THE WOODLAND WORKBOOK

REFORESTATION

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Successful Reforestation: An Overview

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Contents

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So you'd like to plant some trees! As the saying goes, "The best time to plant a tree was 30 years ago—the next best time is now." This publication gets you started on the right track and answers some common reforestation questions. It provides a brief overview of the steps involved in a typical reforestation operation, including:

- Preparing the planting site
- Obtaining suitable seedlings
- Planting seedlings
- Plantation maintenance
- Financing reforestation activities

Also, you'll find references to other publications that provide more detail on reforestation (see pages 7–8). They are highly recommended reading.

Why reforest? Well, for one thing, it's the law. Reforestation is required when timber harvesting reduces the number of trees below specified stocking* levels (see EC 1194, *Oregon's Forest Practice Rules*). You must complete reforestation within 24 months after completing a harvest operation. Depending on site productivity, at least 100 to 200 seedlings per acre must be established. In addition, seedlings must be well distributed across the area and "free to grow" (vigorous and above competing vegetation) within 6 years.

*Stocking is the number of trees in a forest. Usually this is expressed as trees per acre or by some relative measure, such as well stocked, fully stocked, overstocked, understocked.

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'Notification of Operations' required

Before beginning many forest operations, such as thinning, burning, and applying pesticides, you must submit a Notification of Operations with the Oregon Department of Forestry (ODF). ODF must receive the notification at least 15 days before activities begin, and written plans are required under some circumstances.

In general, commercial tree species suited for your site conditions are acceptable species for reforestation. Contact your local Oregon Department of Forestry (ODF) office about your particular reforestation situation.

Because reforestation is labor intensive and expensive, planning is essential to assure success. Lack of attention to any one step can result in costly reforestation failures.

Site preparation

The first thing to consider is the condition of the planting site. This includes the kind and amount (coverage) of vegetation present, soil type, aspect (compass direction the slope faces), and even the kinds of animals that might damage your trees.

Site characteristics are important because they affect critical site resources—water, light, temperature, and nutrients—needed for seedling survival and growth.

Site preparation has three major objectives:

- Reduce the amount of vegetation that competes with tree seedlings
- Reduce habitat of animals that damage (browse and/or clip) seedlings
- Create plantable spots

Water is the most critical factor for seedling survival and growth, particularly the first few years after seedlings are planted. Grass, shrubs, and larger weeds are obvious competitors for moisture and light (Figure 1). It's important to remember that the root systems of grass and other vegetation are very extensive, spreading well beyond the aboveground portion of the plant.

Grass also provides habitat for meadow mice, voles, and gophers, which can severely damage or kill tree seedlings. You must keep grass away from newly planted seedlings for a few years to reduce habitat for these animal species.

Several methods or combinations of methods are available to prepare sites for planting. Costs depend on site conditions, methods used, existing vegetation, and amount of logging debris or slash. See EC 1188, *Site Preparation: An Introduction for the Woodland Owner.*

Mechanical methods

If there is a lot of slash or brush, you may need to use mechanical (tractor) or manual methods to create planting spots as well as to reduce brush competition. Heavy slash after harvest can make it difficult to plant an area and can pose a fire hazard. Disadvantages of mechanical methods are that they can remove topsoil, compact soil, and encourage grass and other vegetation to reestablish.

Burning also can reduce slash and brush competition, but fire can be difficult to

Figure 1.—This spruce seedling is being outcompeted by surrounding vegetation. Photo: Liz Cole, OSU College of Forestry.

control. You first must move the slash into piles so you can control the fire more easily. Contact your local ODF office before doing any burning.

Manual methods

Hand-scalping is difficult, gives only short-lived vegetation control, and is very expensive. You can place mulch mats made of heavy kraft paper or plastic at least 3 to 4 feet square around seedlings immediately after planting. These mats effectively control local vegetation, but they are expensive (Figure 2).

Chemical methods

When selecting chemical methods, know which weeds you want to control, select the appropriate herbicides that are registered for forestry use, and always read and follow label directions. Pesticide registrations change often, so always consult the label; it is your best source of information. Chemical site preparation methods are most cost effective and generally offer better long-term control of competing vegetation.

If you are planting in an old pasture or field or if the site isn't too brushy (that is, you can walk easily through the area), you can use a combination of chemical and manual methods. The purpose of preparing a site is not so much to clear a planting spot completely but rather to expose mineral soil and reduce the amount of vegetation that competes with seedlings for moisture and light.

Finally, remember that you have more options and that it's easier to control competing vegetation with herbicides *before* you plant seedlings. Also, maintaining a weed-free environment the first 2 years after planting helps ensure good survival and vigorous seedlings.

Obtaining seedlings

You can get tree seedlings for your site by encouraging natural seeding, by transplanting wildlings (seedlings growing in the wild), or by purchasing high-quality, nursery-grown seedlings.

Natural seeding of new trees (natural regeneration) from remaining or nearby "parent" trees can be effective under the right circumstances. Species such as hemlock, alder, and lodgepole pine produce regular cone crops and regenerate rapidly from natural seeding. In other cases, relying on natural seeding to regenerate a site is risky because cone crops of many other species (including Douglas-fir and ponderosa pine) are sporadic, and site conditions must be right for seeds to germinate and grow.

Figure 2.—Mats effectively control competing vegetation, but they are expensive.

Using natural regeneration requires a written plan that is reviewed by the ODF stewardship forester. The written plan must be submitted within 12 months after timber harvesting has reduced tree stocking. The written plan should estimate the time needed to regenerate adequately stocked, free-to-grow seedlings and alternative strategies that you will use if natural regeneration does not go as planned. Consult a stewardship forester if you are considering using natural regeneration to reforest your site.

For smaller planting projects (a few acres or less), you can use wildlings, provided they are of the appropriate species and taken from the same geographic area and elevation where you will replant them. Wildlings should appear healthy, be about 2 feet tall, and have an adequate root system left intact after digging. Ask owners' permission before removing wildlings from land that is not yours.

Nursery-grown tree seedlings are used most widely and are available from many sources. A list of nurseries is available from the OSU Extension Service and ODF. To ensure that you'll have enough seedlings for your reforestation project, be sure to order several months in advance. Some nurseries allow you to order seedlings 6 months before the planting season.

Costs vary by nursery and by type of seedling (stock-type) purchased. Prices for most 2-year-old Douglas-fir and ponderosa pine seedlings range from $200 to $500 per thousand. Many forest-seedling nurseries also sell seedlings in smaller quantities, such as lots of 100.

Be cautious of buying "good deal" surplus trees that are given away or sold at low prices at the end of the planting season. These trees may not be suitable for your planting location or may be of low quality after a long period of storage. Low quality will result in poor survival and growth—and so, these trees may cost you more in the long run.

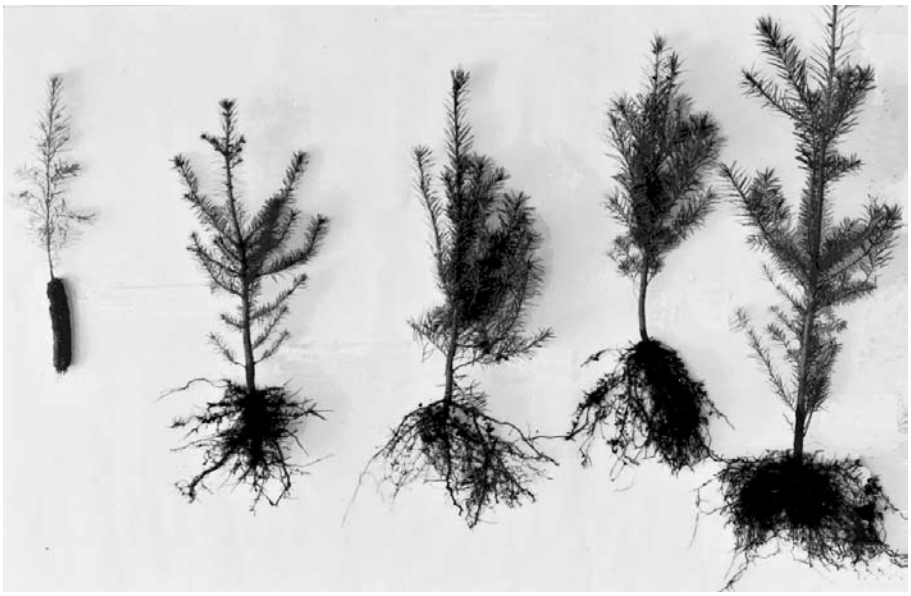

Figure 3.—Examples of the different seedling stock types. From left: container; plug + 1; 2 + 0; 1 + 1; and 2 + 1.

To improve seedling survival and growth, you need to match the seedling properly to the site (environment) where it will be planted. A proper match begins when you order seedlings. You must tell the nursery what species and stock type you want, the seed zone and approximate elevation where they will be planted, and how many seedlings you need. See EC 1196, *Selecting and Buying Quality Seedlings*, for more detailed information.

The following sections review some of the basic considerations for matching trees to your planting site.

Species selection

Different tree species are adapted to different site conditions. Ponderosa pine does well in eastern Oregon and on the drier, heavy clay soils of the Willamette Valley. Douglas-fir does best in many western Oregon locations except on wet sites or in shady areas, where western hemlock or western redcedar may be a better choice. Some species, such as western redcedar, are more susceptible to animal browse.

It is possible to plant more than one species in an area. To be successful, become familiar with the ecological requirements (tolerance to frost, high temperatures, light, and moisture) of the different species and their growth habits. Investigate very carefully before planting non-native (also called "exotic") tree species. Consult a local forester for specific information on selecting species suitable for your area.

Seed zone and elevation

To ensure that trees are adapted to your site conditions, order seedlings that are specifically for your seed zone and elevation. Seed zone maps and related information are in EC 1196, *Selecting and Buying Quality Seedlings*; or, contact a forester with OSU Extension or with ODF.

Stock type

Stock type is a *general* indication of seedling size, age, and other characteristics (Figure 3). For example, a 2-0 seedling is grown for 2 years in a seedbed. A 1-1 seedling is grown for 1 year in a seedbed and then transplanted at wider spacing and grown for another year in a transplant bed. Both trees are 2 years old, but because the 1-1 was transplanted, it is a larger seedling (larger diameter, taller, more root mass). A 1-1 seedling is more expensive, but it may be worth the extra cost in terms of better survival and faster growth.

Larger seedlings can withstand more deer browse and are better able to compete with fast-growing shrubs. On the other hand, on hot, dry sites a smaller stock type may be a better choice because the seedling has a better balance between shoots and roots, enabling the seedling to survive under harsher conditions.

Planting seedlings

Careful handling and proper planting of seedlings are important steps to successful reforestation. You can find more detailed information in EC 1095, *Seedling Care and Handling,* and EC 1504, *The Care and Planting of Tree Seedlings on Your Woodland*. The following sections review some of the basics for successful planting.

Spacing and selecting planting spots

Trees usually are planted at a 10x10-foot spacing in western Oregon and at a 12x12- to 14x14-foot spacing on drier sites in central and eastern Oregon. If you anticipate severe (hot and dry) site conditions and higher than normal seedling mortality, consider planting trees closer together to ensure that enough survive to occupy the site. Table 1 is a guide to the number of trees to plant at a given spacing.

Your planting pattern need not be perfectly square (e.g., 10x10 feet). It is more important to select good planting spots—areas of exposed mineral soil, free of weeds—than to space trees precisely. On hot, south-facing slopes, selecting good planting spots, such as those areas shaded by stumps or logs, can be more effective than planting additional trees and hoping they survive. Following up with good weed control can improve seedling survival on these severe sites.

Table 1.—Trees per acre at various spacings.

Trees/acre	Spacing (ft)
681	8 x 8
436	10 x 10
302	12 x 12
222	14 x 14
170	16 x 16
134	18 x 18
109	20 x 20

Timing

The best time to plant conifer seedlings in western Oregon is from January through March. Hardwood seedlings do best if planted from mid-March to mid-April. Seedlings are dormant during these months and can withstand handling and planting.

Soils in eastern Oregon or at higher elevations may be frozen or snow covered during this time. Plant these areas as soon as possible after snow melts and the ground thaws (late March through April).

Some growers in western Oregon have tried planting in the fall (early October). This is risky because seedlings are not fully dormant and so are susceptible to damage. Also, fall rains are unpredictable, and dry soils generally result in poor seedling survival. Successful fall planting requires obtaining seedlings specially conditioned in the nursery so that the aboveground portion of the seedling is dormant but roots are active and able to grow well into late fall.

Care and handling

Keep seedlings cool (34° to 40°F) and moist and handle them gently at *all* times. When transporting seedlings to the planting site, keep them away from direct sunlight and cover them with a reflective tarp. Store extra seedlings temporarily in a shaded, cool spot at the planting site until needed. Do not allow seedlings to freeze.

Tools and planting

Special long-bladed shovels, planting spades, planting hoes (called hoedads), or power augers are used to plant seedlings. Planting holes should be deep enough to

accommodate roots. Plant the seedling so its roots spread downward in the planting hole and are not crammed in, forming "J–roots." Plant seedlings upright so that all roots are well covered, and firm the soil around roots to eliminate air pockets. Avoid mixing any organic debris, such as rotten wood, branches, or needles, in the planting hole.

Fertilizing seedlings at planting time is not recommended under most conditions. Soil fertility usually is adequate. Fertilization actually may harm seedlings by burning the roots, encouraging excessive top growth, or by encouraging the growth of weeds that compete with seedlings.

If you hire a planting contractor, obtain and check references first. Names of local contractors may be available from an OSU Extension forester or ODF. It is important to monitor tree planters to be sure they do a good job. If you have a large planting job, consider hiring a consulting forester to oversee the planting operation.

Planting costs vary with site conditions, size of seedling, spacing, and availability of planting crews. Costs may range from 25 to 45 cents per seedling or roughly from $100 to $200 per acre. This includes the costs of seedlings and labor.

Seedling protection

If populations of deer, elk, gophers, or mountain beavers are large, you may need to protect newly planted seedlings. To deter deer and elk from eating and damaging your seedlings, you can place protective devices (Figure 4) around seedlings or use repellents. Control gophers by baiting and trapping; mountain beavers usually are trapped to control their populations. For specific information on animal damage protection, see:

- EC 1201, *Understanding and Controlling Deer Damage in Young Plantations*
- EC 1256, *Controlling Vole Damage to Conifer Seedlings*

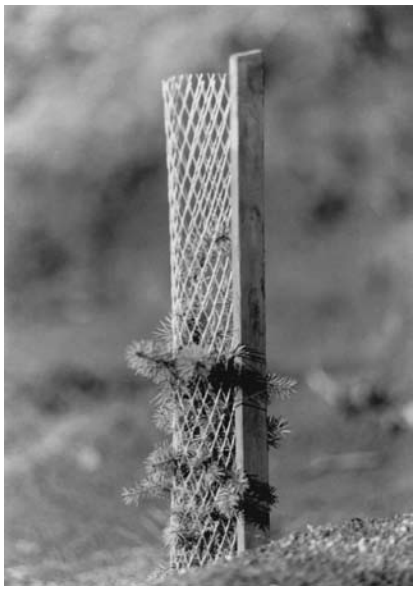

Figure 4.—A Vexar tube protects against browsing deer.

On south-facing slopes, seedlings may be damaged or killed by intense sunlight and heat. Shading the seedling's lower stem with shade cards (available commercially or homemade) can improve seedling survival on these harsh sites, particularly if there is little shade from stumps, logs, and slash.

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.

Plantation maintenance

Once seedlings are planted, additional maintenance often is needed to ensure their continued survival and growth. A systematic walk through the plantation each year can reveal whether seedlings are alive and growing well and whether action is needed to control weeds or protect trees from animal damage.

Seedling growth is slow the first year or two (4 to 6 inches). Some hardwood species, such as alder, can grow much faster. After the first year or two, and depending on site conditions, you should get 1 to

3 feet of height growth on Douglas-fir seedlings in western Oregon and 1 to 1.5 feet of height growth on ponderosa pine seedlings in eastern Oregon as they become established and growth improves.

Be sure to watch the site closely so that weeds don't reinvade before your seedlings take hold and grow. The first 2 years are critical, and retreatment may be necessary to ensure survival. A healthy plantation is your reward for a job well done! Find additional information on weed control in EC 1388, *Introduction to Conifer Release*.

For more information on plantation maintenance and protection from animal damage, contact the OSU Extension Service and the Oregon Department of Forestry.

Financial help for reforestation

Many landowners are interested in financial assistance for reforestation: either reimbursement for some costs of reforestation, or tax savings from having your property assessed as forest land, or state and federal reforestation tax credits.

Cost-share money sometimes is available for reforestation in some situations. For more information, contact your local Farm Services Agency (FSA). The FSA is listed in the phone book under "United States Government—Agriculture Department." FSA administers these cost-share programs and works closely with your local ODF stewardship forester. You can find additional information in EC 1119, *Incentive Programs for Woodland Management and Resource Conservation*.

If your land currently has no trees but could support native, commercial tree species, you might qualify for "forest deferral" if you plant seedlings and manage your land for timber. This special tax designation provides significant property tax savings to you. To qualify, you must have a management plan and own at least 2 acres that are contiguous (not including area for residence), *and* you must establish enough trees to meet or exceed the forest practices minimum reforestation stocking requirements.

Steps for successful reforestation

- Carefully plan and evaluate your site.
- Do an excellent job of site preparation.
- Select the proper species and seedling stock type for your site, and order early.
- Carefully handle and plant seedlings.
- Follow up with weed and animal damage control, if needed, the first 2 years.
- Enjoy your young forest and watch it grow!

Apply for forest deferral between January 1 and April 1 with your county assessor's office. The county assessor can give you additional details.

Reforestation tax credits are available to help offset reforestation costs. Information on state reforestation tax credits can be obtained from the local ODF stewardship forester. Contact the IRS for information on federal reforestation tax credits.

Ultimately, it is your legal responsibility to reforest a site following harvest, which is typically financed by income from the timber harvest.

For more information

OSU Extension publications

Care and Planting of Tree Seedlings on Your Woodland, EC 1504.

Controlling Vole Damage to Conifer Seedlings, EC 1256.

Incentive Programs for Woodland Management and Resource Conservation, EC 1119.

Introduction to Conifer Release, EC 1388.

Oregon's Forest Practice Rules, EC 1194.

Seedling Care and Handling, EC 1095.

Selecting and Buying Quality Seedlings, EC 1196.

Site Preparation: An Introduction for the Woodland Owner, EC 1188.

Understanding and Controlling Deer Damage in Young Plantations, EC 1201.

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