

**Management Principles for Protecting and Restoring Old Growth Habitat  
Washington, Oregon, and Northwestern California  
National Forests and Bureau of Land Management Holdings**

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*Fire exclusion and other human activities led to significant deviations from historical variability in some, but not all, forests. Restoration treatments are warranted, sometimes urgently, only where such activities have resulted in major alterations in ecosystem structure, function, or composition.<sup>1</sup>*

One of the central drivers of federal forest management today are concerns regarding uncharacteristic<sup>2</sup> fires and what management prescriptions are appropriate to restore national forest ecosystems and ecosystem processes after decades of damaging management practices. Past and current management on public forests has in some—but not all—cases severely altered forest structure, biodiversity, and natural fire regimes and related ecosystem processes. Well meaning but misguided fire suppression, for instance has resulted in dense stands of forests where fires would normally have killed younger, shade-tolerant trees and fire-intolerant trees. Logging has transformed many western landscapes from naturally-diverse forests dominated by large, older trees that evolved with thick fire-resistant bark into relatively young simplified stands of smaller trees that are very susceptible to fire and has significantly impaired aquatic and riparian habitats. Excessive road building has increased the risk of fire ignitions . Livestock grazing in places has increased fire return intervals and intensity, while helping young trees get established and form flammable thickets. More recently climate change and drought are causing fire seasons to be longer and fires in some areas to burn hotter than historic conditions.

Older forests and the structure provided by large live trees, dead snags and downed logs are essential to many ecological functions that make forests healthy and provide habitat for numerous fish and wildlife species including rare species and others threatened with extinction. Many wildlife species also depend on large blocks of dense forests whose canopy layers are closed for shelter and nesting (e.g. northern spotted owl, Pacific fisher, American martin and deer). These older forests also provide invaluable ecosystem services including providing an abundance of clean drinking water, filtering the air we breathe, cycling nutrients which are essential for soil development and storing large amounts of carbon. Carbon storage in older forests is the greatest of any forests on earth and therefore these forests play a pivotal role in long-term carbon sequestration<sup>3</sup> and can help mitigate against climate change impacts. Importantly, these old forest habitat features help make forests resilient to natural disturbance.

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<sup>1</sup> Noss et al. (2006): 483

<sup>2</sup> The term “uncharacteristic” refers to fire events of a severity that is well outside the historic range of variability based on site-specific vegetation reconstructions of stand age structure and fire history or early historic records (adapted from Noss et al. (2006).

<sup>3</sup> Turner, D.P. et al. 2007. Scaling net ecosystem production and net biome production over a heterogeneous region in the western United States. *Biogeosciences* 4:597-612.

Unfortunately, most of the large fire-resistant trees across the landscape have been logged and today there is a severe deficit of both mature (late successional) and old growth forest habitat<sup>4</sup>. The amount of older forests varied historically due primarily to natural disturbances like fire. In the Pacific Northwest (the Northwest Forest Plan area), the historical extent of old growth was roughly two-thirds of the landscape<sup>5</sup>. Regrettably, less than 20% remains today<sup>6</sup>. In central Oregon, where large ponderosa pine forests once dominated the landscape, scientists have estimated that 6% or less remains on the Deschutes, Fremont and Winema National Forests<sup>7</sup>. The structural characteristics that make forests resilient to fire must not only be protected, they must be increased over time.

This document sets forth specific principles for the circumstances where management practices – mechanical thinning, prescribed fire and wildland fire use—are appropriate to increase old forest habitat and restore ecological integrity and resilience to forests and reduce unnatural fuel loads that can contribute to uncharacteristic wildfires. We focus on National Forests and Bureau of Land Management lands in Oregon, Washington (both the west and east side of the Cascades) and Northwestern California<sup>8</sup> and address treatments outside of the community wildfire protection zone.

### ***Overarching Goals for Protecting and Restoring Old Forest Habitat***

Over a century of resource extraction, fire suppression, and grazing have altered the natural processes by which forests regulate and renew themselves, especially through wildfire, which is the primary natural disturbance agent in western forests. It is impossible, and not ecologically desirable to manage fire out of forests that have evolved with fire, as natural starts will always occur. Therefore, the focus of managers should not be fighting fires but on restoring the fire resilience of forest stands that have deviated most from historic conditions. Goals for protecting and restoring these forests are to:

1. Move currently degraded forest stands and landscapes towards greater resiliency whereby natural processes such as fire and other disturbances are the primary drivers that maintain old forest structures that serve as wildlife habitat (e.g. large trees, snags, and downed logs).
2. Protect unroaded areas, mature/old/large trees/forest stands, and intact aquatic systems.
3. Let forest stands and landscapes grow back to their historic composition where generally large, fire-resistant trees and structurally diverse stands dominated.
4. Prioritize treatments to forest types that have been most altered by human intervention and where ecological values are at greatest risk to degradation. Use the methods that are the most effective and least damaging. Treatments should be tailored to the specific Plant Association Groups (PAG) based on landscape scale assessments.

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<sup>4</sup> USDA and USDI. (1994). IV-29. Late successional forest characteristics begin to appear in mature forests at around 80 years of age; old-growth forest characteristics begin to appear around 150 years of age.

<sup>5</sup> Strittholt, J. R. 2006. Status of mature and old-growth forests in the Pacific Northwest. *Conservation Biol.* 20:363-374.

<sup>6</sup> Strittholt et al. 2006 (Table 1:367) Percent reductions in old-growth forests for 8 ecoregions in the PNW range from (-33%) to (-95%) of historic conditions: Cascade Mountain Leeward Forests (-56%); North Cascades Forests (-33%); Puget Lowland Forests (-95%); Central Pacific Coastal Forests (-82%); Central and Southern Cascades Forests (-61%); Eastern Cascades Forests (-79%); Klamath-Siskiyou Forests (-62%); and Willamette Valley Forests (-91%).

<sup>7</sup> Noss et al. (2006): 484

<sup>8</sup> Six Rivers, Klamath, Shasta-Trinity, and Mendocino forests, and the western portion of the Modoc.

## ***Management Principles by Fire Regime***

Northwest forests include a wide range of diversity in terms of tree species, understory plants, and wildlife, all influenced by soil types, elevation, aspect, levels of precipitation and natural disturbances. For simplicity, forests can be viewed along a spectrum of dry to moist forests. Forest types can further be distinguished by their natural fire regimes. In general, dry forests tend to burn with low severity and moist forests tend to burn with high severity (sometimes called stand replacing fires). In general, low severity fires tend to burn somewhat frequently (every few years or so). Conversely, forests that naturally burn severely tend to do so more infrequently (every 100 years or more). Plant Association Groups – or PAGs – can provide a proxy for classifying the diversity of fire regimes.

Restoration needs of forests differ depending on the characteristic fire regime, associated PAG, and degree of ecosystem degradation from past and current management. Reintroduction of fire is the most effective method to restore ecosystem processes and resilience and maintain appropriate fuel levels. If it is determined that prescribed fire alone is not appropriate because fuel loads are unnaturally high, then thinning should be done as a pre-requisite to prescribed fire where soil health can be maintained. Prescribed fire should be used following thinning to burn highly flammable slash and brush that can actually increase fire risk and cause subsequent fires to burn uncharacteristically severe if left untreated.

### **Low Severity Fire Regime**

Forests with low severity/high frequency fire regimes are dry ponderosa pine and dry mixed-conifer forests. Low severity fires frequently run low on the ground and burn fine fuels on the forest floor. Logging, fire exclusion, tree planting and livestock grazing have had the most severe impacts altering historical fire regimes in these forests. In cases where such management has altered natural conditions, treatments may include variable spaced thinning (sometimes referred to as skips and gaps) to introduce more varied stand structure, thinning from below (focused on small diameter, fuel ladders and surface fuels) and prescribed fire. The following are some general guidelines for managing forests subject to this fire regime.

- Focus fuel treatments on dry PAGs and avoid moist PAGs.
- Provide enforceable standards that protect all of the old and large trees on site (generally >20" dbh or more than 80 years of age), and large snags, down wood and other aspects of mature and old-growth forest structure, function, and composition, and all components needed to expeditiously restore them. Projects must be based on best available scientific data for local conditions and demonstrate that restoration treatments benefit species associated with old forest habitat.
- Focus management activity on small diameter (generally < 12" dbh) conifer surface and ladder fuels and address their landscape continuity in order to lower the potential for uncharacteristic fire.
- Priority shall be given to projects that reduce small fuels around large, old trees in dry PAGs that are likely to experience uncharacteristic stand replacing fires.
- Restore stand-maintenance fire regimes appropriate to each PAG.
- Ensure large blocks of dense forest remain throughout the landscape to maintain structural diversity and important wildlife habitat.

### **Mixed Severity Fire Regimes**

There is no scientific consensus on how to treat mixed severity fire regimes. Even the definition of mixed severity is under debate. Fire is highly variable in size, frequency and severity in many mid-elevation and some low-elevation forests in the interior west and some regions such as the Klamath-Siskiyou. Steep and varied terrain in western mountain landscapes may be especially prone to mixed severity fire because drier south facing slopes with lower fuel loads can burn at low severity whereas adjacent, moister north-facing slopes that support higher tree densities experience high-severity fire. The natural disparity in density between north and south facing slopes should be maintained. In these forest types, focus on the dry PAGs using the principles for low severity fire regimes. Because of relative uncertainty with mixed severity fire regimes, a more cautious approach is recommended.

### **High-Severity Fire Regimes**

Forests characterized by high-severity fires that kill overstory trees include two types: 1) high elevation and subalpine forests including spruce, true fir, and lodgepole pine; and 2) Douglas-fir/western hemlock and other moist marine-influenced forests.

Forests subject to high severity fires typically support high densities of trees and large fuel loads. In these forests, high severity fires are relatively infrequent – occurring at intervals of one to many centuries, and are predominantly influenced by climate – so fire suppression has had little to no effect on fuels or forest structures. Since fuel structures and tree densities are usually well within the historic range, fuel reduction treatments are ecologically inappropriate for these forest types.

However, clearcut logging has simplified forest structure, turning naturally diverse forests into dense young plantations. For these forests, restoration treatments through variable density thinning can be used to increase structural and species diversity. The following are general guidelines for managing forests subject to this fire regime:

- Fuel reduction treatments are ecologically inappropriate for forest types characterized by high-severity fires.
- Priority shall be given to projects in young managed stands and/or plantations that involve variable density thinning to restore structural and species diversity.
- Protect mature and old growth forest stands (over 80 years of age) including live, dead, and downed trees of any species over 80 years old.

### **Management Principles Specific to Northwest Forest Plan Lands**

- Protect and restore designated Late Successional and Riparian Reserves and manage according to reserve standards and guidelines described in the Northwest Forest Plan, and in a manner that precludes post-fire logging after disturbance events.

### ***Restoration Principles***

When they are necessary, management activities should focus on retaining and restoring diverse and resilient forest and aquatic habitats that accommodate natural disturbances and support native fish and wildlife populations.

1. Where the agency can show, based on best available science, that ecological integrity has been significantly compromised, improve forest resilience and resistance to disturbance from fire and climate change.
2. Protect and restore viable populations of fish and wildlife and their habitats, with particular emphasis on species of conservation concern or special status.
3. Collaboratively prioritize areas through comprehensive and scientifically rigorous multi-scale assessments where treatments (including thinning, prescribed and managed natural fire) will produce the greatest ecological benefits. The assessment should identify which particular areas need treatment and which treatment methods are most effective and least damaging. Develop site-appropriate plans based upon best available science, using collaborative processes.
4. Align management activity with root causes of ecosystem degradation. For example, road abatement and road restoration to reduce road density and road impacts (e.g. erosion, sedimentation, barriers to fish passage); restoring mature and older trees on a substantial portion of the landscape; fuel reduction and prescribed fire to address fire exclusion; and livestock removal for invasive weeds and riparian and/or watershed restoration.
5. Protect and restore aquatic and riparian habitat and hydrological function.
  - a. Management activity in riparian and wetland areas must be in accordance with standards, guidelines and objectives of the Northwest Forest Plan's Aquatic Conservation Strategy (ACS) and PACFISH<sup>9</sup> and INFISH<sup>10</sup>, or their functional equivalent.
  - b. No mechanical treatments on steep or landslide-prone slopes.
  - c. No mechanical treatment on skeletal and highly erosive soils or soils where natural forest regeneration is limited.
6. No new road construction,<sup>11</sup> reduce overall road density and on needed roads improve to drainage standards to minimize their effects on water quality, flow and wildlife.
7. Do not impair the diversity and structural complexity of young naturally regenerated stands of trees that were subject to a natural disturbance event and have not been subsequently logged.
8. Protect and avoid impacts to soils and hydrological function especially compactable, sensitive and other vulnerable soils.
9. Maintain roadless areas that are 1,000 acres and larger and other ecologically significant unroaded areas. Strive to reconnect large roaded or relatively unroaded habitat blocks by strategically decommissioning and/or closing roads.
10. Eliminate the introduction of and reduce the spread of invasive, non-native species and their vectors using ecologically appropriate methods.
11. Employ long-term stewardship contracts and other mechanisms that help ensure that the primary driver for projects is ecological restoration and they also generate revenue for restoration.
12. Develop and fund research and monitoring activities that test management assumptions, evaluate treatment effectiveness, assess compliance, assess species responses and allow for adaptive management practices that are responsive to new information or changed conditions.

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<sup>9</sup> United States Department of Agriculture, Forest Service and United States Department of Interior, Bureau of Land Management. 1995. Decision Notice/Decision Record, Finding of No Significant Impact, Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California.

<sup>10</sup> United States Department of Agriculture, Forest Service. 1995. Decision Notice and Finding of No Significant Impact for the Inland Native Fish Strategy: Interim Strategies for Managing Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana and Portions of Nevada.

<sup>11</sup> Exceptions can be made when a new road segment is necessary to replace a larger network of more harmful roads.

13. Facilitate acquisition of and provide tax credits for, state-of-the-art harvesting, hauling and milling equipment for small logs.

### ***Thinning Do No Harm***

It is critically important that both the risks of inaction and action be taken into account when undertaking restoration to reduce the risk of uncharacteristic wildfire through management.

Effectiveness across the landscape should be the design objective, but not every acre needs to be treated, and representative habitats/ecosystems should be maintained in order to monitor baseline conditions and protect important habitat types. Adaptive management, which reflects the addition of new knowledge gained over time, must be a critical component of any landscape scale thinning strategy.

Tradeoffs should not be made that reduce the risk of uncharacteristic fire but cause harm to other important long-term aspects of the forest that are vital to its health, most especially soils. Soils are the foundation of healthy productive forests now and in the future.

Specifically, thinning must not increase fire hazard by either leaving flammable logging slash and branches on the ground or by opening up stands so widely that the ground is exposed to drying sunlight, rapid growth of plants that act as ladder fuels for fire and increased winds resulting in increased fire severity. In order to reduce the risk of opening forest canopies too much, thinning needs to concentrate on smaller diameter material such as ladder fuels and surface fuels. Additionally, many wildlife species require large blocks of dense habitat for nesting, hiding and reproducing.

Importantly, there are limitations regarding the efficacy of thinning in altering fire behavior: (1) in situations where fire behavior is determined more by local weather such as high winds, hot temperatures and climate conditions rather than fuels, which may be increasingly the case with climate change; and (2) in situations where fire behavior is governed more by steep terrain and access is limited.