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Keeping Idaho's Clearwater Basin Wild
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MANAGEMENT OF OLD GROWTH IN THE U.S. NORTHERN ROCKY MOUNTAINS
Debasing the concept and subverting science to plunder national forests

by Jeff Juel
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Friends of the Clearwater is a 501(c)(3) nonprofit dedicated to protecting and advocating for the wildlife and wildlands of the Clearwater Basin of North Central Idaho. These wildlands comprise the Wild Clearwater Country, and include federal public lands bordered on the north and south by the St. Joe and Salmon rivers, and bordered on the east and west by Montana and Oregon. Our mission includes educating the public about the issues these wildlands face, monitoring government management activities, and holding agencies accountable when their actions violate environmental laws or otherwise threaten ecological integrity or species.

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EXECUTIVE SUMMARY

Old growth originates from complex and interconnected forest ecosystems developing over timescales much longer than a human lifespan. The idea is nurtured by the human capacity for appreciation of nature and by scientific discoveries of the important role old growth plays for sustaining biological diversity. This report touches on old growth's contributions to these recreational, spiritual, ecological and scientific values, and critically examines the management policies and practices of the U.S. Forest Service for national forests of the U.S. northern Rocky Mountains bioregion.

Challenges in defining old growth arise from divergent perspectives, which vary depending upon the values of the beholder. It is undisputed that old-growth forests are structurally complex, feature large, old trees and associated characteristics that develop over relatively long intervals of time, feature large snags and down dead wood, and exhibit variations in forest canopy including small openings caused by various agents of tree mortality. Old growth is structurally distinct from earlier successional stages.

The complex character of old growth makes it fascinating to the general public. Its biological diversity attracts scientific inquiry. Some species have co-evolved with, and depend on, specific conditions in old-growth forests.

The highest quality water is produced by older, intact forests, and several attributes of old-growth forests are important to maintain healthy native fish populations.

Science also recognizes that forests of mature and old trees continue to store disproportionally massive amounts of carbon, helping to moderate the effects of climate change.

The Chief of the Forest Service issued a 1989 policy statement that "recognizes the many significant values associated with old growth forests, such as biological diversity, wildlife and fisheries habitat, recreation, aesthetics, soil productivity, water quality, and industrial raw material. Old growth on the National Forests will be managed to provide the foregoing values for present and future generations." The Chief's statement was partly to address to the controversy surrounding the logging of spotted owl habitat in federally owned Pacific Northwest old-growth forests. This also came shortly after the first long-term land management plans for national forests had been written, as directed by the National Forest Management Act (NFMA). Congress's passage of NFMA itself was largely in response to earlier controversies surrounding clearcutting of national forest lands. By the time these "forest plans" were formulated, logging had already eliminated almost all old growth from private lands, and left the extent of old growth in national forests in the lower 48 states much depleted and highly fragmented.

The relative scarcity of old growth and its recognized importance for wildlife elevated its status as a metric for diversity for planning purposes, following from NFMA's mandate to "provide for diversity of plant and animal communities." And early forest plans recognized the inherent incompatibility of logging and old growth, prohibiting commercial exploitation in those old-growth stands identified for conservation.

Because of the relative novelty of old growth as a scientific concept, forest plans circa late-1980s—many of which remain in effect—reflected a wide variety of management approaches. The prevailing silvicultural view of old growth (i.e., "a decadent stand of trees" and "… an undesirable goal for timber management"), with its strong timber bias, seemed to be waning. Almost all forest plans prioritized protection of much of the remaining old growth. And as directed by NFMA, old-growth "management indicator species" (MIS) were designated under these forest plans. The objective of MIS designation is to keep track of their population trends, which provides feedback on the adequacy of forest plan protections for their habitat, thus insuring viable populations would persist across each national forest.

Generally, forest plans have required a minimum percentage of the forest be maintained in old-growth condition (ten percent at the very most), with old growth well-distributed to reflect biological needs of MIS and other species. However forest planners cited no biological basis to support the adequacy of their respective plan's minimum requirements. And while analyzing timber sale proposals, the agency ignores publicly presented scientific information suggesting their minimums are likely well below historic norms.

Another scientifically questionable aspect of the Forest Service's old-growth policies is an almost exclusive focus on existing old-growth stands, while ignoring the wider geographic and longer temporal contexts within which old-growth stands develop. Even old growth—generally requiring a minimum of 150 years to develop and often existing for centuries more—doesn't last forever, so planning for future old growth is necessary for its persistence on the landscape.

Old-growth stands are only one element of dynamic landscapes. Natural processes including fire, insect activity, disease, wind, regeneration of new seedlings, and nutrient allocations among individual trees interact to maintain a variety of conditions across the landscape. Old-growth components vary spatially and temporally, and only some of this ever-shifting landscape mosaic would exist as old growth at any given time.

Since it's not certain where old growth will occur decades or centuries in the future, maintaining old growth at any semblance of its historic abundance requires allowing natural processes operate across large landscapes. This conflicts with the Forest Service's prevailing prioritization of resource extraction on most national forest land.

Several lawsuits succeeded in halting Forest Service timber sales projected to destroy habitat for old-growth associated species, because the Forest Service could not prove it was preserving forest plan minimums and therefore meeting population viability requirements. The agency lacked comprehensive forestwide old-growth inventories, and had gathered practically no MIS population trend monitoring data.

Because agency budgets prioritize timber production goals above conservation, the Forest Service has responded to lawsuits by changing the rules. This has played out in several ways, primarily by removing quantitative minimum old-growth standards in the process of amending or revising forest plans, which hampers the public from holding the agency accountable. Other changes have included weakening the definition of old growth or altogether erasing the term from forest plans. And in 2012, the agency updated its planning regulations, significantly diminishing the overall role of science in planning and removing the mandate for assuring viability of species.

Paralleling this disturbing trend of devaluing old growth is a Forest Service's culture of controlling nature, emerging in the early 1990s as "ecosystem management." The Forest Service promotes vague, unmeasurable goals such as "improving forest health" and "increasing resilience and resistance to wildfire and insect pests" under this manipulate-and-control management. Such terminology has become ubiquitous in timber sale environmental analysis documents, agency public relations statements, and industry campaigns attempting to conceal the fact that its management bears much resemblance to the unsustainable logging of the past.

This culture also postures that management can engineer better forests than those growing naturally. Such posturing has facilitated—and fully rendered the Forest Service vulnerable to—industry capture. Under a politically inspired misinformation campaign, logging proponents demonize forests as "unhealthy," and as "hazardous fuels" posing risks of "catastrophic fire" to justify management "prescriptions." The fear incited by raising the specter of imminent destruction distracts from and prevents sober evaluation of the science that indicates logging is destructive, and itself increases fire risk.

According to the Forest Service worldview, management even facilitates or accelerates development of old growth. Yet there is little scientific support for—and much expert opinion opposing—the hypothesis that active management can develop or maintain old growth over time.

The Forest Service implicitly or explicitly denies that the natural processes that created and maintained old-growth landscapes over countless millennia can continue to do so without constant and repetitive management intervention. As a product of centuries of natural ecological processes, old growth is an anathema to the Forest Service worldview that asserts lack of intensive management equates to an unhealthy forest.

For old growth to persist, it's not enough to prohibit logging of all existing old growth. Natural processes must be the "managers" for long intervals over large landscapes to be the cradles for future old growth. And there needs to be much tighter constraint on national forests management policies. Old-growth values must be reordered so the wood products that consume forests take a back seat to spiritual, ecological, recreational and scientific values.

Currently, the only detailed initiative that would adequately change management priorities over large landscapes in the northern U.S. Rocky Mountains is a bill in Congress—the Northern Rockies Ecosystem Protection Act (NREPA). NREPA would protect the remaining roadless areas on federal lands in this bioregion as Wilderness, and importantly for old-growth landscapes it would provides a template for preserving biological connecting corridors and restoring damaged landscapes by designating wildland restoration and recovery areas on federal lands.

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I. INTRODUCTION

I submit that an old-growth forest has worth in itself, worth beyond human uses. It is a manifestation of the "fierce, green fire" (Leopold, 1949) of life growing across the face of the earth. Saving old-growth forests for their own sakes, for their intrinsic value as ancient communities of life, represents a novel moral achievement that goes beyond even the most sophisticated human self-interest.

—Kathleen Dean Moore

The conception of old growth originates with complex and interconnected forest ecosystems that develop over timescales much longer than a human lifespan. The idea is nurtured by the human capacity for wonder, fascination, and appreciation of nature, tempered by the awareness of old growth's dwindling presence in an over-developed and exploited natural world.

This report examines the policies of the U.S. Forest Service, an agency tasked with sustaining the values of our national forests into perpetuity. The geographic area of interest is national forests of the U.S. northern Rocky Mountains bioregion, which encompasses large portions of Montana and Idaho, part of Wyoming, and some eastern portions of Oregon and Washington.

First, an overview of some scientific perspectives on old growth is presented. Old growth is then viewed through the lens of humanity's urgent existential crisis—climate change. The bulk of this report examines the management of old growth on national forests of the northern Rocky Mountains bioregion, from the 1980s until present. In conclusion, recommendations for policy changes are discussed.

II. OLD GROWTH AS AN ECOLOGICAL CONCEPT

Old growth …by combining sacred groves with ecological rationality …is a refuge for both the human spirit and a diversity of species threatened by the advance of commercialized landscapes.

—Robert G. Lee

As Lee suggests, spiritual sentiment and rational evaluation are two sides of the same human coin. Since expressions of the former are best left to the more literary and philosophical, and because conservation within our 21st century context demands a strong basis of objectivity, this report leans mostly upon scientific perspectives to advocate for this thing called "old growth."

Defining old growth in objective terms has proven to be no simple matter, however. Hunter (1989) noted, "there is a great deal of confusion over just what constitutes an old-growth stand because there is no generally accepted or universally applicable definition of old-growth."

A. Biological diversity associated with old growth

Scientists recognize the wide diversity of living and nonliving features as a defining character of old growth. Franklin and Spies, 1991 note the "later stages in forest development that are often compositionally and always structurally distinct from earlier successional stages." They describe the complexity and diversity that are defining traits:

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

Countless scientific studies have explored the exceptional role old growth plays in providing essential habitat for wildlife species. Marcot, et al., 1991 recognize that old-growth habitat includes components serving many life functions:

> Old growth provides optimal habitat for some management indicator species, including spotted owl, pileated woodpecker, and marten, and for many other species of plants, fish, amphibians, reptiles, birds, and small mammals. It also provides thermal and hiding cover for ungulates, especially in winter. …Some wildlife species may have co-evolved with, and depend on, specific amounts and conditions of old-growth forests. Specific kinds, sizes, and patterns of old-growth environments are, therefore, keys to the long-term survival of these species. (Internal cites omitted.)

Similarly, Warren (1990) states:

> The greater vertical and horizontal diversity found within an old-growth stand allows for niche specialization by wildlife. Although the individual wildlife species occurring may not

> be unique to old-growth stands, the assemblage of wildlife species and the complexity of interactions between them are different than in earlier successional stages.

The 1987 Forest Plan for the Kootenai National Forest (USDA Forest Service, 1987a) states, "With respect to wildlife (old growth) represents a distinct successional stage that is an important component of wildlife habitat" and also:

> Richness in habitat translates into richness in wildlife. Roughly 58 wildlife species on the Kootenai (about 20 percent of the total) find optimum breeding or feeding conditions in the "old" successional stage, while other species select old growth stands to meet specific needs (e.g., thermal cover). Of this total, five species are believed to have a strong preference for old growth and may even be dependent upon it for their long-term survival (see Appendix I[1]).

Hammond, 2020 states:

> The highest quality water, provided in adequate and manageable quantities throughout an annual cycle is produced by old/old-growth forests. The multi-layered, large canopies, canopy gaps, and accumulations of decayed fallen trees provide for effective, natural water management that benefits forest ecosystems and aquatic ecosystems, and provides for human needs and safety. In short, old-growth forests are Nature's water storage and filtration system.

Likewise, Reeves and Bisson, 2009 note, "many attributes of old-growth forests are important for maintaining healthy fish populations…"

Beyond the numerous species commonly referred to as "wildlife", old growth uniquely exhibits diversity of other life forms (*Id*.):

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

From their literature review, Tomao et al. (2020) conclude, "Old-growth forests are recognized as an important reserve of fungal diversity for several fungal functional guilds. Indeed, a very large number of ectomycorrhizal species can be hosted in old growth stands (Richard et al., 2004; Zhang et al., 2017)." They note:

> • Fungal diversity is positively related with canopy cover, basal area and tree species diversity.
> • Diversity of deadwood size and decomposition stage is positively related to richness of wood-inhabiting fungi.

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[1] The Kootenai National Forest's Forest Plan Appendix I wildlife species list is found in Appendix A of this report.

B. Old-growth ecosystems and old-growth landscapes

As discussed later in this report, Forest Service management policies have focused mainly on identifying, designating, inventorying and managing at the level of the old-growth "stand"[2] or patches consisting of multiple contiguous stands. Kaufmann et al. 2007 identify limitations of this approach: "The term 'stand' may be more useful for management purposes than for describing the ecology of forests." This report advocates for a more holistic idea of old growth—what Kaufmann et al. 2007 call "old-growth forests or landscapes" which:

> …contain sufficient numbers of patches and stands of old growth to be reasonably representative of the forest type in historical times. However, portions of the landscape may be in various stages of development (even temporary openings or patches of very young trees) to provide future old-growth patches in the landscape. Landscapes vary in size, but are generally considered to be at least as large as major natural disturbances, such as fire.

Accordingly, this report examines diversity beyond the stand level, as well as across longer scales in time. Franklin and Spies, 1991 recommend such a perspective:

> Our failure to study old-growth forests as ecosystems is increasingly serious in considerations of old-growth issues. Without adequate basic knowledge of the ecosystem, we risk losing track of its totality in our preoccupation with individual attributes or species. Definitional approaches to old growth based on attributes… predispose us to such myopia. The values and services represented by old-growth ecosystems will be placed at ever greater risk if we perpetuate our current ignorance about these ecosystems. It will also increase doubts about our ability to manage for either old-growth ecosystems or individual attributes (for example, species and structures) associated with old growth. We must increase ecosystem understanding and management emphasis on holistic perspectives as we plan for replacement of old-growth forests.

Green et al., 1992 (Old-Growth Forest Types of the Northern Region), while largely focusing on stand-level old-growth criteria, also acknowledges the need to look beyond:

> (A) stand's **landscape position** may be as important, or more important than any stand old growth attribute. …Stands are elements in **dynamic landscape**. We need to have representatives of the full range of natural variation, and **manage the landscape mosaic as a whole** in order to maintain a healthy and diverse systems. (Emphases added.)

Similarly, Hamilton, 1993 (Characteristics of Old-Growth Forests in the Intermountain Region) incorporates definitions of Landscape Ecology, Ecological Process and Ecosystem in describing old-growth definitions for the Intermountain Region.

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[2] Warren (1990) explains, "Timber stands are delineated on the basis of predominant overstory species, tree sizes, and tree density. Contiguous old-growth habitat may be composed of more than one stand."

C. Disturbance processes intrinsic to old growth ecosystems

Natural disturbance processes are inherent to forest ecosystems in the northern Rocky Mountains. The "Generic Definition and Description of Old Growth Forests" (USDA Forest Service, 1989b) notes, "Sporadic, low to moderate severity **disturbances are an integral part of the internal dynamics of many old growth ecosystems**. Canopy openings resulting from the death of overstory trees often give rise to patches of small trees, shrubs, and herbs in the understory." (Emphasis added.)

Hamilton, 1993 acknowledges that natural tree mortality is important for creating the very conditions that help define old growth:

> Tree deaths resulting in standing dead and down woody materials, plus some living trees with broken tops or rotting boles contribute to decadence, a necessary attribute of Old-growth. Decadent conditions in old-growth result in important snags, logs, and rotting trees that provide potential habitat for several species of birds and small mammals. Decadent conditions also indicate suitable habitat for certain plants which are not easily seen such as saprophytes and lichens which are not readily inventoried.

Franklin et al. 1987, state: "Tree death also demonstrates some principles of ecological processes: the importance of defining the spatial and temporal context of a study, the importance of stochastic processes, the fact that most ecological processes are driven by multiple mechanisms and that the relative importance of these mechanisms changes in time and space, and the importance of species' and ecosystems' natural histories."

Bollenbacher and Hahn, 2008 recognize that "(old-growth) stands, as well as various other forest conditions, have been influenced by landscape-level processes, such as fire (low-, mixed-, and high-severity), insect outbreaks, and disease. These processes result in a mosaic pattern of forest conditions across the landscape."

III. OLD GROWTH AND CLIMATE CHANGE

At least in terms of the modern climate crisis, perhaps the greatest benefit of old-growth forests is their ability to retain carbon.

— Marina Richie, *The Secret Power of Old Growth*

There is growing scientific concern over the imminent effects of climate change on the earth's ecosystems, as well as their implications for human civilization. The Intergovernmental Panel on Climate Change 2018 report states that if greenhouse gas emissions continue at the 2018 rate, the atmosphere will warm up by as much as 2.7 degrees Fahrenheit (1.5 degrees Celsius) above preindustrial levels by 2040, inundating coastlines and intensifying droughts, poverty, and strife. More recently, a 2021 report from the same panel amplifies the urgency to act.

A. Carbon sequestration and old-growth forests

Science recognizes the critical role forests, particularly old growth, play in sequestering carbon and thus moderating the effects of climate change. The vital role forests play as stores of sequestered carbon is recognized by Achat et al., 2015: "Compared with other terrestrial ecosystems, forests store some of the largest quantities of carbon per surface area of land." More specific to old growth, Mildrexler et al., 2020 state, "Large-diameter trees store disproportionally massive amounts of carbon and are a major driver of carbon cycle dynamics in forests worldwide." In a global perspective, "Given the urgency of keeping additional carbon out of the atmosphere and continuing carbon accumulation from the atmosphere to protect the climate system, it would be prudent to continue protecting ecosystems with large trees for their carbon stores, and also for their co-benefits of habitat for biodiversity, resilience to drought and fire, and microclimate buffering under future climate extremes." (*Id.*) Also, Lutz et al., 2018 (co-authored by dozens of scientists) "recommend managing forests for conservation of existing large-diameter trees or those that can soon reach large diameters as a simple way to conserve and potentially enhance ecosystem services" including carbon sequestration.

Thomas DeLuca, former Dean of the University of Montana's W.A. Franke College of Forestry & Conservation, discusses research that shows "if the objective of management is carbon storage, old-growth forests are better left standing." (DeLuca, 2009.) "Old growth, rather than being thought of as stagnant with respect to carbon fixation, can sequester atmospheric carbon dioxide long past the achievement of old-growth conditions." (*Id.*)

McKinley et al. 2011 state:

> [I]f the starting point is a mature forest with large carbon stocks (Cooper 1983, Harmon et al. 1990), then harvesting this forest and converting it to a young forest will reduce carbon stocks and result in a net increase in atmospheric [CO^2] for some time (Fig. 8B; Harmon and Marks 2002). Even if the mature forest is converted to a very productive young forest, it could take several harvest intervals to equal the amount of carbon that was stored in the mature forest, even with 100% utilization efficiency, biomass for energy and substitution (Harmon et al. 1990; Fig. 8A).

Even in cases where logging does not regenerate a stand, carbon emissions can be significant. A literature review by Law & Harmon (2011) concludes:

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

Such conclusions are confirmed in multiple studies such as Campbell et al., 2011, Mitchell et al., 2009, and Reinhardt and Holsinger, 2010.

B. Old-growth stands buffer climate change effects

The microclimatic effects in old-growth stands become of increasing importance as average forest temperatures rise. Frey et al., 2016 find: "Vegetation characteristics associated with older forest stands appeared to confer a strong, thermally insulating effect. Older forests with tall canopies, high biomass, and vertical complexity provided cooler microclimates compared with simplified stands. This resulted in differences as large as 2.5°C between plantation sites and old-growth sites, a temperature range equivalent to predicted global temperature increases over the next 50 years." They hypothesize older, more complex forests may help to "buffer organisms from the impacts of regional warming and/or slow the rate at which organisms must adapt to a changing climate…" Additionally, forest canopies can buffer climate extremes and promote microclimates that in turn provide refugia for species in the understory. (Davis et al. 2019b.)

C. Climate change affects old growth

Acute effects of higher annual temperatures include increased extent, frequency, and severity of wildfire. Similarly, warmer temperatures can foster outbreaks of tree-killing insects, whose populations were more balanced under historic climates. These effects potentially accelerate natural disturbance processes occurring within old growth, creating unknown impacts on its persistence.

As climate conditions change in particular areas, shifts in forest composition are likely. Funk et al., 2014 believe suitable conditions for four common tree species in this bioregion (Douglas-fir, ponderosa pine, lodgepole pine, and Engelmann spruce) could dramatically contract.

IV. OLD GROWTH AND U.S. FOREST SERVICE MANAGEMENT

Foresters trained in the twentieth century …were committed to bringing order to the forest and replacing the messiness of "decadent" older forests with manageable, fast-growing plantations of uniform trees. …The messiness of natural forests was to be ordered by forest regulation. Manipulation of both time and space was fundamental to bringing order to forests. Considerations of time involved measuring how much trees of a given species grow each year and calculating volume accumulation to predict harvestable age. Space was derived from time by calculating how much area of a forest should be harvested and regenerated each year to set a harvest level that would ensure a constant supply of wood.

-Robert G. Lee

Beginning in the 1980s, long-term land management plans for the national forests were written by the U.S. Forest Service, as required under the National Forest Management Act (NFMA). The passage of NFMA was largely in response to the increasing public controversies surrounding overexploitation and clearcutting of national forest lands.

Also in the 1980s, the concern over rare wildlife species brought increased public scrutiny to federal management of old-growth forests. Litigation from environmental groups and the listing of species under the Endangered Species Act (ESA) spurred changes in management of old-growth forests. Already old growth had been logged to a small fraction of what existed prior to EuroAmerican settlement, leading to the need "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." (Endangered Species Act of 1973.)

The highest profile controversy over old-growth forests arose in the federal forests of the Pacific Northwest, with its iconic ancient forests of giant trees such as redwood, Douglas-fir, western hemlock, Sitka spruce, and western redcedar. Increasingly, economic exploitation of the timber resource conflicted with other social values prizing natural forests, and the habitat values native forests provided for species such as the northern spotted owl. In granting an injunction against logging, U.S. District Court Judge William Dwyer called out "a deliberate and systematic refusal … by higher authorities in the executive branch of government … to comply with the laws protecting wildlife."

At that time, the first generation of land management plans ("forest plans") reflected changing public values and to the growing scarcity of old-growth forests. For the first time, explicit protections for some old growth on national forests were adopted.

A. The Forest Service and "Old Growth Values"

In 1989, in the midst of the controversy, Forest Service Chief Dale Robertson issued a "Position Statement on National Forest Old Growth Values" (Chief's Position Statement; USDA Forest Service, 1989a). The Chief's Position Statement began, "The Forest Service recognizes the many significant values associated with old growth forests, such as biological diversity, wildlife and fisheries habitat, recreation, aesthetics, soil productivity, water quality, and industrial raw material. Old growth on the National Forests will be managed to provide the foregoing values for present and future generations. …Where goals for providing old growth values are not compatible with timber harvesting, lands will be classified as unsuitable for timber production."

In the Chief's Position Statement the Forest Service recognized old growth holds a wide range of values beyond timber, and admitted that the agency's timber program fundamentally conflicts with those values. It also included measures national forest managers were to take to reflect this range of old growth values. The direction included:

- Old growth definitions are to be developed by forest type or type groups for use in determining the extent and distribution of old growth forests.

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

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

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

Spies, 2009 notes some **scientific values** of old growth:

> (i) providing controls for measuring the effects of human activities; (ii) shifting our focus to relatively long timeframes to help us understand how and why forests change; (iii) helping us identify the unique contributions of all forest stages to biological diversity and ecological processes; and (iv) opening our eyes to the importance of structural complexity in providing habitat for organisms and the foundation for ecological processes.

B. Management policies of northern Rocky Mountains bioregion national forests

By the late 1980s, most national forests in the U.S. northern Rocky Mountains bioregion had finalized their original forest plans. This section examines some of the ways those plans evaluated old growth.

1. Definitions of old growth in forest plans

Because of the relative novelty of old growth as a scientific concept, forest plans reflected a wide variety of old-growth definitions.

Some forest plans include measurable criteria, e.g., the Nez Perce National Forest (1987):

> Old-growth stand refers to a stand of timber that, generally, meets the following criteria:
> 1. At least 15 trees per acre ≥21 inches diameter at breast height (DBH). Providing trees of this size in the lodgepole pine and sub-alpine fir stands may not be possible.
> 2. Two or more canopy layers.
> 3. At least .5 snags per acre ≥21 inches DBH and at least 40 feet tall.
> 4. Signs of rot and decadence present.
> 5. Overstory canopy closure of 10-40 percent; understory canopy closure of at least 40 percent; total canopy closure at least 70 percent.
> 6. Logs on the ground.

Other forest plans described old growth with less specific terminology, e.g., the Kootenai National Forest (USDA Forest Service, 1987g):

> Several authors have described old growth conditions (Juday, 1978; McClelland, 1977; McClelland et al., 1979; Thomas, 1979) with certain features appearing to be universal. These features include: 1) large diameter trees (often exceeding 20" dbh) with a relatively dense, often multilayered canopy, 2) the presence of large standing dead or dying trees, 3) down dead trees 4) stand decadence associated with the presence of various fungi and heartrots, 5) an average age often in excess of 200 years, and 6) a basal area ranging from 150-400 square feet per acre. Some of the individual features listed above may occur in other successional stages, but old growth stands are unique in integrating all of these features in a complex and diverse whole.
>
> … Old growth stands are representative of a variety of characteristics and it is not possible to define them with a "minimum number" for any one characteristic.

Other forest plan terminology reflected a bias toward the timber value, e.g., the Salmon National Forest (1988):

> Old Growth - A stand of trees that is past full maturity and showing decadence; the last stage in forest succession.
> Old Growth Habitat - Habitat for certain wildlife that is characterized by overmature coniferous forest stands with large snags and decaying logs.
> Overmature Timber - Trees that have attained full development, particularly in height, and are declining in vigor, health, and soundness.

And from the forest plan for the Lolo National Forest (1986): "Old-growth Timber: Individual trees or stands of trees that in general are past their maximum rate in terms of the physiological processes expressed as height, diameter and volume growth."

Yanishevsky (1987), likely the earliest comprehensive critique of old growth considerations in forest plans of the Northern Region, warned "at best, planners are managing for marginally viable populations of old-growth species." Yanishevsky (1987) states:

> With the warning that old age alone is not a sufficient criterion for old growth, researcher Dr. Riley McClelland from the University of Montana has stated that if a single age must be chosen, it at least ought to be set realistically at 200 years. At 200 years, larch/Douglas-fir forests …are just *beginning* to show many of the values associated with old growth habitat. Moreover, there are distinctly valuable ecological characteristics in much older stands. Stands with these older components are also needed to preserve natural diversity.
>
> We found that no forest in Region One used an acceptable minimum of 200 years for estimating current amounts of old growth. Minimum ages range from 100 years …to 160 years… Most forests used a minimum age of only 120 years.

> Setting an unrealistically early age for old growth grossly overestimates the amount of old growth, present and planned, in Region One forests. Using even a realistic age as the *only* criterion has limitations. On-the-ground evaluation of ecological characteristics is essential.

2. Regional old-growth definitions

Not long after forest plans were finalized in the northern Rocky Mountains bioregion the Chief's Position Statement (USDA Forest Service, 1989a) issued a policy directing regional offices to set more consistent old-growth definitions and adopted a "Draft Action Plan" for a Forest Service Old Growth Task Group (USDA Forest Service, 1989c). The number one item for the Task Group was to "Develop a generic definition of ecological old growth. It will identify characteristics for which **measurable criteria** would be established in more specific **definitions for forest types, habitat types, or plant associations**; and would help guide the design of **new inventories** that will include the **measurement of old growth attributes**." (Emphases added.) Green et al., 1992 ("Old-Growth Forest Types of the Northern Region") and Hamilton, 1993 ("Characteristics of Old-Growth Forests in the Intermountain Region") were a direct result of those regional efforts.

Green et al., 1992 admits: "Although old growth ecosystems may be distinguished functionally as well as structurally, this definition is restricted primarily to stand-level structural features which are readily measured in forest inventory." Also, "These old growth minimum criteria, associated characteristics, and descriptions were developed to apply to individual stands." (Id.)

Franklin and Spies, 1991 explain a rationale for writing definitions mainly emphasizing structural considerations within **old-growth stands**:

> Obviously, a series of ecological attributes must be considered because of the many relevant compositional, functional, and structural features. For practical reasons, however, a working definition—one for everyday use in gathering stand data—emphasizes structural and compositional rather than the conceptually important functional features that are difficult to measure.

What followed was a focus on stand-level attributes, measurable from this "practical" perspective. Green et al., 1992 and Hamilton, 1993 set screening criteria for old-growth stands, both establishing a minimum number per acre of old and large trees, varying by "forest type" and geographic area. In other words, the minimum number per acre of trees of sufficient age and diameter vary by forest type and geographic area. For example, for the "Northern Idaho Zone" (Green et al., 1992), in stands meet screening criteria for old growth for one habitat type there must be a minimum of eight trees per acre at least 150 years old and over 21 inches diameter at breast height (DBH), with Douglas-fir, ponderosa pine, or western larch being the tree species counted. For stands in another habitat type, the corresponding numbers are ten trees, 120 years old and 13" DBH of lodgepole pine. And for a third, requirements are ten trees, 120 years old, and 25" DBH of western redcedar, respectively.

This variability was later explained by Hammond, 2020:

> (O)ld-growth attributes will look different in areas of different site productivity and climate, and are influenced by the type, frequency, and distribution of natural disturbance regimes. In other words, the attributes of old-growth forests are manifested in a range of tree ages, sizes, shapes, and distribution, along with accompanying non-tree vegetation. These different old-growth composition and structures in turn shape different habitat types in different old-growth areas. …Old-growth forests that develop in landscapes where stand replacing natural disturbances are infrequent, or do not occur tend to be characterized by larger older trees than old-growth forests found in landscapes where stand replacing disturbances are common.

Green et al., 1992 includes "associated characteristics (such as number of snags, down woody material, dead tops and decay, and diameter variation)" which were to be evaluated but not treated as minimum old-growth criteria. Hamilton, 1993 includes similar discretionary considerations.

In sum, the effect of Regional definitions was intended mostly to clarify how the national forests are to identify **old-growth stands**. They did not mandate Forest Service managers to embrace wider old-growth values nor recognize old-growth landscapes or old-growth ecosystems. They mostly fine-tuned the process whereby structural criteria were used to identify old-growth stands.

The Regional definitions were not developed under the planning process governed by NFMA regulations. Appendix B examines the relationship between the Northern Region's Green et al., 1992 and forest planning.

Yanishevsky, 1994 expressed concerns regarding the Green et al., 1992 definitions for old growth: "Quality of old growth was not addressed during the definition process. The Committee did not take into account the legacy of logging that has already destroyed much of the best old growth. This approach skewed the characteristics that describe old-growth forests toward poorer remaining examples."

3. The necessity of setting aside old growth from logging

Most of the 1980s-era forest plans for northern Rocky Mountains national forests included requirements for maintaining minimum forestwide amounts of old growth, minimum amounts over smaller geographic areas such as watersheds, or both (*e.g., see* Juel, 2003 for standards in national forests of the Northern Region). Also, some forest plans include requirements to identify areas of forest nearly meeting or approximating minimum old-growth criteria, to be applied where forest plan minimums for smaller geographic areas are not being met. Forest plan requirements to identify these stands—referred to, variously as "recruitment", "step-down" or "replacement" old growth—respond to habitat distribution requirements found in the National Forest Management Act (NFMA) implementing regulations.

Those forest plans implicitly or explicitly distinguished between old growth that was not to be logged (in order to manage within minimum standards) vs. old growth in excess of minimum requirements, which could be logged. For example, the Final Environmental Impact Statement for the Kootenai National Forest's original 1987 forest plan noted, "The suitable timber base will be smaller as a result of the removal from timber harvest of additional acres for old-growth timber management for wildlife diversity…" (USDA Forest Service, 1987h) Also, it noted the forest plan "…designated 126,000 acres of old-growth timber as unsuitable timberland. These stands were high volume-per-acre stands which, when removed, reduced the inventory and the resulting inventory per acre." (*Id*.) That Forest Plan defined "unsuitable timber land" in part as: "not selected for timber production …due to: (1) the multiple-use objectives for the alternative preclude timber production, (2) other management objectives for the alternative limit timber production activities to the point where management requirements set forth in 36 CFR 219.27 cannot be met…" (USDA Forest Service, 1987g.)

This "unsuitable timber land" included a forest plan designated Management Area for old growth. Outside that Management Area, the plan allowed logging of old growth as long as minimums within the old growth analysis areas were being met.

The 1988 Forest Plan for the Salmon National Forest allows "no harvest in identified and mapped old growth stands" in one management area within the suitable timber base. The FEIS for the forest plan also recognizes the incompatibility of old growth with timber management:

> The old growth component of habitat diversity is probably the most sensitive component of Forest management activities. **Old growth is essentially a decadent stand of trees, and old growth management is an undesirable goal for timber management. When timber rotation ages are less than the length of time needed to produce old growth, a conflict results**. A downward trend of old growth on suitable acres will occur under all alternatives. Consequently, 10 percent of the suitable acres have been removed from the timber base, by specie type, to ensure maintenance of habitat for minimum viable populations of old growth obligate species. (Emphasis added.)

Also, recall that the Chief's Position Statement directed, "Where goals for providing old growth values are not compatible with timber harvesting, lands will be classified as unsuitable for timber production." (USDA Forest Service, 1989a.)

4. Stand size criteria

Aside from the features to be assessed within stands, managers considered spatial dimensions of the patches of old growth. Such considerations are often based upon habitat needs of species associated with old growth. For example, the Forest Service's Warren (1990) notes, "Of 48 old-growth-associated species occurring in the Northern Region, about 60 percent are thought to require stands larger than 80 acres (Harger 1978)" and "Wilcove et al. (1986) estimated that habitat islands should exceed 250 acres to provide for birds inhabiting forest interior."

Appendix 17 of the 1987 forest plan for the Kootenai National Forest (USDA Forest Service 1987a) exemplifies the relationship of species habitat needs and old growth:

> A unit of 1000 acres would probably meet the needs of all old growth related species (Munther, et al., 1978) but does not represent a realistic size unit in conjunction with most other forest management activities. On the other hand, units of 50-100 acres are the

> smallest acceptable size in view of the nesting needs of pileated woodpeckers, a primary cavity excavator and an old growth related species (McClelland, 1979). However, managing for a minimum size of 50 acres will preclude the existence of species which have larger territory requirements. In fact, Munther, et al. (1978), report that units of 80 acres will meet the needs of only about 79 percent of the old growth dependent species (see Figure 1). Therefore, while units of a minimum of 50 acres may be acceptable in some circumstances, 50 acres should be the exception rather than the rule. Efforts should be made to provide old growth habitat in blocks of 100 acres or larger. …Isolated blocks of old growth which are less than 50 acres and surrounded by young stands contribute very little to the long-term maintenance of most old growth dependent species.

Kootenai National Forest biologist Johnson, 1999 acknowledges, "Patch size also plays a role in habitat suitability. Small patches of old growth may not be usable, depending on surrounding forest conditions." The implication is that modeled population potential for old-growth associated species could be underestimated to an unknown extent because modeling may not quantify the lesser habitat value of smaller patches.

One of the old-growth standards in the Idaho Panhandle National Forests' original Forest Plan (USDA Forest Service, 1987c) was derived from scientific recommendations found in its Appendix 27 (USDA Forest Service, 1987d), in consideration of the habitat needs of the pileated woodpecker, a forest plan management indicator species. That standard read:

> One or more old-growth stands per old-growth unit should be 300 acres or larger. Preference should be given to a contiguous stand; however, the stand may be subdivided into stands of 100 acres or larger if the stands are within one mile. The remaining old-growth management stands should be at least 25 acres in size. Preferred size is 80 plus acres.

Similarly, the 1988 Forest Plan for the Colville National Forest contained standards for specific old-growth management indicator species, which set minimum stand sizes along with spatial configuration and structural considerations for the pine marten, pileated woodpecker, and northern three-toed woodpecker. (USDA Forest Service, 1988a.)

Finally, although the Regional definitions recommended larger stand sizes, they did not mandate minimums nor even a consideration of their biological rationale.

5. Forestwide minimum percentages of old growth

As mentioned above, 1980s forest plans for the Northern Rocky Mountains usually included requirements for maintaining minimum forestwide amounts or minimum amounts within smaller geographic areas. At most these minimums were 10%. The Forest Service assumed that maintaining forest plan minimums would accomplish the task of meeting NFMA requirements for species population viability, as discussed below, all the while the national forests were being managed for high rates of timber production. Yet no scientifically adequate rationale is presented to support the forest plan minimum requirements.

One might assume these minimums resemble estimates of historic amounts in this bioregion prior to EuroAmerican exploitation, so that maintaining such amounts would prevent wildlife populations from vanishing from any national forest, or require listing under the ESA. But such estimates are not reliable, because so much forest had been logged long before adoption of old-growth definitions. This is explained in a Forest Service response to a comment about lack of data on presettlement amounts of old growth (USDA Forest Service, 2019c):

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

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

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

Further, analysis by the Kootenai National Forest's Gautreaux (1999) indicates 22% old growth is near the bottom of "reference conditions" on that national forest. Gautreaux, 1999 estimates include:

- (R)esearch in Idaho (Lesica 1995) of stands in Fire Group 4, estimated that over 37% of the dry Douglas-fir type was in an old growth structural stage (>200 years) prior to European settlement, approximately the mid 1800's.

- Based on research of Fire Group 6 in northwest Montana (Lesica 1995) it was estimated that 34% of the moist Douglas-fir type was in an old growth structural stage (>200 yrs.) prior to European settlement, approximately the mid 1800's.

- Based on fire history research in Fire Group 11 for northern Idaho and western Montana (Lesica, 1995) it was estimated that an average of 26% of the grand fir, cedar, and hemlock cover types were in an old growth structural stage prior to European settlement.

- (F)ire history research in Fire Group 9 for northern Idaho and western Montana (Lesica, 1995) estimated that 19-37% of the moist lower subalpine cover types were in an old growth structural stage (trees > 200 yrs.) prior to European settlement. While this estimate is lower than suggested by Losensky's research, it is a useful representation of average conditions that may be fairly typical for the Kootenai. Lesica's estimate of historic vegetative conditions is also closer to the findings in the ICBEMP assessment that estimated 20-30% levels for historic distributions of mature and late seral forest in moist forests.

- Lesica found an estimated 18% of the cool lodgepole pine sites was in an old growth structural stage (>200 years) prior to European settlement, approximately the mid 1800's. … This same research in Fire Group 8 in drier, lower subalpine types of Montana had over 25% of the stands in an old growth structural stage during the same historical period.

Deciding how much old growth should be preserved on any given landscape and thus included in forest plan direction is partially a question of values—specifically, those beyond timber ("biological diversity, wildlife and fisheries habitat, recreation, aesthetics, soil productivity, water quality") as per the Chief's Position Statement. Thomas et al., 1988 emphasized values pertaining to wildlife and diversity from a context of laws and regulations. In recognizing that meaningful implementation of regulatory requirements must include a simultaneous awareness of the limits of scientific knowledge, they advocate **for preserving all that remains**:

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

V. OLD GROWTH AND THE REGULATORY SETTING

Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area.

— National Forest Management Act planning regulations, 1982

A. Viability as a Forest Service methodology for conserving diversity

The National Forest Management Act (NFMA) requires the Forest Service to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives…" In complying with this diversity mandate, the 1982 NFMA regulations included the viability requirement stated above. Thus, those regulations required forest plans to acknowledge the strong association between many wildlife species and their reliance on a set of habitat conditions forest plans later defined as old growth—habitat which had already been heavily depleted.

The 1982 NFMA regulations also required: "(C)ertain vertebrate and/or invertebrate species present in the area shall be identified and selected as management indicator species and the reasons for their selection will be stated." The rationale was, "These species shall be selected because their population changes are believed to indicate the effects of management activities." (*Id*.) Juel, 2003 includes a list of management indicator species adopted by the original forest plans of Northern Region national forests.

Viability claims under NFMA were the basis of the original successful litigation efforts concerning the northern spotted owl in the federal forestlands of the Pacific Northwest.

The 1987 Forest Plan for the Clearwater National Forest states that old growth "is vital to the perpetuation of old-growth dependent species of wildlife." (USDA Forest Service, 1987f.) In other words—vital for maintaining viability.

Similarly Appendix 27 of the 1987 Forest Plan for the Idaho Panhandle National Forests (USDA Forest Service, 1987d) states, "Drastic reduction in quantity of old growth not only reduces diversity, but it also makes old-growth dependent wildlife vulnerable to significantly reduced populations, extirpation, or even extinction."

And as stated in Green et al., 1992: "Old growth dependent and associated species are provided for by supplying the full range of the diversity of late seral and climax forest community types that make up habitat for these species."

Another provision of the 1982 NFMA regulations required: "Population trends of the management indicator species will be monitored and relationships to habitat changes determined." Thus, the regulations created a feedback mechanism for managers to check if management actions implemented under the forest plan were harming wildlife populations to the extent that forest plan standards needed strengthening to maintain viable populations.

The Committee of Scientists (1999) believe it is vital to "monitor those species whose status allows inference to the status of other species, are indicative of the soundness of key ecological processes, or provide insights to the integrity of the overall ecosystem."

The idea that population trends of management indicator species (MIS) could serve as a proxy for ensuring viability of all wildlife enjoys much scientific support (Committee of Scientists, 1999). It assumes that persistence of MIS populations within the context of managed landscapes would be a reasonable feedback mechanism, given that monitoring populations of all old-growth associated species is impractical.

However, management incentives to actually monitor population trends of MIS pale in comparison to those for exploiting resources in their habitat. Congress bears much of the responsibility for this situation, consistently failing to appropriate sufficient funds for fully implementing forest plan monitoring programs. In evaluating forest plans, Yanishevsky, 1994 noted, "In many cases monitoring is reliant on inadequate funding. This makes even the best intentions meaningless." At best, the Forest Service has gathered spotty data on population trends of management indicator species in this bioregion.

Committee of Scientists member and Nobel Laureate Roger A. Sedjo, (1999) explains his perspective on the problem:

> The major problem is that there are essentially two independent planning processes occurring simultaneously: one involving the creation of individual forest plans and a second that involves congressionally authorized appropriations for the Forest Service. Congressional funding for the Forest Service is on the basis of programs, rather than plans, which bear little or no relation to the forest plans generated by the planning process. There is little evidence that forest plans have been seriously considered in recent years when the budget is being formulated. Also, the total budget appropriated by the Congress is typically less than what is required to finance forest plans. Furthermore, the Forest Service is limited in its ability to reallocate funds within the budget to activities not specifically designated. Thus, the budget process commonly provides fewer resources than anticipated by the forest plan and often also negates the "balance" across activities that have carefully been crafted into forest plans. Balance is a requisite part of any meaningful plan. Finally, as noted by the GAO Report (1997), fundamental problems abound in the implementation of the planning process as an effective decision making instrument. Plans without corresponding budgets cannot be implemented. Thus forest plans are poorly and weakly implemented at best. Major reforms need to be implemented to coordinate and unify the budget process.

B. Shortcutting scientific assurance of wildlife viability

Lacking robust population trend data on management indicator species, which is the science-based substitute, or proxy, for ensuring wildlife viability under NFMA, managers chose to substitute more simplistic, less scientifically robust measures of viability. Estimating the remaining amount of old-growth habitat has been used as a secondary proxy for the population trend proxy. The 1988 Forest Plan for the Colville National Forest (USDA Forest Service, 1988a) included a commitment and intent to "Inventory … old growth forests…" and use the "old growth inventory" as a suggested method of meeting Forest Plan wildlife monitoring requirement[3]. This assumes that maintaining enough old growth to meet forest plan/forestwide minimums would adequately substitute for MIS population trend data, for the purpose of assuring viable wildlife populations. There is a lack of scientific support for this proxy-on-proxy approach. Schultz, 2010 criticizes wildlife analyses based primarily upon habitat availability, because habitat alone is insufficient for understanding the status of populations. (See also Noon et al., 2003; Committee of Scientists, 1999.) The use of the proxy-on-proxy approach glosses over many nuances of the habitat needs of native species. It also places too much faith in forest

[3] At the time the Colville forest plan was replaced upon revision in 2019, the Forest Service had not come close to completing the forestwide old-growth inventory promised in the original Plan. *See* West, 2011.

plan minimums—having been adopted without scientific validation, as discussed above. The "Complex ecological relationships, involving many wildlife species and other organisms, …evolved within old-growth forests" (Thomas, et al., 1988) are essentially ignored in substituting minimum habitat requirements for population trend monitoring.

A simplistic habitat proxy ignores that spatial distribution and connectivity of wildlife habitat across a national forest affects population persistence. It omits spatial and temporal considerations across old-growth landscapes. It also ignores the diversity of "old-growth types" dispersed across the different forest types found in a given national forest—a major outcome of the Regional definition process. Additionally, this proxy-on-proxy ignores many of the human artifacts of management that degrade habitat quality and thus profoundly affect wildlife populations. These include edge effects and habitat fragmentation (Hargis et al., 1999; Harris, 1984; Lehmkuhl et al., 1991; Moriarty et al., 2011; Potvin et al., 2000; USDA Forest Service, 2004a; Warren, 1990; Webb and Boyce 2009; Yanishevsky, 1987). The habitat proxy also ignores many indirect impacts of roads—such factors as noise disturbance (Heinemeyer and Jones, 1994), population pressures on old growth associated wildlife due to facilitation of trapper access (Carroll, et al., 2000; Heinemeyer and Jones, 1994; Jones (undated); Wisdom et al., 2000; Witmer et al., 1998), and loss the of dead tree component from public firewood cutting (Warren, 1990; USDA Forest Service, 2004a).

On occasion, federal courts have allowed the Forest Service to rely on the habitat proxy as evidence of maintaining population viability. Yet Forest Service managers have still struggled to meet forestwide minimums. In the 1990s and early 2000s, at least four national forests in this bioregion—Clearwater, Boise, Kootenai, and Idaho Panhandle—could not satisfy federal courts in this regard.

At times the Forest Service uses questionable methodology to claim it meets a forest plan minimum forestwide old growth requirement. The Nez Perce National Forest Plan requires the Forest Service to "Inventory, Survey and Delineate" old-growth habitat by 1990. (USDA Forest Service, 1987e.) Over thirty years post-deadline, the Forest Service still cannot produce a reliable forestwide old-growth inventory for the Nez Perce National Forest. In the case of this national forest, the Forest Service relies upon Forest Inventory and Analysis (FIA) data to claim it is meeting its forestwide 10% minimum. From a recent environmental impact statement[4]: "The most recent Forest Inventory and Analysis (FIA) data (Bush et al. 2010) indicate that ...approximately 13.6 percent of the Nez Perce National Forest meets the Forest Plan definition of old growth… . Based on this information, the Nez Perce National Forest is above the Forest Plan minimum standard of 10 percent old growth forest-wide."

But this FIA methodology faces insurmountable barriers to calculating old growth at the landscape level. For one, it does not verify the size of old-growth stands in consideration of wildlife habitat needs. In discussing such methodology, a Northern Region report (Bollenbacher, et al., 2009) states, "All northern Idaho plots utilized a primary sample unit (PSU) composed of four fixed radius plots with trees 5 – 20.9 inches tallied on a 1/24th acre plot and trees 21.0 inches DBH and larger tallied on a ¼ acre plot." And the Forest Service's Czaplewski, 2004 states, "Each FIA sample location is currently a cluster of field sub-plots that collectively cover

[4] Hungry Ridge Restoration Project Final Environmental Impact Statement, November 2019

an area that is nominally one acre in size and FIA measures a probability sub-sample of trees at each sub-plot within this cluster."

Sample design for FIA plots is semi-systematic; a sample taken randomly within a systematically placed grid. As stated above, at most each plot samples a maximum of one acre—far smaller than an old-growth stand—and so resulting estimates cannot determine the capability to meet biological needs of the associated wildlife.

Moreover, the location of plots is confidential, and for good reason. Managers are not allowed to know the location of FIA plots, to prevent selective management at plot locations which could skew the FIA data. As a result, conclusions such as the forestwide old-growth percentage claimed by the Nez Perce National Forest cannot be verified by independent investigators. This thwarts independent peer review—a hallmark of the scientific method.

FIA statistics have no correspondence to forest plan minimum old-growth stand sizes, nor to the spatial habitat needs of wildlife species. No mapping of existing old growth is possible using FIA data because the specific location of old-growth stands is not derived from FIA data. Therefore, there can be no scientific study to determine correlation of FIA estimates with estimates based on actual, publicly available data gathered in the forest using forest plan or other old-growth definitions.

The Forest Service does not use the FIA in all analyses on all national forests in the study bioregion. But the use of even a robust, reliable database or other inventory must be supportable by scientific validation, which means results can be replicated. To this author's knowledge, such research does not exist.

C. Removing the viability requirement altogether

For any regulatory structure to be effective, accountability to and empowerment of the public must be built into the equation. Flournoy et al., 2005 discuss how this has played out regarding viability:

> The …requirement that the Forest Service obtain data sufficient to analyze population trends of indicator species and their relationship to habitat changes caused by management activities in the National Forests has been a benchmark against which the public has been able to track the agency's performance. Numerous lawsuits brought by parties tracking Forest Service compliance with that requirement have resulted in judicial invalidation of harmful site-specific projects.

Following those litigation successes, the all-too predictable response of the federal government ultimately led to viability requirements being weakened to the extent that they are virtually unenforceable and/or nonexistent. In commenting on an earlier version of a replacement for the 1982 NFMA Regulations, Flournoy et al., 2005 identify this shift in power as reducing the role of science:

> Given that the Forest Service has freed itself from such scientific constraints as the need to: …ensure species viability through monitoring population data; and …monitor progress toward anything but self-established and broadly stated objectives, it is apparent that the 2004 forest planning rule significantly diminishes the overall role of science in planning.

After multiple attempts, when the NFMA Regulations were finally replaced in 2012 the new 36 CFR § 219.9 at (b)(1) made assurance of viability altogether discretionary. And at (b)(2) the discretion was further watered into merely suggesting "plan components, including standards or guidelines, to maintain or restore ecological conditions within the plan area to *contribute to* maintaining a viable population of the species within its range." (Emphasis added.)

VI. THE FINAL DEVOLUTION OF MANAGEMENT: TARGETING OLD GROWTH FOR LOGGING

(I)t is built into the agency culture that they must always find a way to log trees and that, in turn, feeds back on the science that is cited or requested by the agency. There is a complete lack of objectivity and independence.

—DellaSala and Baker, 2020

Prioritizing non-timber old-growth values constrains exploitation of old growth for timber, and to an extent even hinders the logging of potential future old growth. Since preserving old growth is the antithesis of management and is therefore a natural enemy to the Forest Service—as the old saying goes—truth is the first casualty of war.

A. National Forests and politics

The legacy of overcutting public forests resulted in litigation that reduced public land logging in the 1990s and early 2000s. But the Forest Service, a bureaucracy of the administrative branch of government, is very much a political animal. So in attempting to pacify growing public distaste for logging of national forests while appeasing political pressure and financial interests, managers have concocted layers of rationale attributing ecological benefits to logging.

Steel, 2009 notes "special interests and symbolic politics, a powerful combination that has proven its worth in muddying the waters of public knowledge and stopping intelligent progress in the thoughtful management" of old growth.

In order to muddy the waters, the Forest Service purposefully conflates tree farming techniques—known to grow wood more quickly for harvest on tree farms—with ecological benefits. Ecological damage is justified with a promise of healthier trees—a classic case of missing the forest for the trees. Terminology such as "improving forest health" and "increasing resilience and resistance to wildfire and insect pests" are ubiquitous in timber sale environmental analyses and in public relations campaigns by land management agencies and industry representatives. Yet the results bear much resemblance to the unsustainable logging of the past[5], with no scientifically proven ecological benefits for forests, including old growth.

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[5] See, e.g. "The Clearcut Kings: The US Forest Service Northern Region and its obsession with

Under this politically inspired misinformation campaign, logging proponents demonize "unhealthy" forests to justify management "prescriptions." One finds such language in every timber sale NEPA document[6] prepared by the Forest Service.

One campaign tool is fire. The fear incited by raising the specter of imminent destruction to property and forests distracts from a sober evaluation of any science that might question the application of logging as the solution. Kerr, 2009 notes the "timber industry …exploiting the public's unbounded ignorance of wildfire. The public loves old trees, scenic forests, healthy watersheds, and roadless areas. The public does not love burned forests. Yet."

The federal government, in its "Smokey Bear" role (*Id*.) helps facilitate this charade, with administrative policies such as the 2002 Healthy Forest Initiative (HFI) "to improve regulatory processes to ensure more timely decisions, greater efficiency, and better results in reducing the risk of catastrophic wildland fires." This led to Congress passing the 2003 Healthy Forest Restoration Act (HFRA) to:

> …conduct hazardous fuel reduction projects (fuel projects) on specified types of Federal lands, including on certain lands that contain threatened and endangered species habitat. Directs the Secretary concerned to fully maintain, or contribute toward the restoration of, the structure and composition of old growth stands according to the pre-fire suppression old growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health, and retaining the large trees contributing to old growth structure.

An explicit goal of these programs is to reduce occurrences and severity of wildland fire. This disregards the fact that the ecosystems of this bioregion evolved with fire at all severities. It also ignores the fact that many wildlife and other organisms actually depend upon fire to create their favored habitat conditions. (Hutto 1995, 2006, 2008, Hutto et al. 2016, Saab and Dudley 1998). Even high-severity fire is ecologically important. (Bond et al. 2012.) Snag forest habitat "is one of the most ecologically important and biodiverse forest habitat types in western U.S. conifer forests (Lindenmayer and Franklin 2002, Noss et al. 2006, Hutto 2008)." (Hanson 2010.)

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

In claiming to avert so-called catastrophes, both the HFI and HFRA shortcut the public review and environmental assessment processes required by NEPA and other laws. And what of the old

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supersized clearcuts" (Bilodeau and Juel, 2021), which documents an increase in size and extent of clearcuts in recent years.

[6] The National Environmental Policy Act (NEPA)—requires the Forest Service to analyze the environmental impacts of timber sales in the context of public involvement.

growth the HFRA mentions? The Forest Service focuses on the clause, “contribute toward the restoration of, the structure and composition of old growth stands **according to the pre-fire suppression old growth conditions characteristic of the forest type**…” (Emphasis added.) The emphasis on re-creating historical conditions is not limited to old-growth forests. Old growth is merely a subset of the larger target of exploitation—forests. But before discussing how a distortion of science has been used to promote logging all across forest ecosystems, this report examines how seeking so-called “healthy forests” thwarts the natural processes that create habitat for old-growth associated wildlife. Likewise, vilification of “unhealthy forests” demonizes old growth itself.

B. Disqualifying old growth

Proponents of the tree farming, manipulate-and-control management paradigm portray natural agents of tree mortality as a sign of ecological dysfunction. In old-growth stands, mortality of large trees may disqualify them from old-growth status because the number of live, old trees may decline below a set minimum. In many cases the Forest Service subsequently conducts aggressive “salvage” timber sales in such stands.

Several natural events potentially disqualify old growth from minimum criteria. A fire may be the agent of tree mortality. It could be native insects or fungi. A windstorm could blow down some of the large, old live trees. It doesn’t matter if the event is natural and fully expected of old-growth ecosystems; and it is irrelevant if the rest of the structural components of this “former” old-growth stand continue to provide habitat diversity and therefore serve old-growth associated wildlife species. When a stand no longer meets the minimum numerical criteria, often no other forest plan protection remains to constrain logging. (E.g., USDA Forest Service 2017e, USDA Forest Service, 2016b, USDA Forest Service, 1999a).

Large trees die and are transformed into snags pocked with nesting or denning cavities. They eventually topple to form structures providing cover from predators. They finally become incorporated into forest soil—providing water-holding capacity and soil nutrients as they rot, potentially sequestering carbon for centuries. Such events are natural and expected of old-growth forests—and in fact vital for the cycle of life. But when these events cause a stand to fall below minimum live tree requirements, forest plan old growth protections are removed.

C. Biased diagnoses and false cures

Fire, insects, and tree diseases are vital natural processes comprising the ecosystems within which old growth develops. They create essential and vital habitat conditions for wildlife. Yet today, forestry practiced on national forests is promoted as minimizing the effects of fire, insects and tree diseases. In other words, it is thinly veiled tree farming.

The Forest Service brazenly asserts that national forests across the western U.S. are greatly suffering from exclusion of fire, to justify “treatments” necessary to “restore” forests. Such claims are made in the absence of representative data on historic forest conditions, as discussed in the next section.

Further, since enlightened fire suppression policies are not possible when the Forest Service stokes the terror of fire, the agency's manipulate-and-control paradigm must forever dominate. Odion and DellaSala, 2011 describe this situation as untenable: "…fire suppression continues unabated, creating a self-reinforcing relationship with fuel treatments which are done in the name of fire suppression. Self-reinforcing relationships create runaway processes and federal funding to stop wildfires now amounts to billions of tax dollars each year." Such a management paradigm implicitly or explicitly denies the fact that forest ecosystems have evolved under highly varying climate conditions and disturbances over the millennia and therefore can be expected to exhibit a wide range of conditions and evolutionary recovery mechanisms which truly embody the notion of "resilience."

Insects are also scapegoated as a scourge to forests. Again, this is ecologically absurd. Black, 2005 states:

> Insects, including those that feed on and sometimes kill trees, are integral components of healthy forest ecosystems. They help decompose and recycle nutrients, build soils, maintain genetic diversity within tree species, generate snags and down logs that wildlife and fish rely on, and provide food for birds and small mammals. (Id.)

And Rhoades et al. (2012), state, "…researchers are …finding that beetles may impart a characteristic critically lacking in many pine forests today: structural complexity and species diversity."

In playing the fire card, the Forest Service often claims that trees killed by fire or disease would lead to more severe fires. However DellaSala (undated) summarizes results from dozens of recent field studies from multiple regions and forest types on effects of mountain pine beetle tree kill on fire severity. He states, "There is now substantial field-based evidence showing that beetle outbreaks do not contribute to severe fires nor do outbreak areas burn more severely when a fire does occur." Congressional testimony by Kulakowski (2013) agrees, and also identifies weather and climate as much more relevant to increased fire severity. Hart et al. (2015) found that "that the observed effect of (mountain pine beetle) infestation on the area burned in years of extreme fire appears negligible at broad spatial extents."

D. The myth of ubiquitous low-severity wildland fire

Another Forest Service false premise specific to old growth in the Northern Rockies is that, prior to the advent of logging and fire suppression in the twentieth century, most old growth was maintained under a low severity fire regime. This notion was nurtured at least as early as in the development of the Northern Region's old-growth definitions—Green et al., 1992: "In reviewing historic data it has recently been determined that the bulk of the presettlement upland old growth in the northern Rockies was in the lower elevation, ground-fire maintained ponderosa pine/western larch/Douglas-fir types (Losensky 1992)." When this Losensky cite ("Personal communication. Jack Losensky, Ecologist, Lolo National Forest, Missoula, MT") was requested under FOIA, the Forest Service replied that it had no record of it. (Marten, 2020.)

Green et al., 1992, also states:

> Many of the oldest stands of old growth are dominated by seral tree species that are maintained as dominants and protected from crown fire, by repeated underburns that reduce ladder fuels and competition from more tolerant tree species. These relationships are **well documented by Arno and others (1985), Arno (1980), Fisher and Clayton (1983), and Fisher and Bradley (1987)**. (Emphasis added.)

Yet none of the references cited in Green et al. 1992 specify the geographic extent of the alleged short fire-interval forests in the Northern Rockies. At best, the Forest Service relies upon anecdotal information. There is no credible science supporting the agency's portrayal of most forest conditions in this bioregion being maintained in an orderly, relatively open-canopy status by low severity fire. The basis of rigorous science is data, which the Forest Service lacks.

This lack of scientific certainty is discussed by scientists such as Baker, 2017 who notes the limitations of tree-ring and fire scar studies. Baker observes biases that result in significant underestimates of average between-fire intervals on landscapes in western U.S. dry forests[7]:

> Past reconstructions of low-severity fire in dry forests, using tree-rings, focused on long records of dated fire years in small plots, and most were not intended to accurately estimate key rate parameters of low-severity fire needed to restore and manage low-severity fire across large landscapes. These small-plot reconstructions have known inaccuracies and biases if inappropriately used for this purpose.

Baker, 2017 found that only about 14% of historical dry forests in the western U.S. had average between-fire intervals of less than 25 years. This 14% was "concentrated in Arizona and New Mexico (and) were scattered across parts of all other states."

Also, Northern Region scientists Bollenbacher and Hahn, 2008g acknowledge, "Estimating the historical extent of old forests is also constrained by incomplete fire scar data and imprecise fire histories from the pre-settlement era (Baker and Ehle 2003)."

Baker and Ehle, 2003 state:

> For most of the ponderosa pine forests of the western United States there are no data at all that would allow a determination of whether crown fires or mixed-severity fires were present or absent before EuroAmerican settlement, or have increased or decreased.
>
> … No one, in any study anywhere in the West, has yet estimated how frequent crown- or mixed-severity fires were in ponderosa pine forests, how large these fires may have been, or what the fire rotation for these fires might have been prior to EuroAmerican settlement. … It may be difficult or impossible to determine whether large, high-severity fires did or did not occur in ponderosa pine landscapes prior to EuroAmerican settlement.

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[7] "Dry forests in the western USA cover 25.5 million ha and include dry pine forests, dominated by ponderosa pine (Pinus ponderosa) or other dry pines, and dry mixed-conifer forests that also have firs (Abies concolor, A. grandis, Pseudotsuga menziesii) and other trees." (Baker, 2017.)

Lesmeister et al., 2019 assert, "The extent of these (low-severity) forest types was often overrepresented in historical records due to the ease of traveling through them and the opportunities for pleasing photographs (Van Pelt 2008). In truth, these open, parklike forest conditions do not represent many forests in western North America (Odion et al. 2014)."

Forests of the intermountain west, including ponderosa pine forests, have burned at various severities historically, and high-severity fire is a natural part of this mix (Pierce et al. 2004, Baker et al. 2006, Hessburg et al. 2007).

Overestimating the amount of forest maintained naturally by low severity fire is another aspect of the agency cover story, told to support "treatments" of allegedly unhealthy northern Rocky Mountain forests using wide-scale "thinning" and prescribed burning. Lacking scientific, time-tested validation, the agency still blusters it is "increasing resiliency" and "restoring" forests from the damage its previous heavy-handed management has inflicted—using essentially the same heavy-handed management techniques.

In contrasting to the agency's exaggerations of the geographic extent of landscapes experiencing mostly frequent, low severity fire are Forest Service statements in recently revised forest plans acknowledging that mixed-severity fire regimes dominate the northern Rocky Mountains (*see* e.g., Nez Perce-Clearwater National Forests Draft EIS, Kootenai National Forest Final EIS, Flathead National Forest Final EIS, Colville National Forest Final EIS).

E. Fire refugia and post-disturbance legacies

Certainly, in the fire prone ecosystems of the northern Rockies, wildland fire presents challenges for managers, given that these landscapes have already been logged to well below historic levels of old growth. Also, old growth definitions existing at the time of the Chief's Position Statement were heavily influenced by the notion of old growth based on iconic Pacific Northwest forests, where intervals between severe, stand replacing fires are commonly hundreds of years. Yet despite acknowledging a dynamic landscape caused by the prevalence of fire in the Northern Rocky Mountains bioregion, the Forest Service has no management strategy providing spatially and quantitatively explicit measures to assure old growth will remain well distributed across landscapes over time. And if climate change increases the prevalence of severe wildfire as some climate projections suggest, old growth will be placed even more at risk.

Many areas of forests in this bioregion have longer fire return intervals, allowing forests to develop old-growth character. However, in landscapes where fire intervals may be shorter, "fire refugia" is a term referring to more isolated locations disturbed less frequently or less severely by wildfire than the surrounding landscape matrix. (Krawchuk et al., 2016; Camp et al., 1997; Meddens et al., 2018.)

Fire refugia are more likely than their surroundings to exhibit old-growth habitat characteristics. Camp et al. 1997 say "Before Euro-American settlement, late-successional species and compositions were found within fire refugia-stands that burned less frequently than the surrounding matrix …by virtue of topographic position, soil type, or a combination of environmental conditions and vegetation attributes." The latter "include areas adjacent to stream confluences, on perched water tables, and within valley bottoms and headwalls, especially at higher elevations (higher total precipitation) and on northerly aspects (more terrain shading, less insolation and thus reduced evapotranspiration)."

Ecologically, fire refugia "provide habitat for individuals or populations in which they can survive fire, in which they can persist in the postfire environment, and from which they can disperse into the higher-severity landscape." (Meddens et al. 2018.) The Forest Service has no management strategy that recognizes—let alone conserves—fire refugia. This is a problem during wildfire suppression operations, when burnouts might even target these locations (*Id.,* also *see* Zimmer, 2018).

Lesmeister, et al., 2019 explain why dense, late-successional forest tended to burn with high severity less frequently:

> The microclimate and forest structure likely played a key role in lower fire severity in nesting/roosting habitat compared to other forest types. As succession progresses and canopy cover of shade-tolerant tree species increases, forests eventually gain old-growth characteristics and become less likely to burn because of **higher relative humidity in soil and air, less heating of the forest floor due to shade, lower temperatures, lower wind speeds, and more compact litter layers** (Countryman 1955, Chen et al. 1996, Kitzberger et al. 2012, Frey et al. 2016, Spies et al. 2018). In addition, as the herbaceous and shrub layer is reduced by shading from lower to mid-layer canopy trees, **the connection between surface fuels and the canopy declines**, despite possible increases in canopy layering (Halofsky et al. 2011, Odion et al. 2014). (Emphases added.)

Finally, even where fire severity is such that vegetation is highly altered, patches of older, fire-resistant trees and even larger dead wood remain, providing many of the habitat features sought by old-growth associated wildlife. The Colville Forest Plan Final Environmental Impact Statement defines "biological legacy" as "Organisms, organic matter, and biologically created patterns that persist from the pre-disturbance ecosystem and influence recovery processes in the post-disturbance ecosystem." The Nez Perce-Clearwater National Forest's draft revised forest plan recognizes "live legacy trees and snags" as important as habitat and "are primarily the largest." Still, at best only a fraction of such biological legacies are specifically required for retention during logging operations, allowing continued depletion in managed landscapes.

F. Old growth logging promoted in revised forest plans

Forest plans recently revised or proposed for revision in the northern Rocky Mountain bioregion promote a worldview wherein extensive management actions are necessary to restore and maintain forest ecosystems, including old growth. Scientific information is lacking in support of such assumptions. Wales, et al. 2007 modeled various potential outcomes of fire and fuel management scenarios on the structure of forested habitats in northeast Oregon, and projected that the natural disturbance scenario resulted in the highest amounts of all types of medium and large tree forests combined, and best emulated the Natural Range of Variability for medium and large tree forests by potential vegetation type after several decades.

Next, this section explores examples of forest plan revisions or amendments using false premises and pseudoscience to devolve from conservation oriented approaches to those emphasizing logging. And in every case, following plan changes the Forest Service omitted minimum forestwide old-growth standards.

1. Boise National Forest

Following extensive wildfires on the Boise National Forest, in the early 2000s the outcome of litigation dramatically reduced logging because the Forest Service could no longer meet forest plan minimum old-growth requirements. So the Forest Service sought to sidestep its failed viability proxy by amending it out of the forest plan. This started with changing the term itself—from old growth to "old forest." The Forest Service[8] justified this change:

> Because old forest characteristics have been aggregated into **two basic categories**, it is generally easier to identify, monitor, and compare the characteristics of these old forest types with desired vegetative conditions than it is with "old growth." …Definitions of old growth generally vary by forest type, depending on the disturbance regimes that may be present. Also, within a given forest type, considerable variability can exist across the type's geographical range for specific ecological attributes that characterize late seral and climax stages of development. **This variability among and within multiple (often 10-20) forest types makes old growth characteristics difficult to identify, monitor, and compare to desired vegetative conditions**. (Emphases added.)

In other words, since the Forest Service found it difficult to conserve the diversity of old-growth types while conducting timber sales, the agency chose to remove old growth from the forest plan so it could no longer be held legally accountable for not preserving this diversity.

Boise National Forest managers further explain, "old forest habitat …includes old growth, but is also broader to **include the mid-seral, fire maintained systems**."[9] Yet their previous Hamilton, 1993 old-growth definitions already included such forest types. Furthermore, the "old forest" definition lacks minimum age criteria for the large trees, as found in Hamilton, 1993. This is, ecologically speaking, a critical omission because much of what defines old growth takes much longer to develop that typical timber harvest rotation periods.

Also, substituting "old forest" obscures the fact that forestwide levels of old growth had been reduced below original forest plan minimums because of extensive logging and wildfire. With "old forest habitat" being much more common than old growth, the agency need no longer consider the scarcity of the remaining old growth.

Furthermore, even managing for a minimum of "old forest" is sidestepped, because the agency further devolves from using measurable parameters to instead pursue nebulous "Desired Conditions." In defining that term, the Boise's 2010 forest plan amendment stated, "Also called Desired Future Condition, a portrayal of the land, resource, or social and economic conditions

[8] Passage is from the Final Environmental Impact Statement of Boise National Forest's 2010 Wildlife Conservation Strategy forest plan amendment.
[9] *Id*., emphasis added

that are expected in 50-100 years if management goals and objectives are achieved. A vision of the long-term conditions of the land." So instead of doing its duty to conserve biological diversity, the agency resorts to making promises to "achieve" vaguely stated goals at some point in the distant future.

Furthermore, this ecologically empty "desired conditions" approach has become disturbingly ubiquitous in forest planning, as seen in the 2012 revision of the NFMA implementing regulations.

2. Colville National Forest

As noted above, the original 1988 Forest Plan for the Colville National Forest stated a commitment and intent to "Inventory … old growth forests…" and to use said old growth inventory as a method of meeting Forest Plan wildlife monitoring requirements. (USDA Forest Service, 1988a.) In 2019, the Colville National Forest's revised forest plan was approved, and the words "old growth" were completely omitted—even though the associated Final EIS acknowledged[10] that "Old Growth Dependent Species Habitat …provide(s) essential habitat for wildlife species that require late and old forest habitat components (e.g., structure such as large and old trees, large snags, and downed wood) and contribute to the maintenance of diversity of wildlife habitats and plant communities." In place of old growth, here the Forest Service also uses the term "old forest" in the revised forest plan; and in further obfuscation uses the terms, "late forest" and "late successional forest" without defining either one.

So under the revised Colville forest plan's Orwellian scheme, "…timber harvest would be used as a management tool in the late forest structure MA to maintain and improve resiliency of the late and old forest habitat components (e.g., structure such as large and old trees, large snags, and downed wood)." In other words, logging is explicitly marketed as benefitting old growth and associated wildlife.

Yet the long-term development and persistence of old growth, with its characteristic complexity, proves its inherent natural resiliency and therefore precludes the need for active management. DeLuca, 2009 states, "Old growth forests, having survived the fires, droughts, and insect and disease outbreaks of the past, have shown themselves to be resilient elements of the forest ecosystem. The diversity of species and tree sizes in old-growth forests makes them inherently resistant to dramatic change." The provisions placed into forest plans that allow logging of old growth to increase resilience or resistance are not based in science. Rather, they are loopholes for allowing management (logging) of the entire Forest—old growth included.

3. Kootenai and Idaho Panhandle National Forests

Unlike the original 1987 forest plans of these national forests—which featured old growth forestwide minimum standards of 10%—the 2015 revised forest plans include no minimums. Instead, the newer plans sanction logging in old growth, using the Green et al., 1992 stand-level criteria as minimum retention requirements when logging within stands of old growth. Both

[10] In the Final Environmental Impact Statement for Colville National Forest's 2019 Revised Forest Plan.

revised plans[11] include the following standard: "Within old growth stands, timber harvest or other vegetation management activities shall not be authorized if the activities would likely modify the characteristics of the stand to the extent that the stand would no longer meet the (Green et al.) definition of old growth…"

Under such a management regime, where the Forest Service is less and less willing to abstain from logging old-growth, the best quality old-growth habitat is highly attractive to agency managers seeking to achieve timber targets. The following is an example of what happens under a regime encouraging active management within old growth, using Green et al., 1992 old-growth definitions as minimum qualifying criteria.

Green et al., 1992 recognizes a fairly common "old growth type" in the North Idaho Zone where one often finds large, old Douglas-fir, grand fir, western larch, western white pine, Engelmann spruce, subalpine fir, and western hemlock trees on cool, moist environments. (*Id*.) Such old growth is relatively dense: "There are an average of 27 trees per acre 21 inches DBH or more. The range of means across forests and forest types is from 12 to 53." (*Id*.)

However, Green et al., 1992 sets the "minimum number" of trees per acre 21 inches DBH at only ten. (*Id.*). Which means, under the above Idaho Panhandle Forest Plan standard, the "average" stand could experience logging 17 of its 27 largest, oldest trees and still qualify as old growth.

So why does Green et al., 1992 specify such a small minimum number of large, old trees—so far below the recognized average, and even less than the bottom limit of the recognized range? The answer lies in how those authors intended the criteria to be used: "The number of trees over a given age and size (diameter at breast height) were used as **minimum screening criteria** for old growth. …The **minimum screening criteria** can be used to identify stands that **may meet** the old growth type descriptions. " (*Id*., emphases added.) Green et al., 1992 further explain:

> The minimum criteria in the "tables of old growth type characteristics" are meant to be used as a screening device to select stands that maybe suitable for management as old growth, and the associated characteristics are meant to be used as a guideline to evaluate initially selected stands. They are also meant to serve as a common set of terms for old growth inventories. Most stands that meet minimum criteria will be suitable old growth, but there will also be some stands that meet minimum criteria that will not be suitable old growth, and some old growth may be overlooked**. Do not accept or reject a stand as old growth based on the numbers alone; use the numbers as a guide.**

(*Id.*, emphasis in the original.) So the abuse of the Green et al., 1992 minimum large tree screening criteria results in logging of large, old trees from old growth. And even if the existing stand in the above example possesses only the bare minimum large, old trees, managers could still log smaller and/or younger trees in the old-growth stand without disqualifying it, because numbers of such trees are not a part of the minimum criteria.

[11] *See* Idaho Panhandle National Forest revised forest plan and Kootenai National Forest revised forest plan.

Likewise, the Green et al. 1992 minimum total basal area was set well below the recognized range, again presumably for its utilization as a screening device. For the same old growth type discussed above, the "average basal area is 210 ft^2 per acre. The range is 160 to 270 ft^2". Yet the minimum is either 80 or 120 ft^2 depending upon type sub-categorization.[12] Basal area is a measure of stand density, or the square footage of an acre that is occupied by tree stems. So logging a stand with a basal area of 270 ft^2 (upper end of range) down to 80 ft^2 ("minimum") could result in the loss of medium diameter trees—another enticement for managers with timber priorities to log within old-growth stands.

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

Collateral damage of this forest plan-sanctioned logging in old growth includes the loss or reduction of old-growth habitat components. Green et al., 1992 recognize "Associated characteristics (such as number of snags, down woody material, dead tops and decay, and diameter variation)…". These "associated characteristics" are not included as minimum screening criteria, but represent the very diversity defining old growth in its truest meaning. These associated characteristics are typically and inevitably reduced during logging activities, which would squeeze the diversity out of old growth and the old-growth ecosystem.

4. Nez Perce-Clearwater National Forests

As of this writing, the original forest plans for these two national forests are undergoing revision for the administratively combined unit. Here, the Forest Service concocts yet another scientifically-challenged rationale for logging old growth. The draft forest plan advances the notion that some old growth is "non-desired" and may be "converted to a desired old growth type to meet desired conditions…" The draft Environmental Impact Statement vaguely identifies "Douglas fir, grand fir, western larch, Engelmann spruce/subalpine fir, western hemlock, western white pine, and ponderosa pine forest types on cool, moist environments" as undesirable. Notably, no definition of these "types" is provided. And if the agency determines the conversion of these "types" cannot be engineered—which is likely because there is no science to support such a notion—then the plan would promote "regeneration" (clearcutting) of such old growth.

G. Creating old growth?

Fully embedded within the Forest Service's perspective on old growth is an assumption that management can facilitate or accelerate development of fully functioning old growth. There is simply no science supporting the position that vegetation manipulation can help to maintain old growth over time, or foster development of non-old growth into old growth. As stated by Thomas et al., 1988:

> The ecological complexity of old growth makes it unlikely that forest managers can create functional old growth through silvicultural manipulations of younger-aged, second-growth

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

forests. Certainly, such knowledge does not now exist. …If silviculture is used to expedite this process, it should be done with the understanding that such action is experimental, and **results lie many decades or centuries in the future**. Accordingly, management options that include retention of existing old growth must be given priority. (Emphasis added.)

Pfister et al., 2000 agrees that the outcome of legitimate experimentation to help create old growth can only be known far into the future:

> (T)here is the question of the appropriateness of management manipulation of old-growth stands… Opinions of well-qualified experts vary in this regard. As long term results from active management lie in the future—likely quite far in the future—considering such manipulation as appropriate and relatively certain to yield anticipated results is an informed guess at best and, therefore, encompasses some unknown level of risk. In other words, producing "old-growth" habitat through active management is an untested hypothesis.

Hunter, 1989 quotes from writing by the Society of American Foresters:

> With present knowledge, it is not possible to create old-growth stands or markedly hasten the process by which nature creates them. Certain attributes, such as species composition and structural elements, could perhaps be developed or enhanced through silviculture, but we are not aware of any successful attempts. Old growth is a complex ecosystem, and lack of information makes the risk of failure high. In view of the time required, errors could be very costly. At least until substantial research can be completed, the best way to manage for old growth is to conserve an adequate supply of present stands and leave them alone.

Speaking to the hubris exhibited by forest managers, Franklin and Spies, 1991 ask, "How can we presume to maintain or re-create what we do not understand?"

The Forest Service implicitly or explicitly denies that the natural processes that created and maintained our old-growth landscapes over countless millennia can continue to do so without management intervention. The 2018 revised forest plan for the Flathead National Forest is exemplary of the manipulate-and-control management paradigm:

> Forest plan direction for old-growth forest supports the enhancement of the successional process towards old growth that could be achieved in some stands through management activities.
>
> Vegetation management within old-growth forest (see glossary) shall be limited to actions that
> - maintain or promote old-growth forest characteristics and ecosystem processes;
> - increase resistance and resilience of old-growth forest to disturbances or stressors that may have negative impacts on old-growth characteristics (such as severe drought, high-severity fire, epidemic bark beetle infestations);
>
> … treatment prescriptions that would promote the development of old-growth forest in the future should be considered.

Thus it is unsurprising the Flathead National Forest's revised forest plan claims its general forestwide logging direction promotes the development of old growth:

> …many of the desired conditions for vegetation characteristics (e.g., forest composition and size classes), and the standards and guidelines developed to achieve those desired conditions, also contribute to the long-term development of old-growth forest.

Therefore, much skepticism is justified concerning the Flathead National Forest's proposed Mid-Swan Landscape Restoration and Wildland Urban Interface Project, wherein the agency blusters that up to 35,000 acres of clearcuts could "contribute to the long-term development of old-growth forest."

There has been little research, if any, by the Forest Service to validate the old growth active management paradigm. Independent researchers investigated the ecological effects of forest restoration treatments on several old-growth forest stands in the Flathead National Forest. Hutto, et al., 2014 found:

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

In its zeal to promote the benefits of its active management (logging and burning) of old growth, the Forest Service downplays and ignores the damage it causes.

VII. CONCLUSIONS AND RECOMMENDATIONS

If no management practices are performed for a long time, stands may gradually evolve into so-called "old-growth forests". In the absence of anthropogenic disturbances, forests may slowly recover the natural disturbance dynamics (forest fires and windstorms, parasite outbreaks, fungal decay, gap creation due to insects) and develop those stand structural features (large living trees, large amount of deadwood, canopy gaps of various size, coexistence of senescent, mature and initial stages) typical of primary forests...

—Tomao et al. (2020)

If the worldview prevails where old-growth on national forests is valued more for timber than for other values such as "habitat for certain animal and plants, for aesthetics, for spiritual reasons, for environmental protection, for research purposes, for production of unique resources such as very large trees" (Green et al., 1992)—old growth simply will not persist in our shared landscapes. The natural processes that create and maintain old growth, operating necessarily over large landscapes, will continue to be hijacked and thwarted by Forest Service management policies, and old growth will dwindle into small, isolated remnants. The continuing assault on science, weakening of regulatory protections, and rapidly changing climate do not bode well for our old-growth landscapes and values.

On the other hand, if non-timber values are to hold any sway, management policies of government agencies including the U.S. Forest Service need a drastic overhaul before it's too late. Mildrexler et al. (2020) sum up the benefits of prioritizing these non-timber values:

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

As, Keith, et al., 2009 recognize, "Conserving forests with large stocks of biomass from deforestation and degradation avoids significant carbon emissions to the atmosphere."

The urgency to act on the climate crisis is reason enough to change society's relationship to forests from exploitation to preservation. If our elected officials and the managers they appoint were to strongly lead in objective consideration of what scientists are telling us about the critical role forests play in sequestering carbon and mitigating the effects of climate change, we would also enjoy the other benefits of conserving old growth. However, the emphasis of these conclusions and recommendations is based upon more traditional forest ecology, to help empower those effecting policy changes over their more local or regional landscapes.

A. Recovering old-growth landscapes

In order for old growth to persist on the landscape and return to an extent and condition resembling its past splendor, clearly forest managers are not able to actively create it, as discussed above. Nor can management necessarily choose the specific locations for stands of old growth to develop. This is because ecologically, the dynamics of **old-growth landscapes** operate at very broad scales—both geographically and temporally. From Kaufmann et al. (2007):

> The arrangement of patches—the landscape mosaic—is not constant over time. Rather, natural processes, such as fire, insect activity, disease, wind, regeneration of new seedlings, and competition among individual trees, interact to maintain a variety of conditions across the landscape. Just as the components of patches, stands, and landscapes vary spatially, so do the characteristics of ecological processes vary with time. A wind event may be as brief as a moment or as long as hours or days, fire an hour or a day or months, drought a season or a year or more, regeneration a year or decades or a century or more, and reaching an old-growth condition a matter of centuries. Under the influence of climate and fire, the patches in the mosaic changed with time, and in a fully functioning ecosystem, the old-growth forest landscape was maintained even though the locations and proportions of various patch types varied. And through all the changes of fire-adapted forests, fire remained a primary factor that, with some regularity, shaped the spatial arrangement of patches and stands in the landscape.

Franklin and Spies, 1991 state, "Old-growth forest is a biological or ecological concept that presumes ecosystems systematically change as they persist over long periods. An ecosystem has, in effect, a series of linked life stages …which vary in composition, function, and structure. Such progressions can take a very long time in forests because the dominant organisms, trees, typically live very long."

In a 1983 document that was later adopted into the 1987 Forest Plan for the Idaho Panhandle National Forests (USDA Forest Service 1987d), biologist Danielle Jerry recognized the spatial and temporal "shifting mosaic" created by natural disturbance processes:

> Episotic high and low mortality caused by fire, disease and insects are balanced by primary production. Borman and Likens (1979) describe this condition as a "shifting-mosaic steady state." Over a large area the average condition (steady state) of the vegetation is a forest dominated by old-growth trees. Within the gross boundaries of the old-growth forest are found patches representing every successional stage. The location of these patches of seral vegetation shift over time, for as one stand passes from pole to mature to old-growth trees, another stand may be eliminated by an insect attack. Thus, within the gross boundaries of an old-growth ecosystem a mosaic of varying age class stands constantly shift internal boundaries. Traditional ideas about climax vegetation are not really appropriate, for seral species and a heterogeneous age class are important elements in this "shifting mosaic steady state."

Noon, 2009 describes the multiple scales of this "shifting mosaic" and its importance for biological diversity:

> The distribution of different-aged, small-scale patches embedded within the larger old-growth forest patch is an important source of habitat diversity. Thus, old growth conservation requires management at both landscape and local scales. At the landscape scale, the extent of forest management must be sufficiently broad to accommodate the shifting mosaic of forest age classes generated by large-scale disturbances. At the local scale, individual old-growth reserves must be sufficiently large to incorporate most small-scale disturbance events that promote fine-grained habitat diversity.

Harris (1984) states, "biotic diversity will be maintained on public forest lands only if conservation planning is integrated with development planning; and site-specific protection areas must be designed so they function as an integrated landscape system." Harris, 1984 also states:

> Because of our lack of knowledge about intricate old-growth ecosystem relations (see Franklin et al. 1981), and the notion that oceanic islands never achieve the same level of richness as continental shelf islands, a major commitment must be made to set aside representative old-growth ecosystems. This is further justified because of the lack of sufficient acreage in the 100- to 200-year age class to serve as replacement islands in the immediate future. …(A) way to moderate both the demands for and the stresses placed upon the old-growth ecosystem, and to enhance each island's effective area is to surround each with a long-rotation management area.

And Marcot, et al., 1991 recommend integrating the biological needs of old-growth associated wildlife species across large landscapes to better inform management policies.

Although there are few specifics insofar as designs to restore and maintain old-growth over large landscapes, the following are general recommendations from scientists and other experts.

Yanishevsky, (1987) stated, "It is important to have areas set aside for old growth to curtail timber harvesting, reduce habitat fragmentation or insularization, and ensure the long-term retention of quality old-growth habitat." Also:

> Management schemes based on island biogeographic theories may help reduce impacts of adjacent management on old growth. These schemes (1) dedicate an existing core of old growth with no timber harvesting, (2) surround the core with a long rotation management island (thereby increasing the habitat effectiveness by providing adjacent mature stands), and (3) provide timbered corridors connecting the old growth management areas. (*Id*.)

Foster et al., 1996 state:

> The maintenance of many natural ecosystems requires the protection not only of current old-growth areas, but also of naturally disturbed forests that represent future old-growth. To ensure the continued presence of old growth, these areas must be maintained **within a landscape that is adequate in size to allow for the continuing mosaic of disturbance and for the dispersal of organisms and processes among patches**. (Emphasis added.)

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

> Connectivity objectives should be set for each landscape unit. …Connectivity objectives need to account for all habitat disturbances within the landscape unit. The objectives must consider the duration and extent to which different disturbances will alienate habitats. … In all cases, the objectives must acknowledge that **the mechanisms used to maintain connectivity will be required for decades or centuries**.
>
> Corridor is another term commonly used to refer to a tool for maintaining connectivity. …(T)he successful functioning of a corridor or linkage should be judged in terms of the connectivity among subpopulations and the maintenance of potential metapopulation processes. (Emphasis added; internal citations omitted.)

Noon, 2009 believes "issues of landscape connectivity, measured in terms of the likelihood of successful movement between patches of old-growth forest, become critical to sustaining wildlife over the long term. …Therefore, the matrix in which old-growth reserves are embedded must be managed so as to maintain connectivity among reserves."

Harris, 1984 discusses connectivity and effective interior habitat of old-growth patches:

> Three factors that determine the effective size of an old-growth habitat island are (1) actual size; (2) distance from a similar old-growth island; and (3) degree of habitat difference of the intervening matrix. …(I)n order to achieve the same effective island size a stand of old-growth habitat that is surrounded by clearcut and regeneration stands should be perhaps ten times as large as an old-growth habitat island surrounded by a buffer zone of mature timber.

Thomas et al., 1988 states:

> … Management plans for providing old growth must be based on existing stands because replacement stands cannot be produced by silvicultural practices; they must come from stands that are allowed to develop naturally into old growth.

Warren (1990) states:

> In devising a conservation strategy, Forman and Godron (1981:738) emphasize the importance of recognizing that "no patch stands alone", but is influenced by surrounding patches. Harris (1984) recommended surrounding old-growth habitat islands with a long-rotation management area, and interconnecting these with riparian corridors and other linkages. Similarly, Noss and Harris (1986) suggest that a regional landscape level be used, wherein high-quality nodes, such as an old-growth patch, be integrated with interconnected "multiple use modules" where management activities are scheduled to maintain the integrity of the nodes.
>
> …Natural disturbance regimes such as fire often occur on a spatial scale larger than a landscape patch (Urban et al. 1987). Providing for well-distributed habitat patches with interconnections between habitat patches thus are necessary to maintain species diversity of the long term.
>
> …A complex, multi-storied structure and a mosaic of both early and late successional stages often are important attributes (Bormann and Likens 1979).

Green et al., 1992 recognize, "Stands are elements in **dynamic landscape**. We need to have representatives of the full range of natural variation, and **manage the landscape mosaic as a whole** in order to maintain a healthy and diverse systems." (Emphases added.)

Spies, 2009 describes the important perspective of old growth existing in the whole forest ecosystem:

> Old forests are inextricably intertwined in space and time in a continuum of forest development, just as young, mature, and mixed-age forests are. Focusing on only one part of the continuum is like trying to understand light by examining only one color or wavelength, or like trying to understand a river by looking only at the deep, quiet pools and ignoring the rapids.

Marcot, et al., 1991 bring wildlife into this discussion:

> Landscape attributes affecting the perpetuation of old-growth dependent and associated wildlife include the spatial distribution of old growth; the size of stands; the presence of habitat corridors between old-growth or old-forest stands; proximity to other stands of various successional stages and especially for well-developed mature-forest stages and species with different seasonal uses of habitats; and the susceptibility of the old-growth habitat to catastrophic loss (such as wildfire, insects, disease, wind and ice storms, and volcanic eruptions.
>
> Stand size, in combination with its landscape context (the condition, activities, or both on the adjacent landscape that affect the stand) …can have a major effect on their use by wildlife. …If such stands are separated by unsuitable habitat or disruptive activities, however, the remaining old-growth stands become smaller in effective (interior) size, more fragmented, and possibly not suitable for occupancy or for successful reproduction.

DeLuca, 2009 discusses considerations for recruitment of future old growth:

> A fundamental question that must be addressed is: What developing stands should be priorities for recruitment as old growth stands? What are the dominant characteristics of the stand and the surrounding landscapes that should be considered when identifying sites for old growth recruitment? The following is a simple list of possible attributes that could be considered when identifying priority candidates for old growth recruitment:
>
> 1) Stands should have importance or relevance to the surrounding landscape from a connectivity perspective (largest intact units of naturally functioning forests, species migration potential, and proximity to important (e.g. T&E) habitat).
> 2) Stands should exhibit characteristics of natural forest succession for that forest type and physiography (e.g. multi-aged, understory species diversity, occurrence of fire as appropriate, presence of snags and coarse woody debris)
> 3) Stands should be capable of achieving old growth characteristics without a great degree of human effort or intervention
>
> Fundamental to the notion of maintaining and recruiting old growth forests is the role of natural disturbances on the landscape. Landslides, wildfire, microbursts, etc… will occur and will help shape the landscape. If these processes cause the mortality of a majority of the standing timber, then the question must be asked: Is a dead forest an old growth forest? Clearly there would be a lack of mature trees, but disturbance is a given and is an important part of the natural forest succession pattern.

DeLuca, 2009 believes "Wildlife inhabitation of these stands should also be considered an important index of success in recruitment of old growth condition."

B. Initiatives for protecting old-growth landscapes

The implication is clear: for old growth and its intrinsic values to exist, natural processes must be the main agents of disturbance and change over large landscapes and for long intervals of time. This means active management must be constrained more than it currently is. Major policy changes and reordering of priorities for national forests must be undertaken for old growth to persist.

1. Endangered Species Act

Listings of species under the Endangered Species Act (ESA) have achieved habitat protection over large landscapes, depending upon the ranges of the species protected. Implementing mechanisms under the ESA that restrain or reduce exploitation of ecosystems include creating Recovery Plans and designating Critical Habitat. See this Defenders of Wildlife website for more details on the ESA. Less directly, ESA requirements for consultation with federal agencies such as the U.S. Fish and Wildlife Service (USFWS) result in review of Forest Service management projects that potentially improve outcomes for listed species' habitat, one project at a time. However attempts to attain listing of species are met by USFWS resistance, which can result in rare species not being listed or long delays when they are (e.g., Bechtold, 1999 regarding the bull trout). And subsequent to listing, designation of Critical Habitat and creation of Recovery Plans are likewise vulnerable to political meddling and bureaucratic opposition.

Unlike the northern spotted owl in the Pacific Northwest, listing efforts for old-growth associated wildlife in the Northern Rocky Mountains bioregion have been mostly unsuccessful. The Canada lynx, listed in the 1990s, relies upon old-growth conditions for some of its life functions, but its largely higher-elevation habitat doesn't sufficiently overlap with the forests most targeted by logging, so lynx listing has not resulted in adequate landscape-level protections for old growth.

Wildlife advocates have petitioned the USFWS to list other old-growth associated species, with no success so far. These include petitions for the northern goshawk and fisher—old-growth management indicator species in some forest plans and species of conservation concern across much of this report's landscape of interest. Eventual success in listing such species would open the door for science-based habitat protections not found in current forest plans or other Forest Service direction.

2. Habitat protections under forest plans

Forest Planning under NFMA is a potential opportunity to preserve old-growth ecosystems over large landscapes. The best example is the Northwest Forest Plan (NWFP), which revised existing land management plans following the controversial management of old-growth forests on federal lands in the range of the northern spotted owl. Success of the NWFP has been a mixed bag. It "protected remaining old-growth forests from clearcutting and enabled growth and development of vegetation conditions to support threatened species" (Spies, et al. 2019). And yet, "populations of northern spotted owl and Washington populations of marbled murrelet, along with other bird species associated with older forests, have continued to decline" (*Id*.). Others are even less complimentary of the NWFP's ecological outcomes. According to a web page by Oregon Wild:

> The Northwest Forest Plan was a compromise that did not go far enough to protect the region's remaining old-growth forests, sensitive wildlife species, or, arguably, a sustainable economy. The Plan allows logging and road building in ecologically critical areas, across

> all land use allocations. The Northwest Forest Plan did not fully protect mature and old-growth forests, roadless areas, municipal watersheds, and complex young forests that are recovering from fire. The Plan is also too dependent on under-funded, but necessary, restoration and monitoring efforts. And the Plan expects an unattainable amount of timber production from public land.

Although most of the forest plans in the Northern Rocky Mountains bioregion have been revised in recent years, or are undergoing revision, none improved protection of old growth as did the NWFP. The Flathead National Forest Amendment 21 to its original 1986 forest plan is the only significant forest plan amendment in this bioregion with a central focus on old growth, and it came in response to litigation. Conservationist groups Swan View Coalition and Friends of the Wild Swan submitted an alternative for consideration in the Amendment 21 Final Environmental Impact Statement (USDA Forest Service, 1998). That alternative proposed designating all existing old growth as management indicator species (MIS) habitat blocks and making them off-limits to commercial logging, and managing all younger forests as recruitment old growth with logging subject to strict requirements[13] until the amount of old-growth forest recovers to above the median of the historic range of variability. (*Id.*) It also proposed designating some old-growth recruitment as MIS blocks and providing robust linkage corridors between all MIS blocks based upon the biological needs of the MIS. (*Id.*) The Forest Service ignored the nuances and portrayed the conservationist's alternative as banning all logging, and unsurprisingly did not select it.

As discussed above in this report, more recent plans are written to allow managers wide discretion to authorize logging just about anywhere, including within old growth. Only in cases where other laws prohibit commercial exploitation, such as with the Wilderness Act, is old growth safe from logging on these national forests. Even Inventoried Roadless Areas, supposedly protected by the Roadless Area Conservation Rule and the Idaho Roadless Rule, are subject to heavy logging (Friends of the Clearwater, 2020a).

An avenue for installing into forest plans the notion of how old-growth ecosystems and landscapes actually work involves widening the interpretation of "desired conditions." Forest Plans revised in recent years include this component, which the 2012 regulations define as: "a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be described in terms that are specific enough to allow progress toward their achievement to be determined, but do not include completion dates."

The Forest Service's current interpretation of desired conditions result in management actions striving "toward"—at some vague future time—the attainment of forest conditions conforming to static descriptions, rather than integrating the dynamic nature of ecosystems into management as discussed above in the subsection, **Recovering old-growth landscapes**. For example, the revised Forest Plan for the Kootenai National Forest includes this Desired Condition for old growth:

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[13] "(O)n a very limited and experimental basis, and efforts to change the structure or composition of these forests would be paired with control plots and subject to a scientifically valid and peer-reviewed monitoring program of sufficiently long duration to assess the effectiveness of the treatments in moving the forest toward old growth forest MIS habitat." (USDA Forest Service, 1998).

> The amount of old growth increases at the forestwide scale. At the finer scale of the biophysical setting, old growth amounts increase for the Warm/Dry and Warm/Moist settings while staying close to the current level for the Subalpine setting. Relative to other tree species, there is a greater increase in old growth stands that contain substantial amounts (i.e., 30% or more of the total species composition) of one or more of the following tree species: ponderosa pine, western larch, western white pine, and whitebark pine. Old growth stands are more resistant and resilient to disturbances and stressors such as wildfires, droughts, insects and disease, and potential climate change effects. The size of old growth stands (or patches of multiple contiguous old growth stands) increase and they are well-distributed across the five Geographic Areas on the Forest.

How "old growth increases at the forestwide scale" is not explained. The statement merely describes a trend, with no target numbers specified nor any specific date of achievement. This is typical of current forest plans' interpretation of "desired conditions." However, an abundance of scientific opinion indicates that fully functioning natural processes should be the desired "conditions"—or better yet, **dynamics**. The key phrases are emphasized in the following cites.

McClelland (undated) critiques Forest Service management that "concentrates on the products of ecosystem processes rather than the processes themselves. It does not address the most critical issue—long-term perpetuation of diverse forest habitats, a mosaic pattern which includes stands of old-growth... **The processes that produce suitable habitat must be retained or reinstated by managers**."

Hessburg and Agee, 2003 also emphasize the primacy of natural processes for management purposes:

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

From Sallabanks et al., 2001:

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

Noss, 2001: "If the thoughtfully identified critical components and **processes of an ecosystem are sustained**, there is a high probability that the ecosystem as a whole is sustained."

Hutto, 1995: "Efforts to meet legal mandates to maintain biodiversity should, therefore, be directed toward **maintaining processes like fire**, which create the variety of vegetative cover types upon which the great variety of wildlife species depend.

Noss and Cooperrider (1994):

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

The Environmental Protection Agency (1999):

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

Forest Service researcher Everett (1994) states:

> To prevent loss of future options we need to simultaneously **reestablish ecosystem processes and disturbance effects that create and maintain desired sustainable ecosystems**, while conserving genetic, species, community, and landscape diversity and long-term site productivity.
>
> …We must address **restoration of ecosystem processes and disturbance effects** that create sustainable forests before we can speak to the restoration of stressed sites; otherwise, we will forever treat the symptom and not the problem.

<u>3. Legislation</u>

A legislative effort to preserve large landscapes in the northern U.S. Rocky Mountains is the Northern Rockies Ecosystem Protection Act (NREPA). NREPA has been introduced and re-introduced into Congress repeatedly since the early 1990s. Unfortunately Congress has yet to make a serious attempt to pass the bill. NREPA would designate the remaining roadless areas on federal lands in this bioregion as Wilderness. Importantly for old-growth landscapes, between the core roadless areas NREPA proposes to restore integrity of habitats for the purpose of providing connectivity, within twenty-eight "biological connecting corridors …essential for wildlife and plant migration and genetic interchange" totaling roughly 2,358,000 acres. Within these corridors:

> The practice of even-aged silvicultural management and timber harvesting is prohibited within the special corridor management areas. … ensure that road densities within the biological connecting corridor approach, as nearly as possible, zero miles of road per square mile of land area. Such road density shall not exceed 0.25 miles per square mile…

Furthermore NREPA designates nine “Wildland Restoration And Recovery Areas” covering approximately 1,023,000 acres:

> …managed so as to restore their native vegetative cover and reduce or eliminate invasive non-native species, facilitate native species diversity to the extent possible with climate change, stabilize slopes and soils to prevent or reduce further erosion, recontour slopes to their original contours, remove barriers to natural fish spawning runs, and generally restore such lands in their entirety to a natural roadless and wild condition.

With government agencies and elected officials firmly opposed to protecting old-growth landscapes, it falls upon citizens who appreciate old growth for non-timber values to take the lead. In the words of Margaret Mead, “Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it’s the only thing that ever has.”

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APPENDIX A

Wildlife species in U.S. Northern Rockies bioregion associated with old-growth habitat

I. Forest Plan old-growth associated wildlife species list, 1987 Kootenai National Forest

The species listed below find optimum habitat in the "old" successional stage. They may also utilize the "mature" stage if adequate sizes and numbers of snags/down logs, or large live trees are present.

B= breeding F=feeding

Species	Habitat Need	Species	Habitat Need
Dusky flycatcher	F	+ Common flicker	B,F
Hammond's flycatcher	B,F	Black-backed three-toed woodpecker	B,F
Olive-sided flycatcher	B	Northern three-toed woodpecker	B
Black-capped chickadee	B	Downy woodpecker	B,F
Boreal chickadee	B	Hairy woodpecker	B,F
Chestnut-backed chickadee	B	Lewis' woodpecker	B
Bald eagle	B	Williamson's sapsucker	B,F
Goshawk	B	Yellow-bellied sapsucker	B,F
Osprey	B	+ Varied thrush	B,F
Great blue heron	B	Hermit thrush	B,F
Rocky mountain wolf	B	Common raven	B
Marten	B,F	Kestrel	B
Northern flying squirrel	B	+ Clark's nutcracker	B,F
+ Red squirrel	B	Evening grosbeak	B
Hoary bat	B	Pygmy owl	B,F
Long-eared myotis	B	Saw whet owl	B,F
Little brown myotis	B	Screech owl	B
Silver-haired bat	B	Pygmy nuthatch	B,F
Pacific giant salamander	B	+ Red-breasted nuthatch	B,F
Van Dyke's salamander	B,F	White-breasted nuthatch	B,F
Pacific treefrog	B,F	Tree swallow	B
Spotted frog	B	Violet green swallow	B
Tailed frog	B	Vaux's swift	B,F
Common merganser	B	Golden-crowned kinglet	B
Hooded merganser	B	Winter wren	B,F
Wood duck	B		
Dipper	B		
Western bluebird	B		

In addition, the five species listed below are believed to have an especially strong preference or possibly a dependence on the old successional stage:

Barred owl
Great grey owl
* Pileated woodpecker
Boreal redback vole
* Brown creeper

* = old growth indicator species
\+ = indicators of other types of habitat (riparian tree, for example)

II. List of wildlife in the USFS Northern Region associated with old-growth habitats (Bollenbacher and Hahn, 2008)

Birds	
Northern goshawk	*Accipiter gentilis*
Great gray owl	*Strix nebulosa*
Flammulated owl	*Otus flammeolus*
Northern Pygmy owl	*Glaucidium gnoma*
Saw-whet owl	*Aegolius acadicus*
Boreal owl	*Aegolius funereus*
Barred owl	*Strix varia*
Vaux's swift	*Chaetura vauxi*
White-headed woodpecker	*Picoides albolarvatus*
Pileated woodpecker	*Dryocopus pileatus*
Three-toed woodpecker	*Picoides dorsalis*
Black-backed woodpecker	*Picoides arcticus*
Red-naped sapsucker	*Sphyrapicus nuchalis*
Williamson's sapsucker	*Sphyrapicus thyroideus*
White-breasted nuthatch	*Sitta carolinensis*
Red-breasted nuthatch	*Sitta canadensis*
Pygmy nuthatch	*Sitta pygmaea*
Brown creeper	*Certhia americana*
Hermit thrush	*Catharus guttatus*
Varied thrush	*Ixoreus naevius*
Townsend's warbler	*Dendroica townsendi*
Mammals	
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared bat	*Myotis evotis*
Long-legged myotis	*Myotis volans*
California myotis	*Myotis californicus*
Fisher	*Martes pennanti*[14]
Marten	*Martes americana*
Lynx	*Lynx canadensis*
Wolverine	*Gulo gulo*
Woodland caribou	*Rangifer tarandus*
Boreal red-backed vole	*Clethrionomys gapperi*
Northern flying squirrel	*Galucomys sabrinus*

[14] Based upon recent genetic studies scientists have placed the fisher in a monotypic genus, classifying it as *Pekani pennanti*.

APPENDIX B

Old-Growth definitions: Forest Plan or Regional?

The Regional definitions (Green et al., 1992 and Hamilton 1993) were not developed under the planning process governed by NFMA regulations. Appendix D of Green et al., 1992 explains that its creation was part of a wider 1990 Regional Action Plan—of which step 8 would invoke the forest planning process:

ACTION PLAN: **The Regional Old Growth Committee has revised the action plan (5/90) to accomplish the Chief a objectives and continue the old growth strategy for the Region.**

	ACTION	DATE	RESPONSIBILITY RO/Forest
1.	Initiate analysis to develop definitions Form zone OG Teams for Eastside forests, Western Montana forests, and northern idaho forests	1/90	Hann/Zone OG ID Teams
2.	Initiate public involvement	3/90	Forests
3.	Evaluate inventory procedures	3/90	Hann/Naumann/Deden
4.	Complete draft definitions & descriptions	7/90	Hann/Zone OG ID Teams
5.	Correlate definitions between zones	7/90	Hann/Zone Representatives
6.	Coordinate definitions with adjacent Regions	8/90	Naumann
7.	Initiate development of old growth management strategies (Deferred for SES analysis)	8/90	Subcommittee (Naumann will coordinate)
8.	Develop guidelines for integrating definitions, inventories, and management strategies into the Forest Plan process (Deferred for SES analysis)	9/90	Prather/Forest Planners
9.	Field work to fill data gaps for definitions	7-10/90	Forest Inventory
10.	Write a chapter on old growth for the Effects Analysis Handbook (Deferred for SES analysis	8-10/90	Subcommittee (Prather/Hann will coordinate)
11.	Analyze data for old growth definitions	10/90 - 4/91	Hann/Zone OG ID Teams
12.	Identify values for each old growth type (Deferred for SES analysis)	8/90 – 4/91	Subcommittee (Davis will coordinate)
13.	Correlate definitions between zones	5/91	Hann/Zone Reps
14.	Coordinate definitions with adjacent Regions	6/91	Naumann
15.	Complete summary report on old growth	9/30/91	Naumann-OG Committee Zone OG Committees

However, Action Plan step 8 ("Develop guidelines for integrating definitions, inventories, and management strategies into the Forest Plan process") was cryptically "Deferred for SES[15] analysis" as were steps 7, 10 and 12. Green et al., 1992 states, also cryptically, "These definitions will be used in the implementation of Forest Plans. Where there are conflicts with existing plan requirements, differences will be worked out on a case by case basis." That has played out as the utilization of Green et al., 1992 at the **project** analysis level, ranging from citing it as best available science to proposing "site-specific" forest plan amendments for substituting Green et al., 1992 in place of existing forest plan old-growth definitions.

[15] "SES" refers to a "current Regional effort of Sustaining Ecological Systems" (Green et al., 1992) of which that document was clearly a part of, since it is headed, "NORTHERN REGION USDA FOREST SERVICE APRIL 1992 R-1 SES 4/92."