



Reforestation

Introduction to Conifer Release

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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, broad-leafed weeds called *forbs*, shrubs, or less valuable tree species.

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

This publication helps you evaluate when a plantation release is needed, and describes the basic approach to 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 can often 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 present on the site before harvest. You'll want to know how the

brush reacts to disturbances, increases in light, moisture, and nutrients.

After reforestation, inspect your plantations 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.

Competition from deciduous weed species can be deceiving in winter. It's important to visit your plantation in the summer when foliage is completely leafed out. Then you can evaluate the level of competition during the period of most rapid growth.

You should consider release treatment if one or more of these

conditions is present in 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 relative amount of height-growth for each recent year. Then check the leader length and the distance between annual branch whorls.

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- b. *The crowns of undesirable vegetation are touching and crowding the crowns of planted seedlings, causing the foliage of the desired seedlings to appear 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 figure 1 on page 3.)

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 a wet climate with more than adequate moisture for tree growth. However, the summer months are 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 slopes, sites with shallow soils, or when you plant in old fields, where well-established grass competes for moisture.

Studies in southwestern Oregon, by Oregon State University Forestry Intensified Research (FIR), confirm that survival and growth are improved by controlling competing grass vegetation.

Table 1.—Some common forest competitors

	Western Oregon		Eastern Oregon
Grasses and forbs	Grasses	Fireweed	Grasses (pinegrass)
	Thistle	Foxglove	Wild Oat
	Bracken Fern	Sword Fern	Rye
Woody shrubs	Salmonberry	Thimbleberry	Mountain mahogany
	Elderberry	Salal	Whitehorn
	Evergreen huckleberry	Ceanothus	Deerbrush
		Hazel	Snowbrush
	Manzanita	Cascara	Bitterbrush
	Ocean Spray	Poison Oak	Manzanita
Trees	Vine Maple	Himalaya Blackberry	Mountain maple
	Alder	Tanoak	Willow
		Juniper	
	Bigleaf maple	Madrone	Live oak

These studies showed second-year tree survival was only 0 to 22 percent with no grass control. In contrast, survival in areas *with* grass control was 98 percent. While differences may not be quite as dramatic in locations with more rainfall, it's important not to underestimate the potential negative affect of competition from grasses and forbs.

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

The competitive nature of grasses can be deceptive, since up to 85% 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 slower growing conifer seedlings can establish adequate roots.

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

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

The effectiveness of this method is directly related to the size of the scalped area around each seedling. It's been found that 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.

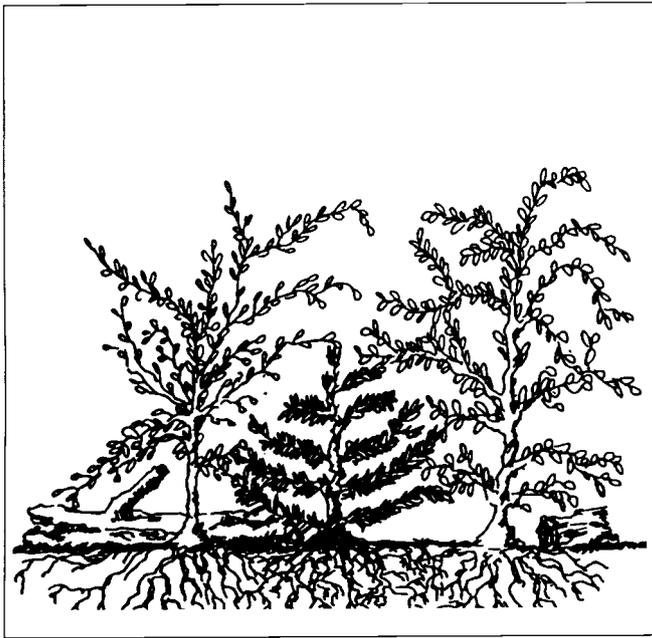


Figure 1.—(Left) Shrubs overtopping a planted seedling, causing reduced leader growth. (Right) Shrubs crowding a planted seedling.

Competition from woody shrubs

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

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

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

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

Competition from lower-value hardwoods

Most hardwood species native to western Oregon exhibit rapid early height growth. Red alder is a prolific seeder and can grow as much as 1 to 3 feet or more in the first year. Hardwoods like bigleaf maple, tanoak, and madrone have extensive root systems.

When cut, they readily sprout, and they're capable of rapid early height growth. Their sprout clumps quickly occupy the site and overtop the slower-growing conifers.

Different species of conifers have varying abilities to tolerate shade from overtopping. Tolerance of tree species is a factor to consider when you assess the need and degree of conifer release treatment.

Early and thorough release is more critical for shade-intolerant species like ponderosa pine, western larch, or Douglas. 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 will likely be necessary, even with shade-tolerant species. Table 2 ranks the tolerance of major conifer species to shade.

Table 2.—Shade tolerance of major conifer species

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

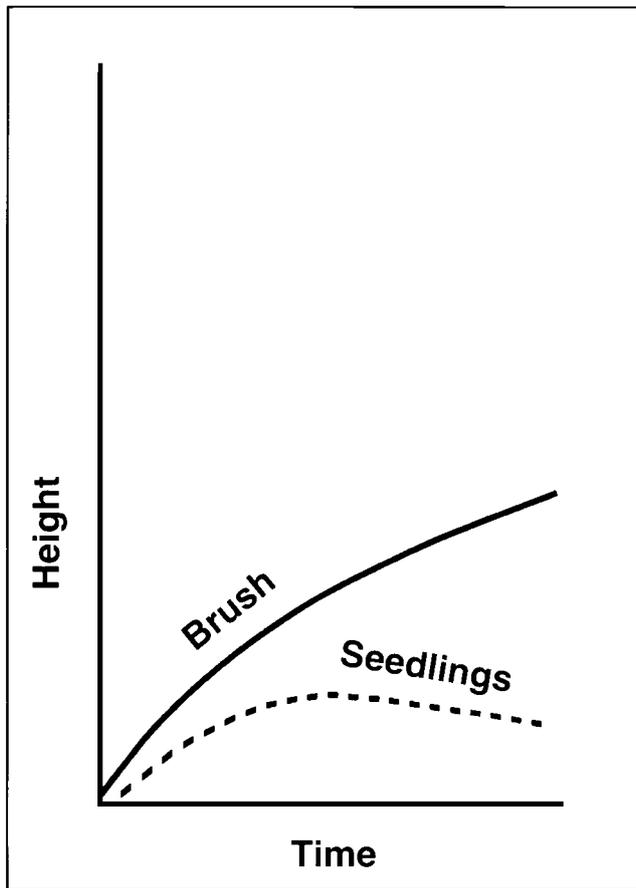


Figure 2a.— No release.

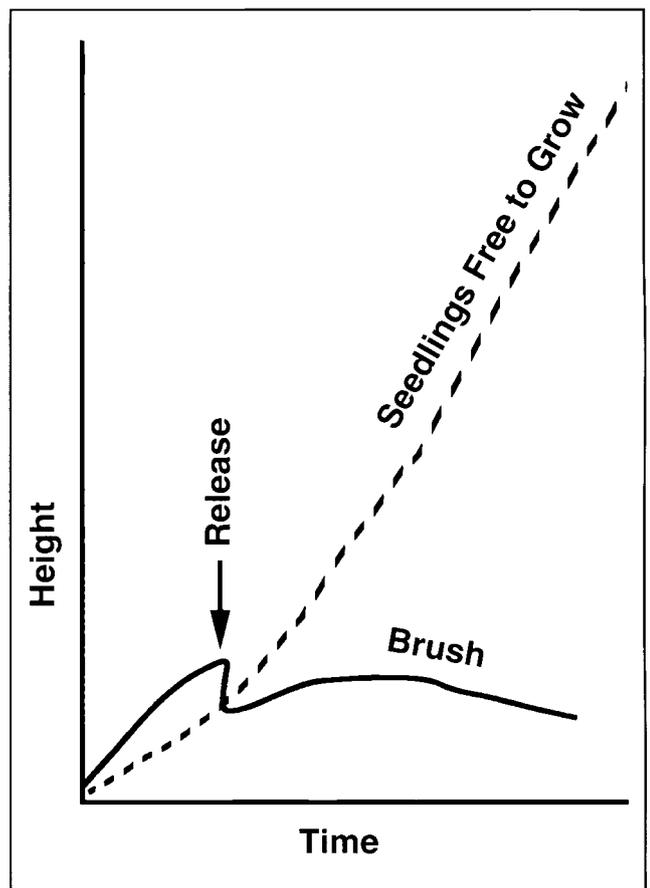


Figure 2b.—With release treatment.

Free to grow

Planted seedlings require a year or two for their root systems to establish. They exhibit less height growth during the early years. Many shrubs and

hardwoods are capable of rapid early height growth. Grasses, forbs, and shrubs can also compete aggressively for limited moisture and nutrient resources.

Foresters rate a plantation as “free to grow” when it reaches a stage of development where the crop trees can dominate the site and grow to maturity without future help. Figure 2 illustrates the free to grow concept.

Release methods

Chemical

Herbicides are the most common method for controlling competing vegetation in forest plantations. A variety of herbicides including 2,4-D, Garlon, Accord, Velpar, and Atrazine, can be used to selectively control targeted weed species when applied at the proper rate and season.

Common application methods include aerial application using a helicopter, ground application using a backpack, or tractor-mounted sprayer. Depending on the chemical you use and the species involved, treatment may be made 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 injection, hack-n-squirt, or cut stump treatment using Garlon, Tordon, Arsenal, or 2,4-D.

For the proper chemical to use, see the current *Pacific Northwest Weed Control Handbook*. Always remember to read and follow the 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 necessity for technical knowledge and, in many cases, the fact that the applicator must be licensed to purchase and use certain chemicals. Using herbicides can also often be unpopular with neighbors and the public.

Manual

Manual control of weeds to release seedlings from competition may be an alternative to herbicides in environmentally sensitive areas or where chemical use is deemed undesirable.

Methods may include cutting with a chain saw, chopping, pulling or removing grasses and forbs from at least a 3 x 3 foot area using a hoe.

Advantages include the ability to maintain control over possible negative environmental affects perceived to be associated with chemical use.

Disadvantages of manual methods are generally more labor-intensive and time-consuming, so they're usually more costly. There's an increased risk

of bodily injury associated with operating cutting tools (especially chain saws), particularly on steep, rough terrain.

Many species are sprouters. This increases the need for more than one treatment to release and reach "free to grow" status.

Mulching

Mulching with straw, bark, or paper has been tried to some extent on federal lands and in Christmas tree plantations as a means of releasing seedlings from grass competition. It's usually quite expensive, but it does help control herbaceous weeds and grasses. In dry

situations where summer drought is a problem, mulching can help retain spring soil moisture into the summer months.

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

Disadvantages, in addition to cost, the mulch may create a favorable habitat for seedling damaging rodents.

Mulch can slide downhill on steep slopes, or blow off in strong winds. This not only reduces the effectiveness of the treatment, it also causes seedling damage.

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

Grazing

Grazing has been tried in southwestern Oregon and east of the Cascades as a form of vegetation management. Research has shown that some gains in tree growth can be achieved when forage is reduced by grazing. However, this practice has had very limited application or acceptance. A great deal of time and expense are involved in regulating animal movements and preventing seedling damage.



Figure 3.—Common herbicide application methods include spraying from helicopter, as shown in this photo.



Figure 4.—Mulching has been tried but is expensive in many cases. Here, paper mulch is being used to control competing plants.

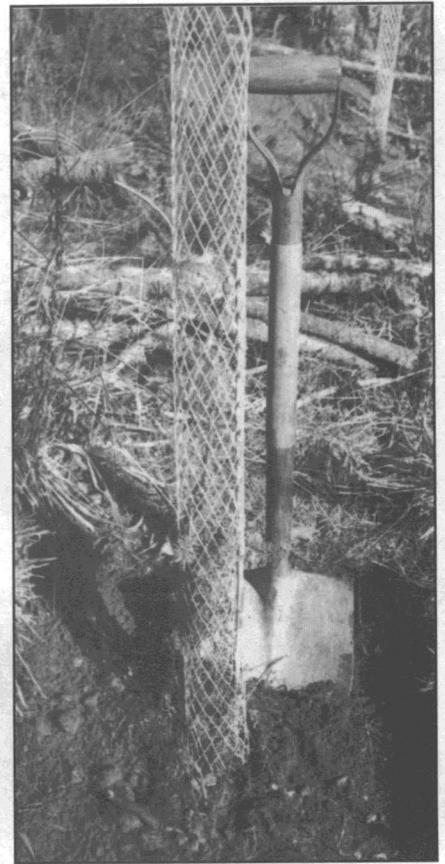


Figure 5.—Manual control as shown here reduces environmental effects of chemical herbicides, but it's more labor intensive.

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 increases survival and early growth. This 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.

You have the most effective plantation release if you do it before the damage to your seedlings is too great. This means that your plantation should be periodically inspected. For small areas, a visual walk-through, criss-crossing along a route representative of the unit, may be adequate.

Take careful note of developing survival problems, 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. Larger plantations may require a more systematic survey; plot lines, in a systematic grid, that are laid out on a map or photo.

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

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 length reduces the number of years that initial investments such as reforestation and conifer release must be carried at compound interest, and brings returns to the landowner sooner.

An added benefit of vegetation control after plantation establishment may be reduced animal damage. Population of voles, deer mice, rabbits, and mountain beavers tend to increase when food supplies are abundant.

Grasses and forbs provide food as well as protective cover from 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.

It's important to remember that whatever method of release is used in your plantation, the objective is to control competing vegetation for a specific period of time 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 at as early an age as possible; not to eradicate all competing vegetation. Extra dollars and effort can be wasted in over treating plantations and damage to crop trees may occur.

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

Extension Service publications

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EC 1188, *Site Preparation: An Introduction for the Woodland Owner*, Fitzgerald, Stephen A., Oregon State University Extension Service (Corvallis, 1989). \$1.00.

Pacific Northwest Weed Control Handbook, a Pacific Northwest Extension publication (latest edition; published annually). \$15.00.

Other publications

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

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

Use pesticides safely!

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