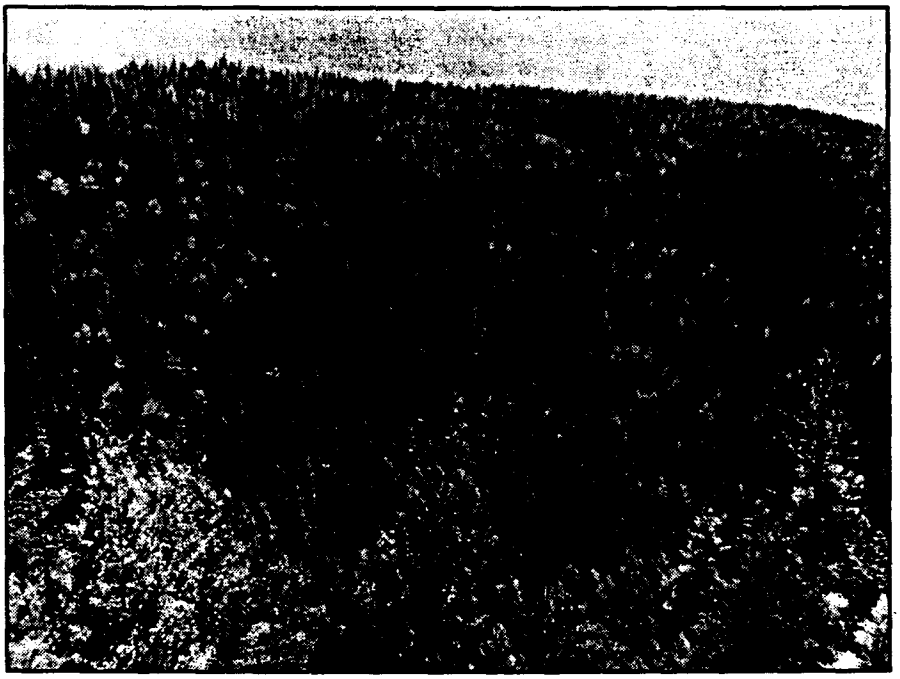
1990

THE GREAT THINNING DEBATE

Ecological Benefits of Thinning Young Managed Stands



Young forests have been a part of forested landscapes in the Pacific Northwest for centuries because fire and other disturbances have initiated succession at various times and at various scales. Three things have brought about interest in management of young managed forests today:

- Land area covered by complex old-forest ecosystems has been reduced, while young managed stands now form a significant portion of many landscapes. The bulk of this transformation has occurred in the last 50 years, and is currently highlighted by concerns for viability of species associated with old forest characteristics.
- Existing managed stands are not "equivalent" to similar-aged unmanaged stands, and the former and existing trajectory intended for many of these stands would neither contribute to nor perpetuate old-forest characteristics on landscapes.
- Management of ecosystems is considered by some managers and scientists to be a better long-term approach to public land management than strict designation of set-aside and intense wood production land.

A Brief History of Managed Stands on the Willamette National Forest

Approximately 350,000 acres of mature and old-growth forest have been harvested in the last 50 years on the Willamette National Forest. Figure 1 displays the acre distribution for stands up to 50 years old on land suitable for timber production in 1989. On the majority of these acres, Douglas-fir dominates the regeneration. These young stands will be a significant part of the landscape for decades to come.

Management practices have changed over the past five decades and have contributed to visible variations in structure and composition of present-day young managed stands. From the 1940's through the 1960's, stands were chosen for harvest based on accessibility, size of trees, and the perceived degree of decadence. The intention was to convert these forests into faster-growing timber lands. These old forests had a considerable amount of wood not economically viable at the time. That wood was left on site.

Slash burning typically took place in the fall. Fires were hot and often burned most slash and duff off the units, except for larger wet logs or more moist sites. In the earliest times, reforestation was more dependent upon timing and success of natural regeneration. Replanting efforts were often delayed with the intention of supplementing natural regeneration. Pre-commercial thinning west of the Cascades began during the 1960's, but not all stands were thinned due to limited funding.

By Matthew Hunter

Some structural and compositional aspects present in young unmanaged stands make some habitable by some "older forest" animal species.

In the 1970's several things began to change. Concern developed over smoke released into the air from slash burning and about soil scorching caused by hot fires. In response to these concerns, burning periods became shorter and were changed to occur primarily in the spring. During spring, the woody material usually contains more moisture than in the fall and it burns cooler.

Utilization standards for material on the site also became more strict. Logging operations were required to take out smaller logs than previously required. Operators were required to remove unusable material from the unit and place it in piles. This lessened the need for hot fires, reduced the time needed for burning, and reduced the likelihood of restarts from large logs.

Moreover, the wood market had changed. Much viously worhtless material became economically viable to ve. After the enactment of the National Forest Management Act in 1976, adequate, timely stocking of harvest units became a high priority. Since the late 1970's, most stands needing stocking level controls have been pre-commercially thinned.

Currently, woody material is left on site, both down and standing, for reasons of structural diversity, animal habitat needs, and long-term site productivity. Quick and thorough stocking of conifer seedlings, and pre-commercial thinning is routine.

These differences in silvicultural practices over time (and variations in stand treatments during similar time periods) have contributed to visible variations in structure and composition of present-day young managed stands. Site-specific characteristics, such as soil type, weather factors, and presence of root rots, have also contributed to the character of existing stands. Stands differ in amounts of large woody material, snags, variation in tree size, species, and spacing.

Examples of completely unmanaged young forests less than 50 years of age are scarce. Most areas burned within the last 50 years have been salvaged. Natural regeneration in fire areas was often supplemented by manual planting. Even naturally regenerated areas were often pre-commercially thinned. Unmanaged forests 50–100 years old are probably more numerous; however, origins and extent of early management are not as easily determined for these stands.

What We Think We Know

Both young unmanaged and managed forests show variation in structure and composition. A comprehensive and precise comparison of vegetative attributes between unmanaged and managed stands has not been made, probably because many of the existing data are not comparable. However, the following description from a paper by Jerry Franklin and Tom Spies is a good summary of what we know:

> *Many natural young and mature stands have some of the attributes of old-growth stands that may not be present in young, managed stands. Perhaps the greatest difference between natural and managed stands is the lower number and volume of large snags and logs in managed plantations. Many young natural forests less than 80 years old have high amounts of carry-over of woody debris, although some young natural stands have little carry-over. Other structural differences between young and mature natural forests and their managed equivalents are less well known. Managed plantations, however, generally will have fewer trees species, more uniform tree sizes and spacing, and no large remnant overstory trees.*

Studies and observations to date suggest that certain structural and compositional aspects present in some young stands make them habitable by some "older forest" animal species. These features include remnant large trees; dead wood in the form of snags and logs; vertical and horizontal variation in tree canopies; and presence of broadleaf trees and shrubs. Most managed stands contain very few of these features. Current studies are investigating plant and animal presence in young managed stands and their response to a wide variety of structural manipulations.

Most studies in young stands have gathered data only on species presence and abundance, not on population dynamics or reproductive success. The difficulty of gathering demographic and genetic data makes it difficult to know the fitness of individuals using these stands, but this difficulty is applicable to any forest age. Changes in site productivity may also play a role in how ecosystems function over long time periods.

Successive short rotations of young forest will serve to reduce and eventually eliminate large-diameter snags and down wood in these stands, unless trees from existing stands are retained and allowed to grow through more than one rotation. Spies and Franklin reported regional variability among old-growth forests and stated that "variability in old-growth forest structure strongly suggests varied developmental histories." A lesson to learn here is that it may be possible to develop desired forest structures and compositions through specific and timed actions in managed stands. Models that can stimulate growth and manipulation of multi-species and multi-layer forests in western Oregon and Washington are currently in development.

Rationale for specific objectives at various scales is sparse. Nevertheless, objectives are necessary. Young stands are often looked at as being of little value to wildlife. However, Spies and Franklin state that "natural young and mature forests have also provided important habitat and ecosystem functions that may be lost if only old-growth forest areas are used to provide habitat diversity for an entire landscape." Managing within the range of natural variation, as suggested by recent developments in ecosystem management, may be a context with which to develop specific objectives. Objectives for stands should be developed within the context of landscape objectives. In turn, landscape objectives should be developed within regional and sub-regional settings. Probably, objectives will not be identical for all stands, nor for all landscapes or regions.

The costs of developing diversity in stands and landscapes are unknown. Published information exists on the costs of thinning stands to traditional spacings and using traditional equipment. However, much less is known about costs of thinning to lower residual densities or creating patches or other variations in structure. There are also few data on costs of using more modern equipment, such as the harvester-forwarder, and recent mid-size yarders. Feasibility, benefits, and costs of designing structure and composition into managed stands are being investigated in several current studies. Long-term and landscape-scale benefits and costs will be more complex to estimate, particularly when many costs and benefits are not necessarily monetary.

Ideas for Increasing Habitat and Species Diversity in Existing and Future Young Managed Stands

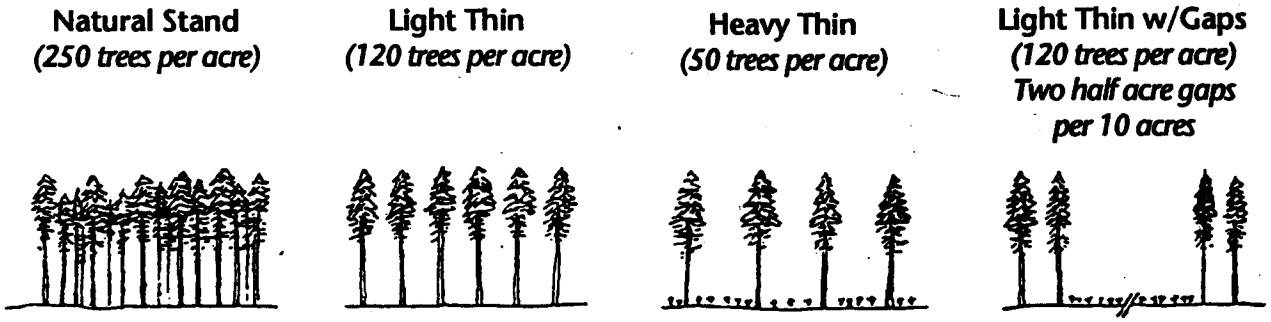
This section can be thought of as a tool box. Generally, tools are used in particular combinations and sequences to achieve specific objectives. The ideas presented here discuss ways to develop the specific feature mentioned or discuss potential changes induced by particular practices. Most would agree that implementing any of the following ideas would likely increase both diversity and logging costs. However, there is little information on the exact economic and ecological consequences of implementing these ideas. Many of the practices and parameters presented here currently are being investigated in stratified designs in several places in western Oregon and Washington. Others are not, but could be operationally tested in demonstration areas or in scientifically designed studies. Some of the ideas are appropriate for current management and are now being implemented.

Broadleaf Trees

Dominant and co-dominant broadleaf species regularly occurring in managed stands are black cottonwood, bigleaf maple, and red alder. Occasionally, golden chinquapin and Pacific madrone are present. Smaller trees not often present in the dominant or co-dominant layer include: Pacific dogwood; California hazel; vine maple; cascara; and bitter cherry.

Encouragement of deciduous and evergreen broadleaf trees in young managed stands may result in population increases in bird species, such as warbling vireos, black-headed grosbeaks, and, at low elevations, black-throated gray warblers and Hutton's vireos. Other species may be tied to the presence and abundance of deciduous trees as well. Deciduous trees, by

Thinning Strategies for Young & Mature Douglas-fir Stands



nature, will allow more light to the forest floor in winter and provide a different type of detritus to the forest floor.

On the Willamette National Forest, the primary factor needed for maintenance of broadleaf trees is light. Maintenance or enhancement of broadleaf trees in young managed stands may be accomplished in two ways:

- By allowing prominence of these species in early regeneration stages;
- By thinning conifers from around broadleaf trees or simply opening the conifer canopy.

Snags and Down Woody Material

Young forests are at the age when trees are becoming large enough to be excavated by woodpeckers. However, most trees in young stands contain little decay above the base of the bole. Topping of some trees in these stands may create potential nesting substrate. Topping would probably be most feasible after thinning so that the topped portion would be less likely to get caught in adjacent canopies. Since these trees are likely to decay rather rapidly, leaving several whorls of green limbs below a de-limbed portions of the bole may make for longer-lasting snag habitat. Another approach to long-term development of decayed bole habitat might be to deeply injure live trees at some mid-point up the bole, leaving the tree live and allowing development of rot in the bole. In the long term, it seems most feasible to consistently retain trees from former stands to act as large tree and snag habitat within rengenerating stands.

As with snags, young managed stands typically do not have large diameter trees as a source for the forest floor. Some young managed stands have high levels of large woody material remaining from harvest activities in the previous stand. Others have very little. In those stands with little downed wood, it may benefit some ground-dwelling species to leave some boles on site during thinning operations. In the long run, as with snags, it seems most reasonable to retain trees in successive generations to act as large tree and log habitat.

Root Rot and Other Fungi

Root rots weaken and kill particular species of trees in a patchlike manner. Unaffected tree species usually prevail in these "pockets." Succession in an area of root rot typically goes something like this: susceptible trees are killed, producing snags for a short period before they fall; root-rot tolerant species, such as cedars or broadleaf trees, often seed in or continue to grow in the infected areas. Sometimes susceptible species reseed in as well. The rot travels over time through susceptible hosts. This results in an increase in the complexity of both vegetative structure and species composition in the affected stand. Both root-rot and stem-rooting fungi may be valuable agents of diversity in managed landscapes.

Slash piles

Piling of limbs and other debris produced during thinning operations may provide cover and nesting/denning habitat for small and medium-sized mammals (mice, voles, squirrels, weasels and skunks), amphibians (salamanders) and a few birds (grouse and winter wrens). Slash piles five to ten feet tall would probably provide the best habitat and be the most feasible to create.

Underburning

A burn on the forest floor would likely effect a change in herb and shrub composition. The specific vegetative response would likely depend upon the timing and intensity of the burn, the seed or sprout source, and the percent of canopy cover. Considerations in using fire in these stands include the ladder fuels and thin bark of these young trees. Controlled burns may be most feasible in heavily thinned areas where stems are farther apart. Spot burning or pile burning may be more reasonable options to put effects of fire in these stands. An occasional fire-killed tree may provide foraging and possibly nesting habitat (depending on size) for cavity-nesting species.

Planting

There are a variety of plantings that could be done. Planting conifer species could form another structural level. Depending on the openness of the canopy, these may be shade tolerant, intolerant, or a mixture of coniferous species. Indigenous broadleaf and/or fruit-bearing trees and shrubs (black cottonwood, willow, bitter cherry, blue elderberry, Indian plum) may be planted in areas after conifers have been thinned to provide a very open canopy, particularly near streams, ponds, and seeps. At the herb layer, mixes of indigenous grasses and forbs might be planted in areas where the ground has been disturbed or the canopy has been opened up significantly. Methods for collecting seed and seedlings from local areas could be explored.

Variations in Thinning Practices

A study of young stands on the Willamette National Forest is implementing two variations from the typical thinning practices: a heavy thinning (50 trees per acre) with conifer underplanting; and a typical thin (100-120 trees per acre) with inclusions of 1/2 acre gaps every five acres where all trees are cut and the patch is replanted with conifers. A control plot is left unthinned. Prescriptions in the young stand study specify all conifer species as being acceptable "crop trees" to be left and allowed to grow in proportion to their presence. Species could be favored in selection of crop trees if a change in composition is desired. Understory trees will be left which may form a shade tolerant understory layer.

Another practice not yet demonstrated on the Willamette National Forest is the variable thin. There are some stands that have had some unevenness implemented in the thinning, but I am referring to something a bit more drastic and noticeable. This pattern would likely result in a wide variety of tree growth rates, sizes, crown shapes, and understory response.

Edge Meshing

An occasional large tree from an adjacent older forest could be felled into the younger managed stand. This would put some newer large woody material into the stand, make a "trail" from one stand into the other, and injure some of the younger regenerating trees for future dead and decaying tree habitat.

Retention of Characteristics in Succeeding Stands

Most of these ideas can be applied to the development of structure and composition in existing young managed stands. However, many of the things discussed above can be enhanced or initiated in the "restart" of a stand to gradually build diversity into stands. Live and dead trees and logs can be retained from previous stands, adding valuable diversity to young growing stands. If large tree structure is desired in areas of short rotation, lives may be retrained from each generation of forest and allowed to grow through several rotations.

Alternative Methods of Management of Early Seral Vegetation

Heavier dependence upon natural regeneration may introduce some natural variability into stands. Allowing herbaceous and broadleaf growth early in stand development may enhance diversity in tree sizes and species composition through more significant competition for resources. Pre-commercial thinning practices could include more variability and selection for diverse characteristics.

Matthew Hunter *is a former Forest Service wildlife biologist. This article is based on research conducted on the Blue River Ranger District in the Willamette National Forest.*

The Thinning of Eagle Creek:
a sign of logging to come?

Setting: Eagle Creek roadless area, Mt. Hood National Forest. A Tier 1 key watershed adjacent to the Salmon-Huckleberry Wilderness in the western foothills of the Cascade Mountains.
Plan: Intensive and extensive commercial thinning variable (CTV) adjacent to the wilderness area and in other roadless area stands.
Objective: Maintain water quality; increase diversity; enhance forest health; and harvest about 20 million board feet of timber.

The current forests in the Eagle Creek drainage were born after a stand-replacing fire swept through the area around 1850, possibly when fires set by Native Americans to maintain huckleberry fields on nearby ridgetops like Old Baldy escaped into the forest canopy.

Pockets of old-growth survived in the rugged canyons and in some wet areas. But most of the drainage is covered in 130 to 140 year old stands dominated by two to three feet thick Douglas-fir.

Although the area is not considered critical habitat for the spotted owl, two owl pairs nest nearby and undoubtedly forage for voles and squirrels on these remote mountain slopes. Pine marten and pileated woodpeckers also inhabit the area, while native cutthroat trout populate the emerald pools in Eagle Creek's south fork.

The Mt. Hood Forest is promoting the Eagle Creek sale as new kind of environmentally sensitive forestry. Instead of clearcutting, the Forest Service is planning a combination of shelterwood cutting and commercial thinning variable (CTV). Most of the thinning operations in the sale will remove between 30 and 35 percent of the basal area of the treated stand.

Usually thinning is used to accelerate growth in young, densely stocked stands, creating a "release" for the residual trees. In this case the trees are too old for thinning to produce any "release." Instead, the silvicultural objective is to "reduce the rate of declining growth."

"There is an emerging forest health problem here that could threaten our first objective for the area, which is water quality," said Jack Gerstkemper, forest planner for the Eagle Creek sale. Gerstkemper explained that the area's declining growth rates and 'overstocking' make the stand vulnerable to disease and fire that could destroy riparian vegetation and reduce water quality.

"We intend to capture the suppression mortality," said Craig Edberg, district silviculturist. Yet, by removing trees that are most likely to develop into snags and downed logs the Eagle Creek sale may actually retard the development of old-growth conditions.

"The Forest Service only seems willing to experiment with innovative forestry methods in roadless areas and other unique areas," said Regna Merritt of the Oregon Natural Resources Council. "This type of experimentation should be kept on plantations in the forest matrix, not in natural stands inside key watersheds, roadless areas, or late-successional reserves."

Oh, by the way. Even though water quality is given as the primary objective of the Eagle Creek sale, according to Gerstkemper, the agency doesn't plan to monitor any of the streams before, during or after logging.

—Jeffrey St. Clair