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Old-Growth Forests Across the National Forest System

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Thank you for this opportunity to comment on the Draft Environmental Impact Statement (DEIS) for Amendments to Land Management Plans to Address Old-Growth Forests Across the National Forest System

As a conservation biologist with over 40 years professional experience in biodiversity conservation, my comments are primarily directed to the DEIS Ecological Impacts Analysis (EIA), and specifically to the topic of biodiversity. The EIA addresses biodiversity in Section 5 - Ecosystem Services, with this opening paragraph on page 11:

Old-growth forests contain a diverse array of plant and animal communities, including many that are rare or absent in younger forests. This diversity plays a key role in maintaining ecosystem function, resilience, and the ability of old-growth to deliver other ecosystem services. Old-growth forests support high levels of biodiversity due to complex structure, with features like large trees, diverse understory vegetation, and abundant dead wood creating a wide range of ecological niches and microhabitats.

This paragraph sets the stage - biodiversity is vital to old-growth forests in maintaining ecosystem functions, resiliency to disturbances, and the ability to deliver ecosystem services. But, what does the Forest Service mean by "high levels of biodiversity"? To understand the answer to this question, we first need to consider - what is biodiversity?

As defined by the Keystone Dialogue (1991):

Biodiversity is the variety of life and its processes. It includes the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning yet changing and adapting.

This definition recognizes variety at four levels of organization - genetic, population/species, community/ecosystem, and landscape/regional. A common misconception by many is that biodiversity is equivalent to species diversity, i.e., the more species in an area the greater the biodiversity. This thinking drives the rationale of wildlife managers to create openings in forests to attract animals not normally found in closed canopy forests, thus increasing local diversity. But, biodiversity is not a numbers game. Quality is more important than quantity. It's not so much the number of species, it is their identity.

For example, fragmenting an old-growth forest with clearcuts might increase species richness at the local scale, but would not contribute to species richness at a broader scale when sensitive species are lost from the landscape (Noss and Cooperrider 1995).

Regrettably, with less than two pages devoted to the subject, the DEIA is clearly deficient in describing the complexity of species and processes that constitute the biodiversity of old-growth forests. In those two pages we only learn about the following:

1. Tree cavities, generally carved by woodpeckers, are one example of a key habitat for a variety of forest species and are generally found in greater numbers in old-growth forests.
2. Lichen diversity is also often significantly higher in old-growth forests.
3. Fungi, including mycorrhizae, are also key components of old-growth forest biodiversity.

With just these three random examples, lichens, fungi, and tree cavities, the Forest Service tries to demonstrate an understanding of the complexity of biodiversity in old-growth forests. Astoundingly, the mention of woodpeckers is the only reference to a member of the Class Animalia! Needless to say, there is a lot more to old-growth biodiversity than just lichens, fungi, and woodpecker holes.

Insects and other arthropods, for example comprise 85% of the taxa in old-growth forests. I would strongly urge you to reference a 2017 paper by Timothy Schowalter entitled, Arthropod diversity and functional importance in old-growth forests of North America. Some of the key points in this paper include the following:

1. Insects and related arthropods reach their highest diversity in old-growth forests because of their stable moderate temperature and relative humidity and the rich variety of resources represented by high plant species richness and structural complexity.
2. From a biodiversity perspective, old-growth provides the greatest diversity of habitats for unique assemblages of species that may not occur or be unable to survive and reproduce in younger forests that lack critical habitats. Commercial forestry has favored harvesting stands long before old-growth characteristics typically appear, thereby threatening the persistence of species that depend on old-growth habitats.
3. Tall multilayered canopies characterizing many old-growth forests have the greatest capacity to buffer interior forest conditions from extreme variation in temperature, moisture, and wind speed. The relatively moderate conditions characterizing old-growth forests provide optimal environmental conditions for a diversity of plant and animal species that cannot tolerate greater variation in environmental conditions.
4. Although efforts to protect increasingly isolated remnants of old-growth forest typically focus on endangered plants and vertebrates, arthropods are equally important to the functioning of forest ecosystems and are vulnerable to extinction through loss of old-growth forests. In fact, the value of old-growth forests may lie primarily in their diversity of native species that provide population sources for colonization and ecological functions in regenerating forests. In particular, the diversity of plant species, predaceous arthropods, and insectivorous vertebrates in old-growth forests help maintain lower abundances of herbivores than often occur in younger, managed, forests.
5. Arthropods typically comprise 70%-90% of taxa and dominate animal biomass in forest ecosystems. Arthropod diversity generally increases with forest age, time since prior disturbance, and the remaining area of forest. Remnant old-growth forests are particularly rich in arthropod biodiversity. Old-growth forests typically provide the richest diversity of plant species, habitats, and vertical and horizontal gradients in temperature, moisture, and soil type that, in turn, support the richest diversity of associated herbivores, detritivores, and their predators and parasites, compared to younger forests.
6. Forest floor arthropod assemblages in upper Midwest old-growth forests were distinct from assemblages in younger, managed forests, and included four carabid species (*Carabus sylvosus*, *Agonum gratiosum*, *Myas cyanescens* and *Platynus decentis*) that were significant indicators of old-growth forests.
7. Outbreaks of native insect species are relatively rare and localized in old-growth forests characterized by high diversity and low density of suitable resources and high diversity of predators and parasites.
8. Arthropods comprise a bulk of diversity and contribute to critical functions in old-growth forests in North America. Although relatively few species appear to be unique to old-growth many species remain unidentified and their old-growth status is unknown.
9. A number of arthropod species in the canopy, stem, and forest floor zones reach peak abundances in old-growth because of the unique habitats (large old trees, large CWD and deep litter) and stable, moderate temperature and relative humidity that characterize old-growth forests, in contrast to younger, managed forests.
10. Arthropods, like other animals, may move across landscapes as they forage or disperse but may not be able to survive and reproduce in all forest types if their resources or habitats are absent. Consequently, many arthropods may be vulnerable to extinction as old-growth forests continue to disappear, potentially threatening nutrient cycling processes critical to forest productivity.
11. Old-growth forests host a particularly rich diversity of predators and parasitoids that contribute to regulation of prey populations. As a result, insect outbreaks are relatively rare in diverse old-growth forests.

Returning to the DEIA, the discussion of biodiversity concludes with the following paragraph:

Forests that contain early-, mid- and late-seral vegetation stages also provide a wide range of biodiversity conditions that may not be found in, or provided by, old-growth forests. Many species rely on a combination of different seral vegetation stages for different parts of their lifecycle and the use of each seral stage differs based on the species. Therefore, maintaining a mosaic of old-growth forests and forests of different ages (stages in forest development) and seral stages is crucial for preserving a broad spectrum of plant and animal communities and associated ecological integrity across broad areas.

This paragraph illustrates the rationale used by wildlife managers to justify logging within forests to create early seral habitats that "increase species diversity." But overall, the creation of non-forested habitats within older forests reduces ecological integrity and resiliency.

In this regard, we should also make note of Section 6 of the DEIA, on page 20:

Silvicultural approaches can aid in restoring old-growth attributes by mimicking natural forest dynamics and promoting structural complexity and biodiversity. Thinning can accelerate individual tree growth, aiding in the restoration of large trees and old forest structures. Prescribed fire and cultural burning can reintroduce fire as a natural modifier of vegetation that can help reduce vulnerability in fire-dependent old-growth forest ecosystems. Vegetation management can also accelerate the restoration process and promote the development of old-growth-like characteristics. Using the best available scientific information as guidance, approaches will vary based on the forest type, existing condition, and site characteristics. Often a combination of practices may be necessary for success and repeated treatments may be important to maintain resiliency after initial activities have been completed.

Forests live to old age because they have managed to evade silviculture. It should be obvious that the old-growth remnant forests that exist today got that way without any help from us. In addition, an unknown amount of late successional forest existing on National Forest lands would advance to old-growth if simply left alone.

In summary, as demonstrated by the two-page DEIA review of biodiversity in old-growth forests, the Forest Service knows very little about the subject. I would urge the Forest Service to conduct investigations of the biodiversity of all National Forest old-growth forests prior to finalizing any management plans for these important ecosystems.

Respectfully,

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