Legacy Retention in Production Emphasis Areas: what might be needed and why?

Background

One of the desired goals of a revised forest management plan is to improve conservation outcomes. A potential tool for quantifying conservation outcomes is to compare Land Allocation model outputs to outputs from previous models. However, there are sufficient differences in policy choices, modeling methodology, model data, and model outputs that limit the utility of such comparisons. Lacking suitable model outcomes, the division has compared the quantity, distribution, and function of retained green trees, snags, and downed wood under an FPA approach versus an FMP approach.

Individual standing green trees, snags and downed wood are important elements of forest ecosystems. They provide habitat for wildlife, serve as nursery sites for germination and subsequent growth of plants and provide important nutrient stores. Retention of these elements and long-term decadence management entail active management for persistence and recruitment of large live trees, standing dead trees (“snags”), and downed wood through time. Approaches vary by landowner and land management objectives, and can have very different outcomes for wildlife habitat over the long-term. Here we examine the implications of different strategies for retaining these legacy features in production areas for wildlife habitat and landscape function across State Forests.

Habitat Components Targeted in Legacy Retention

Remnant old-growth trees - When remnant trees survive a disturbance, or are retained after regeneration harvest, they have major effects on the forest stand that grows on that site. These large, live trees can persist and grow through subsequent stand rotations; providing nesting, roosting, foraging, and denning habitat for diverse species (e.g. raptors, bats, red tree voles) as well as other important ecosystem services through time (e.g. local seed stock, substrate for beneficial soil ectomycorrhizal fungi). Remnant, legacy trees are critical for recruitment of large snags and downed wood in the developing stand and subsequent rotations.

Residual green trees – One approach to provide for long-term persistence of large remnant trees, and thus large snags and downed wood, is to retain adequate residual green trees from current cohorts in regeneration harvests to ensure recruitment of large trees into future stands. In developing stands, patches of green trees of various sizes, ages, and species promote species diversity and act as refugia and centers of dispersal for many organisms including plants, fungi, lichens, small vertebrates, and arthropods. In addition to providing nest and den sites, perches, and foraging substrate for animals in young plantations, residual green trees in regeneration harvests will develop into large trees over time (if retained in subsequent rotations), and help maintain snag and downed wood abundance and diversity when they die.

Snags — Snags provide nesting, roosting, foraging, and denning habitat for many diverse species in the forests of northwest Oregon, including woodpeckers, raptors, bats, arboreal rodents, and mid-level carnivores such as weasels and bobcats. The abundance and diversity of cavity-using species in a forest stand are heavily dependent on the abundance of suitably-sized snags within the stand. Many species prefer specific tree species, sizes or decay classes. Preference for large diameter snags has been documented for several species of cavity-nesting birds, and most prefer snags that are 15 inches and greater. Many bird and mammal species that utilize snags defend territories and exclude all other individuals. Thus, the distribution of appropriate snags is also important for wildlife abundance and diversity. Snags also serve as a recruitment source of future downed wood.

Downed wood - Downed wood on the forest floor provides many important functions in forested ecosystems including mineral cycling, nutrient mobilization, carbon storage, maintenance of site productivity, natural forest regeneration (nurse logs), substrates for mycorrhizal formation, and provision of diverse habitats for wildlife species. Wildlife use downed wood for a variety of habitat needs including thermal and hiding cover, dispersal pathways, denning, feeding, food storage, reproduction (nesting), and resting. Terrestrial amphibians (e.g. Oregon slender salamander, clouded salamander) and forest-floor small mammals (e.g. shrews, mice, voles, weasels) are heavily reliant on downed wood for many aspects of their life histories, and abundant, large downed wood is a key habitat feature for many species in west-side forests. The species, sizes, and decay classes can affect the functionality of this habitat component and its contribution to habitat quality. Species and size affect decomposition rate and thus longevity of downed wood on the site.

Legacy Retention Strategies – Current Forest Management Plan vs. FPA Requirements

Remnant old-growth and residual green trees

Remnant, legacy trees are living trees that are carried forward into a new stand following disturbance, with the intent that they will remain. Residual live trees help to meet the short-term habitat needs of species, provide legacy trees in future stands, and serve as a source of future snags and downed wood.

Current Plan Strategies: Existing old-growth in the planning area occurs as widely scattered individual trees, and occasionally as small isolated patches. Because the occurrence is limited, the Division currently retains all existing old-growth (as defined in the FMP) to provide this element of diversity in present and future stands.

To ensure recruitment of large trees over time, smaller diameter trees retained from current cohorts at harvest serve as recruits for future large remnant trees in subsequent rotations. Current State Forest policies call for retention of 5 green trees per acre in regeneration harvest units. Under the current plan, leave tree requirements may be higher (number, size, species retained, etc.) in areas that are intended to develop complex stand structure, or where snags and downed wood are deficient and could be augmented over time.

Proposed Land Allocation with an FPA-type Strategy: Under an FPA approach, mature and old growth trees would likely be removed from production-emphasis areas in the next rotation of each harvest unit, and over time across the landscape, to optimize volume of products with higher market demand in future rotations, minimize safety risks during operations, and reduce future risk of constraints from threatened and endangered wildlife species.

If leave tree regulations are triggered, ORS 527.676 requires retention of two green trees or snags per acre harvested. Green trees and snags must be at least 30.0 feet tall and at least 11.0 inches diameter at breast height (dbh). There is no requirement that the same trees be retained through subsequent harvests.

Given these minimum requirements, it is unlikely that large, remnant trees would persist in production-emphasis areas, or that new legacy trees would be recruited over time. This can be inferred from Figure 1, which shows the cumulative harvest of acres with large trees (defined as ≥ 18” dbh) under the current Land Allocation harvest model. Within each 5-year time period, acres are subdivided based on minimum thresholds of at least two trees ≥ 18” dbh, 24” dbh, and 32” dbh. The acres harvested within each category in each 5-year period are added to the harvested acres from previous periods.

Over the first 100 years of the plan, cumulative harvest occurs as follows:

- 25 years: approximately 53,000 acres with at least two trees ≥ 32” dbh, 31,000 acres with at least two trees ≥ 24” dbh, and 14,000 acres with at least two trees ≥ 18” dbh have been harvested.
- 50 years: 150,000 acres with at least two trees ≥ 32” dbh, 62,000 with at least two trees ≥ 24” dbh, and 18,000 acres with at least two trees ≥ 18” dbh have been harvested.
- 75 years: most acres with minimum thresholds of two trees ≥ 18” and 24” dbh; by 100 years most acres with minimum thresholds of two trees ≥ 32” dbh have also been harvested.
- 100 years: the chart plateaus after 100 years, indicating that the model has essentially regen harvested every acre available by then.

Subsequent harvested acres with large trees will have likely grown forward from harvest in early periods. Thus, by 100 years the production-emphasis areas have been largely converted to relatively short-rotation plantations.

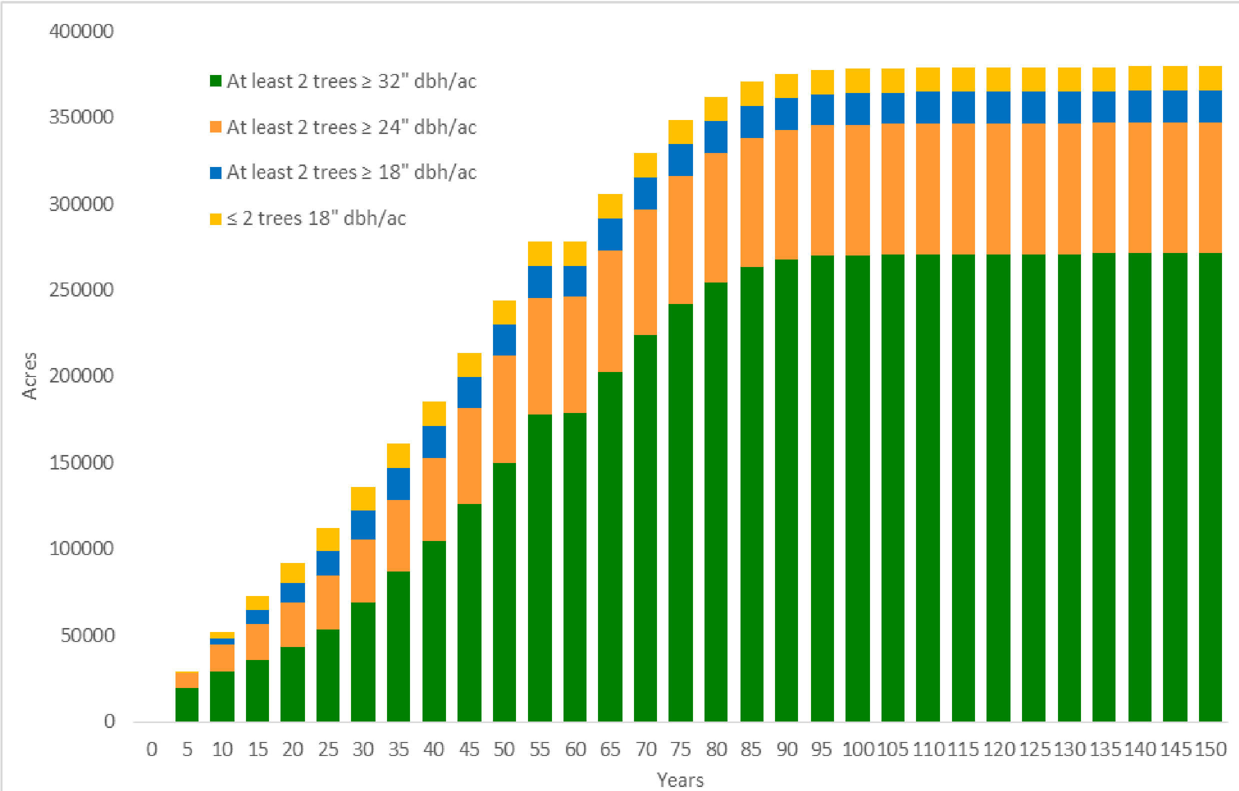

Figure 1. Cumulative harvest of acres with large trees (defined as at least two trees ≥ 18” dbh per acre) under the current Land Allocation harvest model with FPA retention strategies for large trees, snags, and downed wood. In this figure, acres harvested in each 5-year time period are added to the acres harvested in previous time periods.

Snags

Snags can be provided through a combination of existing snag retention, natural mortality in maturing stands, and artificial creation.

<u>Current Plan Strategies</u>: The snag management guidelines presented in the forest management plan are designed to provide nesting, roosting, foraging, and denning habitat for the various species of wildlife that use snags in the forests of northwest Oregon. The Division’s current strategy is to retain all existing snags (that aren’t safety hazards) wherever possible and to provide at least 2 hard snags per acre ≥ 15” dbh across the landscape. In stands designated for older forest structure, the strategy is to manage for 6 snags per acre with at least 2 snags that ≥ 24“ dbh per acre.

Snags are often recruited from the existing stand to supplement those components carried over from the previous stand. Created snags can be used to augment current conditions in deficient areas, but have somewhat limited potential given shorter persistence times relative to large legacy snags. Some snags are created by mechanical damage during harvest or through competition, disease, and disturbance events during subsequent stand development, but represent a limited contribution overall and through time.

Proposed Land Allocation with an FPA Strategy: Under an FPA approach, existing snags would likely be removed from production-emphasis areas during the next rotation and across the landscape over time to reduce operational safety hazards, maximize growing space, and optimize production. If leave tree and downed log regulations are triggered, ORS 527.676 requires retention of two snags or green trees per acre harvested. Snags or green trees must be at least 30.0 feet tall and at least 11.0 inches dbh. A combination of snags and green trees is encouraged but there are no specific requirements for proportions or spatial arrangement or that the legacy snags be retained at harvest where feasible.

Figure 1 demonstrates cumulative harvest of large trees in production-emphasis areas over time, lacking strategies for retention and recruitment. If there are no requirements for legacy retention (beyond minimum FPA requirements), and residual green trees and created snags are removed in each subsequent rotation, snag abundance and diversity will also decline over time in production-emphasis areas.

Downed wood

Downed wood is an integral component of the structure of old forest stands and provides a biological legacy from old stands to young stands after catastrophic events. This legacy can also be provided in managed stands if appropriate requirements are incorporated into timber harvest plans.

Current Plan Strategies: The Department of Forestry's approach is to manage for downed wood at levels approaching known historical levels. Since it may take many years or even decades to develop downed wood that is very decayed, the department's strategy is to protect existing downed logs wherever possible and to supplement existing downed wood by providing additional logs during harvest entries. In regeneration harvest units, an average of at least 600 to 900 cubic feet of hard downed logs per acre are provided. In stands designated for older forest structure, the strategy is to manage for 3,000 to 4,500 cubic feet per acre of downed wood in all decay classes.

Proposed Land Allocation with an FPA Strategy:

Due to increased harvest and related reforestation needs existing downed wood may be damaged or degraded. Additionally, hard logs that are not required to meet FPA minimums may be removed to utilize the material, to clear sites for planting, and to reduce wildfire risk. If downed log regulations are triggered, ORS 527.676 requires retention of two downed logs per acre harvested. Each downed log must be at least 6.0 feet long and contain a total volume of at least 10.0 cubic feet of volume. This represents just over 3% of the current State Forest contribution.

Under this strategy, abundance and diversity of downed wood, particularly large downed wood, would decline over time as removal of existing large trees, snags and downed wood would affect persistence and recruitment. Downed wood in managed stands tends to be of smaller average diameter than found in natural stands, and periodic thinning in managed stands may also reduce the abundance of down wood, since the self-thinning processes are reduced.

Conclusions and Management Implications

Under a Land Allocation model with an FPA approach large trees and existing snags would likely be removed to avoid future T&E constraints and to maximize growing space and optimize production. Some snags (≤ 2 per acre) may be retained until the next rotation under FPA regulations. Some leave trees (≤ 2 per acre) will die and become short-lived snags, but are likely to be removed at subsequent harvest, or fall and contribute to downed wood until harvest. Over time, abundance and diversity of large trees, snags, and downed wood would likely decline at both stand and landscape levels.

With a reduction in upland habitat components, there may be an assumption that riparian areas can provide similar habitat in both amount and function. Habitat provided by riparian areas is limited to the species that utilize those areas, and the individuals that are able to maintain territories therein. Species that are largely reliant on upland habitat features and subdominant individuals may be excluded or persist at reduced fitness that impairs productivity and thus population health. The effective result would be a reduction in both habitat and local population distribution and abundance, and may in turn lead to increased reliance by many species on larger conservation-emphasis areas. Given the habitat needs and territorial nature of many species, this “species packing” effect could lead to management conflicts where different resident species have habitat needs that are at odds (e.g. some early and late seral species). It also reduces population and community resilience via increased risk from catastrophic disturbance.

Such an approach could also vastly reduce the dispersal capacity of landscape. For example, if dispersal is limited for spotted owls by lack of habitat (prey base, cover, perch and roost sites) and interactions with barred owls (e.g. in riparian areas), individuals are unlikely to be successful in conservation-emphasis areas as less habitat in production-emphasis areas would cause more pressure in conservation areas, which are already occupied by both owl species. Given their recent propensity for movement across our landscape (largely a result of barred owl interactions), it is uncertain where owls will disperse to or how our owls would persist over time. They would also be more vulnerable to local disturbance.

In such a landscape, we could expect local declines of many species of birds (e.g. olive-sided flycatcher, purple martin, northern spotted owl, woodpecker spp., raptor spp.), mammals (e.g. bats, flying squirrels, red tree voles, weasels), and terrestrial amphibians (e.g. Oregon slender salamander, clouded salamander). Residents and migrants are unlikely to move into conservation areas because they are either likely to be either occupied or non-habitat, and they are unlikely to be able to so without broad landscape connectivity and permeability provided by functional upland habitats. We could also expect related effects on soil food webs, rates of herbivory, site productivity and other ecosystem processes.

If diversity, abundance, and resilience of wildlife populations decline, there would likely be increased risk of species listings and up-listings under the state and federal ESAs. There may also be concern as to whether such an approach meets GPV (“protects, maintains, and enhances native wildlife habitats”).

For the purposes of this plan, ODF has proposed the following definition adapted from elements of OAR 629-035-0020, Greatest Permanent Value:

> *“Conservation is the maintenance, protection, or restoration of aquatic, riparian, and upland habitats that influence biological and ecological functions through time and across the landscape.”*

This definition allows the development of strategies that will be applied in both the conservation- and production-emphasis areas to meet conservation objectives. It recognizes the need for strategies that protect and maintain natural resources within a managed forest landscape. It recognizes that much of state forests are young forests that may need habitat restoration or enhancement to provide for native wildlife.

Legacy retention and related management strategies that incorporate important habitat elements across and through time are more likely to ensure state forest lands' capacity to meet GPV, and the habitat needs of native wildlife, than strategies that largely exclude them. A continual process of active management for retention of both large, remnant and younger green trees ensures continued recruitment and persistence of large trees, snags and downed wood through time, and can be augmented where needed by additional snag and downed wood creation. These strategies protect and maintain requisite habitat features for native wildlife in production-emphasis areas and can enhance landscape connectivity and permeability for animals dispersing between conservation areas.