

TECHNICAL NOTES

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Plant Materials Technical Note No. 3

TIPS FOR PLANTING TREES AND SHRUBS: REVEGETATION and LANDSCAPING

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A. REVEGETATION and REFORESTATION

Stock type selection:

- ✓ Understand the basic terminology (such as 2-0, 2-1, plug+1, etc.), availability, cost differences, and NRCS, Oregon Department of Forestry (ODF), and Washington Department of Natural Resources recommendations.
- ✓ Match stock type to planting site. For example, favor materials with high root volumes, high root to shoot ratios (specify if possible), especially on drier sites.
- ✓ Favor larger, taller stock (with good root development) for sites with tall weeds (i.e. Reed canarygrass) or brush.
- ✓ If possible, use native PMC selections or material from the same ecoregion, seed zone, watershed, and elevation band. The ODF (1996) has published seed zone maps for 19 tree species in western Oregon.
- ✓ Custom order stock well in advance (1-3 years), especially for non-timber species or unique stock types.
- ✓ If possible, specify stock pre-inoculated with mycorrhizal fungi, nitrogen fixing bacteria, and/or other beneficial microbes.
- ✓ Container and bareroot stock both have their advantages and disadvantages, depending on many factors. Refer to the references for further information.

Planning tips:

- ✓ Evaluate the need for site preparation (i.e. save topsoil, scarify, clear, till, suppress weeds, slope, grade, etc.) at least a year in advance.
- ✓ Plant species on favorable microsites within planned area and match species with correct micro and macroenvironments.
- ✓ Assess need and cost for animal damage control measures, pre and post planting (i.e. beaver, voles, deer).
- ✓ Plan for the most cost effective planting method(s) (mechanized vs. manual or combinations) that will work.
- ✓ Follow NRCS policies and specifications (i.e. 327-Conservation Cover, 342-Critical Area Planting, 380-Windbreak/Shelterbelt Establishment, 386-Field Border, 391-Riparian Forest Buffer, 422 Hedgerow Planting, 490-Forest Site Preparation, 612-Tree/Shrub Establishment), Oregon Forest Practices Act, State laws, and other requirements such as those specified by Cost Share Programs.
- ✓ Plan ahead for trained crews, transportation, irrigation needs, equipment rental, and temporary storage of plants and supplies.
- ✓ Be prepared for several years of follow up monitoring, maintenance, replanting, pest control, etc.

Manual transplanting techniques:

- ✓ Select the right tool for the right job (refer to Hallman 1993, pp. 120-138, for an excellent review of manual tools in reforestation, including advantages and disadvantages for each kind). For example, planting shovels are good for planting large bareroot or container stock on deep, loose soils while planting hoes (hoe-dads) are best for steep, rocky sites, clay soil or heavy slash cover.

- ✓ Avoid the all too familiar planting mistakes such as the J-root (refer to figure 11, from Elefritz 1998).
- ✓ Make planting holes using recommended techniques (refer to diagrams from Pitkin 1982).
- ✓ For planting dates, consult NRCS specification 612. Generally this is January-March at lower elevations in western Oregon. Mid to late fall planting is also an excellent time for larger container stock but only if good soil moisture exists (and persists) or irrigation can be supplied. A few species are limited to spring planting.
- ✓ Scalping (2-4 ft. diameter) helps control competing vegetation, conserve soil moisture and reduce rodent damage. However it is expensive and often minimally beneficial if not repeated after the first year.
- ✓ For sods and meadows, consider spraying 2-4 ft. diameter circular areas with a broad spectrum, low toxicity herbicide like glyphosate instead of scalping. This minimizes disturbance and topsoil displacement. To mark the planting sites, mix the solution with an approved blue-green dye for safety. Follow the label and all laws.

Soil amendments and root treatments:

- ✓ Consider hormonal (IBA, NAA) pre-plant treatments (root dip, drench) of bareroot and container stock using commercial preparations. They may not help, but they are inexpensive and not harmful. Any advantage from B Vitamins is not well established. Limit use of pre-plant dips to trained, knowledgeable crews.
- ✓ Polymer and vermiculite root dips for moisture retention are probably not a warranted expense (see Sloan 1994a) and many are actually detrimental by prohibiting oxygen and carbon dioxide movement in and out of the roots. However, evidence may differ in a few studies, or with one or two newer formulations.
- ✓ Organic soil amendments (such as peat, bone meal, etc.), weed barriers, and surface mulches may be too costly to apply and are usually not recommended except in limited cases. Use is normally restricted to small sites, in combination with seedlings, soil bioengineering, or as "test" treatments within larger plantings (i.e. where sites have depleted or missing topsoil, or excessively well-drained, sandy or droughty soils).
- ✓ Manure is usually not a good idea.
- ✓ Fertilization can have positive, negative or neutral effects on survival and growth. It may be desirable on small sites or sites with poor, eroded soils or exposed subsoils. Top dressed fertilizer promotes herbaceous weeds and can wash away. Avoid contamination of ground and surface waters.
- ✓ As an option, use slow release forms, such as 9-month, 14-14-14 granules or tablets in the hole. Avoid the use of inorganic lawn fertilizers and do not place them in the planting hole.
- ✓ If seedlings are not pre-inoculated (i.e. mycorrhizal fungi, N-fixing bacteria) consider pre-fabricated packets or pre-plant wettable formulations that contain a wide variety of microbial species known to infect the transplants. Use only as an option for small plantings with poor soils or on a trial basis.
- ✓ A good option for eroded soils is to have a stock pile of local "native" soil because it contains valuable microbes. A small amount can be tossed in and around the planting holes. However, the soil should not contain weed seeds, especially reed canarygrass, Canada thistle, or blackberries.

Plant care and protection:

- ✓ Avoid handling the roots and minimize handling in general. Keep in cool storage or heel-in until planting.
- ✓ At the site, protect plants by keeping them moist (esp. roots) and cool in the shade or under a reflective blanket.
- ✓ Never prune roots or top growth unless minor portions are dead, broken or diseased.
- ✓ Dip seedlings in water for one minute just prior to putting them in the planting bag. Take only as many as you can plant in one hour or less while on foot.
- ✓ If needed, apply deer barriers such as vexar tubes (a plastic mesh in the shape of a tube), nets, or budcaps. Liquid repellents can be applied with backpack sprayers. Those with putrefied egg solids are considered the best. Re-apply to new growth.
- ✓ Note that vexar tubes can catch debris during flooding along streams. Some plants can be damaged or broken if the tubes are bent over too far.
- ✓ For voles, wrap the base twice with 6-8 inch wide strips of tinfoil or use "arbor guards". For tinfoil, seedlings should be at least 12 inches tall. This can be effective for up to 2 years. Baits are often ineffective. Mowing or scalping reduces hiding cover.
- ✓ If the planting is near a stream or pond, consider the use of a portable, gasoline engine water pump for periodic irrigation the first growing season. However, do not violate the water rights of others.

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B. LANDSCAPE and ORNAMENTAL PLANTING

Stock type selection:

- ✓ Know the differences (advantages, disadvantages) between the three most common types of stock: bare-root, ball-and-burlap (B&B), and container. For example, the roots of container stock are less disturbed than bareroot material, which can improve transplanting success for certain species..
- ✓ Cost usually determines what size stock someone will buy. Obviously, large stock is more expensive and can be too cumbersome for one person. Container stock rarely exceed 5 gallons in size, and B&B material rarely exceeds 75 pounds. Bare-root is often cheapest, but some species have root systems that are poorly suited to it and are not sold this way.
- ✓ Choose only pest-free healthy material with good form. As an example, fruit tree branches should not be crossed. Favor horizontal branches because they are usually stronger than more upright ones.

Planning tips:

- ✓ First, develop a detailed site plan with cost estimates and time frames. A small scale topographic survey is very helpful. Do the research on plant size, adaptation, growth rate, culture, etc. before you visit the nursery or order stock.
- ✓ Match the right plants to the right place. This includes drainage, soil type, moisture requirements, cold hardiness zone, sunlight, pH, space, color, texture, mature size, and other landscape design criteria. Sunset's Western Garden Book (Brenzel 1995) is a good reference.
- ✓ For farmstead, feedlot, and field windbreaks and hedgerow plantings refer to NRCS specifications 380 and 422 respectively, as well as other appropriate references and requirements. Planning will include fertilization, pest control, irrigation, mulching, pruning, etc.
- ✓ Be prepared for conducting regular, long term, maintenance and management of the trees and shrubs. For example, a permanent trickle irrigation system with a timer is usually best (more efficient and doesn't encourage foliar pathogens compared to sprinklers), especially for upright, drought intolerant species.
- ✓ Native trees and shrubs have a real place in low maintenance landscapes especially where a natural, very informal appearance is desired. This does not mean they will not require any inputs or management. Also, they are not necessarily more drought tolerant than some exotics, especially if their natural habitat is a wetland or any permanently moist or saturated soil. Requirements vary, as with introduced ornamentals.

Manual transplanting techniques:

General:

- ✓ Follow proper storage and handling techniques as described for revegetation stock.
- ✓ Avoid planting in wet clay soils. The sides can glaze (seal) up.
- ✓ Know your soil drainage. Digging a hole the winter before planting and observing how slowly it drains is a good way to tell. Many species planted into slow draining soils will not survive.
- ✓ Do not amend native soil (Chalker-Scott 2000a, 2000c), with rare exception (see below).
- ✓ Do not prune branches, unless broken, dead or badly diseased (Chalker-Scott 2000b). Exceptions are also made for certain fruit trees or those cases where a structural change is needed. When warranted, strategically thin branches rather than indiscriminately top or hedge cut. Always leave the lowest branches intact the first 3-6 years. They are essential for establishment and photosynthetic capacity.
- ✓ There is no strong evidence supporting the use of B vitamins as root stimulators, but there is for solutions with root stimulating hormones such as IBA and NAA.
- ✓ Fertilization is not necessary the first year unless the soil has low natural fertility. Some fertilizers can be detrimental. Slow release fertilizers are the only acceptable forms to use in the planting hole or during the first year. Bone meal will not hurt the plant, but it's rarely needed for survival and growth in most soils.
- ✓ In the following years, fertilize and lime according to annual soil tests.
- ✓ After planting, mulch with 2-4 inches of partially decomposed or nitrogen fortified bark, sawdust, straw or leaf litter. This helps control weeds and store moisture, but soil pH can decline over time.
- ✓ Consider the use of water permeable weed barriers under the mulch.
- ✓ Carefully weigh the use of pre-emergent herbicides registered for weed control in tree and shrub beds, including possible offsite and unintended negative effects.
- ✓ Staking the tree is rarely needed. However, on windy sites use only 1 or 2 stakes, placed in line with the prevailing wind direction. Shield the twine or rope from rubbing and girdling the bark. Plastic, adjustable

cords are an option. Pieces of rubber hose work but expandable ties that do not need readjusting as the trunk widens are best. Stakes should be removed within a couple years.

- ✓ Avoid the use of manure, especially raw, non-composted ones. They are often too high in salts.
- ✓ For ornamental plantings that are normally managed with good fertility and moisture, mycorrhizal fungi inoculants offer no advantage. While spores remain present, beneficial fungi may actually disappear over time. However, for windbreaks and other low maintenance plantings inoculants may be more justified.
- ✓ Decide against the use of moisture retention polymers in most cases. There are varied reports of the effects of these polymers on plant growth, including reports of harmful exclusion of oxygen. Water retention by the polymers is decreased in the presence of soluble fertilizers and wetting and drying cycles.
- ✓ Consider the need for deer fencing and repellents. Newer repellents with putrefied egg solids are considered the best. Always re-apply to new growth and follow label directions.
- ✓ Keep a weed and grass free area beneath each tree and shrub. It should have a radius from the trunk of at least 2 feet. This can eliminate vole girdling in most instances, reduce moisture competition, and keep lawn mowers from hitting the bark. Vole damage can also be reduced with tinfoil wrapped around the base, baits, traps, or cylinders of hardware cloth.
- ✓ Tree trunks can be protected from lawn mowers with loosely applied tree wraps (do not use tape). They also help prevent damage from sun scald but are usually only recommended for certain fruit and nut trees.

Containerized plants:

- ✓ This stock can be transplanted any time of the year, but fall or early spring is still best.
- ✓ Remove peat and fiber pots completely. However, if the pot is small and/or the roots have already grown through then keep it, but remove any portion protruding above ground to prevent moisture wicking.
- ✓ Remove the plant from the pot and observe the roots. Most woody plants were first grown in small pots before being transplanted to larger ones. If the plants have been in a container for an extended period, roots will be spiraled (a sign the plant is root or pot bound) on the outside perimeter, or in a zone at the position of the original pot.
 - ◆ If roots are circling the crown of the plant (base of the trunk or shoot), gently pull away and feather the roots. If they cannot be straightened away from the crown, the plants should be returned to the seller.
 - ◆ If such material cannot be returned, the circling roots must be cut or otherwise straightened away from the crown to prevent continued girdling.
 - ◆ Circling can also occur around the perimeter of the root mass. These should also be gently pulled away and feathered. Some experts recommend a few shallow vertical knife slits to stimulate the roots to grow outward. Only try this if the spiraling is too severe and outer roots too tangled. Avoid severing and removing roots unless they are already dead or diseased.
 - ◆ The butterfly technique (Maleike and Hummel 1994) of slashing down the center of the bottom half and fanning the material out is probably too harsh and indiscriminate for most species.
- ✓ Minimize textural transitions between the potting media and the native soil. Water will not move readily from one soil texture or media type to another. Roots will resist moving from a loose media to a dense soil.
 - ◆ To correct this problem, some experts suggest gently removing most of the potting media with your fingers or at least hosing away the outer few inches of material to free the outside roots.
 - ◆ As with pot bound plants, loosen, uncoil, and spread the roots. Note that other experts do not recommend this procedure for tender or disease prone root systems. Others do not suggest it at all (except for spiraled or circling roots).
- ✓ Do not amend native soil.
 - ◆ However, if the soil is too compacted, clayey, or sandy, then the best choice is to till and amend an entire area (for example a large shrub bed or long border) to a depth of at least 12 inches.
 - ◆ For single specimens, rototill (also to 12 inches or the depth of the container) and amend an area at least five times the diameter of the root mass. Dig your planting hole in the center.
 - ◆ In these cases, limit the amendment to no more than 25% peat moss or organic soil, thoroughly mixed with existing soil. Many times just mulching the surface will lead to a looser structured soil beneath.
 - ◆ Do not attempt to change a clay soil into a coarser textured, looser one by adding sand. It requires nearly 50% sand by volume to effectively change the characteristics of a clay to a sandy soil. Less than this results in a denser soil than either clay or sand alone and adding 50% sand is usually not practical (Chalker-Scott 2000c).

- ◆ In the nursery trade, recommendations can still be found for small transitional zones of amended soil (1/3 organic soil) confined within the planting hole. Most researchers no longer recommend this practice.
 - ◆ For raised beds, some still recommend a transition zone beneath the highly organic top layer or fill.
- ✓ Dig the hole wide enough so that the flared roots or outer root tips are not touching the side.
 - ✓ Roughen the sides so the roots will be less likely to spiral in the hole.
 - ✓ If all or the outer portion of the potting media has been removed to free the roots, form a raised platform or cone of original, undisturbed soil in the center of the hole to support the root mass. Otherwise the bottom can be flat.
 - ✓ Gently lay the root mass on the center of the cone and position the root collar or base of the crown (i.e. level of the original potting media) so it is 1-2 inches above the level of the surrounding soil. Uniformly straighten and flare the loose roots down the sides of cone.
 - ✓ Backfill and gently work soil down and between any loose roots. Firm by hand as you go but do not pack too hard. Standing on the soil to tamp it down will cause too much compaction.
 - ✓ After filling the hole, add water to eliminate air pockets. Pumping the plant up and down can further settle the soil.
 - ✓ On sloping ground, create a temporary berm or terrace to hold water. Some experts recommend berms in all cases (Brenzel 1995), but others suggest it encourages roots to remain within the berm. They suggest mulch is enough (Moll and Rodbell 1994). A good compromise is to remove it after one full growing season.

Bare-root plants:

- ✓ Recommendations for bed preparation, formation of the hole, placing the plant, and back-filling are similar to container plants.
- ✓ Planting time is restricted to late winter and early spring when stock is dug and commercially available.
- ✓ Usually cheaper and easier to plant, they don't have the built-in problem of a growth media differing in texture from the native soil.
- ✓ Soak the roots in water for 24 hours before planting.
- ✓ Cut back any broken or damaged roots to healthy tissue then straighten and flare the roots around the cone.
- ✓ Under windy conditions, some recommend pointing the largest root into the prevailing wind direction.
- ✓ Make sure old graft unions are positioned well above the soil line.

Ball-and-burlap plants:

- ✓ Recommendations for bed preparation and plant placement are similar to bare-root and container stock.
- ✓ Do not drop the ball or let it crack or shatter.
- ✓ The hole should be at least twice the diameter of the ball.
- ✓ With the ball in the hole (on a solid raised platform in the center), the rope and the burlap should be completely peeled back and rolled down to expose at least half of the ball. Some recommend complete removal of the burlap.
- ✓ Most B&B plants are grown in a clay soil. If your soils are a sandy, loamy or lighter garden variety, a barrier to moisture movement will be created by this textural difference. In this case, amending the back-fill soil with 1/3 organic matter may be justified (Brenzel 1995).
- ✓ Water thoroughly and don't let the ball dry out, especially the first two years. A few small holes poked into the ball or the use of a root irrigator will help.

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NOTE: Many OSU Extension Service publications are available through the Internet (eesc.orst.edu)