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

SILVICULTURE

Basic Silviculture
Sustainable Forestry near Chehalis
Forest Soil Considerations
Hardwood Opportunities
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This magazine is a benefit of membership in your family forestry association. Contact the officers listed on page 5 for membership details.
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Markets and hauling costs will have an impact on your current and future silvicultural decisions. Photo courtesy of Mike Albrecht. Large bigleaf maple photo courtesy of Neal Maine.

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The word silviculture can be broken into two components: “silvi” meaning forest and “culture” meaning the raising, improvement and development of some plant. In our case the plant is a tree that resides within a timber stand. A forestland owner engages in active management of a timber stand to meet his/her goals and objectives. A forestland owner's actions are often referred to as “treatments” in the timber stand. Harvesting timber to generate family revenue may be a goal for one owner; however, another owner may have a goal to enhance wildlife or improve family recreation opportunities in the woods. There is a vast amount of information within the silviculture field of knowledge. Books are written on silviculture, or you can enroll in an upper division college course at a university. But more realistically a forestland owner may choose to enroll in classes at a local tree school or seek advice from a forestry Extension agent or state stewardship forester.

To me the essence of silviculture relates to the forestland owner engaging in treatments to improve the productivity of his or her land. How much mortality will an owner tolerate in his timber stand? For example, a Christmas tree grower may strive for 100 percent survival of his seedlings; while a forestland owner may accept 90 percent survival of young trees; and finally a federal land manager may allow a 50 percent survival rate of all trees on this type of public land.

One comment I have heard from a woodland owner is that you don’t have to do anything to your forest. Trees will grow whether or not the owner sets foot on the land. There is some truth to that statement; just let nature take its course. But we have also seen an abandoned Christmas tree farm after 20 years, where all of the trees are three inches in diameter at ground level and the height of each tree is 25 feet. The live crown in these trees may be less than 10 percent and many of the trees have started to tip over because the fixed amount of sunlight, water and nutrients (along with a potential windstorm) of the land cannot support the current number of stems per acre. What a mess!!! The landowner might be best-served to start over.

Timber stands are dynamic. In other words, a tree’s diameter and height are growing over time. If the woodland owner does not practice silviculture, then Mother Nature will create her own system of winners (dominant trees) and losers (repressed trees) in the timber stand over time. An increment borer is a forestry tool a woodland owner can use to see when the growth of a tree is starting to slow down. A thinner growth ring signals reduced tree growth that year. It might be time for a silvicultural treatment (e.g., precommercial thinning or commercial thinning) to take place in the stand. The health of remaining trees in the timber stand will likely improve after the thinning takes place.

Good luck performing silvicultural treatments on your land!
Small Forest Silviculture

I have been impressed by the interest and pride that small tree farmers have in their land. Many of these parcels are very small and will have a small impact on the family income. The individual contributions for the public good such as clean water, wildlife habitat, natural beauty and air (oxygen) is small, but substantial when all tree farms are added together. The satisfaction or credit for providing those benefits must be internal because no thank-yous are likely to arrive in the mail from your neighbors or the county.

But let me touch on tree growing and harvesting. It is unlikely that a small forest can be managed like a larger ownership. Any job that is larger than you can do with your hands is going to be costly because of the expense of moving the equipment. And, in particular, a logger can’t afford to take small commercial thinning (CT) jobs. This suggests that if you own less than twenty or even forty acres your chance of a CT is low.

One thing you can do about this is to cooperate with your neighbors and do CT work at the same time. That spreads the cost of bringing the logging equipment to your forest over more acres.

So if your goal is to someday sell logs to the mill they will have to be of merchantable size and that means they will need room to grow. Too many trees per acre can result in an overstocked stand where individual trees will have reduced growth and many trees may not survive until your final harvest.

One solution to this situation may be a wide precommercial thinning (PCT). Commonly, a PCT is done soon after crown closure to space the trees for their juvenile growth spurt. A PCT spaces the crop trees, removes defective stems and undesirable species, and is usually done by a cutter on his feet. The exact PCT spacing depends on the landowner’s desires and stand conditions, so you need to figure out what fits your forest. But, as an example, in a conifer stand on the Coast, a PCT spacing of 12-by-12 to 14-by-14 is common. I suggest that on small ownerships this PCT spacing could be increased to 16-by-16 up to 20-by-20 or maybe more, especially in Inland forests. This would permit the leave trees to reach merchantable size without a commercial thinning (requires equipment). When it’s time for the final harvest, you will be more likely to have a logger interested in cutting the entire stand.

Any action you take involves some risk. The bad news here is that wider spacing may increase windthrow and delay natural pruning; and understory vegetation will persist under an open forest canopy. But removing trees over time, such as using your forest as a wood lot, could be an alternative to a specific PCT treatment. A wide PCT is not for everyone but may fit the needs of some small tree farms.
Select Your Silviculture

I’ve spoken with many private forestland owners about forest management and their respective objectives. Landowners come from all walks of life and their diversity of opinions and management styles reflects that. However, one common theme I’ve noticed is that family forestland owners tend to favor “selective” logging. This decision is based on things other than maximum growth, net present value or return on investment. I think the decision to “selectively” log is based primarily on other considerations, such as: aesthetics, recreation, certain wildlife benefits and a notion of forest health. This is neither good nor bad since we all have different priorities, but it’s wise to recognize our motivations when choosing a silvicultural system.

The ambiguous term “selective logging” means different things to different people and the use of the term is rarely based on science. Although “selective” logging can be used to manage an even-aged stand, it often carries with it the connotation of individual tree selection, which is a form of uneven-aged management. “Selective” logging is just a method of logging, not a silvicultural system. Some “selective” logging practices have resulted in high-grading, or imbalance of species diversity. There is a relative overabundance of shade-tolerant Douglas fir and grand fir and an underrepresentation of seral, or shade-intolerant species like western larch, ponderosa pine and western white pine. Given this imbalance in species representation and our comparatively short tenure as forest stewards, is the individual tree selection method of uneven-aged management an appropriate silvicultural strategy? It might be if the steward is committed to such an intensive form of management.

In Idaho we have an imbalance of species diversity. There is a relative overabundance of shade-tolerant Douglas fir and grand fir and an underrepresentation of seral, or shade-intolerant species like western larch, ponderosa pine and western white pine. Given this imbalance in species representation and our comparatively short tenure as forest stewards, is the individual tree selection method of uneven-aged management an appropriate silvicultural strategy? It might be if the steward is committed to such an intensive form of management.

I’ll offer that the group selection method (think “small dispersed clearcuts”) might be an attractive alternative for family forestland owners. However, I encourage you to feed your inner tree geek and take a class, go to the library to check out a textbook (“Go where, to check out a what?!?”), or do a Google search on “silviculture” so your decisions are more informed. You’ll be glad you did.
WHAT TO DO IN . . .

AUGUST

➡️ Tree Farmer of the Year Tours.
- Help honor your Tree Farm candidates by attending their tours and invite a friend to attend with you. These are great opportunities for you to learn how it's done by the best in your area.

➡️ Planting This Winter?
- Order seedlings if you haven’t. You may find you are too late for winter 2015/2016 and need to order for 2016/2017. Waiting to get the right seedling is the correct choice.
- Time to rip and break up compacted ground while the soil is dry. Your ground is probably compacted if you are converting pasture to timber.
- Time to do site preparation spray while target plants are in full leaf.

➡️ Good Time for These Projects.
- Rock a road, maybe just a few inches deep so you have access to your property for winter management projects.
- Take a "staycation" before the kids go back to school.
- Pick Himalayan blackberries before you start your fall spray program to control them.

➡️ Invasive Weed Control.
- Remember, controlling invasive weeds is your responsibility. An invasive plant has the ability to thrive and spread aggressively outside its native range. A naturally aggressive plant may be especially invasive when it is introduced to a new habitat.
- Now is the time to control Himalayan blackberries with foliar herbicides. Based upon the type of chemical you use and the seedlings planted, you may do a "directed" spray to avoid contact with your trees, or an "over-the-top" spray. September is also good for blackberry control because they are storing food in their roots for next year. Plan to spray any time after you have ripe berries and before you have a frost. Preferred herbicides are glyphosate (e.g., Accord®) and triclopyr (e.g., Garlon 4®, Garlon 3®, Element 4®). With Accord you need to wait for Mother Nature to rinse the dust off the leaves before application, since the active ingredients bond with the dust particles and are not adsorbed by the leaves. Suspended solids in your water source would act just like the dust particles. For rates and timing in your area, check with a local forester or chemical dealer, and make sure you follow the label instructions. Rubber boots, rain pants and water repellant gloves are now standard apparel when applying herbicides.
- Crossbow® is not registered for forestry use except as a roadside spray. There are now several formulations of Roundup®, and scores of generic glyphosate products, making it very confusing because some do have a forestry use registration, and many do not. Thus, the user must carefully read the entire label to determine if the product specifies a forestry use. Concentration of glyphosate in products also varies; someone who is accustomed to using 48 ounces of old Roundup per acre over trees, and then uses 48 ounces of Roundup Pro®, will probably kill seedlings!
- Himalayan blackberries are an infamous invasive weed in the Northwest, but not the only one. Remember last May when you could see all the yellow bushes blooming on the roadside and up on the sidehill? That bad boy is Scotch broom and is also not from around these parts. It is best controlled in the spring before it sets a new crop of seeds that are viable for around 50 years. It is easy to locate when in full bloom.
- Common landscape plants you may not think of as invasive include:
  - English ivy, Hedera helix
  - English holly, Ilex aquifolium
  - Scotch and related brooms, Cytisus spp.
  - Japanese knotweed, Polygonum cuspidatum
  - Bohemian knotweed, Polygonum x bohemicum
  - Butterfly bush, Buddleja davidii

➡️ Know Your Invasive Weeds Workshops.
- A couple of Weed Watcher workshops were announced this spring. I have heard of shiny geranium and Herb-Robert, and I think I have one or both...
of these invasive plants. But I don’t know how to correctly identify or control these plants. Help your forestry organization plan a Know Your Invasive Weeds workshop before next spring so your members will know what to be on the lookout for and what they can do to control these pests.

**SEPTEMBER**

➤ **Seed Your Bare Ground.**

- Seed roads, landings and other areas where you are trying to establish grass and forbs by the end of September if you want to be in charge, or Mother Nature will do it for you and you may not like what you get. Your local Natural Resource Conservation Service (NRCS) office can help you with your seed mix.

➤ **Safe to Prune.**

- September is generally considered a safe time to prune live limbs, once active growth has slowed for the year and bark-boring insects are inactive for the winter.

**OCTOBER**

➤ **Remember, Safety Pays.**

- You can’t manage your trees from the grave. Follow safe procedures for your tree farm tasks. Remember, safety applies to you and not just to your children and their children.

➤ **October 15th**

- Good date to think of as the end of hauling on dirt for logging shows west of the Cascades.

- Good date to call your logger if you are thinking of harvesting timber in 2016, schedule a site visit and get on his calendar.

➤ **Precommercial Thinning.**

- This is an early thinning in a stand where expenses will exceed revenue. It is often done to get the leave trees to reach a commercial harvest size, while retaining enough crown in the crop trees so they will continue to grow at a moderate to good rate. This task could be well-suited for a college student in need of funds. You get a job done and they earn money for tuition. Work builds character that they will never get with a student loan, so you both win.

➤ **Should I Interplant?**

- Probably not.

- If your initial planting survival meets or exceeds your requirements for reforestation I would not recommend interplanting.

- If you decide to interplant, you need to do it the very next year to keep the size of your established seedlings and interplanted seedlings as close as possible.

- My personal experience with interplanting my 20-acre mostly Douglas-fir plantation is instructive. The original planting was 9-by-9, or around 500 trees per acre, with 85 percent survival. One planter was having a bad day and jay-rooted several seedlings in a row that later died, so I interplanted these holes. I have current stocking as high as 600 trees per acre so I need to thin. Many of the trees I am thinning are the very trees I interplanted because they are the smallest. I need to reduce my stocking level to 350 to 400 trees per acre to maintain a healthy stand until my first commercial thinning. So 300 to 400 trees per acre is probably a good target for reforestation success.

➤ **Know Your Woods Words.**

- **Swiss Needle Cast.** Needle disease that naturally occurs in Douglas-fir and is present wherever Douglas-fir grows. Probably wrongly attributed to the Swiss. Moist spring weather and monoculture plantings that replace more mixed-species natural plantations have helped the disease expand in the Northwest.

**Favorite Forestry Website.**

- Read Amy Grotta and Brad Withrow-Robinson’s Tree Topics blog at: //blogs.oregonstate.edu/treetopics/
Silviculture: The Basis for Managing Your Forest and Woodlands

By STEPHEN FITZGERALD

You are probably a silviculturist and don’t know it. Let me explain. This article discusses silviculture as the basis for managing your forest and woodlands. Silviculture comes from the Latin derivative, “silva” meaning “forests and woods.” The culture and tending of forests or woodlands is both an art and a science and is defined by the Society of American Foresters as: “The art and science of controlling the establishment, growth, composition, health and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.”

The first part of this definition is about the physical aspects of managing or culturing your forest. As family forest owners you plant trees, control competing vegetation, thin your forest and, eventually, harvest trees. The second part of the definition, and the most important, speaks to why you tend your forest; that is, your objectives.

Identifying your objectives

Objectives are what motivate you to manage your land. After all, why would anyone toil through cuts, bruises, and sore muscles! Your objective may be for one specific purpose (e.g., generate income) or could include a suite of goals for wildlife, timber, firewood, grazing, aesthetics, or a legacy to pass on to your children. Aside from the productive capacity of your land, defining your objectives up front is the most important. Without them your management is rudderless and without direction. Of course, your forest will certainly grow without human imposed objectives, but will it grow and develop in a way that benefits you and what you care about?

Think about the future

To be a silviculturist you have to think about the future. When most people in society think about the future they think about tomorrow, next week, next month or maybe next year. But if you grow trees the future is decades out because trees take so dang long to grow. Thus, deciding on management actions out several decades is difficult but is a necessity because what you do (or don’t do) now will affect your forest far out into the future. You might say, “But I can’t predict the future” and that is true. For example, you can’t always predict what will happen to future timber markets, or where and when events like insects, disease, high wind or wildfire will occur. However, I can reasonably predict that if your forest is on an unhealthy trajectory, it will begin to unravel and suffer a greater loss than it would have had it been “in shape” to weather those events. So, it is really important to think about the future trajectory of your forest today. As a silviculturist, you have to take the long view.

What kind of forest do you want?

There are many ways to manage forestland. If you just acquired your property and are still unsure about what or how to manage your land, talk to a professional forester and...
participate in as many landowner field trips as you can to see what approaches other landowners are taking in your area. You should spend some time thinking about what you want before a professional forester comes out to assess your land. Ask yourself, “What do I want my forest to look like when it matures and what do I want it to provide along the way?” This takes some thought and reflection about yourself, your values and the ecological capacity of your land. Your visit with a professional forester will be much more productive if you can articulate these thoughts. As a result of this visit you may revise your goals.

It’s all a continuum

Just like there is a continuum from hot to cold or from season to season, forests also occur on a continuum, from even-aged to multi-aged forests. As humans we tend to look at things in discrete packages, but nature often operates more on a continuum. Because forests operate on a continuum, so should our management approaches. Figure 1 displays the continuum from even- to multi-aged forests and the types of silviculture treatments used to create or maintain them. These are described more fully below.

Even-aged forests

Even-aged forests are created by harvesting all or most of the trees in an area followed by planting or natural seeding. This can include clearcutting and seedtree/shelterwood cutting. Let’s examine clearcutting first.

Forests that develop after clearcutting and planting can grow on short or long rotations, depending on species and site productivity. Douglas-fir, because of its long life span and excellent growth, is a species that can be grown on rotations of 40 years or grown out to 120 years. Hybrid poplar is a fast-growing but short-lived tree and does very well on short rotations (12 years). In the dryer portions of Oregon, Washington and Idaho, short rotations may be a bit longer, in the range of 60 to 70 years. Short rotations allow landowners to intensively manage trees to maximize wood production, yield and economic return. Short rotations allow forest owners to take advantage of improved seedling genetics and earlier adoption of new planting stock adapted to a changing climate.

However, short rotations provide relatively simple forest structure, thus may provide more limited types of wildlife habitat. Aesthetics and wildlife habitat within clearcuts can be enhanced by leaving snags and decayed logs behind, creating irregular harvest boundaries (rather than making a square clearcut) and allowing some vegetation (forbs and shrubs) to remain to provide habitat for pollinators and song birds.

Forests grown on long rotations may start out exactly like stands on short rotations. However, they can be thinned several times to maintain stand health while periodically extracting logs to provide income and other benefits. Forests grown on long rotations produce larger trees and provide a wider assortment of log sizes (small to large) that are used for a greater range of forest products, including high-value poles. Growing a stand on a long rotation requires thinking ahead about thinning frequency and intensity.

Seedtree and shelterwood cutting retain a small portion of the residual stand (1 to 15 trees per acre) to provide seed to regenerate the stand. In a seedtree system, all or most of the reserve trees are removed once seedlings have regenerated beneath (five to ten years later). Once seed trees are removed, the stand looks pretty much like a young clearcut, although the distribution and spacing of seedlings is much more irregular.

–Continued on next page–

**Figure 1. Many different silvicultural treatments make up a continuum of stand structures.**

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than areas that are clearcut and planted. Logging costs are higher because the stand is regenerated over time and the overstory trees are removed in two distinct operations. Assuming natural seeding occurs, reforestation costs may be lower. If natural regeneration fails after a few years (e.g., lack of a good cone crop), planting and vegetation control can be more expensive since understory vegetation has gained a head start on planted seedlings.

**Two-aged forests**

Two-aged forests are also created by utilizing the shelterwood method. Trees regenerate beneath from natural seeding or by planting. However, instead of the overstory trees being completely removed after five to ten years, overstory trees are retained and removed slowly over time to provide growing spacing for the developing understory. This provides a very distinct two-storied stand for a number of decades. The overstory trees provide habitat for a variety of wildlife. Some overstory trees may die creating snags that eventually fall to the ground. This makes excellent wildlife habitat. A two-aged forest may be one technique used to begin developing a multi-aged forest (see Figure 2).

**Multi-aged forests**

Multi-aged forests contain trees with three or more age classes. Multi-aged forest are naturally created by disturbances, such as wind, insects and disease that create openings, followed by seeding of young trees into the openings. Multi-aged forests can be intentionally created by using individual tree selection (ITS) and group selection (GS) harvest methods.

ITS involves removing select trees in areas to release younger trees within the stand. On the surface it resembles a thinning, but in this case the sole purpose of removing trees is to promote other age classes of trees. ITS selection harvests re-occur every 10 to 20 years, depending on site productivity and species, with the goal of creating growing space so all size classes will continue to grow and replace other trees harvested over time. Because selection thinning removes trees here and there and cre-
ates small gaps, there is a tendency to promote only shade-tolerant species (e.g., hemlock, grand fir) over time, and this is not necessarily a good thing. Shade-tolerant trees tend to be more susceptible to disease and logging damage because of shallow roots or thin bark. Trees that require more light to regenerate, like Douglas-fir, ponderosa pine and western larch, require much larger openings. Also, because the cutting cycle is short, it is important to have a well-planned skid trail system to facilitate the logging in such a way as to minimize damage to residual trees and minimize soil compaction. Speaking of logging, harvesting costs are usually higher for ITS because you are removing less wood volume per acre at each harvest entry compared to one clearcut operation.

GS involves harvesting trees in patches of one to three acres at intervals of 10 to 20 years. This creates a multi-aged forest comprised of “mini” even-aged patches. GS can be used to remove trees in root rot pockets, followed by planting of trees resistant or immune to root disease. GS has been used in eastern Oregon to remove groups of pine infected with mistletoe. How large should your openings be? This is a common question. The answer is: it depends! It depends on the light requirements of the tree species you’re managing for and the productivity of your land. Larger openings of 1.5 to 3 acres are needed for Douglas-fir, western larch, lodgepole and ponderosa pine because they require higher light levels to thrive. For shade-tolerant species like western hemlock, grand fir and western redcedar, openings of 0.5 to 1.5 acres are appropriate. As with ITS, GS requires having a well thought out skid trail and transportation system. Skid trails should go through the middle of openings so, as you make additional openings in the back of the harvest area in the future, you can reuse skid trails without damaging planted seedlings and saplings (see Figure 3). Skid trails should not be planted since you will periodically reuse them.

**Summary**

Nurturing and tending your forest is a journey: a long journey. This journey may span a few family generations. As a landowner and a silviculturist you have to take the long view, get things written down in a management plan, and involve the younger generation in the long-term stewardship of your property. Don’t forget to consult with a professional forester, biologist or other natural resource professional; they can help you formulate your management approach.

However, while we know a lot about some silvicultural treatments, like clearcutting, both from a scientific and practical experience perspective, other treatments, such as creating multi-aged forests, have very little scientific information to help guide us. But that should not deter you. Forests operate on a continuum and I encourage you to try different silvicultural methods to create a diversity of forest conditions on your property, even if it’s only in a small area. Part of the fun (yes, fun!) of implementing different silvicultural treatments is to learn along the way and adapt as you go.

**Stephen Fitzgerald** is professor and Extension silviculture and fire specialist at Oregon State University and director of the OSU Research Forests. He can be reached at stephen.fitzgerald@oregonstate.edu.
From Planning to Re-Planting:
On the Ground with Mike Albrecht

By NICOLE STRONG

I have known Mike Albrecht for many years, ever since he joined us for a Master Woodland Manager training in Benton County, Oregon. I know Mike to be thoughtful and detailed, and also know that he recently conducted a harvest on his property. Rather than write about him, I figured I would just ask him some questions and let him share his story in his own words. What I find really valuable from this article is the idea of being strategic in your timing of activities to optimize an ever-fluctuating market, in weighing the cost/benefit of any decision and the importance of relying on all the amazing people who comprise our forestry community to help inform your decision-making.

Strong: Mike, please tell us about your property.
Albrecht: Our property is located near Chehalis, Washington. I grew up on this property and have planted trees, helped my dad harvest and generally been involved in the management of the property since I was old enough to do so. It was originally part of a 110-acre tree farm owned by my parents until their passing; my mother most recently in 2012. At that time the property was divided. My wife and I now own the original 40 acres, which has been in the family since my grandfather acquired it in the early 1900s. My brother has the other 70 acres that adjoin our parcel.

There is a pretty good distribution of age classes of stands on the property from one year old (I had an old pasture planted in the 2013-14 planting season) up to about 45 years old. Some of the older stands have been commercially thinned and there was some salvage logging after a 2012 ice storm that broke out tops and tipped over whole trees.

Strong: What are your management goals for this property?
Albrecht: This property is being managed for long-term income production while protecting the soil, water and wildlife resources and, of course, for the fun and satisfaction of owning and managing a tree farm!

Strong: What treatments did you conduct and how did you decide which silvicultural tools were the right ones?
Albrecht: We recently contracted to harvest an eight-acre stand of 55-year-old timber on the property. I initially considered doing a commercial thinning but the structure of the stand just wasn’t right. Existing trees were pretty uniformly large. Removing only the few overtopped trees would have yielded very little volume and not much income. Additionally, the majority of the trees were fairly large and with current markets not favoring very large trees, it seemed prudent to just conduct a clearcut.

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All yarding, processing and loading was done with one machine.
In addition to producing income, one of my goals was to set the two properties on a course of producing regular periodic income by harvesting every few years and, thereby, regulating the age class distribution; that is, creating stands of many ages so that there can be an ongoing series of harvests at regular intervals.

**Strong:** What were the considerations and work you had to do prior to harvest?

**Albrecht:** Timing of the harvest was a consideration. At the time this harvest was planned (late 2013 to early 2014) log prices had recently bounced back from a several-year low, due to poor general economic conditions. Since timber can sit on the stump almost indefinitely, it seems foolish to harvest during one of these low periods unless you really need the money. There was also the seasonal question since access to this stand is via dirt roads. I originally intended to harvest during the summer of 2014. However, log prices had dropped a bit and my logger suggested that the prices might jump back up if we waited until winter. He was right and prices did come back up. The trade-off was that I had to spend quite a bit of money gravelling the road. However, I penciled it out before proceeding and it seemed like the additional cost would be more than offset by the higher log prices. So we went ahead with it. Also, because of the cost of gravelling the road, I opted to enlarge the size of the harvest unit. I had originally planned to harvest half the stand (four acres) and save the other half for a future harvest, several years down the road. But, to ensure that I would recover my gravelling costs, I opted to harvest the whole eight-acre stand at once.

**Strong:** How did you go about finding the right logger?

**Albrecht:** The logger I used has been a family acquaintance for a number of years, has forestry training, and is a landowner himself. He has conducted previous harvests for us, including the thinnings and salvage operations that I mentioned previously. He runs a turnkey operation and will do everything from acquiring the necessary permits, to finding the log markets, doing the logging accounting, and doing the logging, cleanup, burning and replanting. Because I live in Oregon, and not Washington where the property is located, this makes it a very convenient way to get the work done. It goes without saying that you need to trust your logger if you are going to do it this way and I would not recommend this as a blanket practice in all cases.

**Strong:** What did you do to ensure you would recover your costs?

**Albrecht:** I had originally planned to harvest half the stand (four acres) and save the other half for a future harvest, several years down the road. But, to ensure that I would recover my gravelling costs, I opted to harvest the whole eight-acre stand at once.

**Strong:** What was the biggest consideration?

**Albrecht:** Because the price of cedar was so high when we harvested, I have decided that I will experiment with planting a few hundred western redcedars when we replant. Knowing the issues related to establishing western red-cedar, I plan to keep that project fairly small and separate from the main planting of Douglas-fir.

**Strong:** What advice would you give to someone contemplating harvest for the first time?

**Albrecht:** Talk to lots of people. Talk to other small woodland owners who have recent experience doing what you are trying to do, talk to Master Woodland Managers, talk to Extension foresters, talk to potential loggers and contractors, talk to consultants and talk to anyone who might have experience or knowledge accomplishing what you are trying to do. Ask for their advice and recommendations. Keep talking until you find the approach and the people you are comfortable working with.

**Mike Albrecht** is a landowner, Oregon Master Woodland Manager volunteer, and is nursery manager for Roseburg Forest Products. He can be reached at mjalbrecht2052@gmail.com. **Nicole Strong** is an OSU forestry and natural resources Extension agent serving Deschutes, Crook, Jefferson counties and the Confederated Tribes of the Warm Springs. She can be reached at nicole.strong@oregonstate.edu.
Soil Potential and Constraints for Management of Northwest Forests

By ROB HARRISON

Oil has often been called the nonrenewable resource on which renewable forest and agricultural resources depend. The availability of highly productive soil has been important for the rise of most ancient and many modern societies and civilizations. The presence of productive soil was one of the original reasons for the colonization of what would become the U.S., and the drive to develop the Northwest. Soil degradation has also been cited, starting in ancient recorded history, as the source of the decline of many advanced societies. Though degraded soils can be slowly improved, soil degradation accounts for some current losses in forest productivity in the Northwest. Fortunately, modern forest management offers some options for protecting the soil resource even with the most intensive levels of harvesting. Increasing focus has also been made on how forest soil degradation can reduce important environmental services from forests, such as water quality and supply, climate regulation, nutrient cycling, biodiversity and plant pollination.

General principles of site, soil and silviculture: the Northwest

Forest site productivity is “the production that can be realized at a certain site with a given genotype and a specified management regime.” Site productivity depends both on natural factors inherent to the site, particularly climate and soil factors, and on management-related factors, which can be broadly defined as silviculture. Recognizing soil properties and limitations is an inherent part of good silviculture.

Most site properties, such as climate (i.e., rainfall and temperature), are relatively fixed and cannot be changed by the management of a site. Forestry, unlike agriculture, rarely uses irrigation or microclimate enhancements (e.g., greenhouse, tillage, mulching) to change site at the level of the forest plantation. This is not true in the production of seedlings, where climate is often closely controlled to produce high-quality seedlings in a short time period. There are also areas of hybrid poplar that are irrigated in the Northwest region, though the acreage of irrigated forestland is still relative small in the region.

Few areas in the world can claim climate as variable as the Northwest. Much of the land area has inadequate precipitation to support forests, creating areas where trees are sparse, with extensive savannah-like forests, often shaped by fire, supporting trees such as ponderosa pine. With more precipitation, vegetation grades into dense forests of Douglas-fir, western hemlock and Sitka spruce. Temperate rainforests near the coasts of Washington and Oregon receive up to 130 inches of rain annually, making them the wettest forests in the contiguous U.S.

Forests in the Northwest also range from relatively mild temperatures near sea level to forests of true fir and nonforested alpine areas.

The Northwest region can be classified in many ways, but one useful for forestry is division into zones that support generally similar types of vegetation with similar soils and climates, called ecoregions. Ecoregions in the Northwest include rainforests, deserts, lowlands, subalpine and alpine areas of high complexity and variability. A detailed discussion of Northwest

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ecoregions can be found at: tinyurl.com/NWEcoregions.

Soil properties are also highly variable in the Northwest, including soils formed in areas incapable of supporting forestland, usually due to inadequate or excess water, high altitude or the presence of toxins. The Northwest is endowed with some of the more productive soils in the U.S. The high inherent productivity of these soils, coupled with the lack of previous degradation, make the Northwest the most productive region in the country in terms of volume of wood produced per acre per year.

Soils in the U.S. are classified in a system where the lowest level of classification is the soil series. There are over 20,000 individual soil series mapped in the U.S. Mapping of most Northwest soils is complete and information, including forestry potential and limitations, is available online. Forest landowners can use online maps or GPS coordinates to locate their forestland. A good starting place for this is the Web Soil Survey: tinyurl.com/NWWebSoilSurvey.

Abundant natural resources make the Northwest one of the most desirable places to live in the world. Management of physical soil properties and soil nutrients, primarily nitrogen (N), are the major site factors that can be impacted by forest management. They must be managed carefully to avoid soil and site degradation.

Management of soil physical properties

Soil physical properties that are most likely to be affected by forest management, particularly harvesting, include impacts on soil structure, porosity and pore continuity. Productive soils need to allow water to percolate into the soil profile, but hold water for plant use. Also important is the continuous exchange of atmospheric carbon dioxide (CO₂) and oxygen (O₂) with that produced and consumed by plant root and microbial respiration. Changes in soil porosity are often determined by measuring soil bulk density, which is the density of the whole soil (including pores) when dry. Large increases in soil bulk density due to heavy equipment on the site during a harvest may be a concern. A soil that can percolate water quickly, and keep the soil atmosphere nearly equal in CO₂ and O₂ with the aboveground atmosphere is well-aerated. Compaction increases bulk density and reduces porosity, usually of the largest pores, called macropores, which are most important for water percolation and aeration. Depending on soil properties, compaction can also be neutral or even improve forest growth; thus, the landowner needs information specific to their own forest soil.

A good discussion on the importance of soil aeration and atmosphere on tree growth can be found at: tinyurl.com/SoilsandTreeGrowth, listed under “Soil Compaction & Trees: Causes, Symptoms, & Effects.” There are several best management practices (BMPs) implemented during harvest and site preparation to protect soil physical properties and other important soil properties, including preserving soil nutrients. An excellent source of information about this is available from Oregon State University at: tinyurl.com/SoilBMPs.

Suggested BMPs for the Northwest include:

1) Take extra precaution during harvest activities in or around ecologically sensitive areas, riparian zones, and areas characterized by organic or shallow soils with low nutrient pools (the amount of nutrients existing on the site including above- and belowground biomass and mineral soil components). Intensive biomass harvesting (removal of tops, branches and foliage) should not be conducted in these areas.

—Continued on next page—
2) Conserve large woody debris (see Figure 1.), which is important from a wildlife/biotic diversity perspective and also must be considered when retention guidelines are specified during harvest. Retain all large wood that exists on the forest floor, and large standing snags where it is safe to do so. Large woody debris functions as habitat for a variety of organisms (e.g., fungi, mosses, insects, amphibians). Retention of both large and fine woody debris can protect a site from erosion, surface runoff and soil compaction and rutting. Forest practice regulations in the Northwest often have specific requirements for large woody debris retention.

3) Removing only logs (stem-only harvest) presents a relatively low risk of loss in productivity in most cases, while whole-tree yarding may create a greater risk, depending on how much of the nutrient pool is removed relative to the total pool before harvest. T.R. Fox (2000) emphasized that reduced productivity caused by loss of nutrients in harvested material is likely to be highly dependent on specific site characteristics, particularly available nutrients. J. Evans (1999) concluded from the available literature that removing 10 percent or less of the nutrient pool presented a low risk of reduced productivity on many soils.

4) Retain at least 30 percent of the fine woody debris on slopes suitable for ground-based harvesting and 50 percent or more on steeper slopes.

5) When removing logging residuals for biomass harvest or fuel reduction, or when piling slash to create planting spaces, it is best to wait until the residuals dry so that needles and fine branches can fall off and remain distributed as uniformly as possible across the site.

6) Some displacement of the forest floor to create planting spots can improve seed germination where natural regeneration is utilized, and planting quality and subsequent root growth where forests are replanted. But too much mineral soil exposure (displacement) can reduce water available to seedlings due to increased weed competition and increased evaporation from the surface. Logging slash removal or slash piling that exposes mineral soil can significantly increase invasive weeds like Scotch broom in the humid west, but can also increase tree seed germination in the drier forests east of the Cascades.

Though these are good general guidelines for the Northwest, the specific properties of soils on a specific site will dictate the requirements for BMPs. In general, BMPs in wetter forests west of the Cascades are designed for physical properties and nutrient retention. This is also true of the drier forests of Idaho, Montana and eastern Washington and Oregon, though the potential for managing...
catastrophic wildfire often dictates piling of tops and branches. However, if the methods above are followed, the potential for soil degradation is minimized.

**Management of nutrients**

Generally, maintaining adequate nutrient supply can be achieved by conservation of topsoil and soil organic matter. Nutrient amendments can supplement inherent nutrient pool limitations or replenish nutrients removed in harvested material. The goal is to maintain the productive potential of the soil and, when economically feasible and environmentally acceptable, enhance productivity where nutrient supply significantly limits growth. Nitrogen is most frequently the limiting nutrient in Northwest forests, particularly on soils with low N pools.

Forests growing on soils with large N pools generally have higher productivity than those on soils with small N pools, particularly when soil aeration and temperature are not limiting decomposition and mineralization. Organic matter and topsoil conservation is critical for nutrient pool conservation because the forest floor and topsoil horizons are generally higher in organic matter than subsoil horizons, and this organic matter generally provides a greater proportion of available N than more decay-resistant organic material in deeper soil horizons.

Soil nutrient pools should be maintained or enhanced rather than depleted: long-term nutrient removal should not exceed input. Nitrogen and other nutrient concentrations vary by tree component (e.g., concentration of N in foliage is greater than in branches or stem wood). Therefore, the level of nutrient removal is not exactly proportional to the mass of harvested material, but rather depends on utilization intensity and the type of material removed.

The amount of N removed depends on the harvest procedure and removal intensity. Yarding to a central site removes nutrients from one area and concentrates them in another. High utilization (i.e., removal of foliage, branches, tops and cull logs) increases nutrient removal from the site. Utilization intensity is often determined by the minimum diameter and length of logs demanded by the market and opportunities for using biomass held in branches and foliage. Stem-only yarding removes about five percent of the total site N pool. In contrast, whole-tree yarding can remove substantially more (see Figure 2).

By removing a larger proportion of —Continued on next page—

![After the fire](image)

The fire is over when it is controlled and the firefighters leave, but for forest landowners, the work is just beginning.

After a fire, your local Oregon Department of Forestry Stewardship Forester can help you find the resources you need and provide answers about what to do after a wildfire impacts your land.

**Figure 2.** The impact of harvesting on site nutrients is very site specific. Whole-tree harvesting of tops, branches and foliage will typically double nitrogen removal.
the nutrient pool, the risk of causing a negative impact on nutrient supply and tree growth increases. Evans (1999) concluded from a review of the literature that the risk of declining tree productivity was low for 10 percent removal of an essential nutrient, serious for 30 percent removal, and imminent decline was likely if nutrient pool removal approached 50 percent or greater.

**Nutrient deficiencies: diagnosis and correction**

In general, response to N fertilization tends to be greatest in stands with a below average site index, and least on highly productive sites. Our ability to predict the degree to which a specific site will respond to nitrogen fertilization, however, is still weak.

Use of foliar diagnosis for identifying deficient stands is problematic because foliage is difficult to sample in older stands, nutrient concentration can vary year-to-year based on weather conditions (e.g., amount and timing of rainfall and many other factors), and nutrients from older needles can be recycled to younger tissue. In addition, limited evidence suggests that the total amount of N and other nutrients in the forest canopy (determined largely by total foliage mass) is more important than the concentration of nutrients in the foliage.

Nitrogen-deficient foliage tends to be yellowish green, and leader growth on branch terminals and lateral branches tends to be less vigorous than on trees with adequate concentrations of N (see Figure 3.) Needle size and needle density per unit length of shoot also decline under N-deficient conditions.

R.B. Walker and S.P. Gessel (1991) developed nutrient deficiency levels for seedlings using the solution culture method (see Table 1.) These values should be used with caution when examining foliage from older stands. When implementing foliation sampling in established stands, collect foliage from the upper third of dominant and co-dominant crowns. Foliage sampling should be limited to the dormant season, preferably between October and February, to avoid seasonal changes. Always collect needles that were formed in the previous growing season. T.M. Ballard and R.E. Carter (1985) identified the following three N deficiency levels in Douglas-fir based on foliar N concentration (percent, dry mass basis): very severe: < 1.05 percent; severe: 1.05 to 1.3 percent; and slight-moderate: 1.3 to 1.45 percent.

A generalized relationship between nutrient concentration and tree growth illustrates the range from deficiency to luxury consumption to toxicity (see Figure 4.) The goal of any nutrient amendment is to reduce deficiency levels and improve growth rates while achieving an acceptable rate of return on the investment.
Fertilization to maintain and enhance productivity

A great deal of research has been conducted and continues to be conducted on the use of fertilizer amendments to maintain and increase forest productivity. The Stand Management Cooperative (SMC) at the University of Washington established several sets of regional fertilization trials in coastal Douglas-fir zones of Washington, Oregon and British Columbia. The website for the SMC is: tinyurl.com/UWCooperative.

The Intermountain Forest Tree Nutrition Cooperative (IFTNC) has studies in the eastern parts of Washington and Oregon, throughout Idaho and in eastern Montana. The website for the IFTNC is tinyurl.com/IFTNCoop.

Results of forest nutrition research have varied across the region, and readers of this article are encouraged to visit the websites for more detailed reports on specific soils. The primary response to addition of nutrients has been associated with nitrogen fertilization, and currently approximately 100,000 acres per year are fertilized, primarily in the coastal Douglas-fir region of Washington and Oregon. With successive harvest of Douglas-fir crops from intensively-managed forestlands in the Northwest, the appearance of other nutrient deficiencies becomes an increasing possibility. Nitrogen-fixing species such as alder have sometimes been suggested as a mechanism for increasing site nitrogen. Most of the research has been done in the moist, high-productivity forests west of the Cascades, but there is an excellent guide to fertilizing eastern forests available at: tinyurl.com/EasternFertilization.

Dr. Rob Harrison is professor of Forest Soil and Environmental Sciences at the University of Washington, Seattle and adjunct professor at the State University of Sao Paulo, Botucatu. He can be reached at 509-998-3755 or robh@uw.edu.
Hardwood Silviculture in Your Woodlands

By GLENN AHRENS

Broad-leaved trees, referred to as hardwoods, may seem to be a minor component of our conifer-dominated western forests. Hardwoods make up about eight percent of the forests in the Pacific Northwest (Oregon and Washington) and 1.5 percent in the Inland Northwest (Idaho and Montana). But the impact of the hardwoods on small woodland values can be much greater than that suggested by these overall proportions. Hardwoods can impart substantial value in terms of wood products, wildlife and fish habitat, soil productivity, aesthetics, and other diverse benefits. The goal of this article is to share working knowledge of hardwood silviculture to help inform your decisions and meet your goals related to managing hardwoods.

The basic steps in hardwood management are common to all tree species: site evaluation, site preparation, nursery seedling production, reforestation and establishment, maintenance, weed control, thinning, harvesting and marketing. The biggest gain from managing hardwoods (compared to not managing) comes from ensuring prompt regeneration that is both well-spaced and well-distributed across a management area. This can be achieved by planting or by re-spacing good natural regeneration. However, poor performance is common with natural regeneration that is often either too dense or too sparse across the area of interest.

Spacing and thinning

Temperate forest hardwoods generally need more space for a given size of tree compared to most conifers. Hardwoods tolerate a lower maximum density—number of trees per acre—at a given diameter. For example, spacing guidelines for red alder in comparison to Douglas-fir indicate that in a stand averaging 10 inches in diameter, red alder starts to self-thin (some trees die from overcrowding) at about 200 trees per acre (15-foot spacing) compared to about 300 trees per acre (12-foot spacing) for Douglas-fir (see Table 1). Whether or not thinning is needed and how much to thin depends on several factors:

- Your objectives for basic tree characteristics such as crown size, branchiness and stem taper: objectives for recovering timber value versus non-timber values.
- Crown vigor, tree age and rotation length: how much vigor is left in your trees and how long you expect to grow the trees before harvest.
- Markets for larger- (thinned) versus smaller-diameter trees (not thinned).

When the goal is to grow larger, older trees over longer periods thinning is essential to maintain crown vigor. Thinning may not be beneficial with short rotations or with low price premiums for larger versus smaller logs. Specific guidelines for spacing and thinning vary by species.

It is essential to give trees enough space to support a healthy crown. A general guide is to maintain at least 40 percent live crown ratio (the proportion of total tree height with live branches) for as long as possible through the rotation. Hardwoods build crown first by growing in height and second by spreading horizontally. Fast-growing hardwoods put on most height growth in the first 20 to 30 years, so getting the spacing right in the early years is key to setting the stand or patch up for good growth and stem form. Unlike conifers, hardwoods lean and curve towards the light, so uniform spacing and moderate crowding on all sides encourages relatively straight stems of good form.

Native hardwoods in pure stands or mixtures

Understanding the height growth patterns and shade tolerance of each species is key to management of mixtures. For example, black cottonwood, red alder, and Douglas-fir are all intolerant of shade and differ greatly in height growth pattern and response to crowding (see Figure 1). To sustain an intimate mixture of these species over a 50-year cycle requires strategic spacing to ensure that each species has enough light and growing space at different stages.

Managing hardwoods in even-aged patches or clumps of single species is often the easiest method because it is difficult to combine species with different growth rates. Even a one-tenth acre patch greatly reduces interspecies conflicts compared with more intimate mixtures and the forest is still well-mixed at the stand level. Most of the major hardwood species (other

Table 1. Stand density at self-thinning for red alder compared to conifers. Alder and other hardwoods need more space than conifers of the same size.

<table>
<thead>
<tr>
<th>Average DBH inches</th>
<th>Trees per acre threshold of</th>
<th>Self-thinning</th>
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<tbody>
<tr>
<td></td>
<td>western hemlock</td>
<td>Douglas-fir</td>
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<td>4</td>
<td>2035</td>
<td>1424</td>
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<td>5</td>
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than maple and tanoak are intolerant of shade and must have full daylight for good growth. Managing patches of the same or similar species simplifies spacing treatments and timing.

**Exotic hardwoods in pure stands or groves**

There is interest in management of high-value or fast-growing exotic species such as black walnut, black cherry, chestnut, and hybrid poplar or red alder clones. Failed attempts to grow exotic hardwoods in upland forest settings are common and successful practices are not well-demonstrated. It seems best to undertake culture of exotics in more intensive agricultural or agroforestry settings. There is interest in management of exotic species of interest.

**Pests, diseases and environmental stresses**

Hardwoods have their share of root diseases, stem cankers, bark beetles, leaf blights, defoliators and other pests. Overall, there have been few problems with native hardwoods on appropriate sites. Problems with dieback or poor performance have occurred in poor microsites within plantations or on marginal sites for the species. In many cases, after initial dieback, surviving patches of trees thrive where the underlying site conditions are more suitable. Disease and insect management becomes much more important in hybrid poplar or exotic hardwood plantations with high investment and uncertain adaptability of the species to the site.

Note that there are a few recent hardwood health issues to watch out for:
- emerald ash borer: tinyurl.com/NWAshBorer
- thousand cankers disease of walnut: tinyurl.com/WalnutCankers
- sudden oak death: tinyurl.com/OSUEm8877

**High-value hardwoods**

The expectation (or hope) of producing high-grade wood has driven the interest in hardwoods on the economic side. High-grade products include clear sawlogs, veneer logs, figured wood logs or flitches, wood turning blocks and others. Even if it is only a small proportion of total yield, sorting and marketing or adding value with further manufacturing can be the key. There are many wood entrepreneurs making a good living from high-value western hardwood.

Mainstream commodity markets exist for many western hardwoods, but market options and competition for your wood are very dependent on your location relative to scattered mills and buyers. Products include sawlogs, pulp logs, veneer logs and firewood. In most cases, the hardwood component of your woodland will have a major proportion of the lower-grade material, so having a place to sell this is important to make harvesting profitable, or at least to pay for your management activities.

**Benefits of hardwoods for ecosystems and wildlife**

A component of hardwoods in our conifer-dominated western forests adds biological diversity and increases quality and quantity of food webs in both upland and riparian forest systems. The various hardwood species can have a dramatic effect on soil properties, organic matter and nutrients, and pH (acidity) compared to pure conifer forests. While large conifers may be good for adding woody debris and structure to both aquatic and terrestrial habitat, the hardwood component enriches both food and nutrient cycles, from microorganisms and macroinvertebrates on up the chain to fish, amphibians, birds and mammals. Hardwood snags and logs of alder, cherry and birch may be short-lived, but intentional maintenance of fast-growing hardwood patches provides a continuous supply used by wildlife for both foraging and cavity nesting. And some hardwood species such as maple and oak provide valuable habitat for hundreds of years.

**Pacific Northwest**

Red alder and bigleaf maple are the most abundant hardwoods in the Pacific Northwest. Alder is well-known as a prolific pioneer species establishing and growing rapidly after logging, fire or flood. Key steps for successful management are well-known and well-demonstrated for red alder. Good performance of alder can be expected on appropriate sites in the coast range and west of the Cascades. Typical plantation management starts with establishment of 400 to 600 trees per acre to ensure initial dominance and moderate crowding. Early thinning or re-spacing to 200 to 300 trees per acre in the first five to ten years is common to maintain crown vigor and diameter growth. For timber production, rotations of 25 to 35 years are expected. Longer-term retention of alder is viable for a while, though alder is short-lived and usually declines after 70 to 90 years.

Higher value sawlogs and veneer logs for furniture grade lumber have provided sawlog markets in the $500 to $700/mbf range for logs six inches and greater in diameter. Larger
diameter logs (12’’) free of knots can bring much higher prices for select lumber and veneer. On good sites productivity of alder ranges from 100 to 200 cubic feet/acre/year, which is comparable to Douglas-fir but in shorter rotations.

Bigleaf maple is shade-tolerant and long-lived (~300 years) compared to alder. It is a viable component of both early and late stages of forest development. Productivity of ‘bigleaf’ maple can be similar to alder, though data on this is sparse. Maple is a mainstream lumber species and values for good quality sawlogs are comparable to alder. With maple, there is the potential for extremely valuable figured wood used in musical instruments and fine furniture. Partially-figured logs are worth more than plain sawlogs and maples with highly-figured wood can be worth thousands per tree. This occurs in larger trees and may be relatively common in some areas but exceedingly rare in others. Visual inspection of wood under the bark can detect the presence of ripple, quilted or birdseye patterns.

Both seedling-origin and stump-sprouting maple respond well to thinning. To improve quality and stability of maple sprouts, stumps should be cut less than 12 inches from the ground. Stem form and quality of sprouts is best with crowding from other trees on all sides.

**Inland Northwest**

Predominant hardwoods in the Inland Northwest are cottonwood, aspen and paper birch. Aspen is highly valued for its contribution to wildlife habitat and there are concerns about aspen forest decline in the absence of fire or other regenerating events. The hardwood types of the Inland Northwest are at the southern edge of a much larger extent of these types in Canada. Mixed-species management is of increasing interest for sustaining both ecological and economic values across Canada and the U.S. Efforts are ongoing to develop silvicultural systems, utilization and markets. The University of Idaho has been a leader in resource assessment and trials related to hardwood management and utilization, including both native and exotic hardwood species (Ron Mahoney, Idaho Extension forester, retired).

Managing aspen and birch mixtures with conifers can improve soil properties, wildlife habitat and ecosystem productivity, while providing more diversified wood products. Relatively rapid early growth yields substantial volumes of hardwood for both specialty and commodity markets. Innovative silvicultural systems being tested include two-stage shelterwood for promoting shade-tolerant conifers by removing some overstory hardwoods, and regenerating additional cohorts of hardwoods in patches with maturing conifers.

**Role of small woodlands**

Woodland owners are well-positioned as land stewards both to manage hardwoods and to benefit from the particular values of hardwoods. Woodland owners control an increasing portion of the hardwood resource and hardwoods are more abundant on private woodlands than all other ownerships. Short-lived hardwoods such as alder and birch are declining on federal forests managed for older forest conditions. They are also declining in abundance on intensively-managed private industrial forests as management favors conifer species. Advantages for woodland owners include:

• intimate knowledge of the quality, species and potential products;
• ability to control costs through personal effort;
• ability to focus on minor species and provide small quantities of specialty products;
• flexibility to seek specialty market options including value-added markets;
• ability to micromanage woodlands for personal priorities, regardless of strict return on investment.

**Summary**

Practicing hardwood silviculture is a cyclic process starting with goals and expectations, seeking guidance, trying some management practices, learning how hardwoods respond in the mix with other species, adjusting your expectations and trying again. Look for future opportunities to attend classes or field workshops, review online resources or just have a conversation in order to learn and share your experiences in hardwood management.

GLENN AHRENS is Extension forester, Oregon State University Extension Service, and director of OSU Hardwood Silviculture Cooperative. His general mission for OSU Extension is to improve Oregonians’ knowledge of forest resources and options for sustaining and expanding benefits from forests. Glenn has over 30 years of experience in research, Extension, and private consulting. His areas of specialty include forest ecology, vegetation management, and hardwood management. Glenn can be reached at 503-655-8631 or glenn.ahrens@oregonstate.edu.
McGovern Tree Farm: A Demonstration Forest

By ERIC FEMREITE

In 1903 Matthew McGovern, his wife, Mary, and their two young sons, Matthew Jr. and John, moved from Minnesota to Coeur d’Alene, Idaho. Three years later their youngest child and only daughter, Mary Alice, was born. In 1916, Matthew Sr. began acquiring undeveloped land in the Cougar Creek drainage southwest of Coeur d’Alene and by the early 1920s he gave his son Matthew Jr. this property. By 1931 Matthew Jr. had assembled his 238-acre “ranch”, known today as the Matthew M. McGovern, Jr. Memorial Tree Farm (McGovern Tree Farm).

The McGovern Tree Farm, was donated to the College of Natural Resources (CNR) at the University of Idaho by Ms. Mary Alice McGovern in 1994, in memory of her late brother. Her wishes were that the property be managed in perpetuity as a tree farm. The McGovern Tree Farm demonstrates how private forest owners can forever benefit from the management of their forests. The forest is managed to sustain a complete range of forest and wildlife benefits with the specific objectives of creating natural resource demonstration areas using state-of-the-art forest practices and enhancing diverse forest ecosystems.

In March 1994, a Memorandum of Understanding between the CNR and Northwest Management, Inc. (NMI), a full-service forestry consulting firm in Moscow, Idaho, was established. Under this agreement, the property is managed jointly by CNR and NMI from the perspective of a prudent private landowner seeking periodic financial returns while practicing sustainable forest management. Other outlying properties belonging to the University of Idaho Experimental Forest are managed directly by CNR under the supervision of Experimental Forest manager, Dr. Robert Keefe.

Stewardship activities on the McGovern properties are carried out primarily by students as part of undergraduate coursework and student employment. According to Dr. Keefe, “Working with NMI has been a great model at the McGovern Tree Farm because it fits closely with Mary Alice McGovern’s wishes for the property. It also provides opportunities for our forestry students to work alongside experienced professionals and gain hands-on experience with consulting forestry.”

Various silvicultural prescriptions, through harvesting and fuel treatment projects, have been implemented on the McGovern Tree Farm starting in 1996, with the most recent harvest taking place in 2013. Before any silvicultural prescriptions were implemented, a forest management plan was developed by NMI. The management plan set forth a regime to accomplish the goals identified as long-term maintenance of the property as a tree farm with specific emphasis on forest health, periodic income, minimum environmental degradation and development of demonstration areas. The entire ownership was divided into a series of management blocks for evaluation purposes. These blocks are delineated based on timber type, silvicultural prescription, harvest method and other unique attributes.

The regimes in the forest management plan were projected over the next 30 to 50 years with an emphasis on uneven-aged timber management practices whenever possible. Implementation of the plan provides periodic income while maintaining a healthy productive forest, and habitat for fish and wildlife. Short-term management flexibility is essential to any tree farm. Even-aged management prescriptions have been blended into specific areas as short-term remedies to specific forest health issues, and for

–Continued on next page–
The dominant tree species present on the property are Douglas-fir and ponderosa pine on the south-facing slopes, and Douglas-fir, western larch, grand fir and western hemlock on the north-facing slopes. Western redcedar and western hemlock occur more often in densely-shaded draws and along waterways. Western white pine is present sporadically throughout the property as well. Understory vegetation includes Rocky Mountain maple, red alder and serviceberry in the tall shrub component; ninebark, oceanspray and spirea comprise the low shrub component.

In 1996, a new 3.5 mile road system was designed and constructed to access the majority of the management blocks. This allowed access to the areas identified as needing the most attention and planned demonstration areas, developed by CNR and NMI.

Following road construction, timber harvests were conducted to create small silvicultural demonstration areas with the following prescriptions: clearcut and re-plant, seed tree, shelterwood and sanitation-salvage.

The following year, a second entry occurred in a small area where an adaptive management system was demonstrated to implement a commercial thinning harvest. This block was composed predominately of even-aged Douglas-fir with several areas of root rot. Competition for available water, light and nutrients was stressing the trees and increasing their susceptibility to insects and diseases. Densely-stocked areas were commercially thinned.

The goal of this prescription was to reduce competition, allowing for increased growth in the residual stand of timber. Promotion of a multi-layer stand structure, composed of multiple age classes, allows for periodic harvesting. As a result of this harvest, the residual stand of timber did see a significant growth rate increase. Root rot pockets were planted with ponderosa pine and western larch. Natural regeneration occurred throughout this area and, five years following the harvest, it was adequately stocked with two age classes of trees. This allows for commercial thinning of the merchantable trees every 10 to 15 years.

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Basic Growth and Yield

By DAN GREEN

It is hard to know where to start this article and even harder to know where to stop it. I will risk offending most of you by starting at the beginning. Most trees begin life as a seed. The seed sprouts and for a period of several months in the spring and summer of that first year the embryonic plant in the seed changes into a tiny seedling with the beginnings of a stem, leaves and roots. The seedling absorbs water, sunlight and minerals and grows. Or, if it is unlucky, it does not have enough of one of those resources and it dies.

Fall and winter come and not much, if any, growth occurs. But in the spring the plant begins again to grow.

There are now two types of growth occurring and they will occur every spring and summer until the tree dies. The buds that were set on the stem the year before swell, break open and a new shoot grows out from the bud. If the bud is at the top, it should (doesn’t always) grow up to be the leader and eventually the stem or bole of the tree. If a bud is anywhere else it should (but doesn’t always) grow laterally and eventually form a branch of the tree. In the fall, these shoots will form buds and next year the process will repeat all over again. A similar process is occurring with the roots.

The other type of growth is radial. Just under the bark of each tree, above and below ground, is the cambium, a layer of cells responsible for increasing the girth of the stems and branches. Each spring and summer these cells add a growth ring to the roots, the stem and the branches. We have all counted growth rings and are familiar with this radial growth.

Adding height and girth are essential if a tree is going be dominant in its stand. In any forest there are only so many resources (water, sun, minerals) available to the plants and if a tree is not dominant it gets less of those resources and begins a long slow decline. A forest that has 1000 trees per acre at year 10 may have only 200 at year 60 and 100 at age 100. Dominant trees will increase in the overstory and lesser individuals will comprise the understory. Unless some disturbance (e.g., fire, wind, logging) changes the balance, this tyranny of the dominant trees will continue for decades. They will get taller and more stout, and, for most of us tree farmers, that is a good thing.

The rate at which this happens over an area and over the decades is determined by lots of things. The science of silviculture deals with the manipulation of these factors to create stands that meet certain goals of humans. We can thin the stand so that the dominant trees have even greater space and a greater share of the resources. Or, we can remove some of the dominant trees so that understory trees can get a greater share of the resources. Or, we can do nothing and let nature take its course. Or, we can clearcut and start over. I don’t think the trees care what happens, but people often do.

In fact, people often want to predict how rapidly this kind of change in size occurs. To most foresters, this is what growth and yield is all about. It is complicated. It is never a “one size fits all” kind of prediction. And it is hard to say much of substance about it in a very basic article. As an example, a stand of timber on your forest might be growing on a north-facing slope while another similar stand is growing on a south-facing slope. In Medford, Oregon the north-facing slope will probably do better because it requires less water to grow on a shady north slope than a droughty, hot south slope. But in northern Washington the north-slope trees may not do as well.
as the south-slope trees because, while they both have plenty of water, the north slope will have less sunshine.

Growth and yield predictions need to take these factors, as well as many others, into consideration. In the last century this was done using tables compiled by the pioneers of the forestry profession. The tables got progressively more useful as time went on and, in my opinion, the tables published by Charles Chambers of the Washington Department of Natural Resources are the best overall for unmanaged Douglas-fir, hemlock, and westside mixed species forests. I am no expert on eastside growth and yield but somewhere there are tables for those species, too. Tables are within the scope of anyone to learn to use but they are not simple. Usually when someone needs growth and yield calculations they work with a forester.

In the more recent times, growth and yield tables have given way to computer models. These models do the same job as the old tables but with much more complexity and potentially more accuracy. If you have reason to need good growth and yield calculations, you need to explore growth and yield models. Nothing about them is so complicated that an experienced layman could not operate them, but they are far from being simple.

Beware of putting too much importance on predicting growth and yield. Like so many other things, it can be measured but there is a cost in time and money to do so and there is uncertainty in the answer. Always ask yourself why you need to know something, what the cost will be, and what you can do with the information that you could not do without it.

Growth and yield calculations allow comparison of opportunities to determine which is going to give a better yield, or to predict the volume of a forest at a future time. If knowing either is important, you need to learn to use the tables or the computer model, or talk to someone who works in that arena.

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I’m going to go out on a limb here and hazard a guess that most foresters didn’t spend an inordinate amount of their free time at college pondering the impact that the life cycle of a forest might have on the federal government’s cash flow.

Fortunately, this riveting concept has been considered at length by at least two parties—the federal government and yours truly. Granted, the effort didn’t seem to garner either of us a great deal of fame and adoration, but it at least gives me an opportunity to run through the basics in this article.

As Wikipedia defines it, silviculture is the practice of controlling the establishment, growth, composition, health, and quality of forests. So, in keeping with this, I am going to approach the topic on a timeline from site preparation to tree maturation. Each stage of the cycle has its own unique set of revenues, expenses, activities and goals. With each of these comes a similarly unique set of financial and tax considerations.

To begin the process we need to consider what distinguishes establishment from growing, because the two have very different tax and accounting consequences. The IRS position is that establishment begins with site preparation near the end of the harvest. That is to say, the IRS normally expects some amount of post-harvest activity to be capitalized to the new plantation as initial site preparation activities. Examples of this are removing previously deposited debris, and otherwise making sure the earth is ready to receive the seedlings.

But that’s only the initial part of the establishment process. Most of the costs of replanting need to be capitalized and deducted in future years. Fortunately, in 2004 a new and very advantageous law was enacted that allows a taxpayer to elect, via specific protocol, to expense the first $10,000 “with respect to each qualified timber property.” Any amounts beyond this may be expensed over a seven-year period. Previously most of the reforestation costs could not be expensed until ultimate harvest, 40+ years in the future!

Another thing about this establishment phase has to do with seedlings. Often seedlings will be contracted to another party on behalf of the landowner, normally requiring some amount of deposit and/or advance payment. These expenditures cannot be deducted until those seedlings are in the ground two or three years in the future, at which point they become eligible for the seven-year expensing regime noted above.

So, notwithstanding the foregoing, there is commonly a fair amount of confusion about when establishment ends and growing begins. Establishment costs must be capitalized as planting costs, while growing efforts are simply routine annual activities that generally can be deducted as incurred. In the Pacific Northwest it is accepted, at least by the IRS, that two to three years is a reasonable period for establishment. Sometimes this includes a plant audit and additional seedling planting, some initial suppression efforts, and other “first-year” activities; spraying in year eight or a commercial thinning in year twenty are clearly growing activities. However, these are only rules of thumb and each project needs to be evaluated for its own unique facts and circumstances.

As mentioned above, most silvicultural expenditures incurred while simply growing your trees are imme-
The wages of the foresters, the gas used in their trucks, monitoring for habitat and biology, routine suppression, and all of the things that happen in a routine year on a farm while the trees are maturing. From time to time a thinning is necessary.

With a commercial thinning comes both revenue and expense. Commonly the latter exceeds the former, but it’s an income-generating event nonetheless. So the process, from an economic standpoint, requires tracking of the revenue and direct expenses (e.g., logging and hauling) so they can be properly reported. Also, with thinning there actually are a handful of tax planning opportunities. Unfortunately those are beyond the scope of this article so we’ll have to follow up in the future.

So far there’s been a distinction made between establishment and growing, and at least a few phases within each of those two periods. But from a tax and accounting standpoint there is another very important determination: when the trees transition from premerchantable to merchantable. This is important primarily because that is when the costs and volume of wood transfer into the pool, which is eligible to be deducted when the trees are harvested (i.e., depletion expense).

Obviously, the age at which a Northwest conifer becomes mature is highly debatable. It’s also going to be much different than when a New Zealand conifer, New England hardwood, or husband does. So two things are quite important when establishing the age—the reasonableness of the estimate (i.e., acceptability to the IRS) and the consistency of the estimate’s application. In short, when dealing with Northwest conifers, you’re generally safe using any age from 20 to 35 years. My observation has been that most companies use 20 or 25 years, and follow it consistently every year. (Yes, we all know that no one ever harvests at 20 years, but that’s a bigger technical debate.) One final point: this decision has many very subtle implications on your taxable income and should only be made after careful consideration.

Disclaimer: To ensure compliance with requirements imposed by the IRS, any tax advice contained in this communication was not intended or written to be used, and cannot be used, for the purpose of (i) avoiding tax-related penalties that may be imposed on the taxpayer under the Internal Revenue Code or applicable state or local tax law, or (ii) promoting, marketing or recommending to another party any tax-related matter(s) addressed herein.

Send in Your Tax Question

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We count trees, not beans.
DEAR TREEMAN, My neighbor and I want to make a deal on moving our property lines so they correlate to the existing fences. When I bought the property I had a survey done so I know for sure that the correct boundaries are not the same as the fences. We have agreed on the location of the lines, but neither of us wants to pay for a surveyor to survey a couple acres of forestland containing no dwellings and write up a brand new property description. Is there an easy way out of this? — Mike

DEAR MIKE, One might surmise that the mere swap of a few acres, benefiting all interested parties, isn’t any big deal. That is until myriad state and local governmental agencies, rules and regulations enter the picture. So here’s the good news/bad news report. Keep in mind that this pertains to the state of Oregon.

If permissible, property line adjustments are to be recorded with the respective counties in which they reside. The original legal description has been recorded and if you’re fortunate enough to have your plan accepted, a new legal description is required for the amended property. This should be performed by a licensed surveyor or attorney. A survey is not required, but an accurate statement of the boundaries is necessary before any transfer can take place. This information can be gleaned by referencing points such as existing fences or roads, but they must be in relation to township, range and section.

If the logistics of the process resides within the parameters of your interest and finances, then every county requires you apply for a Conditional Use Permit: key word here is “conditional.” The state of Oregon land use planning rules require a tract to be a minimum of 80 acres to be zoned as forest land. Dating various zoning laws, parcels of forestland exist that do not meet the 80-acre threshold, but the 80-acre size must be maintained in any future property transactions.

The key here is 80 acres: you can stay above this threshold, but you can’t go below it. If your adjustment results in one of the tracts going from 81 to 79 acres, do not pass go—do not collect $200. If not, the next step is consideration of county requirements; they have their own individual provisions. “Conditional” may well constitute different requirements in Lane County than it does in Grant County. A key for the applicant is to keep the plan as simple and straightforward as possible. And remember, the ultimate success of your endeavor is not limited to the contents of the permit, but the recipient thereof. Translation: you catch more flies with honey than you do vinegar. Put a smile on your face and a thank you on your lips. — Treeman

DEAR TREEMAN, To follow up on your last Treeman column, can you tell me if Native American arrowheads are made of flint or obsidian? Or is flint just a broken off piece of obsidian? — Cathy

DEAR CATHY, One topic at a time. Obsidian is a naturally occurring volcanic glass, formed as an extrusive igneous rock. Igneous rocks are formed from the solidification of molten rock material. There are two basic types: 1) intrusive igneous rocks such as feldspar and granite that solidify below Earth’s surface; and 2) extrusive igneous rocks such as basalt, pumice and obsidian that solidify on or above Earth’s surface. Obsidian forms when molten rock material cools so rapidly that atoms are unable to arrange themselves into a crystalline structure. It is known for its characteristic glossy appearance and smooth texture. Obsidian-bearing volcanoes are typically located in or near areas of crustal instability or mountains. In North America, it is found only in localized areas of the West, so if we consider Native Americans indigenous to our region, arrowheads may have derived from obsidian.

On the other hand, flint (chert) is a form of quartz, or silicon dioxide, also called silica and is widely distributed around the world. Quartz is the second most abundant mineral in the earth’s continental crust. As such, flint has been used by humans to make stone tools for at least two million years and was perhaps the most commonly used rock in making arrowheads throughout history. In consideration of our indigenous tribes, arrowheads might have originated from flint.

Arrowheads can be found throughout most of the United States. Depending on the tribe, they may have been made from flint, or obsidian… or bone, antler, chert or quartz. The arrowheads found in some areas are unique because the type of rock or material used to create them cannot be found in the area for hundreds of miles. This reinforces the belief that materials used for arrowheads were traded for other items such as food or clothing. Extrapolate the argument and we can accurately submit our regional tribes could have made arrowheads from a variety of materials, both indigenous and imported.

If we include Alaska in our calculations, walrus tusks can be considered, along with flint, obsidian, antlers and bone. Regarding our region, and in consideration of the information gleaned through our research, obsidian gets the nimrod’s nod for the arrow’s abundant appendages. And you thought we could resist the temptation? The avant-garde of alluring alliterations? Please! — Treeman
McGovern Tree Farm: A Demonstration Forest

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This block demonstrates how a landowner can sustainably harvest merchantable timber while promoting natural regeneration to create a multilayer stand structure.

A third harvest entry on the McGovern Tree Farm took place in a block on a south aspect slope, composed mostly of ponderosa pine with lesser amounts of Douglas-fir and grand fir. The silvicultural prescription for this block was a seed tree harvest to promote ponderosa pine and Douglas-fir growth (best-suited for this warm and dry site), through harvesting of the grand fir. The concern for this prescription was the heavy brush component in the understory that could potentially limit natural regeneration. The two main brush species, oceanspray and ninebark, are common in this area of the Inland Northwest, especially on south aspects. If the brush is already well-established, one can expect it to have an impact on the natural regeneration process by outcompeting the seedlings.

Three years following this harvest, it was determined the brush component of concern in this block did, in fact, limit natural regeneration. Some natural regeneration did occur but some areas were inadequately stocked. It was determined the best approach would be to interplant additional ponderosa pine seedlings in this area, with vegetation control of the brush at the same time. As a result, this block is at the preferred stocking level. Although the outcome of this harvest was anticipated, it was used as a demonstration site for research and teaching, which is the intended use of the McGovern Tree Farm.

This year, University of Idaho researchers Dr. Robert Keefe and Dr. Tim Link are installing treatments along Cougar Creek, which bisects the McGovern property. This new demonstration area will show alternatives for treating stream areas under Idaho's new Class I stream shade rule.

A 1.5-mile McGovern Tree Farm interpretive trail was developed and installed by the University of Idaho recreation program to demonstrate various silvicultural practices. A brochure obtained at the entrance kiosk will guide visitors along the trail and explain forest activity at the various stops. The McGovern Tree Farm is being used today as an opportunity for hands-on experience for high school science classes, and to facilitate Extension programs for loggers and forest owners. It is open to the public by foot traffic only for learning and recreation. For more information, please contact University of Idaho Experimental Forest staff at 208-310-0269. ■

ERIC FEMRÉITÉ has worked as a private land management specialist, logging scale analyst, reforestation manager, emerging market project lead and now as the Land Operations Division manager for Northwest Management, Inc. He provides training and leadership on a wide variety of projects for a diverse clientele, develops stewardship plans and industry efficiency targets, and has extensive training in prescribed burning and wildland firefighting. Eric’s background in project development and emerging business development has made him versatile in managing any size project whether it requires a briefcase or “boots on the ground”. Eric can be reached at 208-883-4488 x134 or femreite@consulting-foresters.com.
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