

STEP 4. PLANT YOUR TREES RIGHT

Well-established guidelines for tree planting in forestry and horticulture generally are applicable for riparian plantings. See *The Care and Planting of Tree Seedlings on Your Woodland*, OSU Extension publication EC 1504 (<http://extension.oregonstate.edu/catalog>), and other resources listed under “For more information” (page 27).

When to plant

Plant bare-root seedlings during the winter dormant season, preferably when soils are above 40°F. Avoid planting during warm, dry, or windy weather. Plant container seedlings (ranging from small plugs to ball-and-burlap stock) from fall through early spring. If soils are moist and warm (above 40°F), fall planting may be advantageous since seedlings' roots may experience significant fall root growth. Plant hardwood cuttings in the dormant season from late fall to early winter.

Seedling care and handling

Once dug or “lifted” at the nursery, bare-root seedlings are vulnerable to damage during packing, transport, storage, and planting. Many problems

Checklist for Step 4: Plant your trees right

Proper planting helps shape the future of your project; many problems with seedling survival can be traced back to improper care and handling.

- Plant at the right time of year—during the winter dormant season for bare-root trees and from fall through early spring for container seedlings.
- Treat seedlings with care from the time they leave the nursery through transport, short-term storage, on-site storage, and planting. Keep bare-root plants cool and moist, and minimize physical damage.
- Use proper tools and planting techniques. Select suitable microsites for seedlings, such as the in shade of logs or on well-drained hummocks.
- Use a planting layout suited to your access needs, maintenance plan, and equipment. Accommodate differing plant growth patterns and competition among species (see Appendix C, page 24).

with seedling survival can be traced back to improper care and handling:

- Keep seedlings moist. Roots dry out rapidly when exposed to sun or wind. If roots appear dry, fine roots and root tips are likely damaged or dead already.
- Keep seedlings cool. When seedling temperatures exceed 42°F (and especially when temperatures remain above 50°F for more than a few hours), they begin “growing in the bag,” using energy needed for survival and growth after planting.
- Handle seedlings with care. Physical damage can result from crushing, dropping, and excess vibration. Avoid tearing roots when unpacking seedlings.

Table 6 lists recommendations for seedling care and handling, focusing on bare-root stock.

Planting tools and techniques

Use the tool that is best suited to the seedling's root system and to soil and site conditions.

For bare-root and container plantings, a heavy-duty, reinforced shovel works well across a range of Willamette Valley soil conditions and is easier for many people to use than a hoedad planting hoe (figure 16). Match the shovel blade size to the seedling's root system. Other hand tools include the dibble and planting bar (suitable for small plugs). Common garden shovels are often unsatisfactory.



Figure 16. Use suitable tools and good planting techniques, and take care to plant each seedling well. Sturdy shovels (a) and planting hoes (b) can produce good results.

Photos by Brad Withrow-Robinson, © Oregon State University.



Figure 17. Auger planting can be helpful for large stock types.

Photo by Brad Withrow-Robinson, © Oregon State University.

Tractor-mounted or handheld power augers can work if the soil is not too heavy (clayey) or rocky (figure 17). Auger planting is especially useful for large container stock.

Take advantage of microsites (i.e., small differences in site conditions, such as soil, elevation, and shade, that affect seedling survival and growth). The shade of a log or other debris can help a seedling endure summer drought. Avoid or minimize hazards. For example, a depression that ponds each winter is not the right site for any but the most flood-tolerant species. Figure 18 shows common tree-planting problems.

Bare-root stock

- Create a hole large enough to position the roots naturally.
- Prepare soil of adequate quantity and quality to fill back around roots without debris or air pockets.
- Position the tree straight and at the proper depth, using the nursery soil line as a guide. Planting too shallowly is a common problem; the root collar (the point where the highest root joins the tree stem) should not be exposed.
- Refill the hole, packing soil around the roots so the tree is held firmly but roots are not compressed.

Plugs or container stock

- Keep the soil–root mass intact.
- Ensure that stock is well watered before planting.
- Prepare a hole large enough to provide some loose soil around the soil–root mass for unimpeded root growth.

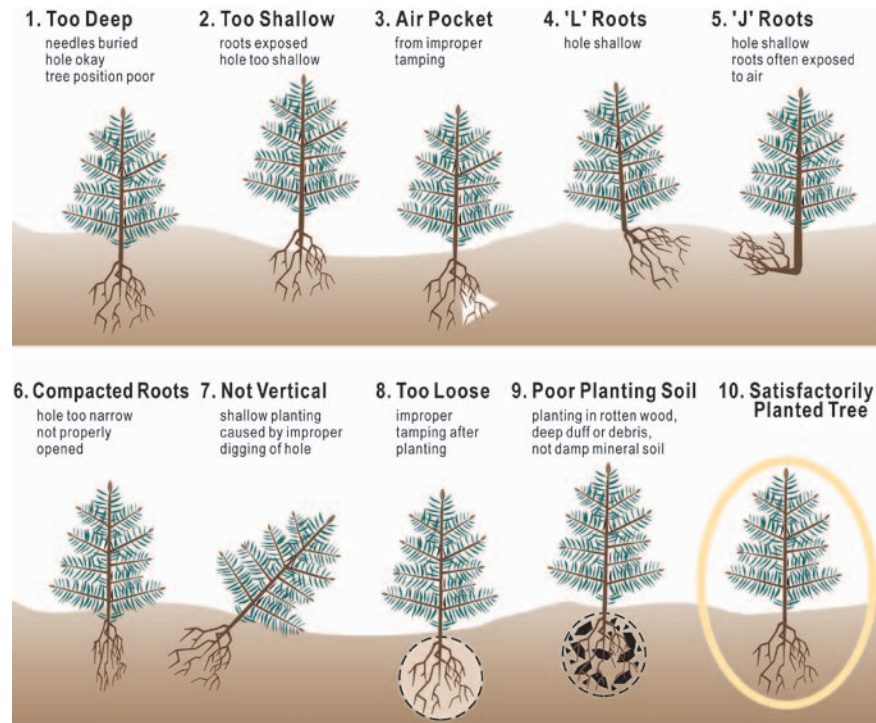


Figure 18. Common tree-planting problems.

Image from Rose, R., and P. Morgan. 1992. *Guide to Reforestation in Western Oregon*. Corvallis, OR: Oregon State University College of Forestry. Reproduced by permission.

Cuttings

- Depending on cutting size and planting depth, you can push cuttings into moist soil or place them in holes excavated with hand tools or machinery.
- Cuttings are less fragile than bare-root seedlings, but general rules for handling, storage, moisture, and temperature apply.
- Soak willow and cottonwood cuttings in water for 1 to 10 days before planting.
- Plant cuttings right side up (i.e., the buds point up).
- Cuttings need to be planted deeply enough so that emerging roots can access moist soils throughout the summer drought period.

Spacing and arrangement

The planting arrangement helps shape stand development and, ultimately, riparian functions. Plant according to the design you developed during your planning process (Step 1, page 2). Use a layout suited to your access needs, maintenance plan, and equipment. If planting a mixture of species, be sure to accommodate differing plant growth patterns and competition among species. See “Spacing and arrangement” in Appendix C (page 24) for more information.

Remember that planting is just one step in creating a riparian woodland. Other actions, such as weed control and thinning, will likely be required to keep the planting on track and achieve your functional goals.

Table 6. Care and handling of bare-root seedlings.

Stage	Recommended practices
Long-term storage (more than 3 days)	<ul style="list-style-type: none"> • Store in a cooler at 33°F to 36°F. • Use packaging that prevents moisture loss. Most nurseries store and ship seedlings in waxed bags or boxes that “breathe” but prevent water loss.
Transport from nursery	<ul style="list-style-type: none"> • Use a refrigerated or insulated truck or reflective tarp (white exterior, silver-foil interior) over seedlings in an open-bed truck. • Do not expose seedling containers to direct sunlight. • Avoid using dark-colored tarps, which build up heat. • Travel during cool times of day if possible.
Short-term storage (a few hours to 3 days)	<ul style="list-style-type: none"> • Store below 42°F (ideal temperature range is 34°F to 36°F).
Transport to planting site	<ul style="list-style-type: none"> • Use proper packaging for seedlings and a reflective tarp. • Do not transport in the open; keep covered. • Do not stack bags more than two high. • When arriving at the site, store seedlings in shade. • Do not take more seedlings than can be planted in 1 day.
At planting site	<ul style="list-style-type: none"> • The greatest risk of damage from moisture loss, temperature, and physical handling is at this stage. • Handle seedling boxes or bags gently; do not throw or drop. • Reseal partially empty bags. • Avoid rubbing or tearing roots when taking seedlings out of the storage bag and putting them in the planting bag. Do not cram too many in the bag. • Seedlings may be dipped in water (for 1 minute at most) before placing in a planting bag, but do not store in water or the roots will die. • Do not leave seedlings unprotected on the ground, and make sure roots stay moist.

Checklist for Step 5: Take care of the planting

Maintenance after planting often makes the difference between success and failure.

- Control competing vegetation for 2 years or more after planting to ensure good survival. Controlling invasive weeds and other competing vegetation leaves more soil moisture and other resources for seedlings.
- Minimize animal damage problems—from livestock or wildlife—by using seedling protective devices, fencing, or repellents as needed. Try to anticipate problems during your initial site assessment (Step 1, page 2), but monitor and respond to problems if they occur.
- Irrigation can help improve seedling survival and growth, particularly for water-loving species on droughty soils. Consider the labor and expense involved, and select species that can survive on the site over the long term without irrigation.
- Visit the site periodically to monitor seedling survival and growth and determine maintenance needs. The first season after planting is the most critical, but maintenance may be needed for several years before seedlings are free to grow.

STEP 5. TAKE CARE OF THE PLANTING

Maintenance weed control

The task at this stage is to maintain the weed control achieved before planting. Without continued control, weeds will quickly return and affect seedling survival and growth. This is a common source of failure in riparian plantings.

Once the planted species begin to shade a significant portion of the ground, weed control becomes much easier. The time required to reach this stage varies. With effective weed control, conifer plantings on unirrigated,