Successful Reforestation Planning to Get the Forest You Want

By OLE T. HELGERSON

Reforestation after timber harvest is not only required by state law in Oregon, Washington and Idaho, but more importantly, it represents your opportunity to build the future forest that you want, whether your goals are focused on timber, wildlife, special forest products, aesthetics, or some mix of these.

The reforestation planning process can be broken down into steps (Figure 1). If any of these steps is missing or done improperly, reforestation may not meet your goals or it may fail completely. This article provides general planning guidance. For specifics with- in each step, see the accompanying articles in this issue of Northwest Woodlands, on-line extension publications, listed references, or consult your local extension or service forester.

Figure 1.
The Reforestation Planning Process.

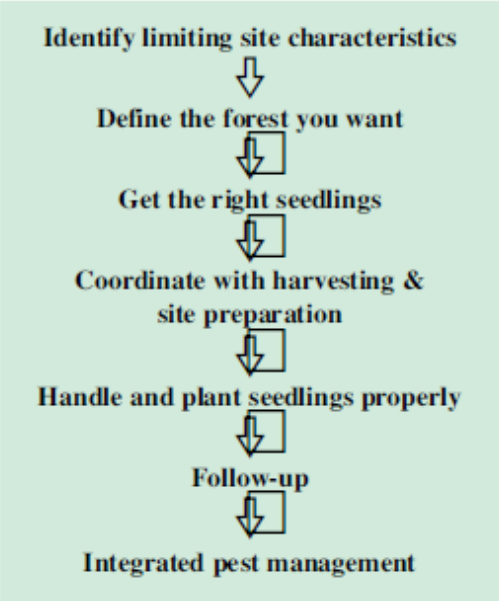
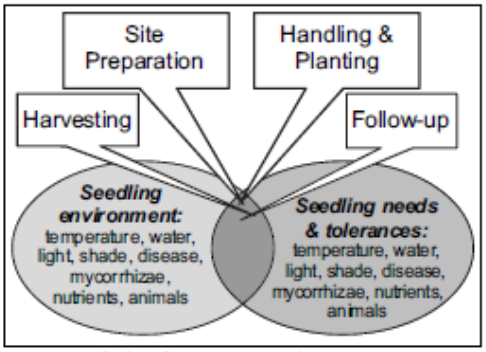


Figure 2.



Successful reforestation that meets your objectives occurs where the seedling's environment and needs overlap.

Identify limiting site characteristics

These are the extremes among the environmental cards that Mother Nature has dealt you that can limit seedling survival and growth. Some site factors, such as weeds, animal browsing and diseases, you may be able to control to varying degrees during timber harvest and site preparation. Other limiting factors that you cannot easily modify, such as frost, growing season length, annual precipitation and heat loads, can be worked around using the right selection of species, seed sources and stocktype. Successful reforestation occurs when the site environment and seedling needs line up to meet your objectives (Figure 2). See the reforestation checklist on page 13 for a more complete set of environ- mental variables to look for.

Define the forest you want

Consider your goals as they fit within the natural site environment and changes created by harvesting and site preparation.

Here is when it is very handy to have a forest management plan defining your woodland goals. If you have not yet defined your goals, now is a good time to do so. Your goals, along with limiting site factors, will guide selection of the regeneration and harvest system, species to regenerate and number of trees per acre (tpa) to establish by planting or natural regeneration.

If timber production is your main goal, then you would probably plant a pure even aged stand of red alder, Douglas-fir or ponderosa pine at relatively high numbers of trees per acre as consistent with site limitations. If disease or insect management is important, then consider planting resistant species or a mix of tree species. Where Swiss needle cast is prevalent, avoid planting Douglas-fir.

If wildlife habitat, special forest products or aesthetics are goals, consider irregular planting to create clumps for cover and gaps for desired understory plants. Establishing two or more tree species and including some hardwoods adds to long-term structural variation valuable for wildlife.

Trees planted more closely together will need to be thinned sooner to maintain good growth; however, thinning varies by species. Red alder seems to grow best at high initial stand densities combined with early thinning that maintains a fairly closed canopy.

For westside Douglas-fir established at about 300 trees per acre, thinning could be considered when trees average about 10 inches diameter at breast height (DBH). Ponderosa pine does better with lower stand densities on its drier eastside sites, either from initially planting fewer trees per acre, thinning or both to minimize bark beetle attacks while growing large trees quickly.

Note, however, that seedlings planted or germinating on the forest floor do not equal established "free-to-grow" seedlings. Expect and plan for some seedling mortality. Even when every- thing goes correctly with planted seedlings, expect up to about 10 per- cent mortality.

Getting the right seedlings

Always select the species, seed zones and stocktypes that match your goals and site conditions.

With your goals, related regeneration method and harvest system now defined, it's time to get serious about selecting the building blocks for your future forest. The most important choice is getting the right tree genes re-established on your site; this means selecting the correct species and seed zone.

A tree species' natural distribution is defined by its response to environmental gradients, as is the distribution of genes controlling how it handles heat, frost, drought, disease and other environmental factors. Experience indicates that planting the wrong species or seed source can greatly reduce yield and create a forest much different than expected. It is always safest to plant native species using a locally adapted seed source as defined by the recent revised seed zone maps available from your state forestry websites or local offices. Failing to do so can increase losses from disease, drought or frost. It is especially important to use a locally adapted seed source when near the ecological limits of species' natural distribution or when crossing major wet-dry or warm-cold gradients such as found in southwest Oregon. For this reason, it is also important to select a seed source from an elevation similar to the planting site; a general rule holds that seed sources can be safely moved about 500 feet up or down in elevation.

If a seed source must be moved, it is regarded as generally safer to trans-plant seedlings into a more benign environment.

Useful Resources

(Mention of commercial names does not constitute endorsement by WSU or Northwest Woodlands)

Planting and other equipment

Terra Tech, 2100 W. Broadway, P.O. Box 5547, Eugene, OR 97405, 1-800-321-1037, www.terratech.net

The Mallory Company, 1814 Baker Way, Kelso, WA 98626-5595, 360-636-5750

Nurseries

More than 40 Oregon, Washington, Idaho and Montana nursery seedling sources exist. Other seedling sources include local conservation districts and woodland owner associations.

Extension and other publications

Many useful publications from Washington State University, Oregon State University, Oregon Department of Forestry, Washington Department of Natural Resources and the University of Idaho provide knowledge on all aspects of woodland management. A selected reforestation list is available by contacting the editor at 503-488-2104 or rasor@safnwo.org.

Transplanting into a harsher environment can be expected to increase the number of maladapted seedlings and losses to things such as drought and frost.

What about planting "super trees" or exotic species? Be very careful. Seedlings from seed developed for rapid growth may be less tolerant of cold and drought and must be matched carefully to the planting site. As for exotic species, long-term observations strongly suggest that the safest course is to stick with native species.

Natural regeneration

After selecting the species that you want, the next task is selecting whether you want to rely on natural regeneration or planting seedlings (or cuttings for cottonwood). Natural regeneration success relies on good seed crops coinciding with good seedbed conditions. It is best suited for eastside and interior forest species, but even then may take a long time. On the westside, natural regeneration is too unreliable for Douglas-fir, although it can work well for western red alder and big leaf maple.

Stocktypes

Planting nursery-grown seedlings achieves reforestation more reliably. Nursery-grown seedlings are available in a variety of stocktypes - a seedling nomenclature based on cultural method, age and size. Stocktypes are available to match high heat loads, droughty conditions, deer and elk browsing, and ease of planting. The most important stock- type specification is, however, good internal physiologic vigor or the ability to generate roots and grow after planting. See page 22 for information on choosing stocktypes.

Coordinate with harvesting and site preparation

If you have not done so already, now is the time to define your harvest methods. How big will harvest openings be? How many overstory trees will be retained? Understory-intolerant species such as westside Douglas-fir or red alder and eastside ponderosa pine or western larch need relatively large harvest openings to ensure adequate light and water for good growth. For natural regeneration, make sure that enough well-formed parent trees remain to provide an adequate seed source. Work with your logger or consultant to ensure that the harvest methods used facilitate regeneration.

Site preparation helps remove factors limiting reforestation success, such as excessive brush, slash or weed populations. To keep costs down, incorporate activities requiring heavy equipment such as brush or stump removal and slash piling as part of the harvest plan. Site preparation for weed control is usually most important and is typically accomplished by mechanical scarification or herbicide application. Herbicides have less potential to damage soil, but must be applied according to label instructions. Prescribed fire can also be used, but requires very careful preparation.

A final and often overlooked step is to order your seedlings early enough so that they are available for planting immediately after harvesting. Seedling shortages happen and reforestation becomes increasingly difficult as competing vegetation reoccupies the harvest site.

Proper handling and planting

All too often, the reforestation planning process breaks at this point. Try to ensure that the seedlings are healthy when you get them from the nursery. Although seedlings are usually healthy, a hard fall frost before lifting that allows the roots to dry during lifting can kill or weaken seedlings. Unfortunately, these seedlings can look perfectly healthy. If lots of seedlings die in the first growing season before summer drought, contact your service forester, extension forester or nursery for assistance.

Handle seedlings gently; research shows that rough handling reduces rooting vigor. Keep seedlings moist and cool until planted. Nursery bags or boxes should not have holes or tears and seedlings should be stored between 33 and 42 degrees Fahrenheit until planting.

Most seedlings are planted during late winter to early spring. Good conditions include moist soils, wet rainy weather and lack of snow cover. Fall planting can work, but requires close coordination between lifting and weather and soils conditions.

Planting hoes and shovels designed for tree planting are durable and effective. Get a tool that easily makes a soil opening deep and wide enough for easy placement of your seedling's roots. Regular shovels are okay for small jobs. Power augers can be effective, but are expensive and unsuited to rocky or clay soils. Machine planting is useful for large open areas.

Seedlings are usually carried in planting bags strapped to the waist, although five-gallon plastic buckets can be used for smaller jobs. Seedling roots should be dipped in water before being placed in bags or buckets; dry roots usually mean a dead seedling. When planting, handle only one seedling at a time. Make the hole adequately deep and wide, and then grab a seedling. To achieve good root placement, guide the seedling roots in place with your hand or gently shake the seedling to get the roots into correct position, or place the seedling extra deep, then pull

it up to correct height to help straighten the roots. Close the hole with one or two pries of the shovel or planting hoe and compact the surface with one boot step. Some seedlings may have one or two excessively long roots. To avoid jamming or twisting these roots, it is okay to trim them. Seedlings should be planted vertically with roots in good contact with mineral soil and with the root collar about an inch below the soil surface. Incorrect planting includes "slipper" planting, twisted or jammed roots, J- or L-rooting, and shallow planting and/or roots in contact with a large rock, snow or organic matter, or in an air pocket.

If hiring planting, use a planting contract specifying suitable and unsuitable planting and payment penalties for improperly planted seedlings. During planting, watch the planters and care- fully excavate around the roots with a hand-sized garden trowel of any suspiciously planted seedling or every 20 to 50 seedlings to ascertain planting quality. Improperly planted seedlings should be immediately brought to the crew boss' attention.

Follow-up

Watch your site and seedlings after planting. If not already planned, be ready to quickly control weeds and damaging animals. Stocking surveys can show whether you are meeting forest practices and your own goals. Decide at what extent seedling death will require fill-in planting.

Integrated pest management

A variety of pests can limit reforestation. Integrated pest management means looking for ways to integrate control of these limiting factors when feasible at every step of the reforestation process, focusing on avoidance, prevention and early treatment rather than waiting until the pest makes is presence fully known. Usually, when a pest problem is highly obvious, damage is so extensive that control is excessively expensive or even unfeasible.

For example, weed cover as low as 20 percent will start to reduce seedling growth and can kill your seedlings if left unchecked. Grass control is usually essential on eastside sites and in southwest Oregon.

For a discussion of common animal pests, see article on page 16.

Always remember:

"Green side up"

American journalist Damon Runyan quipped something along the lines of "that the race is not always to the swiftest, nor the fight to the strongest, but that is the way to bet." In this respect, successful reforestation is never guaranteed. However, by fol- lowing the steps outlined in this article and committing them to paper with the help of the checklist, being proactive in looking for site problems and purchasing seedlings, and acting quickly if seedling or pest problems occur, you will greatly lengthen the odds in your favor.

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Reforestation Checklist

By OLE HELGERSON

Limiting Site Characteristics
Climate and soil

- **Frost:** Eastside Washington and Oregon, and southwest Oregon; valleys or bowl terrain; bushy Christmas tree-like advanced regeneration; clear spring skies. If yes, consider shelterwood or selection harvesting, or plant frost-resistant species such as western white, ponderosa or lodgepole pine.
- **Heat:** Eastside Washington and Oregon, and southwest Oregon; south- to southwest-facing or flat slopes; rocky, shale soils. If yes, plant bushy self-shading seedlings (1+1, P+1, 2+0; avoid larg- er 2+0, 2+1); micro-site plant or apply shadeblocks to container grown P+0 or spindly 2+0 seedlings.
- **High water table:** On eastside plant ponderosa pine, lodgepole pine and cottonwood; on westside plant western redcedar, Oregon ash and cottonwood; avoid Douglas-fir.

Disease (see ODF, DNR, Forest Service and Extension guides for diagnosis)
- **Root rots:** Windthrow, open crowns, declining vigor. If yes, plant resistant species.
- **Mistletoe:** Presence of witches' brooms. If yes, harvest or prune infected trees and/or plant resistant species.
- **Swiss needle cast:** If severe on surrounding trees, such as in the Oregon coastal fog belt, do not plant Douglas-fir.

Animal Damage
- **Deer and elk:** Newer growth raggedly clipped creating bushy seedlings, tracks, droppings. If yes, use repellants, budcaps or plastic mesh; plant 2+1 (BIG) seedlings only on westside.
- **Porcupine:** Debarked seedlings with distinct toothmarks, debarked tree tops. If yes, hunt or live trap and relocate.
- **Voles:** Tunnels in heavy grass cover, debarked seedlings with fuzzy toothmarks. If yes, control grass by herbicides, disking or intensive grazing preferably before planting, wrap seedling stems in aluminum foil, provide predator habitat (perch poles). Note—aluminum foil and predators are ineffective without grass control.
- **Mountain beaver:** Moist sites, large holes in ground, branches neatly clipped from seedlings. If yes, trap with Conibear™-type traps (check legality).
- **Aquatic beaver:** Riparian zones, smoothly clipped seedlings at base, gnawing or felling larger trees, dams not always present. If yes, protect with steel fence posts and chicken wire.
- **Pocket gophers:** Eastside Washington and Oregon and southwest Oregon; tunnel casts on ground in spring; most seedlings are gone or have roots chewed off. If yes, contact service or extension forester, may need to bait burrows; check legality, may need pesticide applicator's license.

Seedling Handling and Planting
- Seedlings kept cool and moist from nursery cooler to planting site (boxes and bags are intact; preferably stored at 33 to 42 degrees F, **do not freeze**).
- Seedlings handled carefully (do not throw or drop bags or boxes).
- Sample 5 to 10 seedlings potted in warm environment and checked in two weeks for root activity.
- Planting weather preferably is cool and moist.
- Planters briefed on quality planting or planting contract used.
- Planters only handle one seedling at a time.
- Inspect 5 to 10 percent of planted seedlings (carefully dig with garden trowel) during planting for J-rooting, L-rooting, "slipper" plant- ing, snow or debris in hole, or air pockets; deduct pay for improper planting as per contract.

Sample Reforestation Planning Checklist

Preparer/Date prepared	
Unit name, harvest system and size	
Site preparation	
Planting date	

Sample Weed Potential and Control Checklist

Weed class	Main species	Secondary species	Potential % cover four years after planting **0-20 *or* 20+**		Select appropriate mechanical, biologic or herbicide weed control; if potential weed cover greater than 20%, control immediately before or after planting to prevent seedling mortality; monitor yearly, control as necessary.
Grass and forbs					
Shrubs					
Hardwood trees					

Sample Seedlings (consider desired future forest and limiting site characteristics) Checklist

Species, seed zone elevation	Stock Type	Nursery	Trees per acre (tpa)	Total seedlings = (tpa x acres)	Total cost = total seedlings x cost/seedling