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June 9, 2023

Douglas Ruppel
c/o Mindi Lehew
Coronado National Forest
300 West Congress Street Tucson, AZ 85701

Re: Peloncillo Firescape Project

Dear District Ranger Doug Ruppel:

WildEarth Guardians respectfully submits these comments regarding the USFS Peloncillo Firescape Project to "treat the vegetation using wildland fire … prescribed cutting, and mastication on at least 35 percent of the Peloncillo Ecosystem Management Area" every 10 years. The public notice states this project intends to conduct, "restoration actions to achieve multiple resource benefits and increase ecosystem resiliency". Although the scoping letter does not state the number of acres affected, it appears the goal is to treat ~18,874 acres per year (85,149 acres in the EMA minus 31,225 acres of wilderness areas, multiplied by .35, per the scoping letter and Forest Plan p 98) with prescribed fire and/or tree removal, including the use of tractors, bulldozers, excavators and other heavy machinery.

WildEarth Guardians is a nonprofit conservation organization with offices and staff in Arizona, New Mexico, and many other western states. WildEarth Guardians has nearly 200,000 members and supporters across the United States and works to protect and restore the wildlife and wild places of the American West. Please add our organization to the contact list to receive any future public notices regarding this project.

As AZ & NM residents, and visitors to the Coronado National Forest, we too share the desire for the forest to be resilient. As ecologists, we understand that achieving this under increasingly extreme temperature and moisture regimes is no simple task. Yet, diverse lines of scientific inquiry identify a range of actions that can be taken to support drought resilience, enhance watershed function, and reduce fire hazard, and that altering forest structure with heavy machinery has unintended, counterproductive effects. We have included comments regarding this science, including a special section on mycorrhizal fungi. We invite you to contact us to discuss ways to make this project more successful.

Cordially,

Lisa Markovchick, PhD
Southwest Ecologist & Conservation Advocate, WildEarth Guardians
lmarkovchick@wildearthguardians.org

We have the following comments to share:

I. Flawed rationales for the claimed purpose and need related to vegetative management.

The Forest Service provides rationales to support its vegetation treatments, namely by citing departures from historic conditions, threats from natural disturbances (wildfire, insects and diseases), and increased wildfire risks due to past suppression actions. However, the underlying assumptions being relied upon are uncertain and exclude the full range of scientific evidence, thereby necessitating detailed environmental analysis under an EIS. To ensure that the agency has taken the required "hard look," courts hold that the agency must utilize "public comment and the best available scientific information." *Biodiversity Cons. Alliance v. Jiron*, 762 F.3d 1036, 1086 (10th Cir. 2014) (internal citation omitted). As such, the Forest Service must adequately demonstrate that the widespread use of specific proposed treatments under the proposed actions will improve ecosystem resilience, and that attempting to attain such a goal will in fact restore ecological integrity. In doing so, we caution the Forest Service not to rely on uncertain and controversial assumptions that the proposed treatments will effectively achieve the intended purposes and meet the stated needs.

A. Climate Change & Historical References

As noted above, the agency relies heavily on departures from historic conditions to support the project's purpose and need. Yet, when relying on such historic conditions to inform vegetative treatments, the Forest Service must account for the fact that climate change is fundamentally altering the agency's assumptions about the efficacy of the proposed actions. In fact, recent science calls into question findings that some forested landscapes historically experienced low-severity wildfire and current trends toward higher severities are substantially departed from historic ranges of variability. Specifically, researchers explained,

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

> accounts, early oblique and aerial photographs, seven paleo-charcoal reconstructions, >18 tree-ring reconstructions, 15 land survey reconstructions, and analysis of forest inventory data. Our rebuttal shows that evidence omitted in the review left a falsification of the scientific record, with significant land management implications. The low-severity model is rejected and mixed-severity model is supported by the corrected body of scientific evidence.

Baker et al., 2023.[1] In other words, the Forest Service cannot rely on one interpretation of historic reference conditions to formulate its vegetation treatments. Rather, the agency must look beyond HRV and inform restoration objectives based on reference sites that represent current ecological conditions of the project area. Such sites would have experienced broadscale disturbances in areas that have a passive management emphasis. In addition, the Forest Service should analyze how those reference conditions may change over the next 50 -100 years based on the best available climate models. It is likely that such analysis will indicate the best management approach is to allow for natural adaptation as a recent study suggests:

> Forests are critical to the planetary operational system and evolved without human management for millions of years in North America. Actively managing forests to help them adapt to a changing climate and disturbance regime has become a major focus in the United States. Aside from a subset of forests wherein wood production, human safety, and experimental research are primary goals, we argue that expensive management interventions are often unnecessary, have uncertain benefits, or are detrimental to many forest attributes such as resilience, carbon accumulation, structural complexity, and genetic and biological diversity. Natural forests (i.e., those protected and largely free from human management) tend to develop greater complexity, carbon storage, and tree diversity over time than forests that are actively managed; and natural forests often become less susceptible to future insect attacks and fire following these disturbances. Natural forest stewardship is therefore a critical and cost effective strategy in forest climate adaptation.

Faison et al. 2023.[2] In fact, Forest Service actions that seek to resist natural adaptation need careful evaluation to determine if such resistance will in fact meet restoration goals, especially given that “in a time of pervasive and intensifying change, the implicit assumption that the future will reflect the past is a questionable basis for land management (Falk 2017).” Coop et al., 2020. While it is useful to understand how vegetative conditions have departed from those in the past, the Forest Service cannot rely on those departures to define management actions, or reasonably expect the action alternatives will result in restoring ecological processes.

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[1] Baker, William L., Chad T. Hanson, Mark A. Williams, and Dominick A. DellaSala. 2023. "Countering Omitted Evidence of Variable Historical Forests and Fire Regime in Western USA Dry Forests: The Low-Severity-Fire Model Rejected" Fire 6, no. 4: 146. https://doi.org/10.3390/fire6040146

[2] Faison, E. K., Masino, S. A., & Moomaw, W. R. (2023). The importance of natural forest stewardship in adaptation planning in the United States. Conservation Science and Practice, e12935. https://doi.org/10.1111/csp2.12935

Given changing climate conditions, the Forest Service should emphasize reference conditions based on current and future ranges of variability, and less on historic departures. Further, the agency needs to shift its management approach to incorporate the likelihood that no matter what vegetation treatments it implements, there are going to be future forest wildfire-triggered conversions to other vegetation types. As such, the Forest Service cannot rely on the success of resistance strategies, as Coop 2020 explains:

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

Coop et al., 2020. Further, equally important to acknowledging the limitations of resistance strategies is the fact that other pertinent scientific findings show warming and drying trends are having a major impact on forests, resulting in tree die-off even without wildfire or insect infestation. See, e.g., Parmesan 2006; Breshears et al. 2005; Allen et al. 2010, 2015; Anderegg et al. 2012; Williams et al. 2013; Overpeck 2013; Funk et al. 2015; Millar & Stephenson 2015; Gauthier et al. 2015; Ault et al. 2016 ("business-as-usual emissions of greenhouse gases will drive regional warming and drying, regardless of large precipitation uncertainties"); Vose et al. 2016 ("In essence, a survivable drought of the past can become an intolerable drought under a warming climate").

Given the fallacies of using historic conditions as a reference for desired conditions and the uncertainty that treatments will maintain or restore ecological integrity in the context of climate change and likely forest conversion scenarios, the Forest Service must reevaluate its assumptions about its proposed vegetative treatments. In fact, many of the agency's assumptions run contrary to the most recent science regarding the impact of logging on wildfire behavior, resilience of the forest to large-scale disturbances, and ability to provide quality wildlife habitat. Many of the scientific studies cited within our comments call into question the Forest Service's assumption that its proposed actions will achieve the stated purpose and need. Ultimately, the agency cannot assert that there is broad consensus in the scientific literature that commercial timber harvest or thinning in combination with prescribed fire reduces the potential for high severity wildfire to the extent characterized in the project scoping letter. In fact, such an approach has been broadly questioned within the scientific literature:

> Fire suppression policies and "active management" in response to wildfires are being carried out by land managers globally, including millions of hectares of mixed conifer and dry

ponderosa pine (Pinus ponderosa) forests of the western USA that periodically burn in mixed severity fires. Federal managers pour billions of dollars into command-and-control fire suppression and the MegaFire (landscape scale) Active Management Approach (MFAMA) in an attempt to contain wildfires increasingly influenced by top down climate forcings. Wildfire suppression activities aimed at stopping or slowing fires include expansive dozerlines, chemical retardants and igniters, backburns, and cutting trees (live and dead), including within roadless and wilderness areas. MFAMA involves logging of large, fire-resistant live trees and snags; mastication of beneficial shrubs; degradation of wildlife habitat, including endangered species habitat; aquatic impacts from an expansive road system; and logging-related carbon emissions. Such impacts are routinely dismissed with minimal environmental review and defiance of the precautionary principle in environmental planning. Placing restrictive bounds on these activities, deemed increasingly ineffective in a change climate, is urgently needed to overcome their contributions to the global biodiversity and climate crises. We urge land managers and decision makers to address the root cause of recent fire increases by reducing greenhouse gas emissions across all sectors, reforming industrial forestry and fire suppression practices, protecting carbon stores in large trees and recently burned forests, working with wildfire for ecosystem benefits using minimum suppression tactics when fire is not threatening towns, and surgical application of thinning and prescribed fire nearest homes.

DellaSala et al., 2022.[3] This article comes in response to an article, Prichard et al. 2021, that we see the Forest Service typically cite to support its proposed actions and assert broad scientific consensus as to their efficacy. Yet, even here the researchers raise several factors that the Forest Service must address in a detailed analysis. For example, they explain:

> Fuel reduction treatments are not appropriate for all conditions or forest types (DellaSala et al. 2004, Reinhardt et al. 2008, Naficy et al. 2016). In some mesic forests, for instance, mechanical treatments may increase the risk of fire by increasing sunlight exposure to the forest floor, drying surface fuels, promoting understory growth, and increasing wind speeds that leave residual trees vulnerable to wind throw (Zald and Dunn 2018, Hanan et al. 2020).

Such conclusions indicate that treatments within areas of mesic site conditions may not be appropriate. In addition, Prichard et al, 2021 explains the following:

> In other forest types such as subalpine, subboreal, and boreal forests, low crown base heights, thin bark, and heavy duff and litter loads make trees vulnerable to fire at any intensity (Agee 1996, Stevens et al 2020). Fire regimes in these forests, along with lodgepole pine, are dominated by moderate- and high-severity fires, and applications of forest thinning and prescribed underburning are generally inappropriate.

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[3] DellaSala, Dominick & Baker, Bryant & Hanson, Chad & Ruediger, Luke & Baker, William. (2022). Have western USA fire suppression and megafire active management approaches become a contemporary Sisyphus?. Biological Conservation. 268. 109499. 10.1016/j.biocon.2022.109499.

Ultimately, what the agency proposes is a long-term active management regime that will require repeated tree cutting and burning since nowhere does the Forest Service state it has any plans to allow unmanaged wildfire to play a natural ecological role. This equates to perpetual management with logging and prescribed burning which is hardly ecological restoration, and the Forest Service's misguided efforts to mimic natural disturbance patterns fail to allow natural processes to function that creates even more novel ecosystems with unknown long-term results.

B. Assumptions And Uncertainty About Vegetation Treatments And Wildfire

Ultimately, we question the agency's assumptions that reducing tree densities and fuel loadings will result in less intense fire behavior. "[W]hat fire scientists call a forest's 'fuel load' is not the main cause of large, unstoppable fires; it's climate factors such as temperature, humidity, and especially wind. But the weather is ephemeral and invisible, while thick underbrush is easy to see and photograph" (Powell, H. 2019, Exhibit 1). See also Exhibit 2 ("Despite What the Logging Industry Says, Cutting Down Trees Isn't Stopping Catastrophic Wildfires").

Science shows that fuel treatments have a modest effect on fire behavior, and that fuel reduction does not necessarily suppress fire. Lydersen et al. 2014 (explaining that reducing fuels does not consistently prevent large forest fires, and seldom significantly reduces the outcome of large fires). Studies from the Forest Service's own Rocky Mountain Research Station refute the Forest Service's assumptions that vegetation treatments will result in less intense fire behavior. Calkin, D.E., et al., 2014 (explaining, "[p]aradoxically, using wildfire suppression to eliminate large and damaging wildfires ensures the inevitable occurrence of these fires").

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

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

Fuel treatments could even make fire worse—exacerbating the problems the Forest Service is claiming to address. Fuel reduction may actually exacerbate fire severity in some cases as such projects leave behind combustible slash through at least one dry season, open the forest canopy to create more ground-level biomass, and increase solar radiation which dries out the understory. Graham et al. 2012, Martinson & Omi, 2013 (finding that in about a third of cases reviewed mechanical fuel reductions increased fire spread). Also fuel reduction can exacerbate fire spread by opening up a forest to wind penetration.

We question the wisdom of attempting to control wildfire instead of learning to adapt to fire. See Powell 2019 (Exhibit 1 - noting that severe fires are likely inevitable and unstoppable). See also Schoennagel et al. 2017 (explaining, "[o]ur key message is that wildfire policy and management require a new paradigm that hinges on the critical need to adapt to inevitably more fire in the West in the coming decades"). The Forest Service must recognize that past logging and thinning practices may have actually increased risk of intense fire behavior on this landscape. But instead of learning from these past mistakes, here the Forest Service is committing to the same mistakes by proposing widespread tree cutting and repeated burning across the landscape. It is well-established that communities (homes) are best protected from fire by home hardening, and judicious removal of fuels within the surrounding 100 - 200 ft radius. Syphard et al. 2014, Cohen, 2000.[4] The Forest Service needs to address the fact that addressing the home ignition zone will do more to protect property than the proposed action.

We also question the need to reduce wildfire, a natural forest process. While some may view wildfires as tragic and the aftermath as a destruction zone, natural ecology shows otherwise. See Powell 2019, (Exhibit 1 - explaining how a young burned forest is an essential natural process and "nature's best-kept secret," providing new habitat for a plethora of birds, abundant wildflowers, insects, mushrooms, etc.). Further, in 2019 conservation scientists Dominick DellaSala and Chad Hanson published a study disputing the assumption that high-severity has increased in recent decades. In this megafire trend study, the researchers analyzed data on large high-severity burn patches across 11 western dry pine and mixed-conifer forests over three decades. They found no significant increase in the size of large high-severity burn patches since the early 1990s. DellaSala, Hanson, 2019. Most research studies define high severity as 90% tree mortality. (Moritz et al. 2014). Therefore, the Forest Service may be overestimating any increase of the amount of high severity wildfire that has been occurring in recent decades. This leads to a bias towards carrying out widespread and intensive fuel treatments to respond to the ostensive increase in high intensity fire.

Impacts from climate change, including changing weather patterns and drought, are the driving factors for wildfires. *Id.* Instead of focusing on thinning and prescribed burning to manage the forest, the Forest Service should focus on how it needs to change its practices to adapt to the changing climate. At an absolute minimum, these studies demonstrate that the proposed treatments

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[4] See also, Exhibit 3 containing a series of articles featuring Dr. Cohen.

are controversial, ill-supported, and have the potential for significant impacts requiring preparation of an EIS.

C. Assumptions and Uncertainty About Vegetation Treatments and Forest Resilience

The Forest Service explains that "[i]ncreased tree density and tree succession have resulted in a higher susceptibility to insects, disease, and drought as trees compete for sunlight, water, and nutrients," and "[i]mproving resistance to bark beetles (e.g. Douglas-fir and western pine beetles) means restoring and maintaining more open (less dense) stand structures to reduce tree stress and beetle habitat suitability." Scoping at 2. Yet, the best available science brings into question many of the Forest Service's underlying assumptions about the efficacy of vegetation treatments in reducing the effects from what can be characterized as a natural response to changing climate conditions. See Hart et al., 2015 (finding that although mountain pine beetle infestation and fire activity both independently increased with warming, the annual area burned in the western United States has not increased in direct response to bark beetle activity); see also Hart & Preston. 2020 (finding "[t]he overriding influence of weather and pre-outbreak fuel conditions on daily fire activity . . . suggest that efforts to reduce the risk of extreme fire activity should focus on societal adaptation to future warming and extreme weather"); see also Blackvet al. 2010 (finding, inter alia, that thinning is not likely to alleviate future large-scale epidemics of bark beetle); see also Six et al., 2018 (study that found during mountain pine beetle outbreaks, beetle choice may result in strong selection for trees with greater resistance to attack, and therefore retaining survivors after outbreaks—as opposed to logging them—to act as primary seed sources could act to promote adaptation); see also Six et al. 2014 (noting "[s]tudies conducted during outbreaks indicate that thinning can fail to protect stands").

Ultimately, science provides only weak support for vegetative treatments as a way to improve forest resilience to large-scale disturbances such as high severity crown fire and insects, and numerous studies question this approach or have found it to be ineffective. In addition, all mechanized treatments guarantee damage to ecosystem components, including soils, mycorrhizal networks, aquatics, and vegetation; they also have the potential to spread exotic plants and pathogens.

The Forest Service claims fuel treatments will help prevent outbreaks of bark beetle, but they virtually always leave slash through the next warm season, when a bark beetle outbreak could occur. Slash should not be left on the ground through the warm season following thinning treatments. This could precipitate a bark beetle outbreak throughout large sections of the Lolo National Forest. This risk must be addressed.

As such, the Forest Service must prepare a NEPA document to carefully consider these impacts and determine the efficacy of specific treatments.

II. Expand project's purpose to include the Forest Service's duty to identify the minimum road system.

Over twenty years ago, the Forest Service recognized the challenges related to its oversized and deteriorating road system. In 2001, the Forest Service promulgated the Roads Rule (referred to as "subpart A").[5] The Roads Rule created two important obligations for the agency. One obligation is to complete a Travel Analysis Report and identify unneeded roads to prioritize for decommissioning or to be considered for other uses.[6] Another obligation is to identify the minimum road system needed for safe and efficient travel and for the protection, management, and use of National Forest system lands.[7]

Under subpart A, the Forest Service has a substantive duty to address its over-sized road system. Identifying a resilient future road system is one of the most important endeavors the Forest Service can undertake to restore aquatic systems and wildlife habitat, facilitate adaptation to climate change, ensure reliable recreational access, and operate within budgetary constraints. This underlying substantive duty must inform the scope of, and be included in, the agency's NEPA analysis. After 20 years since finalizing the subpart A rules, the Forest Service can no longer delay in addressing this duty. Yet, the Forest Service fails to incorporate this duty within the project's purpose and need, thereby failing to ensure the road system provides for the protection of Forest Service System lands, reflects long-term funding expectations and minimizes adverse impacts. See 36 C.F.R. 212.5(b).

As such we urge the agency to include subpart A compliance as part of the project's purpose, especially given the likelihood that the agency will need to evaluate its road system within the project area in order to comply with NEPA. In doing so, we urge the Forest Service to update its previous Travel Analysis Report to reflect any changed circumstances. In addition, we urge the Forest Service to recognize that roads and motorized trails provide vectors for human wildfire ignitions, which is a risk that should be included in any Travel Analysis Process.

Complying with subpart A is a win-win-win approach: (1) it's a win for the Forest Service's budget, closing the gap between large maintenance needs and inadequate (and declining) funding through congressional appropriations; (2) it's a win for wildlife and natural resources because it reduces negative impacts from the forest road system; and (3) it's a win for the public because removing unneeded roads from the landscape allows the agency to focus its limited resources on the roads we all use, improving public access across the forest and helping ensure roads withstand strong storms.

III. The Forest Service must analyze the direct, indirect and cumulative impacts of the proposed action.

[5] 36 C.F.R. part 212, subpart A. 66 Fed. Reg. 3206 (Jan. 12, 2001).
[6] 36 C.F.R. § 212.5(b)(2).
[7] *Id.* § 212.5(b)(1).

NEPA requires the FS to prepare a detailed statement by the responsible official on "the reasonably foreseeable environmental effects of the proposed agency action."[8] A critical part of this obligation is presenting data and analysis in a manner that will enable the public to thoroughly review and understand the analysis of environmental consequences. Toward this end, NEPA requires the agency to "ensure the professional integrity, including scientific integrity, of the discussion and analysis in an environmental document," and "make use of reliable data and resources in carrying out this Act."[9] The Data Quality Act expands on this obligation, requiring that influential scientific information use "best available science and supporting studies conducted in accordance with sound and objective scientific practices."[10] The Forest Service may not ignore topics if the information is uncertain or unknown, and acknowledge where information is lacking or uncertain in a detailed statement. The Agency must also clarify the relevance of the information to the evaluation of foreseeable significant adverse effects, summarize the existing science, and provide its own evaluation based on theoretical approaches in a manner that is not arbitrary or capricious.

A. Disclose site-specific information

The FS should provide detailed, site-specific information regarding existing conditions and how the proposed action will affect forest resources including wildlife, wildlife habitat, streams and riparian areas. We are particularly interested in the disclosure regarding site-specific impacts to any at-risk wildlife. At a minimum, the FS must disclose the location of proposed activities in relation to wildlife that may be present in the project area and important wildlife habitat, as well as perennial or ephemeral streams and riparian areas.

B. Consider impacts from roads and motorized use.

Site-specific analysis is crucial to NEPA's goal of ensuring informed and science-based decision-making. In order to fully comply with NEPA, the Forest Service must also adequately assess and disclose numerous impacts related to forest roads and the transportation system generally including impacts from road presence, temporary and permanent road construction, and motorized use. The Forest Service must consider these impacts in the context of climate change, increased instances of human wildfire ignitions, and impacts to wildlife. The Forest Service must also assess and disclose the cumulative impacts of forest roads, access and fire; and forest roads and climate change.

The best available science shows that roads cause significant adverse impacts to National Forest resources. See, e.g., 66 Fed. Reg. at 3208 ("Scientific evidence compiled to date [2001] suggests that roads are a significant source of erosion and sedimentation and are, in part, responsible for a decline in the quality of fish and wildlife habitat."). WildEarth Guardians, 2020 Exhibit 4 (entitled, "The environmental Consequences of Forest Roads and Achieving a Sustainable Road System") provides

[8] 42 U.S.C. 4332 (C)(i), 2023.
[9] 42 U.S.C. 4332 (D)
[10] Treasury and General Government Appropriations Act for Fiscal Year 2001, Pub.L. No. 106-554, § 515.

a literature review that discloses 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. Erosion, compaction, and other alterations in forest geomorphology and hydrology associated with roads seriously impair water quality and aquatic species viability. 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. 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 archeological resources. Given these widely accepted ecological impacts from roads and motorized use, we urge the Forest Service to conduct a robust analysis of its road-related proposed actions.

1. Use an appropriate baseline

The logical place to begin this requisite analysis is to use an accurate baseline to compare project alternatives. In order to fully disclose the environmental consequences between alternatives as NEPA requires, the Forest Service must differentiate between the existing condition in its No Action Alternative and the legal baseline of system roads and trails. The CEQ recognizes the baseline and no-action alternative can, and sometimes do differ.[11] As such the analysis of the road system and related impacts in this project area should recognize and build on this distinction. Specifically, the agency must differentiate between the miles of national forest system roads and the network of non-system within the agency's jurisdiction. The baseline should only include the former and be separate from the no action that retains the existing condition. Such an approach is necessary in order to fully disclose the environmental consequences of the no action alternative. Yet, by failing to include a baseline of only system roads and trails in its analysis, the Forest Service risks properly disclosing the effects of the no-action alternative, which would then skew the analysis for any action alternative. Adding existing road prisms to the National Forest System is not a simple administrative action, and the agency cannot just assign road numbers in INFRA by claiming there are no immediate on-the-ground actions or direct effects from expanding the road system. While there may be no immediate effects because the unauthorized roads are part of the existing condition, the fact remains that the Forest Service must account for their potential environmental consequences. Without differentiating between system and unauthorized roads in the analysis, the Forest Service would fail to adequately disclose the direct, indirect and cumulative effects to lands, water, and wildlife from adding non-system roads to the system. In addition, without fully accounting for non-system and unauthorized roads not being added to the system in the analysis, any finding of no significant impact will be arbitrary and capricious, and a violation of NEPA.

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[11] See, e.g. , FSH 1909.15, 14.2; Council on Environmental Quality's (CEQ) Forty Most Asked Questions (1981), #3 (explaining "[t]here are two distinct interpretations of 'no action'"; one is "'no change' from current management direction or level of management intensity," and the other is if "the proposed activity would not take place").

2. Forest Roads, Human Access and Fire

Numerous factors drive instances of wildland fires and typically the FS acknowledges topography, weather and fuel as the primary drivers but often asserts that fuels are the only component that can be altered. The agency goes to great lengths attempting to demonstrate how vegetative treatments will change wildland fire behavior. But another major factor is human impacts. Human-ignited wildfires account for more than 90% of fires on national lands, and are five times more likely in areas with roads. Plus, roads can affect where and how forests burn and the vegetative condition of the forest. Yet despite the stated need to establish a resilient future forest, it is unclear how many roads will need to be created or improved to allow for the project action, or how the agency will enforce road closures. Given the scope and scale of the agency's proposal and the stated need to reduce instances of wildland fires, the FS must consider human caused ignitions in a detailed statement.

3. Avoid over-reliance on BMPs, resource protection measures or design criteria

The Forest Service cannot rely on best management practices, design features/criteria or resource protection measures as a rationale for omitting proper analysis. Specifically, when considering how effective BMPs are at controlling nonpoint pollution on roads, both the rate of implementation, and their effectiveness 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 evaluations on roads were conducted in FY2014. Of these evaluations, only about one third of the road BMPs were found to be "fully implemented." *Id.* at 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.* at 13.

Further, a 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 for road construction, presence and use. Edwards et al. 2016. The report found that while several studies have concluded that some road BMPs are effective at reducing delivery of sediment to streams, the degree of each treatment has not been rigorously evaluated. Few road BMPs have been evaluated under a variety of conditions, and much more research is needed to determine the site-specific suitability of different BMPs (Edwards et al. 2016, also see Anderson et al. 2011). Edwards et al. (2016) cites several reasons for why BMPs may not be as effective as commonly thought. 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. Further, Edwards et al. (2016) observes, "[t]he similarity of forest road BMPs used in many different states' forestry BMP manuals and handbooks suggests a degree of confidence validation that may not be justified," because they rely on just a single study. *Id.* at 133. Therefore, ensuring BMP effectiveness would require matching the site conditions found in that single study, a factor land managers rarely consider.

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 (Furniss et al. 2010). BMPs designed to limit erosion and stream sediment for current weather conditions may not be effective in the future. Edwards et al. (2016) states, "[m]ore-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." Id. at 136.

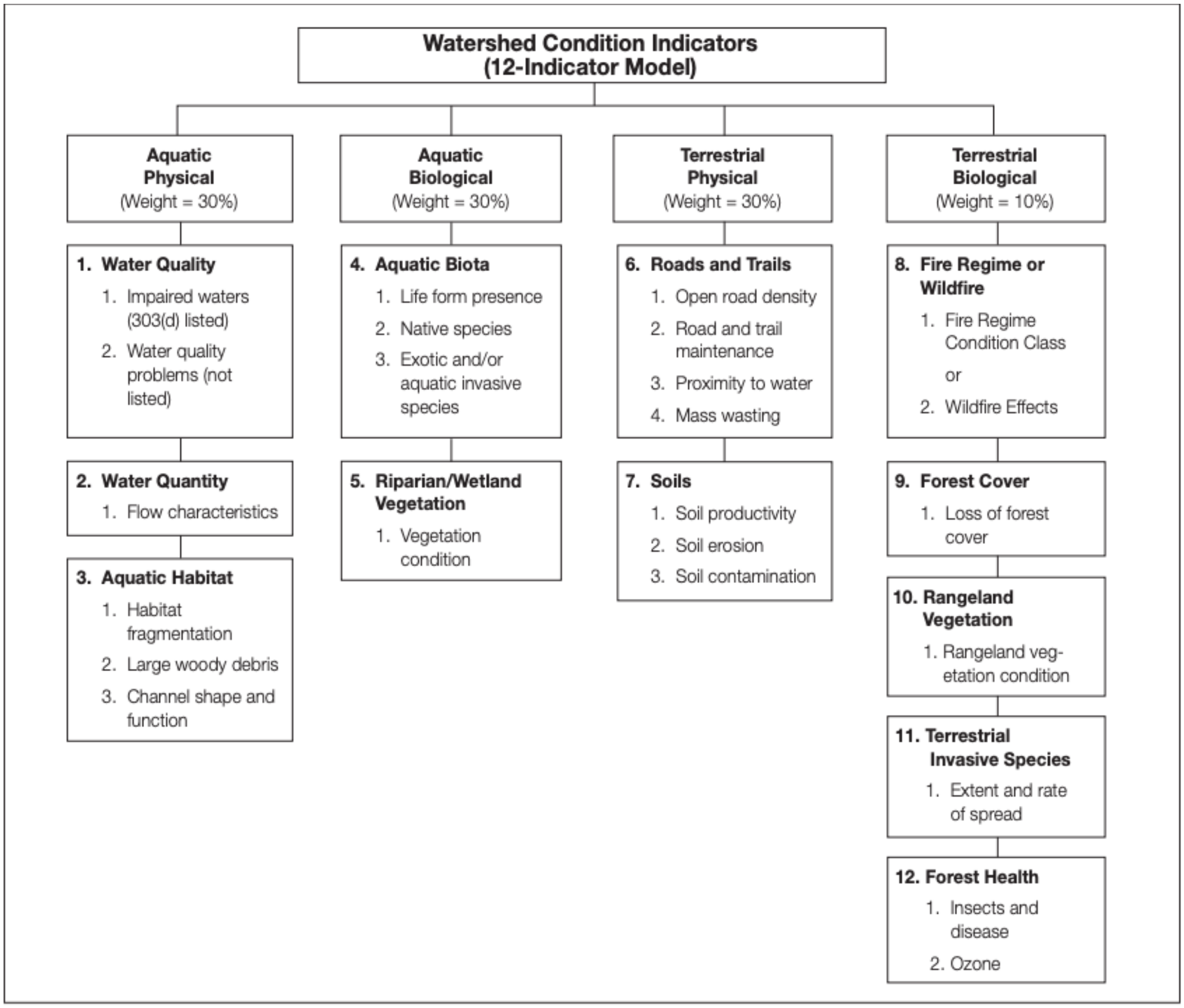
Significant uncertainties persist about BMP or resource protection measures effectiveness as a result of climate change, compounded by the inconsistencies revealed by BMP evaluations, which suggests that the Forest Service cannot simply rely on them to mitigate project-level activities. This is especially relevant where the Forest Service relies on the use of BMPs instead of fully analyzing potentially harmful environmental consequences from road design, construction, maintenance or use, in studies and/or programmatic and site-specific NEPA analyses.

It would be arbitrary and capricious for the Forest Service to assume 100 or even 80 - 90 percent proper BMP implementation and effectiveness as a rationale for not determining potential sedimentation without BMP application. Moreso, the Forest Service must demonstrate how BMP effectiveness will be maintained in the long term, especially given the lack of adequate road maintenance capacity, which is a serious omission given the agency's acknowledgement that it has inadequate funding and must prioritize roads open to passenger vehicles for annual maintenance. Lolo NF 2015 Travel Analysis Report at 13.

C. Consider impacts to watersheds, water quality and water quantity.

Consider and disclose the direct, indirect, and cumulative impacts of the proposed action to water quality, water quantity and overall watershed conditions. In order to take a hard look at the potential environmental consequences to watershed conditions from the proposed actions, the Forest Service must provide a detailed analysis, and absent a more tailored and specific watershed assessment we recommend utilizing the Watershed Condition Framework (WCF) in a manner that addresses each applicable indicator and attribute. *See* Figure 1 below.

Figure 1. WCF Indicator and Attributes[12]



We are particularly interested in the Road and Trail indicator and attributes. Here it is important to note that for classification purposes, and thus analysis purposes under NEPA, the Watershed Condition Classification Guide (WCCG)[13] clarifies the meaning of its open road attribute as follows:

> For the purposes of this reconnaissance-level assessment, the term "road" is broadly defined to include roads and all lineal features on the landscape that typically influence watershed processes and conditions in a manner similar to roads. Roads, therefore, include Forest Service system roads (paved or nonpaved) and any temporary roads (skid trails, legacy roads) not closed or decommissioned, including private roads in these categories. Other linear

[12] *Id.* at 6, Figure 2.
[13] https://www.fs.usda.gov/biology/resources/pubs/watershed/maps/watershed_classification_guide2011FS978.pdf

> features that might be included based on their prevalence or impact in a local area are motorized (off-road vehicle, all-terrain vehicle) and nonmotorized (recreational) trails and linear features, such as railroads. Properly closed roads should be hydrologically disconnected from the stream network. If roads have a closure order but are still contributing to hydrological damage they should be considered open for the purposes of road density calculations.

WCCG at 26. Road densities, the proximity to water, maintenance and mass wasting are essential attributes to consider when determining potential watershed impacts. The Forest Service must consider these attributes, especially the effects of any necessary road-related actions such as construction, reconstruction, and road use. Further, when analyzing the impacts to water quality and water quantity, the FS must provide site-specific analysis of the location of riparian areas, water springs, fens, wetlands, etc., in the project area, and then disclose the foreseeable adverse impacts from the proposed action.

D. Consider Mature and Old Growth Stands

On Earth Day 2022, President Biden issued an executive order requiring the Forest Service and Bureau of Land Management (BLM) to "define, identify, and complete an inventory of old-growth and mature forests" on their respective lands and to "make such inventory publicly available."[14] The order set forth a number of actions each agency must complete. First, the agencies must "define" mature and old-growth forests, "accounting for regional and ecological variations." *Id.* Second, after the agencies have defined mature and old-growth forests, they must then "identify" where those forests are and "complete an inventory" of those forests and make that inventory available to the public. *Id.* Third, after the inventory process is complete, the agencies must then (i) "coordinate conservation and wildfire risk reduction activities, including consideration of climate-smart stewardship of mature and old-growth forests," with other agencies, States, Tribal Nations, and private landowners, (ii) "analyze threats to mature and old-growth forests," and (iii) "develop policies" that address threats to mature and old-growth forests." *Id.*

On April 20, 2023, the Forest Service and BLM took the first step in complying with EO 14072 by publishing *Mature and Old-Growth Forests: Definition, Identification, and Initial Inventory on Lands Managed by the Forest Service and Bureau of Land Management* (MOG Report; Exhibit 5). The MOG Report "contains the first national inventory of old-growth and mature forests focused specifically on Forest Service and BLM lands." MOG Report 1. Importantly, the report's findings are only "*initial* estimates of old-growth and mature forests" on Forest Service and BLM lands. *Id.* (emphasis added). Indeed, throughout the MOG Report, the agencies repeatedly affirm the sequential nature of EO 14072 and that the current definitions and inventory are preliminary in nature:

[14] *See* Strengthening the Nation's Forests, Communities, and Local Economies, 81 Fed. Reg. 24851, 24852 (Apr. 22, 2022) ("EO 14072").

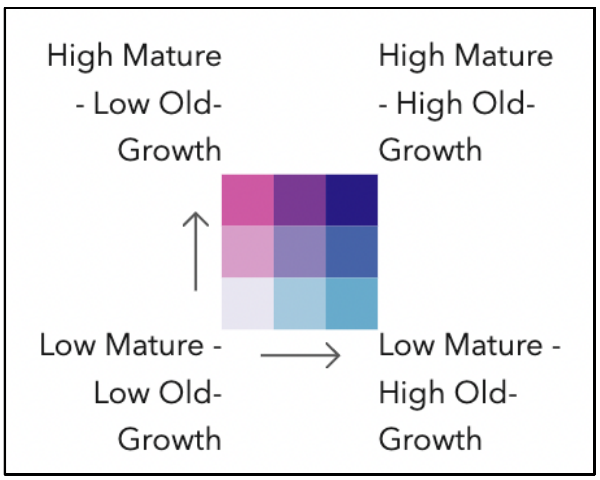
- "The ***initial*** inventory and definitions for old-growth and mature forests are part of an overarching climate-informed strategy to enhance carbon sequestration and address climate-related impacts, including insects, disease, wildfire risk, and drought. ***Initial*** inventory results will be used to assess threats to these forests, ***which will allow consideration of appropriate climate-informed forest management, as required by subsequent sections of Executive Order 14072***." MOG Report 1.
- "The ***initial*** inventory will ***then*** be used to assess threats to these forests, ***which will allow consideration of appropriate climate-informed forest management***, as required by subsequent sections of the Executive order." MOG Report 4.
- "***Once the definitions and inventory are established***, section 2c then calls on the Forest Service and BLM to:
    - Coordinate conservation and wildfire risk reduction…
    - Analyze the threats to mature and old-growth forests on Federal lands…and…
    - Develop policies…to institutionalize climate-informed management and conservation strategies that address threats to mature and old-growth forests on Federal lands."(MOG Report 10-11)
- "This ***initial*** inventory represents the current condition of forests managed by the Forest Service and BLM at the time of the most recent FIA measurement; it does not provide any information on resilience or climate response of these forests…The team plans to apply working definitions for old-growth and mature forest to prior FIA data, which will inform how these forests have changed over the past 10-20 years. In addition, ***the team will explore how old-growth and mature forests are distributed in additional land use allocations that are currently grouped into the 'other' category.***" MOG Report 26.
- "Executive Order 14072 section 2c and USDA Secretarial Memo 1077-004 provide some clarity on ***next steps*** following the initial classification presented here." MOG Report 26.

Contemporaneous to the publication of the MOG Report, the Forest Service also published an advance notice of proposed rulemaking (ANOPR) that, in part, "[b]uilds on ongoing work to implement" EO 14072.[15] The ANOPR explains that EO 14072 "calls particular attention to the importance of Mature and Old-Growth (MOG) forests on Federal lands for their role in contributing to nature-based climate solutions by storing large amounts of carbon and increasing biodiversity." *Id.* at 24498. Elsewhere, the ANOPR stresses "the importance of mature and old-growth forests" for "large tree retention and conservation" and that "[o]lder forests often exhibit structures and functions that contribute ecosystem resilience to climate change." *Id.* at 24502-24503. Finally, the ANOPR states the MOG inventory that is currently "being developed" will "help inform policy and decision-making on how best to conserve, foster, and expand the values of mature and old-growth forests on our Federal lands." *Id.* at 24501.

[15] *See* Organization, Functions, and Procedures; Functions and Procedures; Forest Service Functions, 77 Fed. Reg. 24497 (Apr. 21, 2023).

The ANOPR also announced the "beta version of a new Forest Service Climate Risk Viewer"[16] that "was developed with 38 high-quality datasets and begins to illustrate the overlap of multiple resource values with climate exposure and vulnerability." *Id.* at 24501. "Core information from the [initial] MOG inventory has been integrated into the viewer" to "help inform policy and decision-making on how best to conserve, foster, and expand the values of mature and old-growth forests on our Federal lands." *Id.* The initial MOG inventory displayed in the Climate Risk Viewer was derived from the Forest Inventory and Analysis (FIA) field plot networks, the "primary source for information about the extent, condition, status, and trends of forest resources across the U.S."[17] *See* Climate Risk Viewer. The map displays MOG estimates on Forest Service land within 250,000-acre fireshed polygons, which are considered "the appropriate scale for statistical inference using FIA plots." *Id.* The matrix colors indicate the degree of mature or old-growth forest within each polygon (light-to-dark pink = low-to-high mature forest; light-to-dark blue = low-to-high old-growth forest). *Id.* Polygons classified as "low" indicate 0-25,000 acres of mature or old-growth forest, "intermediate" (25,000-75,000 acres), and "high" (75,000-250,000 acres). *Id.*

Figure 2: Mature and Old-Growth Estimates in Forest Service Climate Risk Viewer.



The project area is within polygons identified as "medium" for mature forests. The Forest Service must further refine this inventory in a detailed statement and disclose how the proposed action may affect these inventories. In doing so, we urge the agency to consider other approaches from independent researchers. Specifically, in September 2022, researchers published the "first comprehensive and spatially explicit assessment of MOG in the conterminous United States,"[18] and

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[16] The Forest Service Climate Risk Viewer is available at: https://storymaps.arcgis.com/collections/87744e6b06c74e82916b9b11da218d28?item=8.

[17] The initial inventory for Oregon is based on FIA data from 2008-2019. MOG Report 62.

[18] DellaSala DA, et al. (2022) Mature and old-growth forests contribute to large-scale conservation targets in the conterminous United States. *Front. For. Glob. Change*, 5:979528, 3 (DellaSalla 2022) (Ex. 3).

made the result publicly available.[19] Another approach utilizes carbon as the basis for defining maturity. Here scientists explained the following:

> Our approach requires addressing two components: (1) individual trees referred to as the "larger" trees in a forest; and (2) mature forest stand development represented by stand age. This method for identifying larger trees in mature stands— and the related assessment of above-ground live carbon stocks and annual carbon accumulation—is intended to be broadly applicable and readily implementable independent of how mature stands are defined. We settled on defining stand maturity with respect to the age of maximum Net Primary Productivity (NPP), which is estimated as the annual net quantity of carbon removed from the atmosphere and stored in biomass (see section 2.2 for definitions of key terms).

Birdsey et al., 2023.[20] Researchers then provided the following definition: "Mature forests are defined as stands with ages exceeding that at which accumulation of carbon in biomass peaks as indicated by NPP," and used Culmination of Net Primary Productivity (CNPP) "to describe the age at which NPP reaches a maximum carbon accumulation rate." With this approach, scientists used FIA plot data for 11 national forests in the lower 48 states including those dominated by frequent-fire return intervals associated with dry pine and dry mixed conifer forest sites. **[INSERT AGE AND DIAMETER PER TABLE]**

Both Birdsey et al. (2023) and DellaSala et al. (2022) demonstrate the ability to define mature forests, quantify their capacity to store carbon, and provide a specific inventory, which we urge the Forest Service complete as part of a detailed analysis necessary to comply with NEPA. The importance of identifying and preserving these forests cannot be overstated as they are part of "nature-based climate solutions" for mitigating the effects of anthropogenic climate change. MOG Report 3. DellaSala et al., 2022 explains how mature forests "provide superior values compared to logged forests as natural climate solutions" to meet the objectives of EO 14072. *Id.* at 16 (citations omitted). But "the current status quo management of MOG and low protection levels on all lands presents unacceptable risks at a time when the global community is seeking ways to reduce the rapidly accelerating biodiversity and climate crises." *Id.* at 16-17 (citation omitted).

Further, we urge the Forest Service to recognize that as they mature, forests sequester and accumulate massive amounts of atmospheric carbon stored mainly in large trees and soils making an invaluable contribution to climate smart management and international climate commitments.

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[19] *See* https://www.matureforests.org/data (last accessed June 8, 2023)

[20] Birdsey R.A., DellaSala D.A., Walker W.S., Gorelik S.R., Rose G. and Ramírez C.E. 2023. Assessing carbon stocks and accumulation potential of mature forests and larger trees in U.S. federal lands. Front. For. Glob. Change 5:1074508. https://doi.org/10.3389/ffgc.2022.1074508

Stephenson et al. 2014,[21] Mildrexler et al. 2020.[22] Other studies demonstrate that unmanaged forests can be highly effective at capturing and storing carbon. Luyssaert et al., 2008.[23] Further, mature and old-growth forests have received increased global attention in climate fora (IUCN 2021)[24] and in the scientific community as natural climate solutions. Moomaw et al. 2019.[25] Notably, Article 5.1 of the Paris Climate Agreement calls on governments to protect and enhance "carbon sinks and reservoirs." Article 38 of the UNFCCC COP26 Glasgow Climate Pact emphasizes "the importance of protecting, conserving and restoring nature and ecosystems, including forests… to achieve the long-term global goal of the Convention by acting as sinks and reservoirs of greenhouse gasses and protecting biodiversity…" UNFCCC 2021.[26] The USA was also one of 140 nations at the COP26 that pledged to end forest degradation and deforestation by 2030. Logging both mature and old-growth forests is a form of forest degradation as it removes important forest structural features.

In addition, several studies demonstrate that maintaining forests rather than cutting them down can help reduce the impacts of climate change. "Stakeholders and policy makers need to recognize that the way to maximize carbon storage and sequestration is to grow intact forest ecosystems where possible." Moomaw, *et al.*, 2019. Another report concludes:

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

T. Hudiburg *et al.*, 2019.[27] Further, a June 2020 paper from leading experts on forest carbon storage reported:

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[21] Stephenson, N & Das, Adrian & Condit, Richard & Russo, S & Baker, Patrick & Beckman, Noelle & Coomes, David & Lines, Emily & Morris, William & Rüger, Nadja & Alvarez Davila, Esteban & Blundo, Cecilia & Bunyavejchewin, Sarayudh & Chuyong, George & Davies, S & Duque, Alvaro & Ewango, Corneille & Flores, O & Franklin, Jerry & Zavala, Miguel. (2014). Rate of tree carbon accumulation increases continuously with tree size. Nature. 507. 10.1038/nature12914.

[22] Mildrexler, David & Berner, Logan & Law, Beverly & Birdsey, Richard & Moomaw, William. (2020). Large Trees Dominate Carbon Storage in Forests East of the Cascade Crest in the United States Pacific Northwest. Frontiers in Forests and Global Change. 3. 10.3389/ffgc.2020.594274.

[23] Luyssaert, Sebastiaan & Ernst Detlef, Schulze & Borner, A. & Knohl, Alexander & Hessenmöller, Dominik & Law, Beverly & Ciais, Philippe & Grace, John. (2008). Old-growth forests as global carbon sinks. Nature. Nature, v.455, 213-215 (2008). 455(11). *See also* Law et al. 2018, Hudiburg et al. 2009

[24] IUCN (2022). IUCN 2021 annual report. Gland, Switzerland: IUCN.

[25] Moomaw, William & Masino, Susan & Faison, Edward. (2019). Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. 27. 10.3389/ffgc.2019.00027.

[26] Exhibit 6.

[27] Hudiburg, Tara & Law, Beverly & Moomaw, William & Harmon, Mark & Stenzel, Jeffrey. (2019). Meeting GHG reduction targets requires accounting for all forest sector emissions. Environmental Research Letters. 14. 095005. 10.1088/1748-9326/ab28bb.

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

B. Law, et al., 2020.[28] Further, to address the climate crisis, agencies cannot rely on the re-growth of cleared forests to make up for the carbon removed when mature forests are logged. One prominent researcher explains: "It takes at least 100 to 350+ years to restore carbon in forests degraded by logging (Exhibit 7; Hudiburg et al. 2009[29]). If we are to prevent the most serious consequences of climate change, we need to keep carbon in the forests because we don't have time to regain it once the forest is logged (IPCC, 2018)." *Id.*

Clearly the role of mature and old-growth forests to store carbon and serve as a natural climate-crisis solution must be part of any detailed project-level analysis. In fact, the Forest Service owes a duty to the public to ensure that these forests remain standing so that they can continue to perform their vital function of "storing large amounts of carbon." MOG Report 3; *see also Light v. U.S.*, 220 U.S. 523 (1911) ("the public lands . . . are held in trust for the people of the whole country."); *Juliana v. U.S.*, 217 F.Supp.3d 1224, 1259 (D. Or. 2016) ("[t]he federal government, like the states, holds public assets . . . in trust for the people.") (*rev'd on other grounds*, *Juliana v. U.S.*, 947 F.3d 1159 (9th Cir. 2020)); *Selkirk-Priest Basin Ass'n Inc. v. State ex rel Andrus*, 899 P.2d 949, 952-54 (Idaho 1995) (public trust doctrine permits challenge to timber sales since increased sedimentation could impact trust resources).

As such, the Forest Service should not be logging any mature and/or old-growth forests at least until it has completed the rulemaking that is currently being considered. Therefore, we are calling for a moratorium on mature and old-growth logging considering EO 14072 "calls particular attention to the importance of (MOG) forests on Federal lands for their role in contributing to nature-based climate solutions by storing large amounts of carbon and increasing biodiversity." 77 Fed. Reg. 24497, 24498; *see also* MOG Report at 3. Continuing to cut down and remove mature and old-growth trees and forests before the "definitions and inventory are established" and the current rulemaking is completed undermines the administration's focus on "nature-based climate solutions" for "storing large amounts of carbon."

[28] Law et al. 2020. Carbon sequestration and biodiversity co-benefits of preserving forests in the western United States. Ecological Applications, 30(2), 2020, e02039.

[29] Hudiburg, Tara & Law, Beverly & Turner, David & Campbell, John & Donato, Daniel & Duane, Maureen. (2009). Carbon dynamics of Oregon and Northern California forests and potential land-based carbon storage. Ecological applications : a publication of the Ecological Society of America. 19. 163-80. 10.1890/07-2006.1.

E. **The Forest Service must account for greenhouse gas emissions and provide a total carbon budget.**

The Forest Service must provide detailed analysis for a project of this scope and scale that utilizes readily available methods and models that represent high quality information and accurate greenhouse gas accounting[30] when undertaking environmental reviews of logging projects on federal lands. Research, including studies done by the U.S. government,[31] indicates that logging on federal forests is a substantial source of carbon dioxide emissions to the atmosphere.[32] Notably, logging emissions – unlike emissions from natural disturbances – are directly controllable. Models and methods exist that allow agencies to accurately report and quantify logging emissions for avoidance purposes at national, regional, and project-specific scales. As such, the Forest Service has the ability and responsibility to disclose estimates of such greenhouse gas emissions using published accounting methods with the express purpose of avoiding or reducing the greenhouse gas associated with logging, and acknowledge the substantial carbon debt created by logging mature and old-growth trees and forests on federal lands.[33]

In particular, we recommend that:

1. The agency should identify and assess the carbon stock of mature and old-growth forests and trees[34] given the substantial carbon value of such trees and forests;[35]

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[30] Hudiburg, T.W., et al. 2011. Regional carbon dioxide implications of forest bioenergy production. Nature Climate Change 1:419-423 https://www.nature.com/articles/nclimate1264. Hudiburg, T.W., et al. 2019. Meeting GHG reduction targets requires accounting for all forest sector emissions. Environmental Research Letters 14 (2019) 095005 https://doi.org/10.1088/1748-9326/ab28bb

[31] Merrill, M.D. et al. 2018. Federal lands greenhouse emissions and sequestration in the United States—Estimates for 2005–14, Scientific Investigations Report. https://doi.org/10.5066/F7KH0MK4.

[32] Harris, N.L. et al. 2016. Attribution of net carbon change by disturbance type across forest lands of the conterminous United States. Carbon Balance Manage:11-24 https://doi.org/10.1186/s13021-016-0066-5

[33] Hudiburg, Tara W., Beverly E. Law, William R. Moomaw, Mark E. Harmon and Jeffrey E. Stenzel. "Meeting GHG reduction targets requires accounting for all forest sector emissions." *Environmental Research Letters* (2019): n.pag. https://doi.org/10.1088/1748-9326/ab28bb
Harmon et al. "Forest Carbon Emission Sources Are Not Equal: Putting Fire, Harvest, and Fossil Fuel Emissions in Context." Frontiers For. Glob. Change (2022) https://www.frontiersin.org/articles/10.3389/ffgc.2022.867112/full

[34] Krankina, O., et al. 2014. High biomass forests of the Pacific Northwest: who manages them and how much is protected? Environmental Management. 54:112-121. Law, B.E., et a. 2021. Strategic forest reserves can protect biodiversity in the western United States and mitigate climate change. Communications Earth & Environment | https://doi.org/10.1038/s43247-021-00326-0

[35] Mackey, B., et al. 2013. Untangling the confusion around land carbon science and climate change mitigation policy. Nature Climate Change, Vol. 3 (June 2013)| VOL 3 | JUNE 2013 | www.nature.com/natureclimatechange. Keith, H. et al. 2019. Contribution of native forests to climate change mitigation. Environmental Science and Policy 93:189-199 https://www.sciencedirect.com/science/article/abs/pii/S146290111830114X. Law, B.E., et al. 2022. Creating strategic reserves to protect forest carbon and reduce biodiversity losses in the United States. Land https://doi.org/10.3390/land11050721. DellaSala D.A, et al. 2022. Mature and old-growth forests contribute to large-scale conservation targets in the conterminous United States. Front. For. Glob. Change 5:979528. doi: 10.3389/ffgc.2022.979528. Birdsey, R., et. al. 2023. Assessing carbon stocks and growth

2. The agency should identify and assess ***gross*** emissions from logging, particularly logging mature and old-growth trees and forests on federal lands, and including the emissions from logging on site and downstream emissions through the entire chain of custody of milling, manufacturing, and transportation; and
3. The agency should provide a high standard of scientific support for any asserted offsets of gross emissions, including discussion of timing factors that address the carbon debit created from logging vs avoiding logging and allowing stocks to further accrue.[36] We also note that storing some carbon in short-lived wood product pools is not compensatory as an offset or avoidance for using other carbon-intensive materials in construction.[37]

The Forest Service must disclose direct and indirect climate pollution from removing, transporting, and milling wood. This includes emissions from loss of stored carbon during the removal at the forest (in-boundary) and manufacturing and transport process (out-of-boundary). That is, Guidance should more closely specify the need to disclose the GHG emissions from logging on site through the entire chain of custody of milling, manufacturing, and transportation, including:

- construction, reconstruction, and maintenance of logging access routes;
- all forms of logging operations (clearcut, selective, postfire, commercial thinning, etc), including any herbicides, insecticides and related treatments;
- transport of logs to mills;
- milling of the wood; and
- transport of products to other sectors.

These emissions and others are all foreseeable impacts of logging projects. In some cases, these impacts may be considerable. For example, the South Plateau Project in Montana, currently pending a decision, will result in at least 40,000 trips by fully loaded logging trucks to remove the 83 million board feet of timber, and will involve the construction (and subsequent obliteration) of up to 57 miles of temporary road. We note that in addressing the impacts of coal mine expansions, federal agencies have disclosed the GHG emissions of equipment used to mine coal and to transport it to market. Land management agencies can and should make similar projections for GHG pollution associated with vegetation removal projects.

The Forest Service routinely asserts that the impacts of logging on carbon stores will be minimal because carbon from logged trees will be stored long-term in forest products. Such assertions are contrary to research indicating that much of the carbon stored in removed trees is lost in the near term, and little carbon is stored long-term in wood products.

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potential of mature forests and larger trees in U.S. federal lands. Frontiers For. Glob. Change. https://www.frontiersin.org/articles/10.3389/ffgc.2022.1074508/full

[36] Moomaw, W.R. et al. 2019. Intact forests in the United States: proforestation mitigates climate change and serves the greatest good. Frontiers in Forests and Global Change. https://doi.org/10.3389/ffgc.2019.00027 .

[37] Harmon, M.E. 2019. Have product substitution carbon benefits been overestimated? A sensitivity analysis of key assumptions. Environmental Research Letters (2019) https://iopscience.iop.org/article/10.1088/1748-9326/ab1e95

For example, a 2019 study evaluated the quantification of biogenic emissions in the state of Washington, which included GHG emissions from logging, but not decomposition of wood products. The study concluded that the failure to address decomposition losses amounted to as much as a 25% underestimation of carbon emissions.[38]

Losses from decomposition vary over time and also depend on the lifetime of the wood product being produced from the timber. Paper and wood chips, for example, have very short lifetimes and will release substantial carbon to the atmosphere within a few months to a few years of production. Bioenergy production and burning has been found to release more emissions than burning even coal, including methane. Product disposal in landfills results in anaerobic decomposition that also releases methane. Methane has a global warming potential about 30 times that of carbon dioxide over 100 years, and over 80 times that of carbon dioxide over 20 years,[39] magnifying the impact of disposal of short term wood products.

Longer term wood products can store carbon for many decades, but this depends on the life of the product. To give a sense of the larger picture, a study modeling carbon stores in Oregon and Washington from 1900-1992 showed that only 23% of carbon from logged trees during this time period was still stored as of 1996.[40] Similarly, > 80% of carbon removed from the forest in logging operations in West Coast forests was transferred to landfills and the atmosphere within decades.[11] In addition, Hudiburg (2019) concludes that state and federal carbon reporting had erroneously excluded some product-related emissions, resulting in a 25-55% underestimation of state total CO_2 emissions from logging.[11] Many of the aforementioned decomposition emissions could be avoided if trees were left standing, especially by protecting carbon stocks from logging of mature and old-growth trees and forests on federal lands.

The detailed NEPA analyses we are calling for would disclose the trade-off and the importance of maintaining the stock value of mature and old-growth trees. In so doing, the analysis would quantify *both* the short-term *and* long-term gross *and* net impacts of logging projects. This will allow agencies to disclose and assess the trade-offs between increasing GHG emissions via logging now – when decreases are most sorely needed – versus alleged increases in storage later. Detailed NEPA analysis would also avoid ignoring short-term carbon losses due to logging based on the erroneous assumption that the residual forest will have significantly reduced potential to have its carbon stores diminished by high-severity fires. Decades of research, however, call these sorts of blanket assertions into question.[14] Moreover, this is not a basis for failing to disclose emissions from the logging itself, especially in comparison to fire. Research shows that emissions from logging greatly exceed those from all natural disturbances combined (fire, insects, wind storms).[41]

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[38] Hudiburg, Tara W., Beverly E. Law, William R. Moomaw, Mark E. Harmon and Jeffrey E. Stenzel. 2019. "Meeting GHG reduction targets requires accounting for all forest sector emissions." *Environmental Research Letters* (2019): n.pag. https://doi.org/10.1748-9326/ab28bb
[39] Intergovernmental Panel on Climate Change, AR6 WG1 (2021): Forster, Piers; Storelvmo, Trude (2021). "Chapter 7: The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity."
[40] Harmon, M.E., Harmon, J.M., Ferrell, W.K. *et al.* 1996. Modeling carbon stores in Oregon and Washington forest products: 1900–1992. *Climatic Change* 33, 521–550 (1996). https://doi.org/10.1007/BF00141703.
[41] Harris, N.L. et al. 2016. Attribution of net carbon change by disturbance type across forest lands of the conterminous United States. Carbon Balance Manage:11-24 DOI 10.1186/s13021-016-0066-5 and

Further, the CEQ recently issued Guidance clarifying that agencies must address the emissions and storage impacts of project-specific vegetation removal projects, "such as prescribed burning, timber stand improvements, fuel load reductions, and scheduled harvesting."[42] We support this direction. In addition, the Forest Service should also assess emissions from pile burning related to forestry operations, as such actions can intensify carbon release.

The nature of the climate change emergency is based on multiple points of emission sources, with each contributing to the problem cumulatively. Therefore, project level analysis is a critical undertaking and one for which land management agencies now have the tools to quantify the contribution of each federal action, including in cumulative effects analyses.

Given the significant climate impact of logging on federal lands, it is critical that agencies estimate and quantify greenhouse gas emissions associated with each individual logging project and provide annual estimates associated with total logging on federal lands. Agencies should expand their abilities and expectations around accounting for logging emissions as a significant contributor to climate change in tandem with continued progress in fire emissions accounting that more accurately captures actual carbon emissions from forest fires.[43]

F. Consider the role of mycorrhizal fungi in maintaining ecological integrity

Study after study has shown that soil biota such as mycorrhizal fungi (symbiotic with plant roots) provide a suite of ecosystem services, such as carbon sequestration, aggregating soil particles and holding them together to reduce erosion and dust and increase water absorption, and support plants in drought survival and recovery through a variety of means. The percent changes or effect sizes from these studies are often large, and even small changes can be biologically meaningful. However, many studies also indicate that native mycorrhizal fungal communities are in decline and do not return swiftly on their own , and that supporting and reintroducing the full diversity of native mycorrhizal communities can have significant beneficial effects. For a summary of this science, we are including Exhibit 8 (a fuller summary of the science and policy surrounding this issue) and a recent scientific publication along the same lines (Markovchick et al. 2023).

G. Cumulative Effects

In addition to providing robust analysis that discloses the site-specific direct and indirect effects, the agency must also take a hard look at cumulative impacts. Toward this end, it is vital that the results of past monitoring be incorporated into project analysis and planning. We request the following be disclosed:

- A list of all past projects (completed or ongoing) implemented in the analysis area.

Merrill, M.D. et al. 2018. Federal lands greenhouse emissions and sequestration in the United States—Estimates for 2005–14, Scientific Investigations Report. https://doi.org/10.5066/F7KH0MK4 Zald, H.J., and C.J. Dunn. 2018. Severe fire weather and intensive forest management increase fire severity in a multi-ownership landscape. Ecological Applications 28(4):1068-1080 https://doi.org/10.1002/eap.1710

[42] CEQ, National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change, 88 Fed Reg. at 1206.

[43] Harmon, M.E., C.T. Hanson, and D.A. DellaSala. 2022. Combustion of aboveground wood from live trees in megafires, CA, USA. Forests. Forests 13 (3)391; https://doi.org/10.3390/fl3030391.

- A list of the monitoring commitments made in all previous NEPA documents covering the analysis area, and the monitoring results.
- A description of any monitoring, specified in those past projects for the analysis area, which has yet to be gathered and/or reported.
- A summary of all monitoring of resources and conditions relevant to the proposal or analysis area as a part of the Forest Plan monitoring and evaluation effort.
- A cumulative effects analysis that includes the results from the monitoring required by the Forest Plan.
- A list of approved watershed and wildlife improvement actions from past NEPA decisions that remain incomplete due to a lack of funding.

Please provide an analysis of how well those past FS projects met the goals, objectives, desired conditions, etc. stated in the corresponding NEPA documents, and how well the projects conformed to forest plan standards and guidelines. Such an analysis is critical for validating the agency's current proposed action under the Superior North Project. Without analyzing the accuracy and validity of the assumptions used in previous NEPA processes one has no way to judge the accuracy and validity of the current proposal. The predictions made in previous NEPA processes also must be disclosed and analyzed because if these were not accurate, and the agency is making similar decisions, then the process will lead to failure. For instance, if in previous processes the FS said they were going to do a certain monitoring plan or implement a certain type of management and these were never effectively implemented, it is important for the public and the decision maker to know. If there have been problems with agency implementation in the past, it is not logical to assume that implementation will be proper this time. If prior logging, prescribed fire and other "forest health treatments" have not been monitored appropriately, the Forest Service must demonstrate how it can ensure the beneficial results it asserts in the scoping document will in fact occur. The agency has an obligation to demonstrate consistency with all the applicable directions in the Forest Plan, and to provide robust cumulative effects analysis as NEPA requires.

V. Demonstrate Compliance with the Clean Water Act

Under the Clean Water Act ("CWA"), states are responsible for developing water quality standards to protect the desired conditions of each waterway within the state's regulatory jurisdiction. 33 U.S.C. § 1313(c). Water bodies that fail to meet water quality standards are deemed "water quality-limited" and placed on the CWA's § 303(d) list. The CWA requires all federal agencies to comply with water quality standards, including a state's anti-degradation policy. 33 U.S.C. § 1323(a). The FS must ensure all activities in this proposal comply with the CWA. In particular, it must ensure its proposal for logging, and the associated road reconstruction, maintenance, and ongoing log hauling other uses of these roads, will not cause or contribute to a violation of water quality standards. We strongly caution the Forest Service against relying on best management practices as the sole mechanism for CWA for the reasons explained above. At a minimum, the agency must ensure its analysis does not assume 100 percent BMP effectiveness and include water quality analysis that compares alternatives with and without the use of BMPs in order to disclose the potential sedimentation resulting from the project activities. At bottom, the Forest Service must demonstrate that it is not contributing sediment to water quality limited stream segments, or exceeding any road-related total daily maximum loads for sediment, and ensure compliance with Montana's antidegradation rules. We caution the agency against over-reliance on best management practices in complying with the CWA requirements as we explained above.

Exhibits

1. Powell, Hugh. Old Flames: The Tangled History of Forest Fires, Wildlife, and People. Living Bird, Summer 2019.
2. Despite What the Logging Industry Says, Cutting Down Trees Isn't Stopping Catastrophic Wildfires. ProPublica, December 2020.
3. Missoula Current. 2022. Part 1 & Part 2: Scientists, Missoula County shift wildfire focus to home ignition zone.; Missoulian. Aug. 2020. Dave Strohmaier and Jack Cohen Guest Column: Community destruction during extreme wildfires is a home ignition problem.
4. Environmental Consequences of Forest Roads - WildEarth Guardians - March 2020
5. USFS Mature and Old-Growth Forests: Definition, Identification, and Initial Inventory on Lands Managed by the Forest Service and Bureau of Land Management. Fulfillment of Executive Order 14072, Section 2(b). April 2023. S-1215a.
6. UNFCCC. B. Law, et al., The Status of Science on Forest Carbon Management to Mitigate Climate Change (June 1, 2020).
7. B. Law, et al., The Status of Science on Forest Carbon Management to Mitigate Climate Change (June 1, 2020).
8. Summary of the Science and Policy Surrounding Mycorrhizal Fungi, WildEarth Guardians, June 2023.

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