Managing Woodlands in the Coastal Fog Belt

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Photo: Lynn Ketchum, © Oregon State University

Figure 1. Woodlands in the coastal fog belt are highly productive.

Landowners face special challenges and opportunities managing woodlands in Oregon's coastal fog belt. This publication discusses forest management treatments that allow you to achieve your goals in this fast-growing environment. We will also explain how several important timber species grow best in specific sites. (Figure 1)

The Fog Belt

The fog belt is bordered by the Pacific Ocean to the west and the Coast Ranges to the east (Figure 2, page 2). It is relatively cool and moist much of the year. In coastal valleys and lowlands, the fog belt may extend 15 to 20 miles inland. In other areas, it may only be a few miles wide. Fog often shrouds the area during summer. In winter, the region receives heavy rainfall from storms coming off the Pacific Ocean. Snow is usually wet and heavy and melts within a few days.

The 360-mile Oregon fog belt extends over a range of vegetation types. Western hemlock, Sitka spruce, western redcedar, red alder, and Douglas-fir are prevalent throughout the range with a gradation to Oregon myrtle, tanoak and Port-Orford-cedar to the south. Impenetrable thickets of salmonberry, elderberry, huckleberry, salal, and vine maple fiercely compete with crop-tree species and provide important food and cover for wildlife. Reducing competition for crop trees, while maintaining diversity for wildlife habitat objectives, is one of the challenges of managing woodlands in this region.

Forest litter decomposes rapidly in the warm, moist environment, leaving a deep humus layer, rich soils, and highly productive woodlands. Stand growth can quickly lead to overstocked conditions, and understocked sites with poor site preparation prior to planting will rapidly produce dense shrubs. The climate also provides optimum growing conditions for invasive weeds and forest pathogens.

These conditions, coupled with steep slopes, demand that landowners protect the soil from excessive surface erosion, massive soil slumps, and compaction, especially during road-building and timber-harvest operations.

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Figure 3. Woodland owners have a variety of ownership objectives.

Landowners should avoid operating heavy machinery on wet soils and should prevent waste soil and debris (sidecast) on steep slopes during road construction or maintenance.

Woodland owners in the fog belt and other regions have a variety of ownership objectives (Figure 3). Some landowners are mostly interested in income from a healthy forest, while others primarily want a cabin, solitude, beautiful surroundings, and abundant wildlife on their property. Some value all these goals. Whatever your goals, well-defined objectives and plans will help you avoid costly mistakes by taking advantage of the fog belt's rapid growth instead of being overwhelmed by it.

Tree Establishment and Vegetation Management

Tree Establishment

To successfully establish trees, landowners must reduce logging debris (slash) and remove competing vegetation through mechanical, chemical, or manual methods. Whether you have recently logged your property or are reforesting a shrub patch, proper site preparation helps ensure reforestation success. Slash, weeds, and compacted soils can kill seedlings, so reduce competing vegetation and replant seedlings as soon as possible after harvest.

Select species and nursery stock best suited for your property. Many landowners rely on high-quality nursery seedlings grown for their specific seed zone. This ensures seedlings are adapted to the site's climatic conditions. Other landowners choose natural regeneration, relying on nearby "seed trees" to disperse seed to the site. Natural regeneration is risky; a bad seed year, poor-quality seed stock trees, or poor environmental conditions for germination all affect seedling survival. Take into account the susceptibility of tree species to insects and disease. In known pockets of laminated root rot, for example, plant western redcedar (resistant to the disease) or red alder (immune to the disease) to prevent disease spread. Any reforestation method must meet Oregon's Forest Practice Standards.

Controlling Competing Vegetation

As your trees become established, monitor the regrowth of competing vegetation. Shrubs, grasses, and other plants stabilize soil

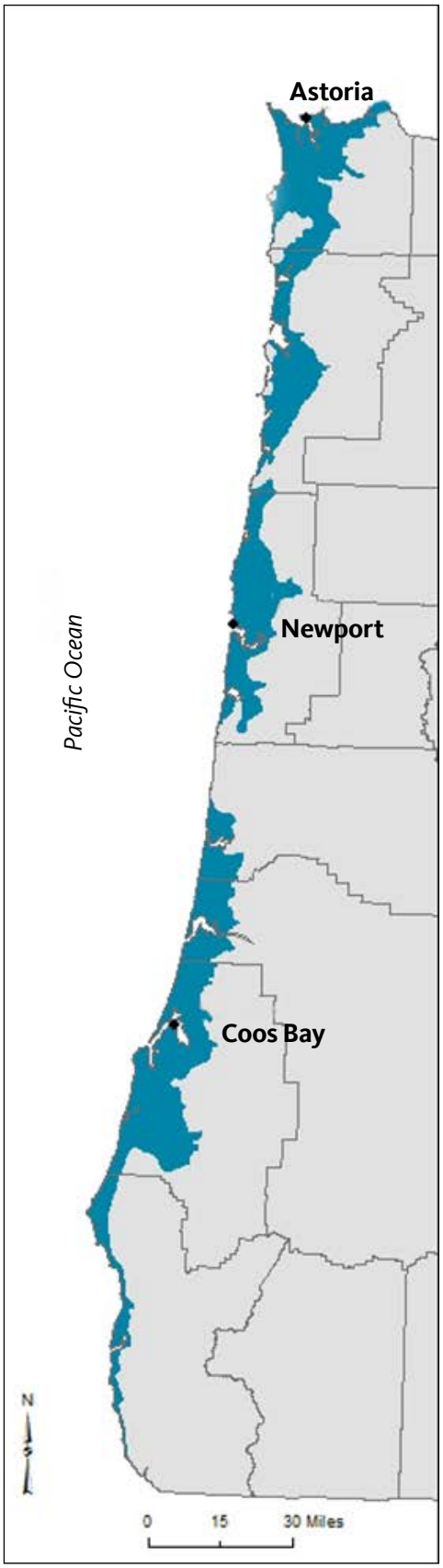

Illustration: Norma Kline, Oregon State University

Figure 2. The blue-shaded areas represent the coastal fog belt along the Oregon Coast.

Photo: Jon Souder, © Oregon State University

Figure 4. Dense thickets of vegetation are common in the coastal fog belt.

and provide wildlife habitat, but they also compete with regenerating conifers and hardwood species (Figure 4). Aggressive shrub growth in the fog belt can quickly overtop seedlings and young trees, suppressing and eventually killing them. Grass is a fierce competitor for moisture on drier sites. Vegetation management helps new seedlings and enhances their growth rate after establishment. Manual, chemical, and mechanical methods of vegetation management each provide advantages and disadvantages depending on your management objectives, time and budget.

Hardwood Management

Many landowners now manage native hardwood trees, once considered weed species, for timber production and other objectives. Hardwood establishment is different from conifer regeneration. Alder and Pacific madrone need mineral seedbeds, abundant light, and protection from temperature extremes, while oaks and chinkapin regenerate in leaf litter. Alder requires summer moisture and does best on lower slopes; ridgetops are generally too dry. Planting hardwood seedlings from mid-March to mid-April reduces the likelihood of frost damage. Control competition to ensure good survival and growth of hardwood seedlings.

Climate, Weather and Animal Damage Protection

While most woodland owners enjoy seeing wildlife on their property, heavy browsing, rubbing, or root consumption can hinder reforestation success. Monitoring is an important way to assess and manage animal damage. If you leave a unit unchecked for a long period of time, you may return to find a shrub patch because your seedlings were killed by mountain beaver (a medium-sized burrowing rodent prevalent in western Oregon) or browsed by elk. It may be necessary to trap mountain beaver. You can hire a contractor or rent equipment and trap the animals yourself. Budcaps, plastic tubing, or spray repellents can reduce damage from elk and deer. Budcaps are small paper or nylon sleeves that are seasonally moved up along the seedling's leader to protect it from becoming a

Photo: Norma Kline, © Oregon State University

Figure 5. Western redcedar damaged by foraging bear.

tasty snack. In young forests, foraging bear can cause significant damage by peeling bark from the base of trees. (Figure 5).

Some woodland owners retain competing shrubs and vegetation for elk and deer to browse. When using this approach, protect your seedlings and monitor the area carefully. Similarly, you can retain broadleaf vegetation to attract songbirds, which feed on insects and reduce the tree damage insects cause.

Woodland owners sometimes plant tree species outside their natural range for variety or in anticipation of shifting climatic conditions. Species adapted to drier, colder, or snowy climates may not be suited to the wet, cool climate in the fog belt, and many of these species are more susceptible to insects or diseases in this climate.

Strong coastal winds can damage or topple trees on your property. Study the prevailing wind patterns on your property and protect newly thinned stands by leaving an unthinned buffer of trees. You can also make multiple light thinning entries in dense stands.

Managing for Your Objectives: A Forest Management Activity Timeline

Use the Forest Management Timeline (Table 1, page 4) and the Major Timber Species Selection Guide (Table 2, page 6) to develop management objectives for your fog-belt woodland. Tree spacing decisions, from initial planting throughout the life of a stand, have a significant influence on stand structure and growth. In general, maximize timber production by choosing your primary species from Table 2 (page 6) and plant to fully occupy the site. Alternatively, to emphasize wildlife

Table 1. Forest Management Timeline

Stand age (years)	Treatment Type[1]	Wildlife Considerations
0-2	Site preparation and reforestation	Consider a diverse mix of tree species
2-5	■ Monitor for survival and free-to-grow[2] status ■ Control competing vegetation	Consider leaving more shrubs
5-10	Control competing vegetation; use spot treatments if necessary	
10-20	■ Thin to reduce stand density for stand health or wildlife habitat	Create or retain gaps for wildlife habitat
20-40	■ Monitor for density and stand health ■ Commercial thinning opportunities ■ Final harvest opportunities	■ Leave woody debris and create snags ■ Variable density thinning
40+	■ Commercial thinning opportunities ■ Final harvest opportunities	■ Continue monitoring forest health and structure. ■ Leave woody debris and create snags

1. Note that this timeline is for a typical fog belt woodland, it describes a trajectory for stands that are successfully reforested and well stocked.

2. "Free to grow" means that a tree has a good chance of outgrowing competing grass and brush to become part of a vigorous, healthy forest.

habitat, choose a variety of species and create or allow gaps and irregular spacing. Gaps and spacing will allow for sufficient growing space (sunlight, nutrients, and water) for understory vegetation to develop. Timber and wildlife values are not necessarily mutually exclusive, depending on the type of wildlife habitat you are trying to create or maintain. The Forest Management Timeline was developed for even-aged forests that were completely cleared during timber harvest, a common condition in the coastal fog belt.

Young Forests

After the initial planting and vegetation management stage, monitor and manage the density of young stands.

Photo: Norma Kline, © Oregon State University

Figure 6. Overstocked conditions.

Pre-commercial thinning may help the stand grow vigorously by reducing tree crowding and canopy loss. Consider thinning 10 to 20 years after planting; a delay of just five years from the optimal time may result in overstocked conditions causing slow tree growth and mortality of some trees. Delayed thinning will result in tall, spindly trees with a small crown size. Stands like this will require more-frequent, low-intensity thinning to prevent thinning shock (a condition that stops the tree from growing) and blowdown (Figure 6).

Continue monitoring your young stands for weeds after site preparation and planting. Many weed seeds survive for years in the soil or are brought in by animals or machinery. Treat weeds immediately to prevent bigger and more costly problems. Monitor roadsides and forest openings for scotch broom and gorse. English ivy and holly will grow in understory shade (Figure 7).

Photo: Lynn Ketchum, © Oregon State University

Figure 7. Monitor your woodlands for invasive weeds.

Economic Objectives

Landowners with an economic objective should monitor density and consider pre-commercial thinning to maintain stand health and desired species composition. Elk and bear damage are primary challenges.

Wildlife/Aesthetic Objectives

Landowners with wildlife and aesthetic objectives should also monitor density carefully in these early years. These landowners will find that variable density thinning (thinning more heavily in some areas, and more lightly in others) creates a diverse understory beneficial to wildlife. Coastal forests without management or disturbance can attain high densities very quickly. Take a walk through these dense conifer stands and you will find, aside from it being very dark and hard to see, few shrubs and smaller trees in the understory and probably less wildlife. This is because most of our native shrubs, forbs, and hardwood trees need sunlight to thrive. Shrub species help wildlife. Managing for a diverse native forest will increase the numbers of songbirds, woodpeckers, and small mammals in your woodland.

To grow wildlife habitat:

- Thin dense conifer stands to encourage understory development and add gaps
- Plant or encourage hardwoods and berry-producing shrubs
- Leave some unthinned areas
- Leave large snags (standing dead trees) and down woody debris (logs) for wildlife habitat

The inherent messy nature of fog-belt forests with their flowering native shrubs and occasional dead tree might be attractive diversity to some landowners. Others may value a more parklike appearance with mown lawns and pruned trees, forgoing some of the wildlife values.

Mixed Objectives

Fog-belt owners with mixed objectives may choose to manage in some range between those with primarily economic or primarily wildlife goals. Some landowners divide their property into stands with different primary purposes. A steep, difficult-to-reach area might be managed as wildlife habitat, while an area near a road might be managed primarily for income. Another possibility is to take a hybrid approach; thinning to create fast-growing trees, leaving some gaps for shrubs and possibly forgoing optimum economic returns in the future.

Mature Forests

Trees in the coastal fog belt that are over 40 years old can reach heights of over 150 feet. Management actions in these stands take specialized skill and equipment to safely cut and remove trees (Figure 8).

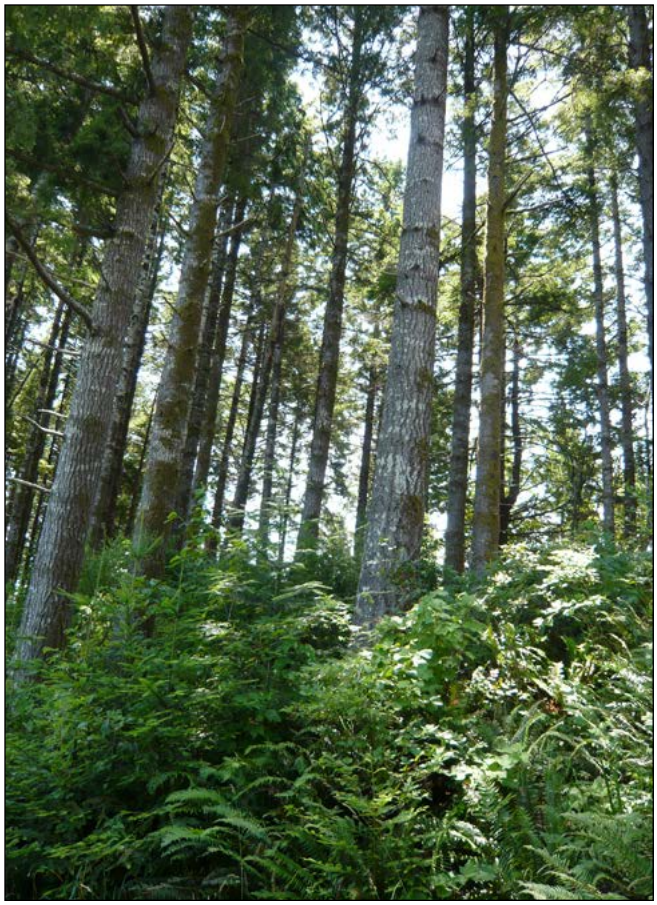

Photo: Norma Kline, © Oregon State University

Figure 8. A mature forest in the fog-belt region.

Economic Objectives

Landowners with primarily economic goals may choose to clearcut harvest stands of timber at this stage depending on log prices and access. Commercial thinning may be an option if log prices are favorable and easy access keeps logging costs low. Considerations for commercial thinning will often depend on past management. Pre-commercial thinning of young stands will prepare a stand for more options at the mature stage. Dense stands with receding crowns may not respond well to thinning. Take precautions for wind during thinning. Keeping in mind the cost, thinning may be more desirable for a landowner doing their own felling and logging. Challenges faced in this period are bear damage and fluctuating timber markets.

Wildlife/Aesthetic Objectives

Landowners with wildlife and aesthetic objectives will often choose to maintain stand health, wildlife habitat, and aesthetic quality by continuing to thin mature stands. As noted above, past management, conditions of tree crowns, and exposure to wind are all important considerations. Create and maintain wildlife habitat by retaining species diversity during

Table 2. Major Timber Species Selection Guide

Characteristic	Douglas-fir	Western hemlock	Sitka spruce	Western redcedar	Red alder
Site requirements Drainage tolerance	Grows only on well-drained sites	Tolerates moderate drainage	Tolerates poor drainage	Tolerates poor drainage	Tolerates poor drainage
Biological risks Root rots	Locally high	Locally moderate	Low	Low	Low
Insects	Low	Low-moderate	High	Low	Low
Big game	High	Low	Low	High	Low
Mountain beaver	High	Moderate	Low	Low	Moderate
Management characteristics Intensity of required management	High	Low	Moderate	Moderate	Moderate-High[1]

1. Unlike naturally occurring alder, alder managed in plantations for production require moderate to high management intensity.

thinning (including both hardwoods and conifers), creating gaps, and leaving snags and downed logs. This does not preclude removing wood for personal use or sale. A great option to balance economics with wildlife benefits is to retain defective trees for snags, leave a few blowdown trees for down logs while removing better-quality trees for lumber. Low levels of bear damage, laminated root rot, and Swiss needle cast will provide natural diversity valued by many wildlife species.

Mixed Objectives

Some landowners with mixed objectives may delay a final harvest past the optimum economic time to enjoy the unique qualities of a mature forest. Others may choose to clear-cut harvest some areas while thinning other areas for wildlife habitat or aesthetic quality.

Selecting Your Woodland Species

Planting and maintaining a mixture of species in your woodland provides forest health benefits and diversity in the coastal fog belt. As timber market conditions fluctuate for tree species over time, it may benefit a small woodland owner economically to have a portfolio of different species to harvest.

Pathogens and some forest insects thrive in the moist habitat of these forests. Mixed stands may offer some “insurance” against losses from these pests. Western-hemlock is subject to attack by the hemlock looper and sometimes suffers from Armillaria root rot. Douglas-fir is susceptible to Swiss needle cast and laminated root rot. Sitka spruce is deformed by the spruce weevil. Each species differs in susceptibility to browsing or clipping by deer, elk, mountain beaver, rabbit, and mice.

Locally, one species may be affected more than another by such problems. For example, avoid planting Sitka spruce on warm sites, such as southern exposures

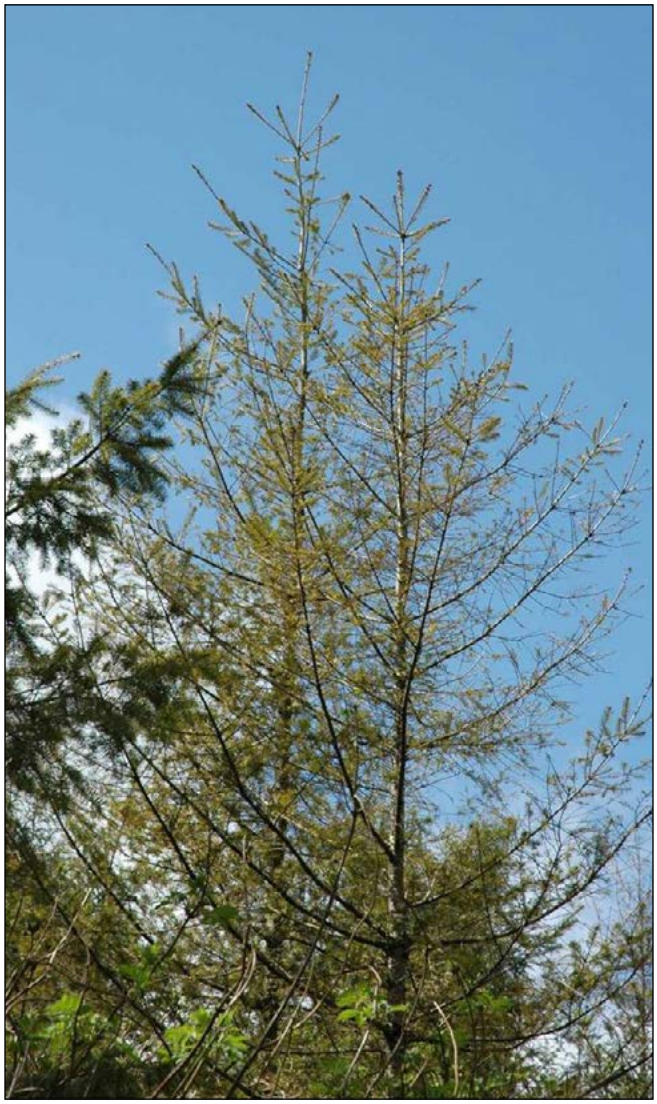

Photo: Stephen Fitzgerald, © Oregon State University

Figure 8a. A Douglas-fir tree shows symptoms of Swiss needle cast, a foliage disease.

Photo: Stephen Fitzgerald, © Oregon State University

Figure 8b. A Sitka spruce shows signs of spruce tip weevil damage.

at the interior edge of the fog belt, because the weevil will cause severe damage in those locations. Also, encouraging a mixture of spruce and Douglas-fir with western hemlock will create a less-favorable situation for hemlock looper attack. (Figures 8a, 8b, page 7)

Encourage mixtures either during planting or during precommercial thinning. During precommercial thinning operations, you can encourage a mixture by eliminating some of the more numerous species present. A red alder and a western hemlock have different growth habits, meaning they take up a different amount of space in the canopy. Consider planting a mix of such species in patches to better accommodate this growth pattern.

Western hemlock favors cool, moist conditions; it is more prominent in the coastal forests than inland. It grows well in shady locations and grows rapidly as an individual tree and in a stand. Hemlock seedlings grow best in protected areas and out of direct sunlight. Soil should be rich, moist, and high in organic matter or duff. The seeds germinate and grow on dead, rotted logs and other organic matter in the shade. However they can also start on bare mineral soil that is exposed during logging or site preparation. Once it gets started, hemlock grows best on well-drained soils and can survive in the shade of other species. Hemlock forests in the fog belt produce up to 15 percent more volume per acre than Douglas-fir. Western hemlock is historically less valuable at the mill than a similar-sized Douglas-fir.

Photo: Lynn Ketchum, © Oregon State University

Figure 9. Western redcedar tolerates shady understory conditions.

But hemlock and hemlock-spruce combinations do produce more wood volume per acre. Western hemlock is prone to injury during thinning, amplifying exposure to rot.

Douglas-fir also occurs in the fog belt. It requires well-drained soils for best growth. The species is managed for its consistent, high-value economic returns. Forest fires and slash burning favor Douglas-fir because they reduce competing shrubs and hardwoods and help reduce animal damage.

Douglas-fir traditionally has demanded high log prices but is difficult to manage on coastal sites because it is less capable of surviving competition from shrubs and alder. Douglas-fir is susceptible to Swiss needle cast, a native foliar disease that decreases the growth and yield of Douglas-fir. In areas with moderate to severe Swiss needle cast, a mixed species planting will limit growth losses.

Sitka spruce occurs naturally only in the coastal climate. There is probably no other conifer that grows as rapidly in the fog belt. It has the ability to tolerate salt spray and grows near the beach, where it may appear to be “sheared” by strong coastal winds. It also grows in poorly drained areas. The spruce tip weevil causes severe deformation of spruce trees by attacking the terminal leader. While the spruce tip weevil will not likely kill the tree, its deforming impact can reduce timber value. The weevil becomes a more serious problem further inland where the added warmth allows it to complete its destructive life cycle more quickly. Spruce produces tough branches that stay on the trunk for years, creating a lower-quality log and increasing harvest costs. Growing spruce at higher stand densities can reduce branch size and improve tree form. Spruce is also susceptible to damage and decay as a result of thinning. Avoid thinning during sap flow in spring. Because spruce is shallow-rooted, avoid thinning older stands that have not had a prior thinning as they are likely to blow down.

Western redcedar can be found in wet areas such as along streams and near springs. This species tolerates shady understory conditions. In mixed-species

and uneven-aged stands it can maintain slow growth rates over long periods. However, it can grow rapidly in full sunlight. This species provides cultural values. Northwest Indians utilized nearly every component of the tree for everything from clothing to baskets. It is used for timber and is valuable for large woody debris for healthy stream habitat. The leaves are a favorite of elk and deer (Figure 9).

Red alder is a hardwood tree that grows faster than any of the conifers during the first 20 years of stand establishment. Wherever tractor logging or site preparation exposes bare mineral soil, alder is likely to seed in. As a nitrogen fixer, it can improve soil quality. Red alder does best along streams and on lower, moist slopes in deep, well-drained soils. Once considered a weed, red alder has become a valuable crop species. Management guidelines are available to maintain optimum growth and form for this species. Under a canopy, alder leans toward openings, reducing the form and dollar value of the log (Figure 10).

Grand fir is found in creek bottoms and moist areas. Because it is tolerant of shady conditions and grows well in the Coast Range, it is a candidate for planting in mixtures with other species. Grand fir is susceptible to decay if it is damaged during thinning operations.

Port-Orford-cedar and redwood are found along the coast south of Coos Bay and Bandon. Port-Orford-cedar is severely affected by Port-Orford-cedar root rot, a soil-borne disease spread along forest roads by logging trucks and other vehicles. Only disease-resistant Port-Orford-cedar is recommended for planting. In Oregon, redwood is at the northern extreme of its natural range and has a very limited management area.

Shore pine is found in boggy areas and sandy soils along the coast and tolerates moderately to poorly drained sites. Shore pine seeds in naturally and competes well with shrub species. Although it is not commercially valuable, it is tolerant of salt spray and is used as an ornamental in the fog belt and elsewhere in the Northwest. Incorrect pruning can cause Sequoia pitch moth infestations.

Oregon myrtle, a hardwood tree found on a range of sites in southern Oregon, grows best on moist sites with deep soils. Open-grown trees are often multistemmed with broad canopies. Oregon myrtle vigorously sprouts from stumps and is highly prized by woodworkers.

Tan Oak, a common southern Oregon hardwood, produces acorns valued by wildlife. This species is severely affected by the introduced Sudden Oak Death pathogen.

Big leaf maple is found in a wide variety of sites and soils and grows best on river terraces and areas with deep, well-drained, moist soils. These shade-tolerant hardwood trees are capable of regenerating in the shade of other species. Best-quality trees grow from seedlings.

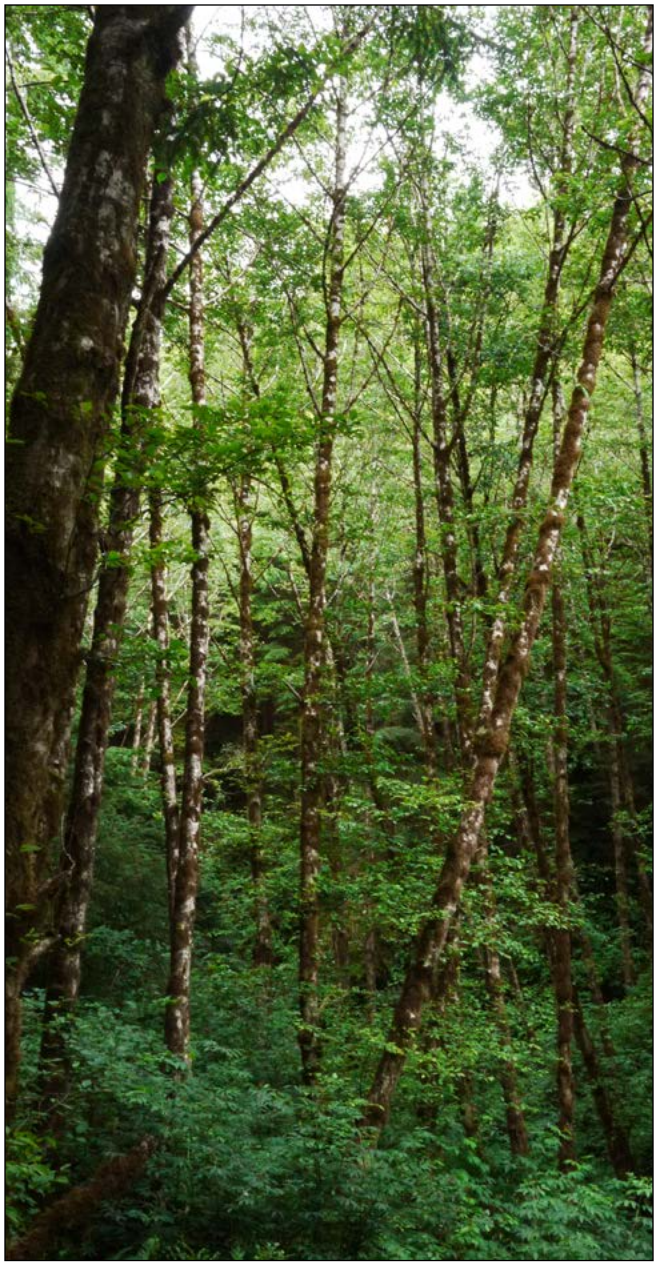

Photo: Jon Souder, © Oregon State University

Figure 10. Red alder thrives in moist conditions .

Maple sprouts compete vigorously with newly planted conifers after harvest. The highly figured wood is valued in specialty markets.

Cascara is a small hardwood found in moist, well-drained soils. The bark has medicinal value and has been harvested extensively in some locations. The fruit is eaten by mammals and birds.

Madrone is often found on tough, dry sites such as dry road edges and along waterways where other species do not thrive. Distinctive red peeling bark and its irregular shape make it a valued landscape tree.

Photo: Jon Souder, © Oregon State University

Figure 11. Fog belt woodlands provide multiple benefits.

Understory Species

Highly productive fog-belt woodlands are capable of growing many plants. Shrubs such as salmonberry, thimbleberry, salal, vine maple, rhododendron, and a variety of blackberries, huckleberries, and elderberries reach their maximum growth rate and size in this zone. Depending on your management objectives, they are either competing with your primary crop tree or creating richly diverse wildlife habitat.

Fog-belt woodlands are a source of many values, including timber, drinking water, aesthetics, and wildlife habitat, and there are multiple perspectives regarding the management of these resources. As a forest landowner, you have choices regarding the multiple benefits your woodland provides, ranging from wildlife habitat to increased timber productivity. These choices present both challenges and opportunities in this dynamic and productive ecosystem (Figure 11).

Additional Resources

Find these and other forestry publications in the OSU Extension Catalog at http://extension.oregonstate.edu/catalog/.

Site Preparation: An Introduction to Site Preparation (EC 1188).

The Care and Planting of Tree Seedlings on Your Woodland (EC 1504)

Identifying and Managing Mountain Beaver Damage to Forest Resources (EM 9063)

Introduction to Conifer Release (EC 1388)

Thinning: An Important Timber Management Tool (PNW 184)

Timber Harvesting Options for Woodland Owners (EC 1582)

Managing Insects and Diseases of Oregon Conifers (EM 8980)

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