

Virginia Department of Forestry Hardwood Tree Planting Guidelines July 6, 2007

Purpose: To provide guidelines for the establishment of hardwood trees through *planting* on open land. Specific goals for stand establishment will depend on landowner's objectives and may include riparian forest buffer establishment, wildlife habitat, forest product production, aesthetics or other. The goal should stress rapid establishment of a forest stand with the right species on the right site under the right conditions for the desired purpose. **Ninety percent (90 %) of the seedlings must be planted according to these guidelines to qualify for cost share.**

1. Site Evaluation: A field site evaluation by a professional forester is the first and essential step to successful hardwood establishment. USDA programs require a written management or site plan for each hardwood planting. VDOF Form 75 (Forest Management Plan) will suffice if it includes site information including but not limited to:

- 1.1. Soil description and condition (type, depth, drainage class)
- 1.2. Aspect and position on slope or topographic feature
- 1.3. Existing vegetation (herbaceous and woody, extent, species)
- 1.4. History of, and present site use
- 1.5. Existing trees and available seed sources (wind, water, animal dispersed)
- 1.6. Flood potential
- 1.7. Deer, vole and other mammal potential

Recommendations should include site preparation method, shelter height, and spacing. If herbicides are recommended, state the name, rate, and time of year to apply, see Appendix "A" (Herbicide Use Guidelines). A map showing species and number to be planted and location shall be attached. Maintenance shall include information from section 8.

2. Site Preparation: Purpose: To remove woody and herbaceous competition and habitat conducive for voles and mice. By creating more bare soil, site preparation may increase the likelihood of natural hardwood regeneration, including invasive species.

2.1. Chemical:

- 2.1.1.1. Use approved herbicide per label instructions by certified applicator to control vegetation that will compete with planted trees.
- 2.1.1.2. Broadcast, band (min. of 4 feet), or spot spray according to Appendix A..
- 2.1.1.3. Second application may be required for hard to control species.
- 2.1.1.4. Be aware of the potential for invasive species that may invade sprayed sites.

2.2. Mechanical:

- 2.2.1.1. Disking or tilling: can be effective at reducing sod and breaking up hard soil. Double or multiple passes may be needed.
- 2.2.1.2. Sub-soiling or ripping: can be effective in breaking up hard plow pan layers or heavy sod and to lay out planting rows.

2.2.1.3.Scalping: can be effective in removing sod and may provide early season freedom from competition and can be done using tractors, or scalping spots with hand planting tools to remove grass roots.

2.2.1.4.Close mowing or pre-planting grazing: can make the site easier to plant but will not provide competition control.

Note: With any soil disturbing practice, consider potential for soil movement, slope, and proximity to water. Perform these practices well in advance of planting, so that soil will adequately settle prior to planting.

2.3. Burning:

2.3.1.1.May be used to reduce vegetation and create better planting conditions.

2.3.1.2.Burning does not provide long term control of grasses but may improve habitat conditions for certain birds and wildlife.

2.3.1.3.Consider using burning in conjunction with herbicide treatment (before burning, or the spring following burning).

3. Species Selection: Right species, for the right site, for the right purpose.

3.1. Based on landowner and project objectives, select the correct specie or species mix best suited for the site and with the highest probability of success. Trees already present on or near the site will aid in this selection process. If a strong seed source (particularly light wind borne seeds) for an individual species is present, then planting that species may not be necessary.

3.2. Site characteristics must be taken into full consideration when selecting species not naturally occurring on the site.

3.3. Species are to be selected by a professional forester, not the planting contractor. Contractors have discretion over where the seedlings are purchased but the acting forester is responsible for selecting proper species based on site characteristics and management objectives or program criteria. The forester needs to communicate the location where each species is to be planted.

3.4. Review and select trees based on the silvicultural characteristics of the species.

3.5. If consistent with objectives, choose species with aggressive growth characteristics that will quickly occupy the site, outgrow or suppress competing or invasive species and create the benefits of a forest environment. Rapid site occupation by planted trees of the proper species will reduce the need for site maintenance.

3.6. Use of “Nurse or Trainer” trees: Inter-planting of conifers can be useful in hardwood stand establishment to encourage vertical development, shade competition, ameliorate soil conditions and foster root development and create forest conditions more quickly. Use conifer species that are best-adapted to the site conditions and with growth rates that are consistent with the hardwood species being planted. Interplanted conifers should be evenly spaced between planted hardwoods. Consider diminished conifer species like shortleaf pine, as well as white pine. Plant only enough to meet site needs. These may be removed when they have achieved their desired purposes, and when practical to do so. (USDA program guidelines limit to 200 tpa for white and shortleaf pine and 50 tpa for loblolly pine).

3.7. On sites subject to wet soil part of the year, use appropriate wet soil adapted species, not upland oaks. Northern red oak should only be planted on well drained, northern or eastern aspects on the middle to lower slopes. White oak grows best on north and east-facing lower slopes and coves and grows well on moderately dry slopes and ridges with shallow soils.

4. Seedling Selection and Care:

4.1. Use hardwood seedlings that have a **root collar diameter of at least .25” to .3”** or greater.

4.2. Inspect seedlings for any injury, and for general condition. Musty smelling or moldy seedlings should be avoided.

4.3. Choose seedlings produced from seed sources at or near the same latitude as the planting site.

4.4. Handle and store seedlings carefully by planting them promptly, storing them in a cool dark place, out of the sun, wind, and high temperatures. Avoid freezing.

5. Seedling Density and spacing

5.1. Select density and spacing appropriate to management or program objectives and species characteristics.

5.2. Be careful with planting near power lines, entrance roads, fences, gates etc. Leave room for ingress and egress. Use shrubs or small trees in areas where power lines are overhead. Leave at least 15 feet from the center of roads, 20 feet from the dripline of existing trees, and 10 feet off of fence lines.

5.3. Do not plant shade intolerant species under the canopy or within 20 feet of larger overstory tree driplines.

5.4. Where an abundance of natural seedlings are expected, but supplemental planting is desired for species diversity or specific program guidelines, plant a lower stand density. More intensive site preparation and maintenance can be expected to establish and keep these trees in the stand.

5.5. CREP program requirements call for planting a minimum of 110 well-distributed hardwood seedlings per acre (20 by 20 foot spacing), 80 percent of which being hard mast producing trees of four to five species, with the remaining 20 percent of the trees being soft mast producing species. **If any part of the project area includes overstory trees, only plant in the open area and adjust spacing to plant the average required trees per acre for the total area, or plant shade tolerant species or shrubs under the overstory trees.**

6. **Planting Methods:** Utilize a planting method best suited for the site, seedlings, and provides practicality to the objectives.

6.1. Trees should be planted with the root collar (where the seedling stem meets the roots) at the same level as existing ground level. Seedlings are not to be “L” or “J” rooted, plant holes should be free of debris and have only one seedling per hole. The seedling should be set in the ground with no air pockets or voids and within 30 degrees of vertical.

6.2. Tree planting along with shelter and mat installation should be completed prior to April 15th in the coastal plain and piedmont, and by May 1st in the mountains.

- 6.3. Hand planting using, hoedads, shovels, augers, or machines can be done successfully if the planting hole is large enough to allow the roots to spread out and deep enough to plant with the root collar at ground level without “L” or “J” rooting. **Dibble bars should not be use because they do not make an adequate hole for many hardwood seedling roots.**
 - 6.4. Soil augers can be useful when planting larger seedlings and for efficiency. Use care when in heavy clay soils where augers could create a smooth hard wall that will restrict water and roots. To account for soil settlement tree shelters should be set and buried 2-3 inches below ground surface. Any soil removed by the auger or machine should be placed back into the hole to secure the seedling at ground level and prevent the seedling from settling below ground level.
 - 6.5. Planting machines, pulled by a farm tractor, can be very effective and efficient, particularly with higher seedling densities and may be more suitable in Piedmont and Coastal Plain soils. Care must be taken to assure proper depth and avoid “L” or “J” rooting.
 - 6.6. With any planting method, soil should be packed tightly around trees to prevent air pockets and secure the seedling.
7. **Seedling Protection Devices:** The use of shelters can aid in survival, early growth (through micro-environment effect), and protection from predation by voles, mice, deer, and livestock. They aid in locating and maintaining seedlings and offer protection when spraying nearby competition.

Following are recommendations related to this system:

- 7.1. **A 4' tree shelter is recommended.** Shorter shelter sizes are available and may be used but the forester must provide technical justification and confirm the absence of significant deer-damage potential elsewhere on the property and/or by consulting with the local Game and Inland Fisheries biologist. The tract plan (VDOP Form 75) dictates tree shelter size. Tree shelters should be durable enough to stay in place for at least 5 years to provide protection against deer, voles and mice, yet be biodegradable, unless the landowner agrees to the added expense of removing the shelters after the tree reaches a diameter of 2 to 3 inches. Flat packaged shelters must be rolled to overlap the ends providing a fully enclosed tube around the seedling.
- 7.2. Tree shelters must be **installed 2-3 inches below the ground surface** to reduce rodent entry and wind chimney effects.
- 7.3. **The planting spot shall be scalped** to remove sod before planting to reduce herbaceous competition inside the shelter.
- 7.4. Shelters should be tied securely using **releasable** cable ties.
- 7.5. Stakes shall be a 1" by 1" (7/8" minimum) **white oak heartwood or treated pine stake**. Bamboo stakes, steel rebar or other non-biodegradable material may not be used. **The stakes should be installed on the north side of the shelter.**
- 7.6. **Bird nets shall be used** on 3 or 4 foot shelters and **installed leaving a small opening in the top.**

- 7.7. Grass control mats shall be used** (usually 3' x 3') to reduce sod competition. They must be tied down flat and securely using metal landscape pins. Mats should be centered over the seedling providing even protection around the seedling. On very rocky ground, secure as best as possible and consider additional chemical or mechanical treatment to obtain grass control.
 - 7.8.** Flooding can knock down shelters. Shorter shelters could be considered where flooding is likely and deer damage is expected to be light. Install stakes on the downstream side of tubes if flooding is expected. If taller shelters are used, use longer stakes and install them deeper.
 - 7.9.** Carefully consider costs and benefits of shelters and mats when making prescriptions. Be aware that costs, contractor preferences, and landowner preferences are not acceptable technical reasons or justifications for using shorter tubes or less seedling protection.
- 8. Maintenance:**
- 8.1.** A forester should perform field reinspections to determine seedling survival, condition, and to evaluate competition. This should be completed by the late summer/early fall of the second growing season. Consider and record natural hardwood seedling stocking, species, and desirability. This will affect decisions regarding competition control.
 - 8.2.** Consider replanting if seedling survival is poor (<50%). Inter-planting or replacing seedlings in close proximity to surviving seedlings is not recommended. However, if there are large spaces between surviving seedling, replanting in these areas can be considered. Carefully assess the condition of the site. Further site preparation or competition control will likely be necessary to ensure survival of replanted trees.
 - 8.3.** Assess the need for competition control, particularly vertical, or overtopping competition and non-native or invasive species. Foliar herbicide spraying with approved herbicides according to label can be effective if planted seedlings can be located and protected. Spraying over seedlings prior to bud-break may be an option, but only with labeled herbicides over labeled species.
 - 8.4.** Mowing or disking may be considered to retard competing vegetation or to reduce sod and thatch that may provide vole and rodent habitat. However, consider the effects on any desirable natural regeneration prior to using these practices.
 - 8.5.** Remove bird netting when tree growth reaches top of tube. If shelters do not degrade and split, they must be removed when the tree is 2 to 3 inches in diameter. Biodegradable shelters with a perforated line will split off with normal stem growth.
 - 8.6.** The landowner should check the site annually for broken stakes or invasive species. Efforts should focus to control and prevent invasive species from developing in hardwood plantings. The landowner should anticipate having to replace up to 10% of the stakes by the fifth year.
 - 8.7.** Keep livestock out of planted areas.