. §§ 1604(c) and (g); 36 C.F.R. §§§§ 219.1(b), 219.11(c), 219.12(f)(9)(iii) and 219.15 (1982).

Furthermore, the "Guidelines for Wildlife and Rare Plants" in the revised Forest Plan do not ensure compliance with NFMA requirements to ensure MSO viability or the ESA requirement to avoid jeopardy. The relevant guideline states, "Activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans." Forest Plan at 62 [emphasis added]. The analysis conclusion that the revised plan will ensure MSO viability is arbitrary and capricious, in violation of the APA, for at least four reasons:

(1) It ignores the criteria prescribed by NFMA for viability determinations, including "changes in vegetation type, timber age classes, community composition, rotation age, and year-long suitability of habitat related to mobility of management indicator species." 36 C.F.R. § 219.19(a)(1) (1982). MSO is a management indicator species under the revised Forest Plan. The Forest Service admits uncertainty regarding MSO habitat and population trends on the Apache-Sitgreaves National Forests.

(2) It relies on plan components (*i.e.*, desired conditions, objectives and guidelines) as the sole basis for viability findings, and asserts that projects "would incorporate" applicable recovery plans for federally listed species including MSO. The only relevant proposed guideline would not constrain project-level decisions because guidelines "may be modified for a specific project," and "the forest supervisor may amend the plan at any time."

(3) The MSO Recovery Plan (USDI 2012b) is not enforceable in project-level management decisions, and the Forest Service is well aware of this fact. Merely referencing it in a plan guideline fails to ensure viability. *See* USDI (1996a: 39) (concluding jeopardy to MSO and adverse modification of critical habitat where forest management plans "lack the management direction to prevent the development of forest project-level activities that are likely to adversely affect the Mexican spotted owl," and stating, "The definition of standards and guidelines [in the 1996 forest plan amendment] states that standards and guidelines are, 'the bounds or constraints within which all management activities are to be carried out in achieving forest plan objectives'"); *also see* USDI (1996b: 29) (concluding no jeopardy to MSO and no adverse modification of critical habitat because the Forest Service formally adopted recommendations of the MSO Recovery Plan (USDI 1995) as "standards and guidelines" in forest management plans, including the Apache-Sitgreaves Forest Plan, with a Record of Decision).

(4) The efficacy of management direction, as described in desired conditions and objectives for ponderosa pine and mixed conifer vegetation types, in promoting MSO viability and recovery is uncertain (USDI 2012b). The Forest Service is required to disclose controversy and uncertainty regarding effects to MSO and its critical habitat, but it has not done so here, in violation of the NEPA and APA.

B. Failure to explain change of management approach regarding MSO viability.

The revised Forest Plan repeals or deletes many standards and guidelines for management of MSO critical habitat that previously governed project-level activities under the 1987 Forest Plan, as amended (USDA 1996). Those include "standards and guidelines," as defined by the 1996 Forest Plan Amendments and accepted by the FWS no-jeopardy biological opinion as reasonable and prudent measures, that: (1) required survey of suitable MSO habitat and designation of PAC where owls are found; (2) forbade vegetation treatments in MSO nest cores and allow only limited treatments in PAC; (3) required selection of an equal number of PAC as untreated control areas when treatments are done; (4) prohibited harvest of trees larger than 9-inches diameter in PAC; (5) maintained a portion of "target/threshold" habitat suitable for nesting/roosting behaviors and retain at least 150-170 ft^2/acre basal area and 20 trees/acre larger than 18-inches diameter at breast height; (6) retained trees larger than 24-inches diameter at breast height in suitable nesting/roosting habitat (*i.e.*, "restricted areas"); and (7) required monitoring of MSO habitat and population trends. *See* USDA (1996: 87-91). No such requirements occur in the revised Forest Plan, and no explanation is given why they should not carry forward from the prior plan to the new one.

Repeal of those standards and guidelines affecting MSO habitat is a significant adverse effect of the revised Forest Plan, which will result in an actual physical effect on the environment. *See Citizens for Better Forestry*, 341 F.3d 961, 973 (9th Cir. 2003). Repealing environmental standards in a forest plan results in lesser or no environmental standards at the site-specific level. *Id*. at 975. "[A]n agency changing its course must supply a reasoned analysis." *Motor Vehicles Manufacturers Assoc. v. State Farm*, 463 U.S. 29, 57 (1983). The Center repeatedly commented throughout the planning process that the Forest Service must explain the effect of its change of course by deleting or weakening standards and guidelines.

Changes Sought:

- Withdraw the ROD and remand the EIS for further analysis of management direction and plan components applicable to MSO viability and recovery.

- Ensure that the revised Forest Plan contains adequate management direction and plan components to meet minimum management requirements of the NFMA.

IV. Failure to ensure viability of sensitive northern goshawk and 14 vertebrate prey species.

In 1996, the Forest Service amended forest management plans in the Southwestern Region, including the Apache-Sitgreaves Forest Plan, with standards and guidelines affecting management of habitat for northern goshawk and its 14 vertebrate prey species associated with ponderosa pine forest habitat. Those standards and guidelines, now repealed by the revised Forest Plan at appeal, originated from scientific recommendations of Reynolds and others

(1992). *See* USDA (1995: 24) ("Currently, the best guidelines we have for desired conditions for the distribution of structural stages are the goshawk guidelines. These guidelines recommend for a foraging area a vegetation structural stage distribution of 20% in early, 40% in mid and 40% in late structural stage"). The Forest Service explained in the 1995 FEIS supporting the 1996 Forest Plan Amendments that the "goshawk guidelines" provided for the viability of wildlife species associated with herbaceous and shrub-dominated vegetation communities within a matrix of interspersed forest patches:

> Some species totally depend on one or more of these cover types and respective vegetation structural stages (VSS), while others are casual uses. Regardless of the degree of use, it is important to maintain a diversity of cover types and vegetation structural stages across landscapes to sustain healthy wildlife populations and communities.
>
> This programmatic analysis of the alternatives is primarily based on three broad habitat characteristics that can be evaluated at the programmatic EIS level. These three wildlife habitat characteristics are cover type, vegetation structural stages (VSS), and forage production. Cover type and VSS represent the overstory characteristics of the habitat and forage production represents the understory. The structural stages are grouped by early, mid and late stages (VSS 1&2, VSS 3&4, and VSS 5&6, respectively).

USDA (1995: 28-29). It accounted for environmental effects of implementing forest plans, including the Apache-Sitgreaves Forest Plan, on wildlife species that require "forage production" as an essential habitat element. *See id.* 30 ("The alternatives that would produce the most forage, in decreasing order, are E, A, F, C, D and G. Since understory habitat is important for many of the non-TES wildlife species and there is a need to increase understory habitats"). The Forest Service adopted the goshawk guidelines in a Record of Decision (USDA 1996a) with the following management standard: "Sustain a mosaic of vegetation densities (overstory and understory), age classes and species composition across the landscape. Provide foods and cover for goshawk prey." In support of that standard, the 1996 ROD explicitly incorporated the *Management Recommendations for the Northern Goshawk in the Southwestern United States* (Reynolds et al. 1992), which state on page 15:

> We designed foraging areas consisting of forest conditions that would provide a high overall diversity and abundance of prey […] Sufficient prey habitats are provided so there is food to support goshawks in all seasons, especially during winter when fewer prey are available, and in years when prey populations are low due to factors such as drought or deep snow cover. Because no single species will be abundant enough to support goshawks, especially during the winter, habitats for all 14 prey species are provided.

In goshawk post-fledging areas ("PFA"), "prey habitat should be intermixed with dense hiding cover," and features of prey habitat in PFA include "small (<2 acre) openings in the tree canopy to produce herbaceous and shrubby foods for the herbivorous prey" (Reynolds et al. 1992: 15-16). Those "openings" constitute Vegetation Structural Stage One ("VSS 1"). *See* USDA (1996: 92) (defining VSS 1 as "grass/forb/shrub" habitat). In forage areas outside of PFA, the Forest Service (USDA 1996) applied the recommendations of Reynolds and others (1992) to provide

for a diversity of habitat conditions required by goshawk prey species. *See* Reynolds and others (1992: 16-17) (summarizing "the importance of snags, downed logs, openings, large trees, herbaceous and shrubby understories, and interspersion of VSS to the selected prey species of the goshawk"). Those recommendations and the 1996 ROD amending forest plans, including the Apache-Sitgreaves Forest Plan, assumed that "Openings, and associated herbaceous and shrubby vegetation, provide important food and cover for a number of goshawk prey species." *Id.* at 17. The recommendations also acknowledged that "Interspersion measures the degree of intermixing of vegetation structural stages. Only the red squirrel responds negatively to interspersion of structural stages; its populations reach a maximum in unbroken old forests." *Id.* at 18. Recognizing the importance of "closed forests" to red squirrel and six other goshawk prey species, the management recommendations further state:

> [G]oshawk foraging habitat in the three forest types consists of forests with relatively open understories and large trees. Large trees are required for hunting perches, and openness provides opportunity for detection and capture of prey by goshawks. These forests have small to medium openings (<4 acres) and patches of dense mid-aged forests. Openings are scattered to:
>
> 1) enhance the availability of food and habitat resources of prey that use them, and
> 2) limit the effect of large openings on the distribution and abundance of prey species that use interior forests.

Id. According to the Forest Service, "Alternative G incorporates the needs of the Mexican spotted owl and northern goshawk. The science behind the needs are contained in two publications, 'Mexican Spotted Owl Recovery Plan' and 'Management Recommendations for the Northern Goshawk in the Southwestern United States' (GTR RM-217, 1992)" (USDA 1995: 27). Therefore, the amended forest plans, including the former Apache-Sitgreaves Forest Plan now repealed, incorporated the scientific recommendations discussed above to ensure the viability of goshawk prey species with an assumption that approximately 20 percent of forest lands will consist of relatively open, early-seral vegetation, including grass/forb/shrub openings. The Forest Service stated in NEPA analysis (USDA 1995) that intermixing of six VSS classes, as prescribed by the standards and guidelines adopted in a ROD (USDA 1996), would maintain viable populations of the goshawk and its 14 prey species.

The FEIS supporting the revised Apache-Sitgreaves Forest Plan does not address <u>any</u> of the scientific analysis or management recommendations relevant to viability of northern goshawk or prey species discussed above. It abandons the former standards and guidelines for management of goshawk habitat without explanation of need to change management approach, or environmental effects of the change, in violation of the NEPA and APA. Notably, the FEIS also does not mention that one goshawk prey species, red squirrel, exclusively uses closed-canopy forest habitat, and that six of the 14 vertebrate prey species of goshawk exhibit life histories indicating preferences for "closed forest" habitat (Reynolds et al. 1992: 18).

Indeed, the guidelines for canopy cover in goshawk habitat adopted in the former Forest Plan, now repealed, provided for the viability of "all 14 prey species" associated with "medium/large tree vegetative structural stages," as well as the goshawk:

> PFAs provide the young hawks with cover from predators, and sufficient prey to develop hunting skills and feed themselves in the weeks before juvenile dispersal. Thus, forests in the PFAs should contain overstories with a canopy cover greater than 50% and well-developed understories and habitat attributes (e.g., snags, nest trees, foods) critical in the life-histories of goshawk prey species.

Reynolds et al. (1992: 14). The FEIS ignores relevant science in its assessment of viability for goshawk and its prey, and arbitrarily concludes without evidentiary support that reduced canopy cover will benefit those species, in violation of the APA.

Furthermore, the FEIS does not explain its expectation that additional nesting habitat for the goshawk would result from increases in the abundance and distribution of medium to large trees under the revised planning direction.[5] Even if vegetation treatments successfully reduce tree density and improve growing conditions in ponderosa pine forest, evidence in the planning record strongly indicates that large tree recruitment will be more limiting over time as chronic drought imposes widespread tree mortality (Seager et al. 2007, Seager and Vecchi 2010, Williams et al. 2012). The revised Forest Plan is not specific about proposed treatments in ponderosa pine forest habitat; it merely proposes managed fire, mechanical thinning and "habitat improvement" over 10 years, and fails to consider foreseeable effects of chronic drought to vegetation growth.

In addition, the FEIS fails to explain how repeal of standards and guidelines affecting ponderosa pine habitat would "improve" the viability of northern goshawk or its prey. The Forest Service stated in prior NEPA analysis that the 1987 Forest Plan, as amended by the scientific recommendations of Reynolds and others (1992), discussed above, would maintain viable populations of goshawk and its 14 prey species by interspersing the six VSS classes with approximately 20 percent of ponderosa pine forest consisting of relatively open, early-seral vegetation including grass/forb/shrub openings (USDA 1995). The FEIS contains no explanation why the revised Forest Plan will accomplish viability better than the 1987 Forest Plan, as amended (USDA 1996). In fact, it completely fails to consider effects that may result from reduction of forest habitat for goshawk or prey species that prefer closed-canopy or old forest structure.

By repealing former standards and guidelines that controlled management of goshawk habitat, the revised Forest Plan disregards the scientific basis for ensuring viability of the goshawk and its prey, as established by prior NEPA analysis (USDA 1995). Indeed, the Forest Service based two environmental impact statements on the repealed standards and guidelines (USDA 1995, 2006). In doing so, it established a habitat-proxy relation of ponderosa pine forest structure to goshawk viability, and a proxy-on-proxy relation of goshawk habitat to viability of 14 prey species using the best available science.

[5] The FEIS likewise fails to explain similar statements regarding effects to habitat of Mexican spotted owl resulting from new management direction under the revised Forest Plan.

Notably, the only mention of "mid-aged to old" ponderosa pine forest in the revised Forest Plan isolates it to small groups ("2 to 40 trees per group") generally one acre or less in area. The desired condition for "interlocking or nearly interlocking" tree crowns occurs within small groups of trees surrounded by open "interspaces" consisting of "a native grass/forb/shrub mix" (*i.e.*, early-seral vegetation). The desired condition does not specify whether the ponderosa forest type should be dominated by tree groups or by interspace, or what spatial spread of vegetation stages might be considered appropriate—the 10/10/20/20/20/20 formula of VSS distribution advanced by Reynolds and others (1992) is lost. Further, there is no requirement in the revised Forest Plan for retention of existing old forest, nor is any specific level of canopy cover desired in "mid-aged to old" ponderosa forest. Land managers are invited but not required to consider locating nest areas and family areas with no particular expectation of management within them other than desired conditions that are common to each area, and may not be achieved for decades or centuries. In sum, the revised Forest Plan is a significant retraction of previous standards and guidelines established using the best available science. At minimum, an explanation for such drastic change of management approach is required.

Nowhere in the planning record does the Forest Service provide a rationale for eliminating the standards and guidelines that ensured viability of goshawk and its prey. Therefore, the decision to adopt the revised Forest Plan is arbitrary and capricious and in violation of the NEPA, the NFMA and the APA. Moreover, the lack of binding standards affecting project-level effects to goshawk habitat fails to ensure viability, and thereby violates the NFMA and the APA.

Changes Sought:

- Withdraw the ROD and remand the EIS for further analysis of management direction and plan components applicable to sensitive wildlife species and habitats.

- Ensure that the revised Forest Plan contains adequate management direction and plan components to meet minimum management requirements of the NFMA.

V. Arbitrary and capricious selection of management indicator species.

Regulations implementing the NFMA require the Forest Service to determine "the suitability and potential capability of National Forest System lands for […] providing habitat for management indicator species." 36 C.F.R. § 219.20 (1982); *also see* FEIS at 232 ("NFMA regulations also direct the identification of management indicator species (MIS) to assess how plan alternatives may affect wildlife populations (1982 Planning Rule section 219.19 (a)(1)) and as a monitoring tool upon plan implementation (219.19(a)(6))"); *id*. 260 (MIS "have habitats influenced by forest management and activities. They are selected so that the effects of each alternative on wildlife populations can be estimated").

The revised Forest Plan's identification of MIS: (1) fails to capture the range of potential natural vegetation types ("PNVT") that host threatened and endangered species whose viability is of planning concern; and (2) significantly changes course from the 1987 Forest Plan (USDA 1987a), which designated 17 MIS that better represented the range of habitats found on the Apache-Sitgreaves National Forests.

The revised plan identifies three MIS: Mexican spotted owl, northern goshawk and pronghorn antelope. Together, those species are assumed to indicate management effects on other species associated with dry mixed conifer, wet mixed conifer, ponderosa pine, Great Basin grassland and montane-subalpine grassland PNVT. *See* FEIS at 260-263 (MIS and indicator habitat). Those PNVT comprise 1.16 million acres (~55 percent) of the approximately 2.1 million-acre planning area. *Id*. at 261-262 (Table 74 (MSO) and Table 75 (goshawk)). The MIS identified by the revised Forest Plan are not reasonably likely to indicate management effects to species viability in any <u>other</u> PNVT, including spruce-fir, Madrean pine-oak, piñon-juniper, semi-desert grassland, interior chaparral and riparian habitats that comprise approximately 45 percent of the national forests. *See* FEIS at 145-146 (Tables 22 and 23). Therefore, the revised plan ensures that habitat and population trends for species associated with PNVT where no MIS is designated, including riparian areas, will be unknown to the Forest Service and the public, in violation of the NFMA and the APA.

Furthermore, the revised Forest Plan proposes a change of management direction from the 1987 Forest Plan (USDA 1987a) by scrapping MIS designations of pygmy nuthatch (old growth ponderosa pine), red squirrel (old growth spruce-fir and mixed conifer), Abert squirrel (mid-mature ponderosa pine), hairy woodpecker (primary cavity excavator in mid-mature aspen, mixed conifer, ponderosa pine and riparian), plain titmouse (late seral piñon-juniper), cinnamon teal (wetlands), and other species including yellow-breasted chat, Lincoln's sparrow, Lucy's warbler, turkey and mule deer. *See* USDA (1987b: 69-71); *also see id*. 198 ("Management indicator species [] were used to measure effects of management activities on habitat. Primary factors in selection of MIS's were to indicate the condition of habitat necessary to maintain viable populations of all vertebrates, and to provide species diversity"). The FEIS contains no explanation or reason why those former MIS no longer are important to monitor effects of forest plan decisions on the affected PNVT and associated species assemblages, in violation of the NEPA and APA.

Notably, the revised Forest Plan does not designate any MIS for snag habitat. "Snags are an integral component of the Forest ecosystem and fulfill all or part of the habitat requirements for approximately 35 species of wildlife in the Apache-Sitgreaves" (USDA 1987b: 200). "There exists a direct relationship between the breeding density of secondary cavity nesting species and the number of quality snags in the ecosystem. Lack of suitable nesting cavities is the primary factor limiting [] secondary nesting species." *Id*. 201 (*see* Tables 84 and 85 pasted below). "A minimum of 80 snags per 100 acres is needed to support primary cavity nesters. An average of 221 snags per 100 acres [is] recommended for secondary cavity nesters such as the pygmy nuthatch." *Id*. "Maintaining 60 snags per 100 acres will maintain a 40% population level of primary cavity nesters. However, approximately 200 snags per 100 acres are needed for secondary cavity nesters." *Id*. The Forest Service acknowledges in the present analysis the importance of snags to primary and secondary cavity nesting species. However, the FEIS does

Table 84. Snag Numbers Needed to Maintain Woodpeckers at Designated Levels.

Species	Snags Required/100 Acres to Support Percentage of Population % of Maximum Potential 100	70	40 1/
Yellow Bellied Sapsucker	150	105	60
Hairy Woodpecker	150	155	60
Average	150	130	60

1/ The 40% level is considered the minimum that will support a self-sustaining population.

Table 85. Snag Numbers Needed to Maintain Both Average and Maximum Breeding Densities.

Species	Nesting Pairs/100 Acres at 173 Snags per 100 Acres Average Density	at 288 Snags per 100 acres Maximum Density
Pygmy Nuthatch	28	43

not consider, nor does the revised Forest Plan provide for, viability of snag-dependent species, in contrast to the 1987 Forest Plan (USDA 1987a). There is no explanation for this omission, in violation of the NEPA, the NFMA and the APA.

Furthermore, the failure of the revised Forest Plan to designate MIS for riparian habitat is inexplicable. *See* FEIS at 92 ("Even though they make up less than 3 percent of the forests' land [riparian areas] comprise the most potentially productive and diverse components of forest and range ecosystems. Fish, wildlife, and many plant species depend on riparian areas for their existence"); *also see id*. 93 (Table 14 showing riparian vegetation and soil conditions trends "away" from desired conditions); 94-95 (Table 15 showing most riparian habitats in the national forests are "functioning at risk," or "not properly functioning"); 101 (Table 16 listing native fish species and their occupied habitats); 103 ("Most streams and aquatic and riparian habitats have experienced considerable degradation and alteration from a variety of human and management related activities; their ability to recovery and improve has been affected, especially as ongoing and new impacts occur."); *id*. ("All the native [fish] species have lost much of the population redundancy within and outside the forests."); 107 ("The native fish species and populations

analyzed here (especially federally listed) lack the resiliency to survive environmental disturbances from either natural or anthropogenic actions (e.g., fire and suppression of fire, climate variation, degraded watersheds and aquatic habitat, altered hydrologic conditions, loss of riparian and aquatic habitat, recreation demands, nonnative species introductions, roads). The watersheds and ecosystems these aquatic species and their habitats depend on are also altered and departed from historical conditions; and while most of these impacts have occurred slowly over many decades, the individual and collective impacts still remain"); *also see* USDA (2008b: 75) ("Three species—the Chiricahua leopard frog, the Little Colorado spinedace, and the loach minnow,—are currently in danger of being extirpated from the forests"). In addition,

> Several sensitive species continue to decline on the landscape, such as the longfin dace, Sonora sucker, desert sucker, speckled dace, montane vole, New Mexican meadow jumping mouse, water shrew, northern leopard frog, Arizona toad, narrow-headed gartersnake, Mexican gartersnake, and many invertebrates, especially aquatic invertebrates. All fish species are declining in numbers and populations on the forests and throughout their respective ranges.

USDA (2008b: 75). The revised Forest Plan is "likely to adversely affect," and in some cases incidentally take, six federally-listed fish species and their critical habitat (USDI 2015). Native fishes, amphibians, reptiles and macrointertebrates that rely on riparian areas are ideal candidates for designation as MIS due to the potential ubiquity of aquatic habitat disturbances resulting from planned management activities, yet the revised Forest Plan unreasonably declines to so designate them. More, as noted above, the new plan changes course from the 1987 Forest Plan by omitting hairy woodpecker, cinnamon teal and aquatic macroinvertebrates from the MIS designation as riparian associates, and it does so without explanation. *See* USDA (1987a: 61); (1987b: 70-71).

The absence of reason in the planning record for failing to carry forward prior MIS designations is arbitrary and capricious, and violates the NEPA and the APA. Moreover, failure of the Forest Service to designate MIS for snag and riparian habitats is inexplicable in light of prior NEPA analysis and information in the record, and violates the NFMA and APA.

Changes Sought:

- Withdraw the ROD and remand the EIS for further analysis of MIS selection to include reasons for not selecting species previously determined by the Forest Service to be important indicators of management effects.

VI. Arbitrary and capricious determinations of grazing capability and suitability.

Regulations implementing the NFMA require the Forest Service to determine "the suitability and potential capability of National Forest System lands for producing forage for grazing animals and for providing habitat for management indicator species." 36 C.F.R. §

219.20 (1982). "The present and potential supply of forage for livestock, wild and free-roaming horses and burros, and the capability of these lands to produce suitable food and cover selected wildlife species shall be estimated." *Id*. § 219.20(a). Where the agency identifies lands that are "in less than satisfactory condition," it "shall" plan for their restoration. *Id*. The agency must consider, among other things, "possible conflict or beneficial interactions among livestock, wild free-roaming horses and burros and wild animal populations, and […] direction for rehabilitation of ranges in unsatisfactory condition…" *Id*. § 219.20(b).

Ecological costs of livestock grazing exceed those of any other use of national forest lands in the American Southwest. In this arid region subject to chronic and intensifying drought (Seager et al. 2007, Seager and Vecchi 2010, Williams et al. 2012), livestock grazing is the most widespread cause of species endangerment, lost soil productivity, and degradation of the human environment (Beschta et al. 2012, Fleischner 1994). Grazing destroys vegetation, displaces soil, and consumes enormous quantities of water to the detriment of native species and the ecosystems on which they depend (Belsky et al. 1999, Belsky and Blumenthal 1997). According to the planning record, "Livestock grazing has been identified as one of the primary threats to ecological sustainability for the majority of the vegetation types that occur on the ASNFs; spruce-fir forest is the only exception. Without appropriate range management, environmental conditions will not improve and may even decline" (USDA 2008b: 59).

To inform analysis of grazing capability and suitability, as required by the NFMA, the Center requested in comment on the DEIS that the Forest Service consider and analyze the following criteria for designating lands as <u>unsuitable</u> for grazing:

- High or severe soil erosion hazard identified by Terrestrial Ecosystem Survey.
- Slopes steeper than 30 percent.
- Lands within 200 feet of perennial or intermittent streams or wetlands.
- Occupied and/or critical habitat of threatened or endangered species or species proposed for listing.
- Designated conservation areas for sensitive or management indicator species.
- Occupied locations of endemic species.
- Lands impacted by high-severity fire effects to vegetation or soil.

However, the Forest Service applied only two factors to determine which lands are generally capable of supporting livestock grazing. *See* FEIS at 147 (footnote 22) (capability factors include soil stability and forage productivity). For this purpose, it relied on analysis completed nearly 30 years ago. *See id*. 480 ("The capability of the lands on the Apache-Sitgreaves NFs to produce forage for grazing animals was determined in the 1980s during the first round of forest planning. Landscape scale conditions that determine capability have not changed significantly since the first evaluation"). On the basis of that antiquated capability analysis, the basis of which does not appear in the planning record, all of the action alternatives designate the same 1,901,512 acres in the national forests as suitable for grazing. *See* FEIS at 480 (Table 152).

The grazing capability determination based on old and undisclosed information, and the suitability determination that flowed from it, are arbitrary and capricious, and violate the NEPA,

the NFMA and the APA, for two reasons. First, the planning record demonstrates that range capability diminished over the life of the 1987 Forest Plan:

> The [1987 Forest Plan] EIS identified a maximum permitted use of 219,510 AUMs. In 2008 – the total authorized 200,259 AUMs. Note: A review of forage production and estimated available AUMs was completed in 2000. Based on this data (see attached) the grazing capacity is estimated at 78,984 AUMs. According to the 2000 analysis, the lower level of grazing demonstrates availability of vegetation primarily for the protection of watersheds, soils, and streams (riparian areas), as well as providing for wildlife needs (habitat, hiding cover, fawning cover, and forage).

(USDA 2009: 5). The Forest Service determined in 2009 that range capability was just 36 percent of the maximum use authorized in the Forest Plan (USDA 1987a). That analysis followed a similar one in 2000, when:

> [A] forest plan supplemental monitoring report detailed adjustments to the expected output of livestock grazing from 204,000 animal unit months (AUMs) in the 1987 forest plan to roughly 79,000 AUMs. This adjustment reflected the numerous changes to individual grazing allotments from 1995 to 2000. These changes were based on the following:
>
> - Allowable use levels in the 1987 forest plan were closer to 50 percent of forage production. This factor was reduced in recent AMPs.
> - Allowable use by range condition class reduces the amount of forage committed to livestock grazing.
> - A portion of forage in some allotments is specifically allocated to wild ungulates.
> - More vegetation is committed to achieve watershed protection.
> - Provision for more forage available to wildlife; directly to herbivores and indirectly to predators, such as northern goshawks.
> - Production estimates in the 1987 forest plan included a substantial emphasis on timber harvest with grass seeding to increase forage for wildlife and livestock.
> - Lack of forage production projects such as piñon-juniper treatments with grass seeding.
> - Continued in-growth of forest and woodland canopies which suppress herbaceous species.

USDA (2008b: 53-54). As recently as 2011, range capability was significantly reduced from what was assumed in the prior round of forest planning:

> In 2011, permitted livestock Animal Unit Months (AUMs) totaled 130,000 of which 8,912 were from sheep and the rest was mostly cattle with incidental amounts from work horses and burros. In the same year, authorized livestock AUMS totaled 81,433 before the Wallow Fire disrupted grazing on all or part of 45 grazing allotments. In most years, the numbers of livestock permitted under the term grazing permits is more than what is authorized (actually allowed to graze and billed for by the forests).

Evans (2012: 6). The Forest Service does not explain why it considers range capability determinations from the mid-1980s to have "not changed significantly," nor does it address the significance of newer information that it created and is available in the planning record. This is a clear case of failure to consider an important aspect of the issue, in violation of the APA.

Second, the best available science provided to the Forest Service with public comment demonstrates that the planning assumption that rangeland capability has "not significantly changed" since the mid-1980s is erroneous. Prior estimates of range capability did not account for synergistic effects of livestock grazing and climate change on soil, water, vegetation and fire regime (Beschta et al. 2012). It is unlikely that rangelands in the planning area ever will return to "historical norms" that supported forage production capacity over the past century:

> Despite ample uncertainties in model projections of hydroclimate change, and the continuation of natural climate variability on all timescales, it seems very probable that [South Western North America – "SWNA"] will be drier in the current century than in the one just past. Skillful prediction of the magnitude and timing of this drying will require prediction of the rate of anthropogenic change and prediction of the evolving natural variability for which currently there is scant evidence of any predictability beyond the interannual timescale. Another likely outcome is a continuing decline in winter snowpack and earlier onset of snow melt that will add to the stress on regional water resources.

Seager and Vecchi (2010: 21282). Historically, "interglacial climates in the southwestern US can experience prolonged periods of aridity, lasting centuries to millennia, with profound effects on water availability and ecosystem composition. The risk of prolonged aridity is likely to be heightened by anthropogenic forcing" (Fawcett et al. 2011: 520). Williams and others (2012) noted that while average winter precipitation totals in the Southwest have not been exceptionally low in the recent past, average summer-fall evaporative demand since 2000 is the highest in the past 1,000 years. Forest drought stress over much of the past 13 years, including in 2011 and 2012, matched or exceeded the recorded "megadroughts" of the 13th and 16th centuries. The only other 13-year periods when similar conditions occurred with such frequencies in the past 1,000 years were during the megadroughts themselves. The strongest megadrought occurred during the second half of the 1200s and is believed to have played an important role in the abandonment of ancient Puebloan cultural centers throughout the Southwest. The observed trends in drought stress on forest conditions coincide with strong climate model agreement on anthropogenic greenhouse warming. Model projections indicate that megadrought-level stresses on water availability and vegetation production will be regularly exceeded by the mid-21st century, and even the wettest and coolest years of the late-21st century will be more severe than the driest, warmest years of the past millennium (Williams et al. 2012). The Forest Service does not

account for this information in the FEIS, even though it was repeatedly cited by the public and is available in the planning record.

Drought will continue to impact range capacity and suitability for the duration of the revised Forest Plan (Fawcett et al. 2011, Seager et al. 2007, Seager and Vecchi 2010). It is likely to transform resource availability by stressing water supplies and net productivity, which in turn will produce novel environments (Williams et al. 2012). Water and forage resources already are over-allocated on the Apache-Sitgreaves National Forests, and overutilization of available forage by livestock is common (Evans 2012, USDA 2009). Excessive livestock grazing, even outside of riparian areas, is a significant threat to aquatic species viability (USDA 2008b: 59).

The Forest Service failed to consider foreseeable effects of chronic drought to range capability and suitability, and failed to candidly disclose past instances when livestock grazing has exceeded capability. The Forest Service violated the NEPA, the NFMA and the APA with its clearly outdated, arbitrary and capricious assumptions of range capability and suitability.

Changes Sought:

- Withdraw the ROD and remand the EIS for further analysis of grazing capability and suitability to account for chronic and deepening foreseeable drought conditions affecting forage production, prior withdrawal of forest lands from grazing suitability by site-specific NEPA decisions, and worsening soil and watershed conditions that are caused, in part, by livestock grazing.

- Ensure that the revised Forest Plan contains adequate management direction to restore and rehabilitate forest lands degraded by livestock grazing, as required by the NFMA.

Conclusion

Contact information for each of the appellants is provided on page two of this notice of appeal. Please direct all communication regarding this notice to the undersigned lead appellant, and timely notify all of us regarding developments in your review including an appeal decision.

Sincerely,

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References

Belsky, A.J., A. Matzke and S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. *Journal of Soil and Water Conservation* 54: 419-31.

Belsky, J. and D.M. Blumenthal. 1997. Effects of livestock grazing on stand dynamics in upland forests of the Interior West. *Conservation Biology* 11: 315-27.

Beschta, R.L., D.L. Donahue, D.A. DellaSala, J.J. Rhodes, J.R. Karr, M.H. O'Brien, T.L. Fleischner and C.D. Williams. 2012. Adapting to climate change on western public lands: addressing the ecological effects of domestic, wild, and feral ungulates. *Environmental Management* 52 (Nov.). DOI 10.1007/s00267-012-9964-9.

Evans, D. 2012. *Range Specialist Report, Forest Plan Revision DEIS*. Apache-Sitgreaves National Forests Range Management Program: Springerville, AZ. December 12. 21 pp.

Fawcett, P.J., J.P. Werne, R.S. Anderson, et al. 2011. Extended megadroughts in the southwestern United States during Pleistocene interglacials. *Nature* 470: 518-21.

Fleischner, T.L. 1994. Ecological costs of livestock grazing in western North America. *Conservation Biology* 8: 629-44.

Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, G. Goodwin, R. Smith, and E.L. Fisher. 1992. *Management Recommendations for the Northern Goshawk in the Southwestern United States*. USDA For. Serv. Rocky Mtn. Res. Sta. Gen. Tech. Rep. RM-GTR-217. Fort Collins, CO.

Seager, R. and G.A. Vecchi. 2010. Greenhouse warming and the 21st century hydroclimate of southwestern North America. *PNAS* 107: 21277-82

Seager, R., M. Ting, I. Held, Y. Kushnir, J. Lu, G. Vecchi, H. Huang, N. Harnik, A. Leetmaa, N. Lau, C. Li, J. Velez, and N. Naik. 2007. Model projections of an imminent transition to a more arid climate in southwestern North America. *Science* 316: 1181-84.

USDA Forest Service. 2015. *Riparian Specialist Report, Forest Plan Revision EIS.* Apache-Sitgreaves National Forests: Springerville, AZ. May 14. 24 pp.

_____. 2014. *Final Vegetation Specialist Report, Forest Plan Revision Final Environmental Impact Statement*. Apache-Sitgreaves National Forests: Springerville, AZ. October. 672 pp.

_____. 2009. *CER Supplement to meet AMS Requirements*. Apache-Sitgreaves National Forests: Springerville, AZ. December. 14 pp.

_____. 2008a. *Comprehensive Evaluation Report.* Apache-Sitgreaves National Forests: Springerville, AZ. December. 48 pp.

_____. 2008b. *Forest Plan Revision Resource Evaluations*. Apache-Sitgreaves National Forests: Springerville, AZ. July. 109 pp.

_____. 2008c. *Ecological Sustainability Report.* Apache-Sitgreaves National Forests: Springerville, AZ. December. 134 pp.

_____. 2007. Forest Inventory and Analysis National Program—Forest Inventory Data Online. http://www.fia.fs.fed.us/tools-data/

_____. 2006. *Final Supplement to the Final Environmental Impact Statement for Amendment of Forest Plans in Arizona and New Mexico*. Southwestern Region: Albuquerque, NM. http://www.fs.usda.gov/detail/r3/landmanagement/planning/?cid=stelprdb5211559

_____. 1999. Forest Inventory and Analysis National Program—Forest Inventory Data Online. http://www.fia.fs.fed.us/tools-data/

_____. 1996. *Record of Decision for Amendment of Forest Plans in Arizona and New Mexico*. Southwestern Region: Albuquerque, NM. May. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_021447.pdf

_____. 1995. *Final Environmental Impact Statement for Amendment of Forest Plans.* Southwestern Region: Albuquerque, NM. October.

_____ 1993. *Report of the Forest Ecosystem Management Assessment Team.* Portland, OR. http://www.blm.gov/or/plans/nwfpnepa/index.htm#1993%20FEMAT%20Report

_____. 1987a. *Apache-Sitgreaves National Forests Plan*. Springerville, AZ. August. 236 pp.

_____. 1987b. *Environmental Impact Statement for the Apache-Sitgreaves National Forests Plan*. Springerville, AZ. 362 pp.

USDI Fish and Wildlife Service. 2015. *Biological and Conference Opinion – Land and Resource Management Plan for the Apache-Sitgreaves National Forests.* AESO/SE 02EAAZ00-2013-F-0363. Arizona Ecological Services Field Office: Phoenix. May 13.

_____. 2012a. *Biological Opinion on the Continued Implementation of the Land and Resource Management Plan for the Apache-Sitgreaves National Forests of the Southwestern Region, USDA Forest Service*. Region 2: Albuquerque, NM. April 30. http://www.fws.gov/southwest/es/arizona/Documents/Biol_Opin/120001_A_SNFs_Final_LRMPBO.pdf

_____. 2012b. *Mexican Spotted Owl Recovery Plan, First Revision*. Region 2: Albuquerque, NM. September.

_____. 2005. *Programmatic Biological and Conference Opinion, Continued Implementation of Land and Resource Management Plans for the Eleven National Forests and National Grasslands of the Southwestern Region*. Cons. #2-22-03-F-366. Region 2: Albuquerque, NM. June 10. 1,010 pages. http://www.fws.gov/southwest/es/arizona/Documents/Biol_Opin/FS%20LRMP%20BO%20FINAL%206-10-05.pdf

_____. 1996a. *Biological Opinion on Implementation of Forest Plans*. Region 2: Albuquerque, NM. November 26.

_____. 1996b. *Biological Opinion on Amended Forest Plans*. Region 2: Albuquerque, NM. November 26.

_____. 1995. *Recovery Plan for the Mexican Spotted Owl*. Region 2: Albuquerque, NM. December.

Williams, A.P., C.D. Allen, A.K. Macalady, et al. 2012. Temperature as a potent driver of regional forest drought stress and tree mortality. *Nature Climate Change* (30 Sept.). DOI: 10.1038/NCLIMATE1693

TO: 4FRI Executive Board and Planning Team

DATE: January 16, 2020

RE: Stakeholder Comments: 4FRI Rim Country Draft Environmental Impact Statement

The Four Forest Restoration Initiative (4FRI) is a collaborative, landscape-scale restoration project intended to restore lands across portions of four National Forests (Apache-Sitgreaves, Coconino, Kaibab, and Tonto). The collaborative component of 4FRI is managed by a Stakeholder Group (SHG), which was formally chartered in 2010 and has been heavily engaged in the initiative since its inception. Per that Charter, the mission of 4FRI is to: *(1) integrate comprehensive restoration, fire management, and community protection planning at the landscape scale; (2) strategically prioritize and place restoration treatments; (3) safely re-establish natural fire regimes at the landscape scale; (4) identify and implement sustainable cost offset opportunities through wood and biomass utilization; (5) employ monitoring and adaptive management supported by the best available science; (6) build public support for accomplishing restoration and community protection through public education; and, (7) support land use policies that enable landscape-scale restoration while meeting the ecological goals of the 4FRI.*

The SHG collaborative has broad representation from state and local government, utilities, non-governmental organizations, private industry, academic institutions, and private citizens. Working relationships between the SHG and Forest Service were formalized in a Memorandum of Understanding (dated March 8, 2011), which stipulated that the 4FRI Collaborative shall be fully engaged in all phases of the NEPA process, including efforts to:

> *A. Develop agreement-based recommendations that are intended to inform and build agreement on: the purpose and needs statement, alternatives, collection and use of data, impact analysis, development of a preferred alternative, and/or recommendations regarding mitigation of environmental impacts;*
>
> *B. Provide input to the U.S. Forest Service in a timely manner that matches the needs of an efficient NEPA and implementation timeline;*

Pursuant to the MOU, the SHG is pleased to provide comments on the Draft Environmental Impact Statement for Rim Country (RC DEIS). Please note that individual stakeholders will also be providing separate comments as they see fit.

STAKEHOLDER REVIEW PROCESS

4FRI stakeholders worked closely with the Rim Country Planning Team through most of the EIS process. Much of the initial work was undertaken by the Planning Work Group, which was chartered in 2015 then put on hiatus in mid-2018. In December 2018, the SHG chartered a new DEIS Work Group (DEIS WG), tasked to continue collaboration with the Forest Service in developing the DEIS, review the draft document, and prepare comments on behalf of the full SHG. Between January and November 2019, the DEIS WG (Appendix I) held numerous meetings with the 4FRI Planning Team and Executive Board while also soliciting input from the 4FRI Multiparty Monitoring Board and other stakeholders. The 4FRI DEIS Working Group acknowledges and thanks the Forest Service for this collaborative effort to provide clarity on the DEIS and listen to SHG concerns. We thank the Forest Service Executive Board for the incorporation of key changes that, while delaying the release of the DEIS, provided increased trust for these collaborative efforts.

These efforts were distilled into draft comments that were provided to the full SHG for review and consideration. Following a final revision, these comments were approved by full consensus with no reservations, by the SHG on January 8, 2020. There is concurrence between stakeholders and the Forest Service on many aspects of the RC DEIS. In the interest of streamlining the Forest Service's content analysis, we have focused our comments on elements of the RC DEIS requiring additional information, analysis, or clarity. We also recommend modifications of treatment designs in order to reflect the best available science and maintain the social license developed through the 1st 4FRI EIS process. Per our discussions and verbal agreement with the 4FRI Planning Team, we anticipate continued collaborative work on a number of these issues, which will occur concurrently as the Forest Service completes the Rim Country EIS.

Our comments fall into eight major categories: (1) Flexible Toolboxes (aka Condition-based Management), (2) the degree of openness pre- and post-treatment, (3) old-growth protection and large tree retention, (4) management of dwarf mistletoe, (5) description of pre-treatment conditions, (6) role of the collaborative in implementation, (7) adaptive management and monitoring, and (8) issues previously discussed with the Forest Service and resolved in the published DEIS.

KEY ISSUE 1: FLEXIBLE TOOLBOXES

The RC DEIS encompasses a vast planning area of considerable biological complexity, for which existing data can be limited and sometimes inaccurate—stand exams being a prime example. The SHG understands this creates a need for flexibility during implementation, in order to ensure that a particular unit of the landscape receives the appropriate restoration treatment. To address this need, the RC DEIS includes a Flexible Toolbox Approach with two Flexible Toolboxes—one for mechanical treatments in terrestrial uplands and one for work done to restore watersheds and aquatic systems. Both are examples of "Conditions-based

Management," an emerging paradigm for Forest Service projects across the western US. The SHG understands the intent of Flexible Toolboxes on Rim Country, but has numerous outstanding questions and concerns about the Flexible Toolbox Approach presented in the DEIS. At this point, we are not in a position to present a consensus statement on this approach. We also note that the Conditions-based Management approach is complex, controversial among 4FRI stakeholders, and, to our knowledge, has yet to be evaluated in a rigorous scientific framework. Under these circumstances, the SHG feels that the Forest Service must proceed cautiously, articulating the RC DEIS Flexible Toolboxes as clearly as possible, with inclusion of appropriate sideboards to maintain stakeholder support.

Concerns and Recommendations Applicable to Both Flexible Toolboxes

1. CONCERN: Restoration efforts in aquatic systems and terrestrial uplands (through the two Flexible Toolboxes) should be effectively integrated. The RC DEIS treats the two Flexible Toolboxes as discrete entities and decision processes, which may complicate prioritization/implementation of projects, decrease efficiency, and potentially compromise outcomes on the ground. For example, there are situations where needed or planned restoration of an aquatic system will influence treatment selection in the adjacent uplands and vice versa; however, the RC DEIS lacks a mechanism to address this.

   RECOMMENDATION: the SHG recommends that the Forest Service work with stakeholders to develop an effective bridge between aquatic and terrestrial restoration efforts and their respective Flexible Toolboxes, and include this in the Final EIS.

2. CONCERN: The RC DEIS lacks a robust framework for allocating and tracking treatment application temporally and spatially. The overarching concern is that flexibility provided by the Flexible Toolboxes could inadvertently result in an overall action with individual and/or cumulative effects that are different or in excess of those analyzed and disclosed in the EIS. The SHG is also concerned that treatments be applied across the four-forest footprint in a manner that is predictable, reliable, and repeatable over the lifespan of the EIS. These concerns are most critical for the Mechanical Treatments Flexible Toolbox, but apply to the Watershed and Aquatics Flexible Toolbox as well. Assuming that the Flexible Toolbox cannot result in more acres than analyzed in the NEPA decision for each type or intensity of treatments, the Mechanical Treatments Toolbox poses particular challenges for implementation—one can envision scenarios under which the acreage limit for a particular thinning treatment is reached well before work is completed across the planning area or where the acreage allocated to that treatment is concentrated on a relatively small area. The SHG understands that the Forest Service has processes and reporting in place that collect some of the data needed to track implementation, but these are not standardized across Forests/Districts nor integrated in a manner that can support all four forests.

RECOMMENDATION: The SHG recommends that the Forest Service allocate sufficient resources to develop an appropriate tracking system, with coordination at the Region, Forest, and District levels. We request that this tracking system be incorporated in the Final EIS (FEIS) Implementation Plan and: (a) effectively allocate treatments with fixed acreage limits across Forests and Districts; (b) ensure that treatment acreages do not exceed sideboards in the ROD; (c) ensure consistent interpretation of decision criteria and treatment application over shelf-life of the Rim Country ROD with a mind toward the inevitable staff turnover; (d) allow tracking of accomplishments in near-real time, and last but not least (e) provide regular, timely updates to the SHG and interested members of the public. Accurate tracking of what treatments are actually implemented will be critical to the validity of the monitoring and adaptive management framework, and will ensure compliance with the ROD.

Concerns and Recommendations Applicable to the Mechanical Treatments (Terrestrial) Flexible Toolbox

1. CONCERN: The treatments' decision process should be clearly interpretable and understandable to stakeholders, the public, and implementers. As presented in the RC DEIS, the SHG finds the Flexible Toolbox framework for Mechanical Treatments complex and extremely confusing, thereby potentially leading to inconsistent and unpredictable treatment decisions. We also note that the text narrative (RC DEIS Appendix D, Section F) is sparse on details and does not directly correspond to the decision process illustrated in the graphics and decision matrices. Most importantly, we are concerned that this process appears open to interpretation and may not provide an adequate road map for repeatable application over the expected implementation time period of this EIS.

   RECOMMENDATION: To address these shortcomings, the SHG recommends that the FEIS include a reliable implementation process that includes more complete explanations of the overall approach, filters, and decision criteria. If included, graphic illustrations of the Flexible Toolbox decision flow should be complete and correspond 1:1 with the narrative description presented in the text.

2. CONCERN: The logic framework and science underlying the decision parameters and their quantitative thresholds in the Decision Matrices (DEIS Appendix D, Section F) are not clearly articulated. The Forest Service provided a verbal explanation to the DEIS WG on October 7, 2019.

   RECOMMENDATION: The SHG recommends that this information be added to the FEIS along with appropriate citations from the scientific and professional literature.

3. CONCERN: There is uncertainty whether or not acreages for each treatment type represent fixed ceilings. In meetings with the DEIS WG, the Forest Service has indicated that the

acreage allotted to a particular treatment can be decreased, but cannot be increased, as the EIS Effects Analysis is bounded by the upper amount. This suggests a "trade-off" process is relied upon for the implementation of the Flexible Toolbox; any such process needs to be captured more fully in the FEIS. The SHG is most concerned about higher-intensity mechanical treatments; however, the RC DEIS does not provide sufficient information for us to comment on the net acreage assigned to them (see Key Issue #2, below).

RECOMMENDATION: The SHG recommends that operational elements of the Mechanical Treatments Flexible Toolbox be clearly explained in the FEIS and that the Forest Service work with stakeholders to develop collaboratively supported treatment acreage allocations for inclusion in the ROD.

4. CONCERN: There is insufficient clarity on the criteria used to determine changes in treatment intensity, i.e., the degree to which intensity can increase or decrease on a particular area (the former being of greatest concern to stakeholders) and specific circumstances under which such adjustments can occur. This element of the Flexible Toolbox is likewise complex and not easily understood, even for those well-versed in forest management practices. The potential for confusion among the public (and Forest Service implementers at District level) is huge, as is the negative response that could occur. In discussions with the DEIS WG, the Forest Service has explained the difference between "hard" Habitat and Forest Cover Filters and "soft" Decision Modifiers included in the Flexible Toolbox. The SHG understands that "hard" Filters can change treatment type, but "soft" Modifiers only allow changes in treatment intensity. We also understand that the assigned treatment intensity can only increase when ground conditions do not match those described in the stand data, but treatment intensity can always be decreased at the implementer's discretion.

   RECOMMENDATION: The SHG recommends that these operational elements of the Flexible Toolbox be described in greater detail in the FEIS/Implementation Plan, along with specific examples of circumstances under which treatment intensity could be adjusted up or down. These could include, but not be limited to: an area found to have different site index than indicated in the stand data, triggering a more intense treatment, or development of new residential areas or infrastructure resulting in an expansion of the WUI, that would likewise receive more intense treatment.

Concerns and Recommendations Applicable to the Watershed and Aquatic Flexible Toolbox

1. CONCERN: There is an understanding that aquatic ecosystems are integrally linked to upland forest conditions and that restoration treatments in the uplands will improve both aquatic and watershed health; however, there is concern that restoration specifically focused on aquatic systems may take a back seat to work done in the uplands. The SHG

understand the pressing need to restore forest ecosystems that are outside the natural range of variability and pose significant risks to communities and resource values. However, restoration of degraded aquatic systems is an equally high priority to 4FRI stakeholders. Over the course of RC DEIS preparation, the Arizona Game and Fish Department, Forest Service, Trout Unlimited, and US Fish and Wildlife Service have worked collaboratively to identify and prioritize aquatic habitat restoration needs within the Rim Country footprint. These recommendations reflect known site-specific conditions as well as long term restoration goals identified in Arizona Game and Fish Department watershed management plans applicable to the planning area. An example plan for the Verde River Watershed can be found at http://arcgis.azgfdportal.com/verdewatershed.

RECOMMENDATION: The SHG recommends that this list of prioritized restoration projects (Appendix II) be included in the FEIS.

2. CONCERN: The RC EIS and ROD should provide site-specific coverage for priority projects. The SHG understands that environmental review is an expensive, time-consuming process and that Forest Service capacity for NEPA is increasingly constrained. Efforts like the Rim Country EIS should preclude or minimize the need for additional NEPA before initiating a project.

   RECOMMENDATION: The SHG recommends that the FEIS provide site-specific coverage for priority restoration projects listed in Appendix II. The Rim Country final decision should be sufficiently clear so as to prevent the need for, and confusion about, additional NEPA on these projects. Additionally, we consider it important that the Forest Service maintain flexibility to conduct additional restoration work in any other aquatic system within the Rim Country footprint that is not listed in Appendix II, which may be needed after the ROD is signed (e.g., following damage to aquatic systems from post-wildfire floods).

3. CONCERN: As a CFLRP project, stakeholder engagement is required throughout the planning and implementation of projects associated with the RC DEIS.

   RECOMMENDATION: The SHG recommends establishing a formal coordination process between the Forest Service and stakeholders that occurs when planning watershed/aquatic restoration projects. Early engagement with stakeholders will facilitate accomplishment of priority projects, help leverage additional funds, and facilitate sharing of resources and site-specific information.

KEY ISSUE 2: DEGREE OF OPENNESS PRE- AND POST-TREATMENT

The degree of forest stand openness following mechanical thinning is a significant concern among stakeholders, which is exacerbated by the ill-defined “interspace” concept used in the RC DEIS.

Concerns and Recommendations

1. CONCERN: "Interspace" is a spatial concept that does not directly translate into quantitative metrics of forest structure readily understood by stakeholders and the public. This creates considerable uncertainty about conditions following mechanical thinning, which may or may not comport with stakeholder expectations. For example, on field trips to the Chimney Springs Task Order (1st EIS, Coconino NF), stakeholders saw considerably different openness on areas thinned to the same level of interspace. We also saw areas thinned to different levels of interspace that were visually indistinguishable. To address this uncertainty, stakeholders have previously requested that pre- and post-treatment conditions (and the treatments themselves) be described in terms of "canopy cover and openness," removing "groups," "interspaces" and other confusing or redundant terms. Until these canopy cover/openness data are in hand, the SHG cannot comment on treatment designs that are potentially controversial, but we want to register our concern with these.

   RECOMMENDATION: The Forest Service has verbally agreed to develop canopy cover/openness metrics for inclusion in the FEIS, as part of the ongoing collaborative efforts with the stakeholder DEIS Work Group. This work is recommended to incorporate learning from implementation on the 1st EIS area as well as available literature on the natural range of variability for canopy cover, openness, aggregation, and other relevant metrics (literature bibliography attached as Appendix III). If interspace is used in implementation, the FEIS should provide a clearly understood and repeatable method for estimating interspace as well as a crosswalk with canopy cover/openness and other relevant stand descriptors (e.g., basal area, trees per acre).

2. CONCERN: RC DEIS prescriptions include "regeneration openings," which the SHG considers scientifically unjustified and a potential impediment to meeting restoration objectives. The SHG asserts that regeneration openings are inconsistent with current science for frequent-fire forests as well as fundamental principles of forest restoration—which emphasize the role of natural processes rather than sustained yield from a regulated forest. There is also concern that on some sites, too-intense mechanical thinning will facilitate excess regeneration and undesirable proliferation of ladder fuels.

   RECOMMENDATION: The SHG recommends that the Forest Service remove regeneration openings from treatment designs in the RC DEIS.

3. CONCERN: There is uncertainty about the "Open Reference Condition" modifier included in the Mechanical Treatments Flexible Toolbox. In meetings with the DEIS WG, the Forest Service has explained the process for using this modifier, which we understand applies solely to mollic-intergrade soils where savannah treatments are not proposed. However, the RC DEIS presents minimal information on this treatment, consisting of a brief footnote in the Mechanical Treatments Flexible Toolbox (RC DEIS Appendix D) and definition in the Glossary (RC DEIS Appendix F). We are also concerned that the proposed approach appears subjective and open to various interpretations by implementers. For example, how would

suspected mollic-intergrade soils be identified on areas where not previously mapped? Would field personnel be required to conduct standardized soil assessments (e.g., dig soil pits)? This modifier is further complicated by issues of scale, as it can be applied to "portions of a stand."

RECOMMENDATION: The SHG recommends that the Forest Service provide a clear rationale for this modifier, including supporting science. The FEIS and Implementation Plan should also specify the process for identifying unmapped units of mollic-intergrade soils and the minimum size unit to which the modifier can apply.

4. CONCERN: There is uncertainty about the extent and location of WUI treatments and how they influence net openness across the landscape post-treatment. The SHG worked with the Forest Service to develop a WUI definition for use in Rim Country. We understand that these areas will receive the most intense mechanical thinning treatment. In discussions with the Planning Team, the DEIS WG requested a summary of WUI treatment acreages by cover type and maps showing the spatial location of these treatments, also by cover type. Some, but not all of this information is currently included in the online visualization tool.

   RECOMMENDATION: The SHG recommends that the online tool and FEIS present complete information on the extent and location of WUI treatments and how they influence post-treatment conditions.

KEY ISSUE 3: OLD GROWTH PROTECTION AND LARGE TREE RETENTION

Since the inception of 4FRI, stakeholders have consistently asserted that cutting old growth is contrary to fundamental principles of forest restoration and unacceptable. Protecting existing old-growth and retaining large trees that represent the next cohort of old growth are central to the social license developed for landscape-scale restoration that includes mechanical thinning. The Collaborative Forest Landscape Restoration Program (CFLRP), which funded work done under the 1st EIS, and for which a renewal proposal has been submitted (to include implementation on Rim Country), is likewise very clear about the need to conserve old/mature forest structure. During preparation of the 1st EIS, 4FRI stakeholders invested enormous effort developing a consensus "Old Growth Protection and Large Tree Retention Strategy" (OGPLTRS, see Project Record), which the Forest Service then translated into "Old Tree" and "Large Tree" Implementation Plans included in the FEIS. Our expectation has been that the substance and intent of this foundational stakeholder work will be brought forward into the RC DEIS.

Concerns and Recommendations

1. CONCERN: At a minimum, the Rim Country EIS should incorporate old tree protections included in the 1st EIS. The SHG notes that Age Class 3 trees (per Thompson 1940) have been included in the Old Tree Implementation Plan (OTIP, RC DEIS Appendix D) per our previous request. However, those age classes are missing from the accompanying illustration (Figure 94).

RECOMMENDATION: The SHG recommends that the figure be updated to match the text.

2. CONCERN: There is uncertainty in some of the language regarding old tree protection. The OTIP (RC DEIS Appendix D, p. 617) indicates that "*Removal of old trees would be rare. Exceptions would be made for threats to human health and safety, and those rare circumstances where the removal of an old tree is necessary in order to prevent additional habitat degradation*." The latter portion of this statement could be interpreted as "habitat degradation" caused by old trees.

   RECOMMENDATION: The SHG does not believe this is the Forest Service's intent and recommends that the statement be clarified and include examples of habitat degradation situations requiring old tree removal.

3. CONCERN: The RC DEIS contains at least one statement inconsistent with the stakeholder old tree–large tree document and LTIPs included in the 1st EIS and RC DEIS. The "Modeling Assumptions" section of the Draft Silviculture Report (no pagination), states:

   > *"Within this project area, the majority of trees that meet the old tree definition are greater than or equal to 18". On the ground cutting prescriptions will follow the Old Tree Implementation Plan (OTIP) and* ***trees larger than 18" that do not meet the OTIP criteria may be cut during implementation****."* [emphasis added].

   RECOMMENDATION: This statement should be revised to be consistent with OGPLTRS/OTIP/LTIP and specify how ponderosa pine and other conifer species will be treated.

4. CONCERN: The old tree age criterion included in the 1st 4FRI EIS has not been incorporated in the RC DEIS. Section D (p. 617) of the RC DEIS defines old tree age as: "*Established prior to 1870, predating Euro-American settlement*."

   RECOMMENDATION: The SHG recommends that the Forest Service replace this statement with this language from the 1st EIS: "*Approximately 150 years and older*."

5. CONCERN: The RC DEIS contains unnecessary language concerning application of the OTIP to subsequent NEPA decisions.

   From the OTIP (RC DEIS Appendix D, p. 617):

   > "*This old tree implementation plan will be applied to the Rim Country Environmental Impact Statement Record of Decision and may not apply to subsequent decisions on the same project area or on other areas within Region 3. Subsequent decisions may include an old tree implementation plan that reflects project specific current conditions and the purpose and needs of subsequent projects*."

This statement is beyond the scope of the RC DEIS EIS and inconsistent with NEPA guidance provided by the Forest Service (personal communication to DEIS WG from Katherine Sanchez-Meador).

RECOMMENDATION: Given the sensitivities surrounding harvest of old growth, the SHG recommends that this statement be removed.

6. CONCERN: The RC DEIS should expressly prohibit harvest of old and large young ponderosa pine trees to "mitigate" dwarf mistletoe infection. This issue was brought to the forefront by a recent timber sale in the 4FRI CFLRP footprint (Little Creek TS, Apache-Sitgreaves NF), where extensive harvest of old and large ponderosa pine trees occurred, ostensibly to address forest health issues from dwarf mistletoe infection. As communicated in the April 27, 2017 letter to Forest Supervisor Best (see Project Record), the SHG considers such practices inconsistent with the best available science, 4FRI stakeholder expectations, and the social license that has taken more than a decade to develop. We note and appreciate that the RC DEIS Implementation Plan (Section D, p. 617) states that "*old trees would not be cut for forest health reasons.*"

   RECOMMENDATION: The SHG recommends that this language be carried forward into the FEIS.

KEY ISSUE 4: MANAGEMENT OF PONDEROSA PINE DWARF MISTLETOE

Over the past two years, the 4FRI Planning Team and SHG have had ongoing conversations about management of dwarf mistletoe, particularly in ponderosa pine, which the Forest Service has articulated as representing a significant threat to forest health on the RC DEIS footprint. The 4FRI Planning Team had originally proposed extremely aggressive "mitigation" treatments, including even-aged management, on a large portion of the RC DEIS planning area having estimated high levels of dwarf mistletoe. Following several meetings and field trips, the SHG submitted a letter to the Forest Service (dated April 4, 2017), which stated that the Forest Service had not presented a compelling case that dwarf mistletoe infections in ponderosa pine on the planning area were significantly outside the natural range of variability and presented a meaningful obstacle to restoration. We asserted that restoration treatments followed by prescribed fire at regular intervals should be sufficient to meet objectives. The mistletoe management approach in the RC DEIS has been refined somewhat; however, it remains a core element of the Mechanical Treatment Flexible Toolbox. The SHG feels that this emphasis is misplaced and inappropriate for a project ostensibly focused on ecological restoration rather than sustained-yield timber production. We also note that the RC DEIS does not clearly distinguish between dwarf mistletoe infections and associated treatments in ponderosa pine and mistletoes that occur in other conifer tree species.

Concerns and Recommendations

1. CONCERN: Dwarf mistletoe is a high-level decision variable in the Mechanical Treatments Flexible Toolbox. This creates a perception that managing this endemic, natural disturbance agent is a restoration priority—an approach that is at odds with the best available science and stakeholder perspectives. Consistent application of this element of the Flexible Toolbox is unlikely, given the apparent subjectivity of rating stand-level mistletoe infection. For example, during collaborative field trips held by the SHG and Forest Service, it was evident that perceptions of what constitutes a "severe" infection vary considerably across Forests/Districts.

   RECOMMENDATION: The SHG recommends that the Forest Service remove dwarf mistletoe as a decision variable in the Mechanical Treatments Flexible Toolbox.

2. CONCERN: The RC DEIS should incorporate the best available science applicable to management of ponderosa pine dwarf mistletoe. The RC DEIS cites some, but not all of the current science relevant to this issue.

   RECOMMENDATION: A list of pertinent references is provided in Appendix III. The SHG recommends that this information be incorporated into the FEIS, with a clear explanation of the scientific basis for the proposed treatment approach.

3. CONCERN: The initially proposed 55–70% Interspace dwarf mistletoe treatments are not supported by the best available science and contrary to SHG perspectives. Following a request from the SHG, the 4FRI Executive Board agreed to remove these treatments from the RC DEIS (letter to SHG dated September 12, 2019, see Project Record).

   RECOMMENDATION: The SHG appreciates this modification and recommends it be carried forward into the FEIS and ROD.

4. CONCERN: The DEIS does not differentiate between ponderosa pine dwarf mistletoe and other mistletoes. In discussions with the 4FRI Planning Team, the SHG has emphasized that ponderosa pine dwarf mistletoe is but one member of that group of parasitic plants present on the RC DEIS planning area, each of which can have differing effects on host trees and cannot be treated alike from a management perspective.

   RECOMMENDATION: The SHG recommends that the Forest Service clarify differences between the ecology and management of mistletoes in the FEIS.

5. CONCERN: The Mechanical Treatment Flexible Toolbox includes mechanical treatment of ponderosa pine stands with "severe" dwarf mistletoe infection. This approach is not supported by the best available science and contrary to stakeholder expectations. The SHG has previously recommended that such stands be deferred from mechanical treatment or

designated as “burn only.” In discussions with the 4FRI Planning Team, the Forest Service has indicated that both options are covered under the RC DEIS, though not explicitly stated.

RECOMMENDATION: The SHG recommends that the FEIS/Implementation Plan clearly identify deferral or burn only as preferred options for ponderosa pine stands with “severe” levels of dwarf mistletoe.

KEY ISSUE 5: DESCRIPTION OF PRE-TREATMENT CONDITIONS

In comparison to the 1st EIS area, which was predominately ponderosa pine, the Rim Country planning area has a number of other forest cover types targeted for treatment, including mixed-conifer/frequent fire, mixed-conifer with aspen, and ponderosa pine-evergreen oak. The SHG understands the complexity this adds to the RC DEIS and has recommended that the document more fully address diversity of the planning area.

Concerns and Recommendations

1. CONCERN: The RC DEIS should be more specific with respect to existing conditions and treatment allocation for target cover types present on the planning area. Stakeholders have emphasized this need in previous discussions with the 4FRI Planning Team, requesting a tabular summary and spatial representation of treatment allocation across cover types. Some of the spatial information is now available in an online visualization tool, which we appreciate.

   RECOMMENDATION: The SHG recommends that the online tool be completed and a tabular summary made available to stakeholders and then included in the FEIS.

2. CONCERN: The RC DEIS should include spatial representation of WUIs in the planning area, overlaid by cover type and proposed treatments. The SHG had previously requested that this information be added to the online visualization tool. We appreciate the Forest Service’s attention to this request, but note that only some of this information is currently presented.

   RECOMMENDATION: The SHG recommends that the complete information be made available online, with a tabular summary made available to stakeholders and then included in the FEIS.

3. CONCERN: Protection of stands with a preponderance of large, young trees (SPLYT). Conservation of these stands is a high priority to stakeholders and a critical component of collaborative agreement. At the outset of the RC DEIS process, the SHG and Forest Service devoted considerable collaborative effort developing a methodology to identify and map these stands. The selected approach was formally adopted by the SHG, communicated to the Forest Service (see SHG Position Statement dated October 13, 2017) and appears in the RC DEIS (Section D, p. 638). However, following personnel changes on the 4FRI Planning

Team, the Forest Service informed stakeholders that this approach is not viable for implementers in the field, who must verify stand conditions (including the presence or absence of SPLYT characteristics) prior to treatment assignment via the Flexible Toolbox.

RECOMMENDATION: The SHG recommends that the Forest Service develop a replacement SPLYT methodology that leverages work already completed (e.g., stand mapping and field assessments by stakeholders and the Forest Service). This second iteration should be done collaboratively and in the field, with participation by Forest Service personnel who will use the final product.

KEY ISSUE 6: COLLABORATIVE ROLE IN IMPLEMENTATION

As a CFLRP project, the Forest Service is mandated to facilitate stakeholder engagement in all phases of 4FRI, from planning through implementation. However, since completion of the 1st 4FRI EIS, stakeholders have had limited engagement in implementation of restoration projects. The SHG has a formal Multi-Party Monitoring Board (MPMB); however, that group is largely focused on long-term data collection to assess ecosystem responses to restoration treatments (effects monitoring). In discussions with the 4FRI Planning Team, we have acknowledged mutual interest in formal collaboration during implementation, in order to facilitate shared learning about treatment outcomes, assist the Forest Service with outreach to field personnel, and inform adaptive management.

Concerns and Recommendations

1. CONCERN: There is uncertainty about the degree to which treatment outcomes will comport with CFLRP requirements and stakeholder expectations. As articulated in these comments, the SHG is concerned with various aspects of implementation on Rim Country—e.g., retention of old and large trees, management of dwarf mistletoe in ponderosa pine, conservation of SPLYT stands, and application of the Flexible Toolboxes. Our expectation is that these actions will reflect stakeholder expectations and occur in a manner that is predictable, reliable, and repeatable. The SHG feels this need is best addressed by more effective coordination among Forest Service staff on the Planning Team and at Forest/District level, and by creating a formal mechanism for collaborative engagement during implementation.

   RECOMMENDATION: The SHG recommends that the Forest Service work with stakeholders to develop an appropriate framework for this. A recent, informative example is attached in Appendix V (Spruce Beetle Epidemic-Aspen Decline EIS, Grand Mesa, Uncompahgre, and Gunnison National Forest).

2. CONCERN: The framework for stakeholder engagement should to be memorialized in a manner that is binding and ensures follow-through. The DEIS WG and 4FRI Planning Team have discussed and concur on this need.

RECOMMENDATION: The Forest Service agreed to research this question and provide appropriate guidance, that the SHG recommends be carried forward with appropriate placement in the FEIS.

3. CONCERN: Collaborative implementation should be bolstered by mechanisms outside the RC DEIS. It was suggested that the 4FRI Memorandum of Understanding could be revised to meet this need.

   RECOMMENDATION: The SHG concurs and commits to working with the Forest Service and other partners on a potential revision of the MOU.

KEY ISSUE 7: ADAPTIVE MANAGEMENT AND MONITORING

Science-driven monitoring and adaptive management are key requirements under CFLRP and a high priority for 4FRI stakeholders. The SHG has been actively engaged in this process since initiation of the 1st EIS, under auspices of the Multi-Party Monitoring Board (MPMB). The MPMB has worked closely with the 4FRI Monitoring Coordinator to develop a new plan for the RC DEIS planning area and looks forward to continued collaboration refining the questions and approach for Rim Country. We have identified nine key concerns that should be addressed and then included in the FEIS.

Concerns and Recommendations

1. CONCERN: The Rim Country Monitoring Plan (RC DEIS Appendix E) should be updated to reflect work completed since the 1st EIS and improvements in monitoring design.

   RECOMMENDATION: The SHG recommends the following modifications:

   - Monitoring questions, indicators, triggers, and thresholds should be completed and/or updated as needed—a process that can be informed by the living monitoring document maintained by the MPMB.
   - Vague wording in this section (e.g., the term “appropriate”) should be clarified with necessary context, sideboards, and direction.
   - The Monitoring Plan should incorporate information from 4FRI monitoring reports including, but not limited to Hjerpe and Mottek-Lucas (2018) as well as relevant information from the RC DEIS Specialist Report (“Socioeconomic Environmental Consequences”).
   - Monitoring efforts in treated areas (e.g., groundwater assessment (p. 792) should include control and pre-treatment data collection in a BACI (Before-After-Control-Impact) design to support the strongest inference.
   - The Monitoring Plan will need to be updated to reflect openness metrics (and associated assessments on the 1st EIS area) being developed in collaboration with the SHG.

- Indicators (e.g., spatial metrics, forest structure, and wildlife variables) should be measured at the same scale whenever possible.

2. CONCERN: The relationship between Monitoring Plans in the 1st EIS and Rim Country needs to be clarified. The FEIS should clearly state that the Rim Country Monitoring Plan does not apply to the 1st EIS area, but rather complements it. It is also important to indicate that some indicators overlap both EIS areas, but others are unique to Rim Country.

   RECOMMENDATION: The SHG recommends that the text in RC DEIS Appendix E (p. 663) be modified accordingly.

3. CONCERN: Forest cover types, tree species, and structural components currently listed in the RC DEIS Monitoring Plan are specific to the 1st 4FRI EIS.

   RECOMMENDATION: The SHG recommends that this section be updated to reflect the Rim Country planning area. This should include additional descriptions and justification in RC DEIS Appendix E (p. 674–675) for mixed-conifer and other forest types, and adjustment of indicators, thresholds, and triggers for mixed-conifer (including monitoring of species proportions, diameter distributions, and spatial distribution of trees).

4. CONCERN: The relationship between implementation, implementation monitoring, and treatment effectiveness needs is not clearly articulated in the RC DEIS Monitoring Plan. These components need to be effectively integrated in the Monitoring Plan.

   RECOMMENDATION: The SHG recommends that RC DEIS Appendix E be expanded to articulate implementation tracking requirements, and indicate how this information will be linked to effectiveness monitoring when developing adaptive management recommendations. This could be presented in a table of similar theme as Table 130, that lists specific tracking metrics for effectiveness monitoring across Districts/Forests, which could then be reviewed with monitoring results to produce adaptive recommendations.

5. CONCERN: The RC DEIS Monitoring Plan should leverage the best available technology and tools. There have been a number of significant advancements since completion of the 1st 4FRI EIS.

   RECOMMENDATION: The SHG recommends that the Monitoring Plan be updated to include the following:

   - Fire Hazard Index (FHI), a new modeling approach used in the RC DEIS analysis of fire effects, but only loosely referenced in the Monitoring Plan.

- Various technologies and products that could be used to monitor tree age structure, spatial aggregation, canopy openness, patch size, patch configuration, patch density, and patch evenness, as well as the frequency and scale (e.g., UAV based imagery on a project basis).
- Quantification of snags using LiDAR data.

6. CONCERN: Scale of the RC DEIS monitoring plans does not match the analysis area.

   RECOMMENDATION: The SHG recommends that the scale of the Biophysical and Social and Economic plans be revised as needed throughout the FEIS. This includes inclusion of language in RC DEIS Appendix E indicating that fire analyses are performed at the HUC 6 level.

7. CONCERN: References in the RC DEIS Monitoring Plan should reflect the best available current science.

   RECOMMENDATION: The SHG recommends that references in RC DEIS Appendix E be updated. Examples include, but are not limited to:

   - Forest thinning and groundwater recharge (O'Donnell 2018, Moreno et al. 2016)
   - Canopy openness, soil moisture, and snowpack accumulation (Broxton et al. 2019)
   - Scale and grain considerations (Wasserman et al. 2019).
   - Climate science (Seager and Vecch 2010, Barnes and Polvani 2013, Lu et al. 2018, Singh et al. 2018, Espinoza et al. 2018, the 2018 National Climate Assessment)
   - Human dimensions and economics (Egan and Nielsen 2014, Brown 2015, Esch and Vosick 2016)

8. CONCERN: Additional detail is needed on the adaptive management process.

   RECOMMENDATION: The SHG recommends that the Monitoring Plan (RC DEIS Appendix E) more clearly articulate specific steps in the monitoring and adaptive management process (as illustrated in Figure 100) and indicate that decisions will be made in collaboration with the SHG and MPMB.

9. CONCERN: The RC DEIS should more explicitly acknowledge the role of the MPMB.

   RECOMMENDATION: The SHG recommends that the FEIS emphasize the collaborative approach to monitoring and adaptive management and add language (e.g., in RC DEIS Appendix E, p. 662) indicating that the 4FRI MPMB is well established and will play a significant role going forward.

KEY ISSUE 8: PREVIOUS ISSUES RESOLVED IN THE PUBLISHED DEIS

1. CONCERN: drift from the intent of CFLRP. Stakeholders were concerned that the drafty-draft RC DEIS did not include key CFLRP language articulating a focus on thinning small diameter trees and protecting large/old-growth trees. The DEIS WG provided recommended language to the 4FRI Planning Team, which was approved by the Executive Board and added to the RC DEIS.

   RECOMMENDATION: the SHG appreciates that modification and recommends it be carried forward into the FEIS and ROD.

2. CONCERN: terms and definitions needing clarification or correction. The SHG previously requested that the term "overmature" be removed or placed in appropriate context. While overmature remains in the document, it is with respect to the age classification tables based on cited literature. The definition of overmature used is based also on the cited literature.

   RECOMMENDATION: the SHG appreciates changes made in the DEIS and request they be carried forward into the FEIS and ROD.

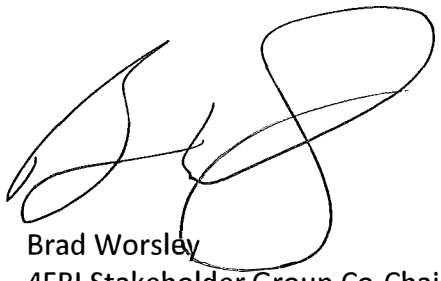
3. CONCERN: removal of 55-70% interspace treatments used for the management of mistletoe. The SHG asked for removal of 55-70% interspace treatments, listed in an early version of the DEIS, to manage mistletoe. This was a departure from the 1st EIS, and does not meet the intent or goals of the CFLRP. On reception of the SHG official request (see Project Record), the Executive Board removed all treatments above 55% interspace outside of WUI.

   RECOMMENDATION: the SHG appreciates this change made in the DEIS and recommends it be carried forward into the FEIS and ROD.

Thank you for the opportunity to comment. The 4FRI Stakeholder group appreciates the effort it took to develop the Rim Country DEIS; we greatly appreciate the collaborative effort in the last year. We look forward to continuing to work with our USFS partners to complete the Final EIS incorporating recommendations and finalized Stakeholder documents. For any clarification, please contact the 4FRI current co-chairs.

Sincerely,

Greg Smith
4FRI Stakeholder Group Co-chair



Brad Worsley
4FRI Stakeholder Group Co-Chair

APPENDIX I

RIM COUNTRY DEIS WORK GROUP PARTICIPANTS[**]

Pascal Berlioux (Co-chair)	Eastern Arizona Counties Organization
Clay Crowder	Arizona Game and Fish Department
Alicyn Gitlin	Sierra Club
Bruce Greco	Apache County
Shaula Hedwall	US Fish and Wildlife Service
Joe Miller	Trout Unlimited
Rob Nelson	Arizona Game and Fish Department
Nathan Rees	Trout Unlimited
Joe Trudeau	Center for Biological Diversity
Steve Rosenstock (Co-chair)	Grand Canyon Trust
Todd Schulke	Center for Biological Diversity
Travis Woolley (Co-chair)	The Nature Conservancy
Amy Waltz (Co-chair)	NAU Ecological Restoration Institute

[**] affiliation while participating in the work group, may not reflect current status

APPENDIX II
PRIORITY AQUATIC RESTORATION PROJECTS

Location Name	Forest/District
Headwater Meadows and Springs	
Alder Creek	Apache-Sitgreaves NF / Black Mesa RD
Beaver Creek (Turkey Crk trib)	" "
Beaver Creek, including Beaver Park	" "
Black Canyon Creek	" "
Brown Creek	" "
Chevelon Canyon Creek	" "
Double Canyon	" "
East Fork Woods Canyon	" "
Fairchild Draw	" "
Gentry Creek	" "
Hart Canyon	" "
Long Tom Cabin	" "
Pius Farm Draw	" "
Thompson Creek	" "
Turkey Creek	" "
Wiggins Crossing	" "
Willow Creek	" "
Woods Canyon Creek	" "
Barbershop Canyon Creek	Coconino NF / Mogollon Rim RD
Bill McClintock Draw	" "
Campbell Spring	" "
Cienega Draw	" "
Coldwater Spring	" "
Crackerbox Canyon Upper E, W	" "
Dane Spring	" "

Dines Tank	"	"
East Clear Creek	"	"
East Clear Creek/Miller Creek Confluence	"	"
East Miller Canyon	"	"
Foster Spring	"	"
General Springs	"	"
Houston Draw	"	"
Immigrant Spring	"	"
Jones Crossing	"	"
Jones Spring	"	"
Kehl Spring	"	"
Leonard Canyon Creek	"	"
Lower Buck Spring	"	"
Merritt Draw	"	"
Miller Canyon	"	"
Miller Canyon	"	"
Pivot Rock Spring	"	"
Potato Lake	"	"
Potato Lake Draw	"	"
Poverty Draw/Poverty Spring	"	"
Quaking Aspen Canyon	"	"
Schneider Spring	"	"
Upper Buck Spring	"	"
West Bear Canyon	"	"
West Fork Leonard Canyon Creek	"	"
Whistling Spring	"	"
Willow Spring	"	"

Bear Springs	Tonto NF / Payson RD
Candy Spring	" "
Foster Spring	" "
Little Green Valley	" "
Pieper Hatchery Spring	" "
Pine Spring	" "
Poison Spring	" "

Streams

Willow Springs Canyon	Apache-Sitgreaves NF / Black Mesa RD
Canyon Creek	Apache-Sitgreaves NF / Black Mesa RD & Tonto NF / Pleasant Valley RD
Show Low Creek	Apache-Sitgreaves NF / Lakeside RD
East Bear Canyon	Coconino NF / Mogollon Rim RD
East Fork Leonard Canyon Creek	" "
General Springs Creek	" "
Webber Creek	Tonto NF / Payson RD
Bray Creek	" "
Sycamore Creek	" "
Chase Creek	" "
Dude Creek	" "
Bonita Creek	" "
Ellison Creek	" "
Horton Creek	" "
Dick Williams Creek	" "
Christopher Creek	" "
Unnamed tributary of Chase Creek	" "
East Verde River	" "
Mail Creek	" "
Pine Creek	" "

East Verde River	" "
Tonto Creek	" "
Gordon Canyon Creek	Tonto NF / Pleasant Valley & Payson RDs
Haigler Creek	Tonto NF / Pleasant Valley RD

Other

Houston Draw	Coconino NF / Mogollon Rim RD

APPENDIX III
CITED LITERATURE AND ADDITIONAL REFERENCES

Quantifying Spatial Heterogeneity and Metrics to Define "Openness"

Cannon, J.B., M.E. Chambers, and A.S. Cheng. 2017. Monitoring fine-scale spatial patterns of restoration treatments in the Uncompahgre Plateau, presentation. Colorado Forest Restoration Institute, Colorado State University.

Churchill, D.J., Larson, A.J., Dahlgreen, M.C., Franklin, J.F., Hessburg, P.F., Lutz, J.A., 2013. Restoring forest resilience: From reference spatial patterns to silvicultural prescriptions and monitoring. Forest Ecology and Management 291: 442–457.

Churchill, D.J., Seager, S.T., Larson, A.J., Schneider, E.E., Kemp, K.B., Bienz, C., 2018. Ecological functions of spatial pattern in dry forests: Implications for forest restoration. The Nature Conservancy newsletter.

Churchill, D., Carnwath, G., Larson, A.J., 2017. Historical Forest Structure, Composition, and Spatial Pattern in Dry Conifer Forests of Western Blue Mountains, Oregon. USDA Forest Service General Technical Report NW-GTR-965.

Clyatt, K.A., Crotteau, J.S., Schaedel, M.S., Wiggins, H.L., Kelley, H., Churchill, D.J., Larson, A.J., 2016. Historical spatial patterns and contemporary tree mortality in dry mixed-conifer forests. Forest Ecology and Management 361: 23–37.

Dickinson, Y.L. and Spatial Heterogeneity Subgroup of the Front Range Roundtable. 2014. Desirable forest structures for a restored Front Range. Colorado Forest Restoration Institute, Colorado State University, Technical Brief CFRI-TB-1402, Fort Collins, CO. 23 p.

Dickinson, Y., Pelz, K., Giles, E., Howie, J., 2016. Have we been successful? Monitoring horizontal forest complexity for forest restoration projects. Restoration Ecology 24: 8–17.

Hamilton, R., Cushman, S., McCallum, K., McCusker, N., Mellin, T., Nigrelli, M., Williamson, M. 2013. Multiscale landscape pattern monitoring using remote sensing: The four forest restoration initiative. RSAC-10022-RPT1. Salt Lake City, UT: U.S. Department of Agriculture, Forest Service, Remote Sensing Application Center. 24 p.

Iniguez, J.M., Fowler, J.F., Moser, W.K., Sieg, C.H., Baggett, L.S., Shin, P., 2019. Forest Ecology and Management Tree and opening spatial patterns vary by tree density in two old-growth remnant ponderosa pine forests in Northern Arizona , USA. Forest Ecology and Management 450: 117502. 15.

Jeronimo, S.M.A., Dow, L.R., Kane, V.R., Churchill, D.J., Franklin, J.F., 2017. Using LiDAR to Guide Silvicultural Restoration in the Crater Lake Panhandle: Final Report to the National Park Service.

Larson, A.J., Churchill, D., 2012. Tree spatial patterns in fire-frequent forests of western North America, including mechanisms of pattern formation and implications for designing fuel reduction and restoration treatments. Forest Ecology and Management 267: 74–92.

Matonis, M.S., Binkley, D., 2018. Not just about the trees: Key role of mosaic-meadows in restoration of ponderosa pine ecosystems. Forest Ecology and Management 411: 120–131.

Naumburg, E., Dewald, L.E., 1999. Relationships between *Pinus ponderosa* forest structure, light characteristics, and understory graminoid species presence and abundance. Forest Ecology and Management 124: 205–215.

Pelz, K.A., and Dickinson, Y.L. 2014. Monitoring forest cover spatial patterns with aerial imagery: A tutorial. Colorado Forest Restoration Institute, Colorado State University, Technical Brief CFRI-TB- 1401. Fort Collins, CO. 47 p.

Rodman, K.C., Sánchez Meador, A.J., Moore, M.M., Huffman, D.W., 2017. Reference conditions are influenced by the physical template and vary by forest type: A synthesis of *Pinus ponderosa*-dominated sites in the southwestern United States. Forest Ecology and Management 404: 316–329.

Sánchez Meador, A.J., Parysow, P.F., Moore, M.M., 2011. A new method for delineating tree patches and assessing spatial reference conditions of Ponderosa Pine Forests in Northern Arizona. Restoration Ecology 19: 490–499.

Tinkham, W.T.; Dickinson, Yvette; Hoffman, Chad M.; Battaglia, Mike A.; Ex, Seth; Underhill, Jeffrey. 2017. Visualization of heterogeneous forest structures following treatment in the southern Rocky Mountains. Gen. Tech. Rep. RMRS-GTR-365. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.

Wasserman, T.N., Andrew, J.S., Waltz A.E.M, 2019. Grain and extent considerations are Integral for monitoring landscape-scale desired conditions in fire-adapted forests. Forests. 21 p.

Wiggins, H.L., Nelson, C.R., Larson, A.J., Safford, H.D., 2019. Using LiDAR to develop high-resolution reference models of forest structure and spatial pattern. Forest Ecology and Management 434:, 318–330.

Zachmann, L.J., Dickson, B.G. 2017. Four Forest Restoration Initiative – Landscape Pattern Analysis. Technical Report. Landscape Conservation Initiative.

Management of Dwarf mistletoe (primarily in Ponderosa Pine, but also Douglas-fir)

Beatty, J.S. 1982. Integrated forest protection guide, southwestern dwarf mistletoe, *Arceuthobium vaginatum* subsp. *cryptopodum* (Engelm.) Hawks. and Wiens, in ponderosa pine. USDA Forest Service R3-82-13. 12 p.

Bennetts, R.E., G.C. White, F.G. Hawksworth, and S.E. Severs. 1996. The influence of dwarf mistletoe on bird communities in Colorado ponderosa pine forests. Ecological Applications 6:899–909.

Bickford, C.P., T.E. Kolb, B.W. Geils. 2005. Host physiological condition regulates parasitic plant performance: *Arceuthobium vaginatum* subsp. *cryptopodum* on *Pinus ponderosa*. Oecologia 146:179-189.

Conklin, D.A. and W.A. Armstrong. 2001. Effects of three prescribed fires on dwarf mistletoe infection in southwestern ponderosa pine. USDA Forest Service, Southwestern Region, Forestry and Forest Health Report R3-01-02.

Conklin, D.A. and B.W. Geils 2008. Survival and sanitation of dwarf mistletoe-infected ponderosa pine following prescribed underburning. Western Journal of Applied Forestry 23:216-222.

Conklin, D.A. and M.L. Fairweather. 2010. Dwarf mistletoe and their management in the Southwest. USDA Forest Service, Southwestern Region, Forestry and Forest Health Report R3-10-01.

Dahms, C.W.; Geils, B.W., tech. eds. 1997. An assessment of forest ecosystem health in the Southwest. USDA Forest Service, RM-GTR-295. 97 p.

DeWald, L.E. and M.F. Mahalovich. 2008. Historical and contemporary lessons from Ponderosa pine genetic studies at the Fort Valley Experimental Forest, Arizona. In: Olberding, Susan D., and Moore, Margaret M., tech coords. 2008. Fort Valley Experimental Forest—A Century of Research 1908-2008. Proceedings RMRS-P-53CD. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 408 p.

Ganey, J.L., D.L. Apprill, T.A. Rawlinson, S.C. Kyle, R.S. Jonnes, and J.P. Ward JR. 2013. Nesting habitat of Mexican spotted owls in the Sacramento Mountains, New Mexico. Journal of Wildlife Management 77:1426–1435.

Garnett, G.N., C.L. Chambers, and R. L. Mathiasen. 2006. Use of witches' brooms by Abert Squirrels in Ponderosa pine forests. Wildlife Society Bulletin 34(2):467–472.

Geils, B.W., and R.L. Mathiasen. 1990. Intensification of dwarf mistletoe on Southwestern Douglas-fir. Forest Science 36:955-969.

Harrington M.G., and F.G. Hawksworth. 1990. Interactions of fire and dwarf mistletoe on mortality of southwestern ponderosa pine. *In*: Krammes JS (Ed.), Effects of fire management on Southwestern forest resources. USDA Forest Service, General Technical Report RM-191, pp. 234-240.

Hawksworth F.G., Geils BW. 1990. How long do mistletoe-infected ponderosa pines live? Western Journal of Applied Forestry 5:47-48.

Hawksworth F.G, Weins D. 1996. Dwarf mistletoes: biology, pathology, and systematics. USDA Forest Service, Agriculture Handbook 709.

Hawksworth F.G., Geils BW. 2002. Damage, effects, and importance of dwarf mistletoe. *In*: Geils BW, Tovar JC, Moody B (Eds.), Mistletoes of North American Conifers. USDA Forest Service, General Technical Report RMRS-GTR-98, pp. 57-66.

Hedwall, S. J., and R. L. Mathiasen. 2006. Wildlife use of Douglas-fir dwarf mistletoe witches' brooms in the Southwest. Western North American Naturalist 66:450–455.

Hedwall, S. J., C. L. Chambers, and S. S. Rosenstock. 2006. Red squirrel use of dwarf mistletoe-induced witches' brooms in Douglas-fir. The Journal of Wildlife Management. In Press.

Heidmann LJ. 1968. Silvicultural control of dwarf mistletoe in heavily infected stands of ponderosa pine in the Southwest. USDA Forest Service, Research Paper RM-36.

Herman FR. 1961. Silviculutural control of dwarf mistletoe on southwestern ponderosa pine. USDA Forest Service, Station Paper No. 62.

Hessburg, P.F., N.A. Povak, R.B. Salter. 2008. Thinning and prescribed fire effects on dwarf mistletoe severity in an eastern Cascade Range dry forest, Washington. Forest Ecology and Management. 225:2907-2915.

Hoffman, C.M., R.L. Mathiasen, and C.H. Sieg. 2007. Dwarf mistletoe effects on fuel loadings in ponderosa pine forests in northern Arizona. Canadian Journal of Forest Research 37:662–670.

Hudler, G.W., N. Oshima, and F.G. Hawksworth. 1979. Bird dissemination of dwarf mistletoe on ponderosa pine in Colorado. American Midland Naturalist 102:273–280.

Koonce, A. L. and L.F. Roth. 1980. The effects of prescribed burning on dwarf mistletoe in ponderosa pine. Proceedings of the Sixth Conference on Fire and Forest Meteorology, pgs 197 – 203. Society of American Foresters, Washington, District of Columbia.

Koonce, A.L. and L.F. Roth. 1985. The effects of dwarf mistletoe on fuel in precommercial ponderosa pine stands. In: Proceedings of the 8th Conference on Fire and Forest Meteorology, Seattle WA. Society of American Foresters, Washington DC, pp. 66-72.

Maffei, H., and J. Beatty. 1988. Changes in the incidence of dwarf mistletoe over 30 years in the Southwest. Pages 88–90 *in* B.J. VanDerKamp, editor, Proceedings of the 36th Annual Western International Forest Disease Work Conference. Department of Forest Sciences, University of British Columbia, Vancouver, British Columbia, Canada.

Maloney, P.E., Smith, T.F., Jensen, C.E., Innes, J., Rizzo, D.M., and North, M.P. 2008. Initial tree mortality and insect and pathogen response to fire and thinning restoration treatments in an old-growth mixed-conifer forest of the Sierra Nevada, California. Canadian Journal of Forest Research 38: 3011–3020.

Mathiasen, R.L. 1996. Dwarf mistletoes in forest canopies. Northwest Science 70:61-71.

May, C. A., M. L. Petersburg, and R. J. Gutiérrez. 2004. Mexican spotted owl nest- and roost-site habitat in northern Arizona. Journal of Wildlife Management 68:1054–1064.

Parker, T.K., C.L. Chambers, and R.L. Mathiasen. 2017. Dwarf mistletoe and breeding bird abundance in ponderosa pine forests. Western North American Naturalist 77: 40-50.

Parks, C. G., and E. L. Bull. 1997. American marten use of rust and dwarf mistletoe brooms in northeastern Oregon. Western Journal of Applied Forestry 12:131–133.

Parks, C. G., E. L. Bull, R. O. Tinnin, J. F. Shepard, and A. K. Blumton. 1999. Wildlife use of dwarf mistletoe brooms in Douglas-fir in northeast Oregon. Western Journal of Applied Forestry 14:100–105.

Reich, R.M., J. Lundquist, and V.A. Bravo. 2000. Spatial relationship of resident and migratory birds and canopy openings in diseased ponderosa pine forests. Environmental Modeling and Software 15:189–197.

Parmeter, J.R., jr. 1978. Forest stand dynamics and ecological factors in relation to dwarf mistletoe spread, impact, and control. *In*: Scharpf RF, Parmeter JR (Eds.), Proceedings of the Symposium on Dwarf Mistletoe Control Through Forest Management. USDA Forest Service, General Technical Report PSW-31, pp.16-30.

Saab, V.A., C.E. Bock, T.D. Rich, and D.S. Dobkin. 1995. Livestock grazing effects in western North America. Pages 311–356 *in* T.E. Martin and D.M. Finch, editors, Ecology and management of neotropical migratory birds. Oxford University Press, New York, NY.

Seamans, M. E., and R. J. Gutiérrez. 1995. Breeding habitat ecology of the Mexican spotted owl in the Tularosa Mountains, New Mexico. Condor 97:944–952.

Smith, L., R. Hofstetter, and R. Mathiasen. 2013. Insect communities associated with Douglas-fir dwarf mistletoe witches' brooms in northern Arizona. Southwestern Naturalist 58:395–402.

Stanton, S., and K.S. Hadley. 2010. Influence of western dwarf mistletoe (*Arceurhobium campylopodum* Engelm.) on surface fuels and snag abundance in mature Ponderosa pine and mixed conifer stands in central Oregon. Natural Areas Journal 30:261-270.

Tinnin, R. O. 1982. Witches' broom formation in conifers infected by Arceuthobium spp.: an example of parasitic impact upon community dynamics. American Midland Naturalist 107:351–359.

Tinnin, R. O. 1984. The effect of dwarf mistletoe on forest community ecology. Pages 117–122 in F. G. Hawksworth, and R. F. Scharpf, technical coordinators. Proceedings of the symposium on biology of dwarf mistletoes. United States Forest Service Research Paper 111. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.

Tinnin, R. O. 1998. An alternative to the 6-class dwarf mistletoe rating system. Western Journal of Applied Forestry 13:64–65.

Monitoring and Adaptive Management

Barnes, E.A. and Polvani, L., 2013. Response of the midlatitude jets, and of their variability, to increased greenhouse gases in the CMIP5 models. *Journal of Climate*, *26*(18), pp.7117-7135., https://doi.org/10.1175/JCLI-D-12-00536.1.

Brown, S.J. 2015. Administrative and Legal Review Opportunities for Collaborative Groups. ERI White Paper—Issues in Forest Restoration. Ecological Restoration Institute, Northern Arizona University and the Western Environmental Law Center. 12 p.

Broxton, P. D., van Leeuwen, W. J. D., & Biederman, J. A. (2019). Improving snow water equivalent maps with machine learning of snow survey and lidar measurements. *Water Resources Research*, 55, 3739– 3757. https://doi.org/10.1029/2018WR024146

Egan, D. and Nielsen, E. 2014. The History of the Four Forest Restoration Initiative: 1980s–2010. ERI White Paper—Issues in Forest Restoration. Ecological Restoration Institute, Northern Arizona University. 27 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/617/rec/7

Esch, B.E., and Vosick, D. 2016. The Four Forest Restoration Initiative (4FRI): The Role of Collaboration in Achieving Outcomes. ERI White Paper—Issues in Forest Restoration. Ecological Restoration Institute, Northern Arizona University. 15 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/271/rec/12

Espinoza V, Waliser DE, Guan B, Lavers DA, and F.M. Ralph, 2018, Global Analysis of Climate Change Projection Effects on Atmospheric Rivers. *Geophysical Research Letters*, 45(9), 4299-4308.

Hjerpe, E. and Mottek-Lucas A. 2018. Regional Economic Contributions of the Four Forest Restoration Initiative. The Conservation Economics Institute. https://www.fs.fed.us/restoration/documents/cflrp/results/4fri/RegionalEconomicContributions4FRI-Dec2018.pdf

Lu, J., Xue, D., Gao, Y., Chen, G., Leung, L.R. and Staten, P., 2018. Enhanced hydrological extremes in the western United States under global warming through the lens of water vapor wave activity. *npj Climate and Atmospheric Science*, *1*(1), p.7.

Moreno, H.A., Gupta, H.V., White, D.D. and Sampson, D.A., 2016. Modeling the distributed effects of forest thinning on the long-term water balance and streamflow extremes for a semi-arid basin in the southwestern US. *Hydrology and Earth System Sciences*, *20*(3), pp.1241-1267.

O'Donnell, F. C., Flatley, W. T., Springer, A. E., & Fulé, P. Z. 2018. Forest restoration as a strategy to mitigate climate impacts on wildfire, vegetation, and water in semiarid forests. *Ecological Applications*, *28*(6), 1459–1472. https://doi.org/10.1002/eap.1746

Seager, R. and Vecchi, G.A., 2010. Greenhouse warming and the 21st century hydroclimate of southwestern North America. *Proceedings of the National Academy of Sciences*, *107*(50), pp.21277-21282. https://doi.org/10.1073/pnas.0910856107

Singh, I., Dominguez, F., Demaria, E. and Walter, J., 2018. Extreme landfalling atmospheric river events in Arizona: Possible future changes. *Journal of Geophysical Research: Atmospheres*, *123*(14), pp.7076-7097. https://doi.org/10.1029/2017JD027866

Wasserman, T.N., Sánchez Meador, A.J. and Waltz, A.E., 2019. Grain and Extent Considerations Are Integral for Monitoring Landscape-Scale Desired Conditions in Fire-Adapted Forests. *Forests*, *10*(6), p.465.2018 National Climate Assessment.

APPENDIX IV
EXAMPLE FRAMEWORK FOR COLLABORATIVE ENGAGEMENT IN IMPLEMENTATION

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Appendix E:

Public Engagement in Adaptive Implementation

A Process for Adaptive Implementation of the Spruce Beetle Epidemic-Aspen Decline Management Response EIS

Grand Mesa, Uncompahgre, and Gunnison National Forest
USDA Forest Service
In cooperation with:
Rocky Mountain Research Station, USDA Forest Service
Colorado Forest Restoration Institute, Colorado State University

Appendix E – Process for Adaptive Implementation of the Spruce Beetle Epidemic –Aspen Decline Management Response EIS

INTRODUCTION AND BACKGROUND

The purpose of this document is to describe activities comprising the adaptive implementation and monitoring framework for the SBEADMR project. The primary goals are to:

- continue the public participation and collaborative learning that occurred during the planning phase, encourage and support the continuation of collaborative workgroup efforts throughout implementation;
- ensure implementation of treatments is responsive to dynamic on-the-ground conditions, new scientific information, and public input;
- demonstrate compliance with management direction specified in the EIS/ROD;
- conduct a transparent adaptive implementation process that keeps the public informed of and involved in treatment unit timing, design, and monitoring;
- ensure integrated engagement of interdisciplinary team members, field personnel, scientists, line officers and the public;
- focus on shared priorities and work to resolve concerns and solve problems related to selection and implementation of SBEADMR treatment units;
- conduct monitoring activities, interpret and share results, adapt implementation practices to improve results and better meet project objectives.

ADAPTIVE IMPLEMENTATION FRAMEWORK

The SBEADMR FEIS/ROD specifies this adaptive implementation framework for defining treatment locations and design, determining monitoring questions, reviewing and evaluating the effects of treatments, and adjusting management towards desired conditions and away from undesirable conditions. These actions will involve public stakeholders, the science team, and forest staff. The public participation and collaboration process that occurred during the planning process was significantly aided by the efforts of a collaborative workgroup of diverse stakeholders. This group has indicated that it would like to continue convening and facilitating collaborative work to assist in applying this adaptive framework. Specific phases and activities are outlined below. The intent is that this adaptive implementation framework will be utilized over a multi-year timeframe (8-12 years).

Stakeholder opportunities to influence SBEADMR implementation are outlined for each step of the process. Opportunities are confined by the sideboards of the selected alternative, as outlined in the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD). Further, the Forest Service retains the authority to make final decisions related to location, extent and types of treatments planned and completed consistent with the FEIS/ ROD. However, if at any-time a stakeholder has a specific question or concern related to any aspect of implementation under SBEADMR, forest staff will respond to stakeholder input to the greatest extent practicable and will provide feedback to stakeholders about how their concerns were addressed. The process outlined here is required by the ROD and stakeholder involvement will be ongoing throughout the life of the project.

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The adaptive implementation steps will cover pre-implementation treatment planning; post-implementation review; annual monitoring, evaluation, and new science integration; and annual management review with forest leadership team.

Commercial and non-commercial treatments that occur under the authority of the FEIS/ ROD will take up several years to pass through all the phases of implementation. Therefore, at any given time there will be several projects occurring that have passed through different steps of implementation and monitoring. The public will be invited to participate as discussed below.

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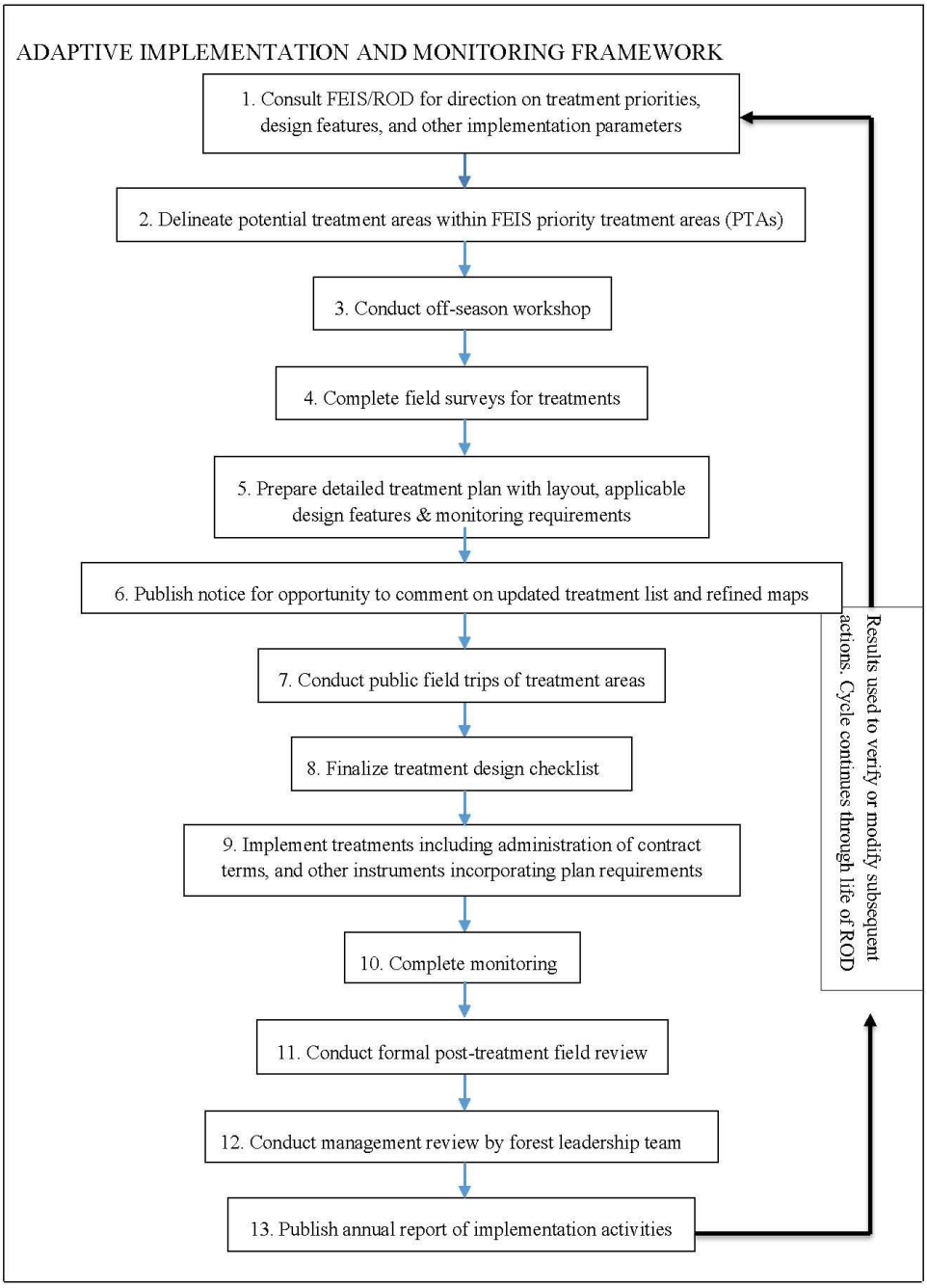

Figure 1. Adaptive implementation and monitoring framework. Details are provided below.

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Step 1) Consult the FEIS/ROD for direction on treatment priorities, design features, and other parameters.

The direction in the FEIS/ROD reflects comprehensive public participation and collaborative efforts conducted over a three-year planning period. The public had opportunities to influence all elements of these documents.

Stakeholder Opportunities:

A. Become familiar with the implementation parameters of the FEIS/ROD to develop an understanding of these limits and requirements and enhance ability to more meaningfully participate in implementation and adaptive management;
B. Treatment needs outside of the FEIS/ROD would need to be addressed under separate planning efforts.

Step 2) Delineate treatment units within the FEIS priority treatment areas (PTAs).

The priority treatment areas (PTAs) will form the bounds for out-year SBEADMR treatments that become part of the normal Forest Service program of work, including the 5-year timber sale, fuels management, and wildlife habitat programs. Nearer-term treatment units will be delineated with more detail, while out-year treatments may be shown with broader PTA boundaries.

Stakeholder Opportunities:

The forest will share information on the details of proposed treatment units as they become available, thereby enabling the collaborative workgroup (Adaptive Management Group) and all stakeholders the opportunity to learn about implementation activities prior to the subsequent steps. Updated information will be posted on the forest website.

Step 3) Conduct off-season workshop with stakeholders and science team.

Each year a winter or spring workshop will be held with stakeholders, treatment implementation team, and forest leadership team members to discuss implementation program, including:

- Proposed new out-year treatments;
- Report status of treatments already planned/in process of being implemented;
- Findings from the prior-year management review of treatments and the out-year program of work;
- Monitoring results to date and proposed coming-year and out-year multi-party monitoring;
- Evaluation and feedback on potential need for change in implementation or monitoring practices;
- New science and individual studies within the context of the larger body of scientific literature;