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**A Guide to Creating Diverse Early Successional Ecosystems through Variable Retention Regeneration Harvest on the Coos Bay District of the BLM**

Jerry Franklin

Norm Johnson

**Background**

Moist Forests, such as occur on the Coos Bay District, are characterized by disturbances that typically include a significant stand-replacement component at intervals of one to several hundred years; subsequently forests require centuries to redevelop the characteristic massiveness and structural complexity of old-growth forests. Key elements of a Moist Forest restoration strategy include:

- *Reserving existing older forest stands not already incorporated into reserves*, as well as individual older trees found within younger stands proposed for management, using a threshold age;

- *Accelerating development of complexity in existing young forest stands*, using a variety of silvicultural approaches, including variable density thinning in plantations;

- *Implementing regeneration harvests in younger forests located within Matrix (areas allocated to sustained timber production as one of their objectives), applying a variable retention harvest system*. Significant structural and compositional elements (e.g., individual trees, snags, and logs and small intact forest patches) would be retained to sustain biota and enrich the post-harvest stand;

- *Encouraging development of early successional ecosystems immediately following harvest*, in part by using less aggressive approaches to site preparation and tree regeneration. Early successional ecosystems are pre-forest ecosystems that occupy forested sites between a stand-replacement disturbance and re-establishment of a closed forest canopy. These ecosystems are typically rich in biodiversity, provide conditions for many species that are habitat specialists, and have unique functional roles. Well-
developed examples of such ecosystems are currently rare in Moist Forest landscapes because of intensive approaches to establishing new forests, such as dense tree planting and efforts to control competing vegetation (Swanson et al. 2011); and

- Incorporating all of the above into a comprehensive silvicultural system that also includes longer rotations (e.g., 100-160 years) and multi-aged and mixed-species stands, thereby increasing both the diversity and resiliency of managed federal forest lands and increasing future social options.

**Variable Retention Harvesting**

This document provides a guide to the concept and application of variable retention regeneration harvesting (VRH) for Moist Forests. It also includes a description of a silvicultural system that uses the principles of ecological forestry and that emphasizes creation of diverse early successional ecosystems as a stage in forest development.

General goals in applying VRH include:

- Providing for continuity of forest structure, function, and biotic composition between forest generations;
- Regenerating a new cohort of trees;
- Life-boatng plant and animal species by providing critical habitat, food sources, and micro-environmental conditions;
- Structurally enriching the post-harvest ecosystems, including the early successional (pre-forest-closure);
- Providing conditions for expression of the early successional (pre-forest) ecosystem; and
- Altering visual conditions from within and outside of the harvest unit.

VRH involves the retention of structures, organisms, and conditions from a pre-harvest forest stand for incorporation into the post-harvest ecosystem and, ultimately, forest stand. These can include individual structures, such as old trees and snags, small (e.g., 1/4 to 4+ acre) intact areas of the pre-harvest stand, or patches of ecologically important conditions found in the pre-harvest stand (e.g., seeps and rock outcrops).

VRH is intended to be a part of a comprehensive silvicultural system. Elements of that silvicultural system can include provisions to allow significant expression of the early successional (pre-forest) stage, regeneration of a new tree cohort, development and intermediate management of mixed-age stands, and long rotations (e.g., >120 years). Goals of this silvicultural system include creation of more resilient and diverse ecosystems and landscapes,
maintenance of well-regulated high-quality hydrologic systems, sustained availability of culturally important resources, and a continuous flow of diverse forest products.

**Initial Application on the Coos Bay District**

The general prescription proposed in the Coos Bay Pilot Project is retention of 20 to 30% of the pre-harvest forest. The majority of the retention will be in the form of small (e.g., ½- to 3-acre) intact patches (“aggregates”) that are not entered during the harvesting operation. Additional retention will occur as individual trees and snags and small clusters of trees. Retention of some of the individual trees will be to provide candidates for snag creation either using fire (broadcast slash burning) or mechanical means.

Riparian buffers that extend into harvest units can often be counted as contributing to some portion of the retention target. Limitations on credit for riparian buffers are necessary, though, because such buffers typically are spatially concentrated in portions of harvest units, rather than well distributed throughout the unit. To achieve the stated goals for retention, retained structures need to be reasonably well distributed through the harvest unit; conversely, creation of large areas lacking in retention should be avoided (see below).

**Selection of the Aggregates for Retention**

Several types of areas will be candidates for location of retained pre-harvest patches or aggregates. These include:

- Representative patches of the pre-harvest forest stand (required);
- Locations of old-growth trees (required);
- Concentrations of large woody debris
- Locations of large snags selected for retention;
- Special habitats within the harvest unit, such as seeps, rocky outcrops, and other areas of high species diversity;
- Patches dominated by hardwoods (if not adequately covered above); and
- Facilitation of Northern Spotted Owl foraging.

**Distribution of the Aggregates**

The goal in locating aggregates is to have them well distributed throughout the harvest unit. Logging methods will constrain potential locations, particularly on areas logged by cable systems. *The intent is to avoid creating large open areas lacking retention but, also, provide conditions suitable for development of early successional ecosystems and regeneration of shade-intolerant species.* Obviously, for a given level of retention (e.g., 30%) there will be tradeoffs between aggregate size and distributional objectives. E.g., focusing on distribution may require creating more small aggregates rather than a few large aggregates. On the other hand, some objectives, such as facilitation of Northern Spotted Owl foraging, may require larger aggregates.
Foresters in British Columbia mandated a distributional requirement in applying VRH. In the Clayoquot Sound area of Vancouver Island, all portions of a harvest unit had to be within 2 tree heights of an aggregate or the edge of unit. The BC legislature in their legal definition of VRH require that 50% of the harvest area be within 1 tree height of an aggregate or edge (riparian buffers count in meeting this requirement).

**Selection of Individual Structures for Retention**

Some distributed tree structures are typically desirable, generally in the form of individual trees or small clusters of trees. These should be dominant or co-dominant trees of species more capable of tolerating an open condition (e.g., Douglas-fir). Some old-growth trees might also be retained in this way rather than as part of aggregates. Some of these trees are expected to provide a source of distributed snags within the harvest unit. Logging considerations will largely dictate available locations for these structures.

**Post-Harvest Reforestation Strategy for VRH Units**

Goals in subsequent treatment of the harvested sites will be to provide for significant development or expression of the early successional ecosystem that dominates between a stand-replacement disturbance and re-establishment of a closed forest canopy. Tree planting will be conducted at low levels (e.g., 200 +/- trees/acre to assure basic levels of restocking; natural regeneration will be expected to significantly augment the planting over time. Aggressive artificial regeneration and other treatments to hasten re-establishment of a forest canopy will not be undertaken, so as to allow for development of the early successional ecosystem.

Slash treatment can be accomplished either mechanically or by fire, but aggregates should be protected during such treatments.

**References**


