THE WOODLAND WORKBOOK

REFORESTATION

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Introduction to Conifer Release

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Contents

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Recently reforested sites revegetate quickly after timber harvesting. Competition for essential growth elements—sunlight, moisture, and nutrients—often depresses the vigor and survival of the desired crop trees. Competition comes from grasses, broadleaf weeds called *forbs*, shrubs, or less valuable tree species.

Effective site preparation before reforesting can do much to slow the reinvasion of forest weeds (see *Site Preparation: An Introduction for the Woodland Owner,* EC 1188). However, follow-up vegetation control often is required. This practice commonly is referred to as *plantation release.*

This publication helps you evaluate when a plantation release is needed and describes basic release treatments.

When is plantation release needed?

The level and degree of competition in forest plantations can change in just 1 or 2 years. Problems with competing vegetation often can be minimized if you detect them early and take care of them promptly.

To anticipate release needs, it's important to evaluate which brush species were on the site before harvest. You'll want to know how the brush reacts to disturbances and to increases in light, moisture, and nutrients.

After reforestation, inspect your plantation at least twice a year. In winter, it's easy to inspect the number and condition of planted seedlings because grasses, forbs, and other vegetation are at their lowest levels. However, competition from deciduous weed species can be deceiving in winter, so it's important to visit your plantation in the summer, too, when foliage is completely leafed out. Then, you can evaluate the level of competition during the period of most rapid growth.

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Consider release treatment if one or more of these statements is true for your plantation.

a. *Undesirable vegetation is taller than the planted seedlings, and the shade it creates has reduced the current or a recent year's growth*. To determine this, look at the crop trees' relative amount of height growth for each recent year. Then check the leader length and the distance between annual branch whorls.

b. *The crowns of undesirable vegetation are touching and crowding the crowns of planted seedlings, causing the foliage of the desired seedlings to look sparse or unhealthy*. Sparse foliage on planted seedlings usually indicates that the seedling is losing the competitive struggle for space, sunlight, moisture, and nutrients. Healthy foliage is essential for rapid growth; this is where the plant's food is manufactured by photosynthesis.

c. *Dense grasses and forbs are creating a favorable habitat for seedling-eating animals such as mice, moles, mountain beaver, rabbits, or big game*. East of the Cascades, grasses and forbs create prime habitat for pocket gophers.

The combination of overtopping, competition for moisture, and gopher damage can cause substantial mortality (see Figures 1a and 1b.)

***Table 1.*—Some common forest competitors.**

	Western Oregon		Eastern Oregon
Grasses and forbs	Grasses Thistle Brackenfern	Fireweed Foxglove Sword fern	Grasses (pinegrass) Wild oat Rye
Woody shrubs	Salmonberry Elderberry Evergreen huckleberry Manzanita Oceanspray Vine maple	Thimbleberry Salal Ceanothus Hazel Cascara Poison-oak Himalaya blackberry	Mountain-mahogany Whitehorn Deerbrush Snowbrush Bitterbrush Manzanita Mountain maple Willow
Trees	Alder Bigleaf maple	Tanoak Madrone	Juniper Live-oak

If your plantation shows any of these conditions—or a combination of them—it's prudent to consider a plantation release treatment to protect your reforestation investment. Table 1 lists some common forest competitors.

Competition from grasses and forbs

We often think of western Oregon and Washington as having a wet climate with more than adequate moisture for tree growth. However, summer is quite dry most years, and drought periods are common.

During the summer, competition for nutrients and moisture can become critical for newly established conifers. Moisture competition from grasses and forbs can affect growth and, ultimately, survival.

This is even more important on south-facing slopes, on sites with shallow soils, or when you plant in old fields, where well-established grass competes for moisture.

OSU studies in southwest Oregon confirm that survival and growth are improved by controlling competing grass vegetation.

These studies showed second-year tree survival was from zero to 22 percent with no grass control. In contrast, survival in areas *with* grass control was 98 percent. In locations with more rain, differences may not be quite as dramatic, but it's important not to underestimate the potential negative effect of competition from grasses and forbs.

East of the Cascades, where rain is generally less, competition for moisture becomes even more critical. Many eastside grasses and forbs germinate in fall and winter as small plants. Early in spring, their roots begin to grow while the soil temperature is still too cold for conifer root growth.

Grasses' competitive nature can be hard to appreciate at first, since up to 85 percent of their total mass is below ground. This gives the grasses an advantage—they can use up available moisture and nutrients early in the season, before the more slowly growing conifer seedlings can establish adequate roots.

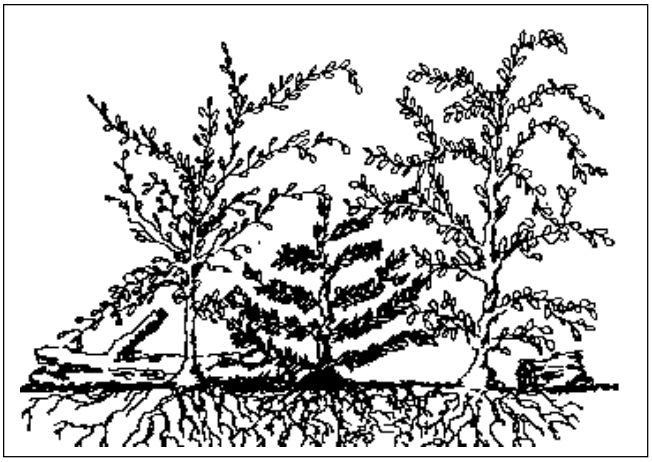

Figure 1a.—Shrubs overtop a planted seedling, reducing leader growth.

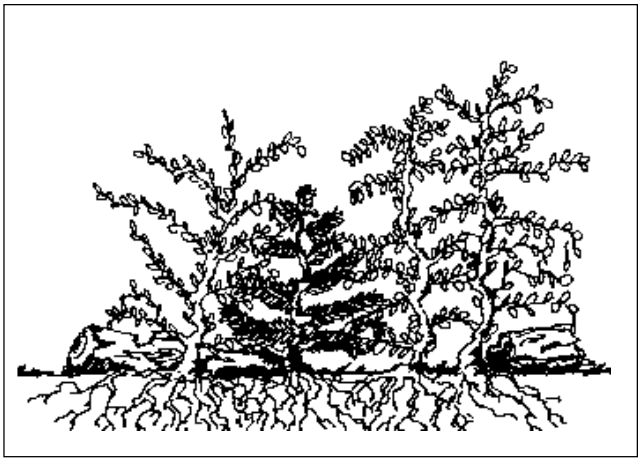

Figure 1b.—Shrubs crowd a planted seedling.

Newly established seedlings can be released from grass and weed competition by herbicides applied from aircraft or a backpack sprayer. However, if you work in hardwood plantations, be careful—they're more susceptible than conifers to some herbicides.

Hand scalping (physically removing the grass from around individual seedlings) can be done on a limited scale; however, you might need to repeat the treatment in the same year and in subsequent years.

The effectiveness of scalping is related directly to the size of the scalped area around each seedling. Scalps less than 3 feet in diameter aren't effective.

Placing paper mulch around each seedling after scalping can slow the reestablishment of grasses and forbs.

Competition from woody shrubs

Shrub species often are both abundant seeders and aggressive sprouters. Increases in water, nutrients, and sunlight after harvest or other site disturbance promote rapid development. Species that were in the stand before harvest—but appeared to be minor components—can occupy the site completely in 1 to 2 years. They really can compete with the slower-growing conifer seedlings.

Salmonberry and thimbleberry are examples of westside brush species that are aggressive sprouters. A dense stand of salmonberry has several miles of rhizomes beneath the ground and has hundreds of thousands of active buds that can sprout readily.

Ceanothus, manzanita, scotch broom, and gorse are examples of species with hard-coated, long-lived seeds that are stored in soil and triggered to germinate after fire. Many woody shrub species can grow 10 to 15 feet tall or even taller. If they compete with seedlings or overtop them, the plantation can fail or lose a great deal of growth, requiring a release treatment.

Manzanita, bitterbrush, and snowbrush are examples of eastside shrub competitors. These have vigorous root growth early in the season that allows them to capture moisture better than the more slowly developing conifers. Even when survival isn't endangered, competition from these shrubs can reduce conifers' height and diameter.

References to other publications

When you're referred to another OSU Extension Service publication, or to one from another publisher, you'll find additional information in "For further reading," page 7.

Competition from lower value hardwoods

Most hardwood species native to western Oregon grow taller rapidly while young. Red alder is a prolific seeder and can grow as much as 1 to 3 feet or more in the first year. Hardwoods such as bigleaf maple, tanoak, and madrone have extensive root systems.

When cut, these trees sprout readily and can grow tall quickly. Their sprout clumps quickly occupy the site and overtop the more slowly growing conifers.

Different species of conifer have varying tolerances to shade from overtopping. Consider this factor when you assess the need and degree of conifer release treatment.

Early and thorough release is more critical for shade-intolerant species such as ponderosa pine, western larch, or Douglas-fir. More shade-tolerant species (Sitka spruce and western hemlock) are better able to compete and grow in partially overtopping vegetation.

If overtopping is severe, release treatment likely will be necessary, even with shade-tolerant species. Table 2 ranks major conifer species' tolerance of shade.

Free to grow

Planted conifer seedlings require a year or two to establish their root systems. They grow taller less quickly during the early years. Many shrubs and hardwoods can grow taller fast. Grasses, forbs, and shrubs also can compete aggressively for limited moisture and nutrients.

***Table 2.*—Shade tolerance of major conifer species.**

Westside		Eastside
western hemlock	Tolerant	Englemann spruce
western redcedar	↑	white fir
Sitka spruce		grand fir
grand fir		Douglas-fir
noble fir		ponderosa pine
Douglas-fir	↓	lodgepole pine
incense-cedar	Intolerant	larch

Foresters rate a plantation as "free to grow" when the crop trees reach the stage that they can dominate the site and grow to maturity without future help. Figures 2a and 2b illustrate the free-to-grow concept.

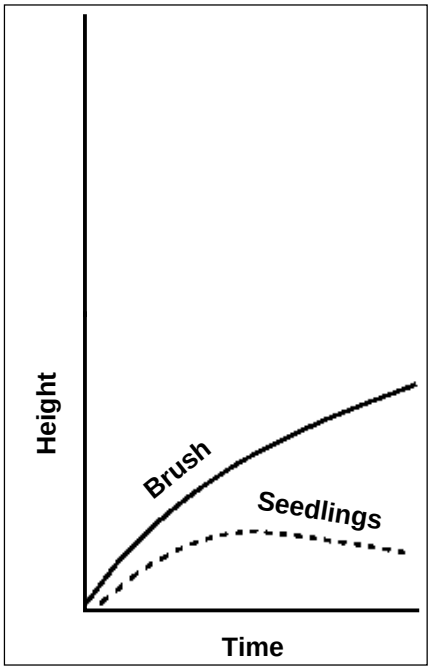

Figure 2a.—No release.

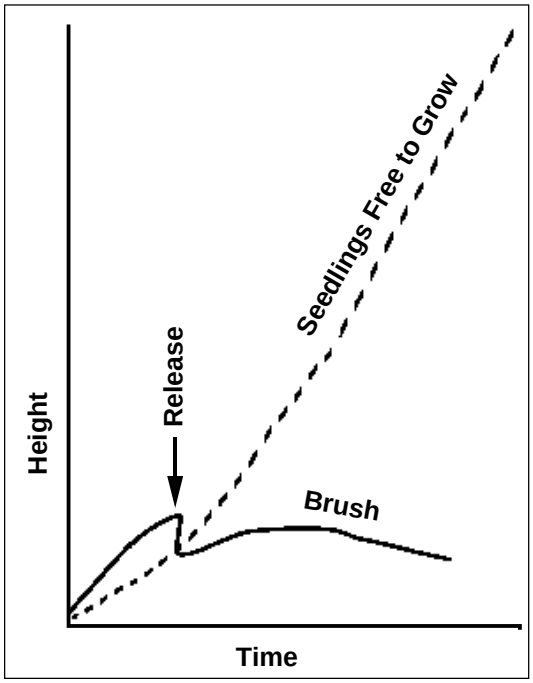

Figure 2b.—With release treatment.

Release methods

Chemical control

Chemical control (herbicides) is the most common way to control competing vegetation in forest plantations. A variety of herbicides including 2,4-D, Garlon, Accord, Velpar, and Oust can be used to control selectively targeted weed species when applied at the proper rate and season.

Common application methods include aerial application, from a helicopter (Figure 3), and ground application with a backpack sprayer or tractor-mounted sprayer. Depending on the chemical you use and the species involved, treatment may be during mid- to late summer as a foliar application or during the dormant season in early spring before budbreak.

You can treat individual hardwoods by the injection, hack-and-squirt, or cut-stump method using Garlon, Arsenal, or 2,4-D.

For the proper chemical to use, see the current edition of the *Pacific Northwest Weed Management Handbook*. Always read and follow label directions.

Advantages of chemical control include cost-effectiveness and ease of application. *Used properly*, herbicides can be the cheapest, safest, and most effective way to control weeds.

Disadvantages include the need for technical knowledge and, in many cases, the fact that the applicator must be licensed to buy and use certain chemicals. Also, using herbicides often can be unpopular with neighbors and the public.

Manual control

Manually controlling weeds to release seedlings from competition can be an alternative to herbicides in environmentally sensitive areas or where chemical use is undesirable.

Methods include cutting with a chain saw or chopping, pulling, or using a hoe to remove grasses and forbs from an area at least 3 feet square (Figure 4).

Advantages include the ability to avoid possible negative environmental affects that some believe are associated with chemical use.

Use herbicides safely!

- **Wear** protective clothing and safety devices as recommended on the label. **Bathe or shower** after each use.
- **Read** the herbicide label—even if you've used the herbicide before. **Follow closely** the instructions on the label (and any other directions you have).
- **Be cautious** when you apply herbicides. **Know** your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from herbicide use.

Figure 3.—Common herbicide application methods include spraying from a helicopter.

Figure 4.—Manual control as shown here reduces environmental effects of chemical herbicides, but it's more labor intensive.

Disadvantages of manual methods are that generally they're more labor intensive and time consuming, so they're usually more costly. Also, there's an increased risk of bodily injury associated with operating cutting tools (especially chain saws), particularly on steep, rough terrain.

Many hardwood species are sprouters. In those cases, you'll need more than one treatment to release and reach free-to-grow status.

Mulching

Growers have tried mulching with straw, bark, or paper (Figure 5) to some extent on federal lands and in Christmas tree plantations as a way to release seedlings from grass competition. It's usually quite expensive, but it does help control herbaceous weeds and grasses. In dry seasons, mulching can help retain spring soil moisture into the summer.

Advantages include maintaining weed control without the perceived negative effect of chemicals or the danger of power tools.

Disadvantages, in addition to cost, are that the mulch may create favorable habitat for rodents, which can damage seedlings.

Another drawback is that mulch can slide downhill on steep slopes or blow away in strong winds. This not only reduces the effectiveness of the treatment but also damages seedlings.

Mulching won't control fast-growing hardwoods or stump sprouts.

Grazing

Some growers in southwest Oregon and east of the Cascades have introduced grazing as a form of vegetation management. Research shows that some gains in tree growth can be achieved when forage is grazed. However, this practice has had very limited application and acceptance. A great deal of time and expense are involved in regulating animals' movements to prevent seedling damage.

Figure 5.—Growers have tried mulching, but it's expensive in many cases. Here, paper mulch is being used to control competing plants.

Summary

There are several benefits to managing vegetation in forest plantations. Early control of grasses, forbs, and brush can increase moisture, nutrients, and light available to conifer seedlings—which in turn increases their survival and early growth, reduces planting losses, and results in a more uniform stand.

Benefits of good stand uniformity include higher volume yields per acre, less limby trees, and lower logging costs.

Plantation release is most effective if done before seedlings are too badly damaged. This means that you should inspect your plantation periodically.

For small areas, a walk-through that crisscrosses along a route representative of the unit might be adequate. Larger plantations might require a more systematic survey, using plot lines in a formal grid that are laid out on a map or photo.

During your inspection, note survival problems that might be developing, animal damage, crowding, and overtopping by competing vegetation. It's a good idea to document your inspection on a simple map for your management file.

Getting seedlings to free-to-grow status at the earliest possible age can shorten the time needed for forest stands to reach harvestable size (rotation).

Shorter rotation reduces the number of years you must pay interest on financing to cover initial expenses such as reforestation and conifer release; therefore, you'll realize investment returns sooner.

An added benefit of controlling vegetation after plantation establishment can be reduced animal damage. Populations of voles, deer mice, rabbits, and mountain beaver tend to increase when food supplies are abundant.

Grasses and forbs provide food as well as protective cover for predators. When these plants are reduced, small mammals move to other sites where food is more abundant. The crop trees benefit from increased availability of nutrients and moisture and, as a result, grow vigorously above the level of animal damage.

Increased early height growth, achieved with effective vegetation control, may reduce or even eliminate the need to protect seedlings from animal damage.

It's important to remember that whatever method of release you use in your plantation, the objective is to control competing vegetation for a specific period with little or no damage to the planted seedlings.

It's also important to remember that where timber production is the primary motive, the goal of any release treatment is to achieve free-to-grow status as early as possible, **not** to eradicate all competing vegetation. Dollars and effort are wasted in overtreating plantations, which also could damage crop trees.

Large voids or bare spots may increase exposure to harsh elements such as wind, frost, and erosion. Voids can be invaded by more competitive, harder-to-kill species, thereby aggravating the problem. Open areas actually can encourage and concentrate animal use and damage.

To avoid these problems, it's important to choose the right method and level of conifer release for your site.

For further reading

OSU Extension publications

Fitzgerald, Stephen A. *Site Preparation: An Introduction for the Woodland Owner*, EC 1188 (reprinted 1998). $2.50

Pacific Northwest Weed Management Handbook, a Pacific Northwest Extension publication (revised and reissued annually). $35.00

To order copies of the above publications or additional copies of this one, send the complete title and series number along with a check or money order (payable to Oregon State University) for the amount listed, to:

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Other publications

Cleary, Brian D. *Vegetation Management and Its Importance in Reforestation*, Research Note 60. Oregon State University Forest Research Laboratory, February 1978. No charge for single copy; order from Publications, College of Forestry, 154 Peavy Hall, Oregon State University, Corvallis, OR 97331-5704.

Fiddler, Gary O. and Philip M. McDonald. *Competing Vegetation in Ponderosa Pine Plantations: Ecology and Control*, PSW 113, USFS General Technical Report, 1989. No charge for single copy; order from USFS Pacific Southwest Forest and Range Experiment Station, PO Box 245, Berkeley, CA 94701.

The Woodland Workbook is a collection of publications prepared by the Oregon State University Extension Service for owners and managers of private, nonindustrial woodlands. Information has long-range and day-to-day value for anyone interested in wise management, conservation, and use of woodland properties. The Workbook is organized in sections in a 3-ring binder with tabbed dividers for each section. To order, and to get a current list of titles and prices, inquire at the OSU Extension Service office that serves your county.

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