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Comments: Please consider my comments on the Notice of Intent (NOI) regarding Land Management Plan Direction for Old-Growth Forest Conditions Across the National Forest System (U.S. Department of Agriculture, Forest Service, 20 December 2023). It is good to protect old-growth, and in general I support this plan, but it needs to go further to protect mature forest of younger age classes as directed by President Biden in his Executive Order signed on Earth Day 2022 (Biden, 22 April 2022). (All sources cited herein are incorporated by reference.) Protecting mature forests is as important as protecting old-growth for maintaining a favorable carbon balance between forested landscapes and the atmosphere (Birdsey et al., 2023).

In addition to amending Forest Plans to incorporate consistent policy on mature and old-growth forest, National Forests that are delinquent in revising their Plans (> 15 years since a new Plan) should be required to undertake an environmental analysis and revise their Plans to reflect up-to-date understanding of forest ecology, climate change, and wildfire dynamics.

Mature and old-growth forest support high biodiversity and are crucial for achieving international climate goals (Dellasala et al., 2022). One of the objectives mentioned in the Notice of Intent is to recruit future old-growth conditions. The best way to obtain old-growth forest conditions is to allow forests to grow old. For this and other reasons, I support a moratorium on logging mature and old-growth stands on National Forest System land during the current climate change crisis.

Deforestation rates surpassed rates of afforestation in all regions of the conterminous United States in the early part of this century, and forest disturbance is associated with reductions in carbon sinks (Zheng et al., 2011). Birdsey and coworkers (2023) analyzed the potential of middle-aged forests in the eastern United States for climate mitigation and determined that reducing harvest levels could sequester substantial carbon. Although harvested wood could substitute for building materials whose production results in greater emissions, Harmon (2019) has argued that this substitution effect may have been dramatically overestimated. Thus we may conclude that current forest policy in the USA is exacerbating anthropogenic climate change. Climate change, in turn, feeds back to affect the frequency and scale of forest disturbances that contribute to deforestation and destabilize forestry-dependent economies (Keskitalo et al., 2011).

Seidl and coworkers (2017) explored the topic of forest disturbance under climate change, concluding that "both ecosystems and society should be prepared for an increasingly disturbed future of forests". For this and other reasons, we should do all we can to protect forest that has remained unaffected by large disturbances for decades and centuries.

An objective stated in the Notice of Intent is to monitor mature and old-growth forests. This is important for understanding the mechanisms of forest ecology and the trajectories of our forests. Funds should be made available for independent researchers to investigate aspects of forest ecology such as tree succession and regeneration, population trends of animals and other forest organisms, soil nutrient cycling, and response to natural disturbances.

Another objective stated in the Notice of Intent is to foster long-term resilience of old-growth forests. It is important to understand that resilient does not mean unchanging, whether we adopt the definition introduced by Holling (1973) or that used by Pimm (1991). Simply because we observe that aspects of forests are changing, that does not mean we should rapidly take action to fix them. We need to study these changes and think about them, but we should be patient as the forests are patient. Our understanding of forests advances rapidly relative to the lives of trees, but the actions we take now may have unintended consequences long into the future.

The Notice of Intent states that initial analysis of threats to old-growth following the President's (22 April 2022) Executive Order has indicated that wildfire is the greatest threat to old-growth forest. However, the term "threat" is defined in the NOI to mean a change in land cover classification without necessarily a change in ecological integrity or function. Since wildfire is a functional component of many forests, it does not follow that fire always threatens the integrity of forest ecosystems. Logging, in contrast, is not a natural component of forested ecosystems and can thus both threaten functional integrity of ecosystems and convert landscapes from one land cover class to another.

In terms of carbon dynamics, Harmon and coworkers (2022) found that a relatively small proportion of aboveground biomass was emitted as atmospheric carbon even in intense fires in the Sierra Nevada. Furthermore, Bartowitz and coworkers (2022) presented an analysis indicating that timber harvest in the western United States causes greater carbon emissions to the atmosphere than does wildfire. Even if wildfire is a significant threat to some western forests, it is clearly not a threat in regions where it seldom occurs such as the Central Hardwoods (Donovan et al., 2023; see supplementary figures in this reference for ecoregional data).

One objective stated in the NOI is to provide consistent national direction recognizing the role of old-growth in resilience of forests to wildfire. This is important to ensure that all Forest Plans prioritize the protection of old-growth rather than using fuel reduction as a rationale for cutting trees in these ecosystems. The NOI also states that science-based vegetation treatments can be used. Oftentimes, vegetation treatments are counterproductive to the goals of biodiversity protection, carbon sequestration, ensuring water quality, fostering resilience, and reducing fire risk, so they should be avoided. Vegetation treatments that are used should certainly be based on the best available science, however.

One vegetation treatment mentioned in the NOI is "restoring prescribed fire in fire-adapted ecosystems". While it may sometimes be desirable to restore fire in fire-adapted ecosystems, it is not prescribed fire to which forest ecosystems are adapted—certainly not prescribed fire as it is practiced with modern techniques. Also, it is important that prescribed fire not be too broadly applied; not all forest communities can be considered to be fire-adapted, and fire should only be used when the ecological benefits outweigh the harm to organisms and air quality and the emission of greenhouse gases.

An objective stated in the NOI is to manage old-growth conditions for ecosystem diversity, habitat, recreation, aesthetics, and water quality. It is worth noting that these five values can often be achieved most readily by leaving old-growth forest alone.

The NOI notes that the Forest Service has for some time encouraged the development of Forest Plan language that provides for succession of young and mature forests into old-growth. There is certainly room for improvement in this regard, as many Forest Plans identify areas where tree harvest is considered appropriate. Instead, the amendments that are to be added to Forest Plans under this proposal should discourage cutting trees in young and mature forest to allow these younger seres to succeed to old-growth forest. As stated in the Purpose of the Amendment in the NOI, it is important to recognize when natural succession can achieve desired conditions.

The NOI identifies 10 areas of agreement based on responses to the Climate Resilience Advance Notice of Proposed Rulemaking (ANPR) from last year (USDA Forest Service, 21 April 2023). These areas of agreement form a good basis for the development of a consistent policy.

Under the Purpose of the Amendment in the NOI, it is stated that units will be asked to create an Adaptive Strategy for Old-Growth Forest Conservation but would be allowed to adopt an "existing strategy that meets this intent". If an existing strategy is to be used, it should not only meet the intent but also be likely to achieve the goals of protecting old-growth forest and allowing the recruitment of future old-growth conditions.

The last purpose mentioned in the "Purpose of the Amendment" section is "co-stewardship with Tribes and

Alaska Native Corporations and collaboration with States, local governments, industry partners, and public stakeholders". While co-stewardship is a worthwhile goal, collaboration with industry on National Forest System lands would not be necessary if commercial extractive activities such as logging and mining are not planned for mature and old-growth forest on National Forest System lands. It would, however, be worthwhile for the Forest Service to collaborate with industry partners by helping to identify and protect old-growth forest on private lands.

Under "Need for Change", the NOI lists several important topic areas, but "redundancy of old-growth forest conditions" should not be a concern. In most regions of the United States there is very little old-growth remaining, and redundancy is valuable for ensuring ecosystem and landscape stability and resilience. Perhaps the wording should read "lack of redundancy".

Under "Substantive Provisions", the NOI identifies CFR 219.8-219.11 as being the sections of the planning regulations relevant to the proposed amendment. Most of the other sections of CFR 219 are also relevant and should be considered. However, emphasis does not need to be placed on CFR 219.11 as stated in the NOI, as timber harvest does not need to be a part of this proposal.

In the description of the proposed action under "Desired Conditions", mention is made of "proactive stewardship, including for retention and recruitment". Active management is certainly not required for retention of old-growth, since active management would alter old-growth conditions. For recruitment, I would generally argue that the best way to recruit old-growth forest conditions is to allow forests to grow old.

Under "Standards for Management Actions Within Old-Growth Forest Conditions", the NOI even mentions "percentage and proportion of forest interior". Clearly, active management cannot increase forest interior area; it can only decrease it. Also mentioned is the goal of promoting the extent of disturbances, which is of dubious value (Kellett, et al., 2023). We all expect disturbance to increase with climate change (e.g., Seidl et al., 2017), so we do not need to create disturbance. The Tongass National Forest, which is of global significance for its extensive old-growth temperate rainforest, should not be exempted from standards 2 and 3 as stated in standard 4.

I am glad that the Department of Agriculture is undertaking this initiative and hope that protections for mature and old-growth forests will be as strong as possible.

Thank you for considering my comments,

Donald Edward Winslow

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