

# Northwest Woodlands

A Publication of the Oregon Small Woodlands, Washington Farm Forestry, Idaho Forest Owners & Montana Forest Owners Associations

## SILVICULTURE 101

### Designing Your Forest

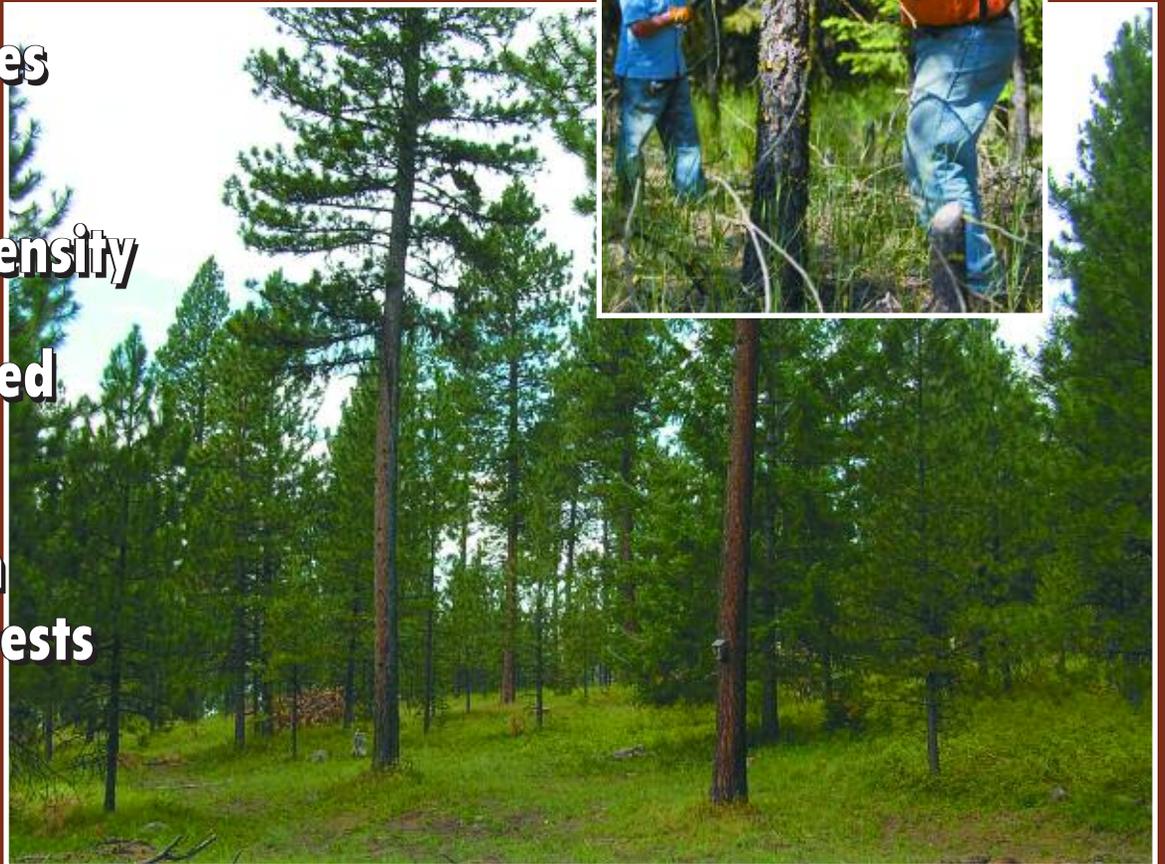
### Spacing and Thinning Red Alder

### The Realities of Pruning

### Planting Density

### Uneven-aged Challenges

### Thinning in Conifer Forests



**NEXT ISSUE . . .**  
**Forestlands Around the West:**  
**What Others are Doing**

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your family forestry association**

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*An uneven-aged mixed conifer forest after thinning. Photo courtesy of Stephen A. Fitzgerald.*

*Inset photo: Creating a shaded-fuel break for an educational demonstration, Bill Hundley (left) uses a Stihl telescoping pole saw while WSU Extension forester Andy Perleberg uses a 13-inch Fanno pruning saw. Photo courtesy of WSU Extension Service.*

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Eight additional pages of color in this issue was made possible by a generous financial donation by the Clark County Farm Forestry Association. Thank you for helping to improve the look and readability of *Northwest Woodlands*.

# Designing Your Forest: Silviculture 101

By **STEPHEN A. FITZGERALD**

**D**o you know what you want your forest to look like when it grows up? Although this question may sound a little silly, it is one I



ask family forest owners who are trying to decide how best to manage their forest for the future. The answer is important and one that is fundamental to how you go about managing your forest.

How do you develop a vision for your forest? One of the best ways is to talk to other forest owners. Attend woodland tours to see what other forest landowners are doing and ask lots of questions. Talk to Service, Extension and consulting foresters and invite them to visit your property. They can provide ideas on your forest's potential and management strategies that might be best for you.

Once a landowner has answered this first question, the next question is: how are you going to get your forest there? In other words, what kinds of treatments are needed (and when) to shape the stand so your future forest is closer to what you envision and is producing the types of values you want, whether they be for timber, wildlife habitat or scenery.

Although I can't answer the first question for you, I can provide an overview for the second question on the kinds of treatments you might use to "culture" your forest. This is known as silviculture. Specifically, *silviculture is the art and science of managing forests from establishment through maturity, given landowner objectives*. Objectives are key because they drive management (treatment) decisions and are determined from the visioning process just discussed.

But what's this "art" stuff?

Although there is large body of forest science that can help us manage forests, not everything is known and not all of the existing forest science may apply directly to your forest, so sometimes forest landowners have to adapt new ideas and techniques and see if they work. That's the art.

## Silviculture Systems

Because silviculture spans the life of a forest, it involves establishing trees, nurturing and tending those trees, and conducting some kind of harvest to re-establish trees again. The system of harvest (even-aged, uneven-aged, coppice) is important because it affects the structure and development of the forest produced and the type of intermediate stand treatments you might apply (more on intermediate stand treatments later). The silviculture cycle is depicted in

Figure 1. As a forest landowner, you may have inherited a young or older stand somewhere in the cycle and each may require different treatments to shape the stand to where you want it to go in the future. Again, the key here is: where do you want to take the stand?

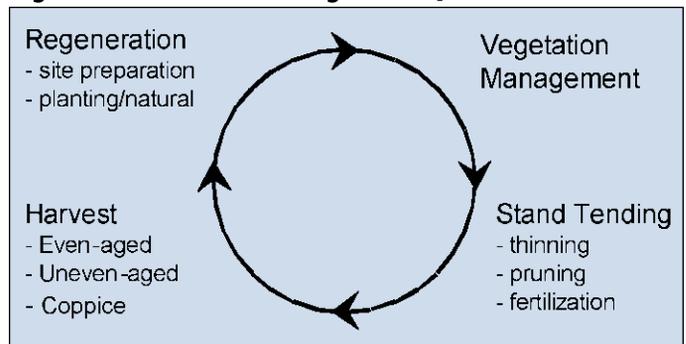
Forests can be managed using even-aged or uneven-aged systems. A third method is the coppice system, which involves managing and culturing trees from stump sprouts. Coppice

is not used much in the Pacific Northwest, although much of the second-growth redwood that is harvested comes from coppice growth (from old-growth stumps), as redwood is one of the few conifers that sprout.

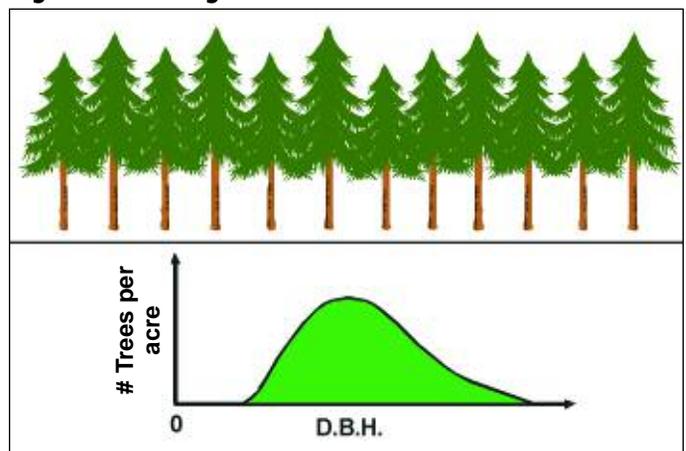
Even-aged management produces stands that are relatively uniform and have an even canopy and narrow range of tree diameters (Figure 2). Even-aged management methods include clearcutting, seed-tree cutting and shelterwood cutting.

When clearcutting, essentially, the entire stand is cut, the site is then prepared to reduce slash and competing vegetation, and the area is typically planted, although natural seeding of conifers, at times, is relied upon to reforest an area. To increase the structure, diversity and wildlife habitat within clearcuts, landowners can leave individual or clumps of

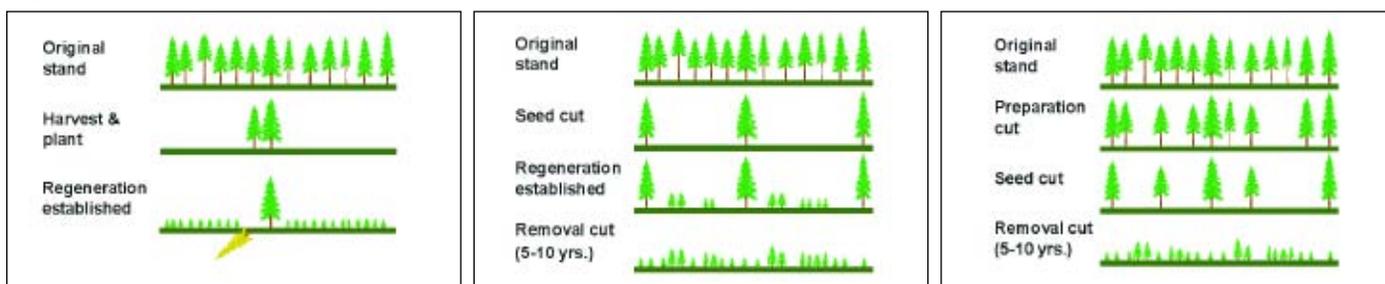
**Figure 1. Silviculture Management Cycle**



**Figure 2. Even-aged Stand**



**Figure 3.**



green trees.

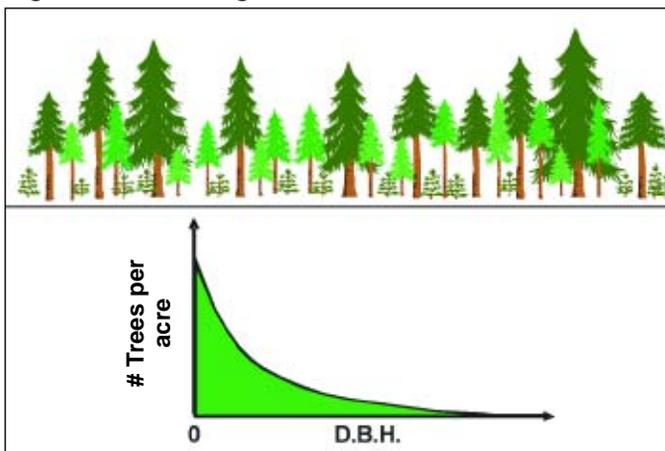
Seed-tree and shelterwood cutting involves harvesting most of the stand, except a few (2-12 trees per acre) large, vigorous trees that are left to provide seed for regeneration and/or shelter to help protect and lightly shade developing seedlings (see Figure 3). Seed trees need to be vigorous and free of insects and disease. After about 5-10 years and after the seed and shelter trees have done their job, the large overstory trees can be removed. If they are not removed, the stand can be managed as a two-aged stand to create a more structurally diverse forest. Historically, little seed-tree and shelterwood cutting has occurred on family forestlands, but it may have a place, depending on your objectives.

Some disadvantages of seed-tree and shelterwood cutting, compared to clearcutting and planting, is that overstory trees can be subject to windthrow and can reduce the growth of understory seedlings if the overstory is too dense (i.e., in the case of a shelterwood); and cone crops may not occur in a timely fashion so the site may need to be under-planted to meet minimum reforestation requirements in your state. Check with your state forestry office about relying on natural seeding using these methods.

Uneven-aged management—sometimes referred to as multi-aged management—involves creating a forest that has three or more ages/diameter classes of trees (see article

by Bob Mezger). Figure 4 shows the diameter distribution, known as an “inverse-J” shaped diameter distribution for an uneven-aged stand. On

**Figure 4. Uneven-aged Stand**



the curve, trees continually move to the right as they grow. Uneven-aged management can use group selection (GS) or individual tree selection (ITS) to create a multi-aged forest. GS involves harvesting trees in small groups or openings approximately one-half acre to two acres in size, which creates an uneven-aged forest comprised of several mini even-aged stands of various ages. ITS involves removing (thinning) a tree here and a tree there across the entire stand to open up and create growing space for new seedlings to establish. In fact, with the uneven-aged management system, regeneration, stand tending and harvesting all take place concurrently. Uneven-aged management is appealing to many owners because it maintains a continuous forest canopy, is aesthetically pleasing and maintains more “mature” forest conditions. Despite these benefits, it is

more complicated to manage forests in this manner and a large body of forest science is not readily available to guide us. Also, not all forests can be managed in an uneven-aged fashion.

There are three important decisions to make regarding uneven-aged management.

1. First, decide how large of trees to grow. This decision is based on tree value (economics) and biological potential of the site.

2. Second, decide what density or stocking level you should manage your stand at. This varies widely due to differences in site

productivity. It suffices to say that uneven-aged stands should never be managed at “full stocking” as growing space is needed to continually recruit and grow new seedlings.

3. Based on the second decision, how should the growing space be allocated to each of the diameter classes? For example, you can allocate more of the growing space to smaller diameter classes, which would produce a steep inverse J-shaped curve; or you could allocate more growing space to the larger diameter classes, which produces a flatter inverse J-shaped curve. It’s advantageous to have more of the growing space allocated to larger trees, which have economic value. You don’t want to have too many small trees that you will end up pre-commercially thinning out anyway.

To maintain several age classes in a forest, careful tending is needed. The

inverse-J shaped curve is an idealized stand condition that is maintained, more or less, by your management actions. Many stands often have deficits in one size class and excess in others (Figure 5). When there are excess trees in some diameter classes, thinning is needed. If there are deficits in some diameter classes, no thinning may be necessary. How do you know if your stand is moving toward an

uneven-aged condition and whether you have excess trees or deficits in any of the diameter classes? The best way is to systematically place inventory plots across the stand and on each plot tally species, tree diameter and trees per acre.

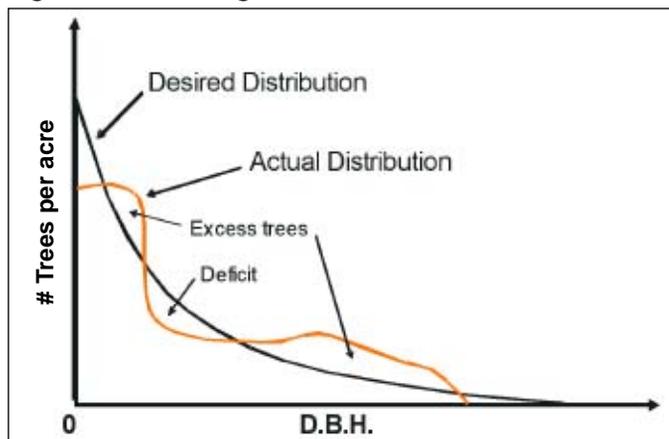
It is important at each harvest entry that enough growing space is created to allow for new seedlings (a new age class) to develop. If natural regeneration doesn't occur in a timely fashion, some planting may be needed.

### Intermediate Stand Treatments

Once you've decided the direction you are taking your forest (even- or uneven-aged), there is a number of stand treatments you can apply to further mold your stand or forest to your liking. Table 1 provides an overview of several intermediate stand treatments that are commonly used. Many of you have likely already used one or several of these treatments on your property over time.

Perhaps the two more important intermediate stand treatments forest landowners can use are thinning and improvement cutting. Thinning removes trees to a specified spacing or density and concentrates the growth potential of the site onto fewer, high

**Figure 5. Uneven-aged Stand**



quality trees (Figure 6). Thinning is done in young stands, known as pre-commercial thinning, or in medium to large sawtimber-size stands where the thinning would be a commercial thinning. Planting densities will determine whether you need to pre-commercially thin and will affect when you can come in to do a commercial thinning (see article by John Trobaugh).

Commercial thinning can involve cutting more of the smaller trees (suppressed, intermediate and small codominant trees) in the stand, otherwise known as "low thinning" or "thinning from below," or it can involve cutting a small percentage of larger trees in the dominant and codominant crown classes, known as

**Figure 6. Thinned Douglas-fir Stand**



"high thinning" or "thinning from above." Because low thinning cuts the smaller merchantable trees in the stand, logging costs are often higher; the converse is true for high thinning. High thinning is probably most applicable in young, even-aged stands where the goal is to remove some of the rougher dominant trees to free up growing space for higher quality codominant trees.

However, a word of caution about high thinning: if too many of the big trees are removed, you may end up "high-grading" the stand, thus reducing future growth potential and value. Refer to Jim McCarter's article on thinning methods.

Improvement cutting is useful in stands that haven't been previously managed. Improvement cutting often targets the removal of undesirable tree species and trees that have been damaged or have defect. The goal of improvement cutting is to remove "the junk" and leave the higher quality trees to continue to grow. Often, thinning and improvement cutting are combined; that is, the stand is thinned to a target spacing or density while removing undesirable tree species and trees with defects.

### Summary

Silviculture systems and intermediate stand treatments are the tools for creating your future forest. However, you must decide what you want your future forest to look like first and then choose the appropriate silviculture system and stand treatments to get you there. Without a vision and a plan, you probably won't get there. For example, by not doing or delaying some treatment now (because you don't have a plan) may mean you forego or delay some

future value (e.g., a certain kind of wildlife habitat or marketable timber). Creating a vision is not an easy task. Because it may take a few decades to create that future forest, younger family members, who will eventually be entrusted with the care of your forest and making your vision a reality, should be involved in the process.

Remember that your forest can be managed in a variety of ways. It is not always a choice of either even- or uneven-aged or about low thinning or high thinning. You can decide to manage some stands in an uneven-aged fashion and others with even-aged methods depending on site and

stand conditions. Likewise, you can thin forests in different ways over time depending on their current condition and growth potential.

Finally, whether you manage your forest in an even-aged or uneven-aged fashion or some combination of the two, to better facilitate your management a good transportation system is needed. In fact, I encourage people to think about their transportation system first before considering silviculture options. For example, because uneven-aged management requires periodic entries, skid trails should be established every 75-125 feet to provide good access so logs can be effi-

ciently skidded to smaller landings and to minimize damage to the residual stand. No matter what silvicultural system you choose, a well-designed skid trail and haul road system will better help you achieve your silviculture goals.

As forest landowners, you are all silviculturists! Go and do good work! ■

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**Table 1. List and Description of Intermediate Stand Treatments**

Treatment	Stage of Stand Development	Description of Treatment	Comments
Weeding	Seedling	Eliminates or reduces competing vegetation from herbaceous plants and shrubs.	Weeding is often referred to as "release."
Cleaning	Sapling	Frees selected young trees from competition from other trees. Favors trees of better species and quality early-on in stand development.	This is usually conducted in young stands in conjunction with precommercial thinning.
Liberation Cutting	Sapling	Removes trees in the overstory to release young understory saplings.	The overstory may be comprised of hardwoods or scattered conifers of poor form and vigor.
Thinning	Sapling to large sawtimber-sized trees	Removes excess trees to a specified density or spacing. Thinning operations can be precommercial or commercial. Commercial thinning often uses low or high thinning methods.	Performed in even- or uneven-aged stands. Often combined with improvement cutting.
Improvement Cutting	Pole-sized to large sawtimber-sized trees	Removes undesirable tree species or trees with defect or damage.	Performed in even- or uneven-aged stands. Often combined with thinning.
Pruning	Sapling to small pole-sized trees	Lower branches are cut off using hand loppers or hand saws. Pruning is done in lifts to gradually increase the base of tree crowns.	Pruning is done to improve wood quality, reduce disease and fire risk, and improve aesthetics.
Fertilization	Sapling to small sawtimber-sized trees	Typically 200 pounds of nitrogen applied per acre in thinned stands to temporarily boost tree growth and wood volume.	Often applied within 10 years of harvest. Few family forest owners fertilize their stands.
Prescribed Burning	Small to large sawtimber-sized trees	Used to thin out small trees or other undesirable species and reduce fuels on the forest floor.	Due to liability in the event a fire escapes, few family forest owners use prescribed burning.
Sanitation Cutting	Small to large sawtimber-sized trees	Removes trees affected by insects, disease or physical damage to <u>prevent</u> additional mortality in the future from insect and disease.	Often combined with salvage cutting. Sanitation cutting by itself may be non-commercial.
Salvage Cutting	Small to large sawtimber-sized trees	Removes dead and dying trees to capture their value before rot and decay render the tree of no value.	Often combined with sanitation cutting. Salvage cutting is commercial.