Planting and Care of Fine Hardwood Seedlings

Hardwood Tree Improvement and Regeneration Center
Northern Research Station
USDA Forest Service
Department of Forestry and Natural Resources
Purdue University

Site Preparation for Tree Planting in Agricultural Fields and Hardwood Forests

Charles H. Michler, *Northern Research Station, USDA Forest Service*
Ron Rathfon, *Southern Indiana Purdue Agriculture Center*
Department of Forestry and Natural Resources
Purdue University

Site preparation is used to create favorable growing conditions for hardwood seeds and seedlings, and to facilitate tree planting operations. Site preparation includes controlling undesirable vegetation; improving soil structure, drainage and fertility; and reducing logging slash. In the Central Hardwood Region, three site conditions exist where site preparation may be needed: fallow fields and pastures (old-field), fields recently in row crop production, and existing timber stands. Site preparation methods include plowing, disking, deep ripping, mowing, burning, herbicide application, fertilization, control of undesirable competing trees and shrubs, and reducing logging slash (Fig. 1, 2).

Old-Field Sites

Early succession old-fields are often dominated by cool-season grasses, broomsedge, and rank weeds such as goldenrod and horseweed. Pioneer shrubs and trees of varying sizes and densities may also become established. Sod-forming grasses such as tall fescue are strong competitors for soil moisture and nutrients. One method to kill grasses and deep-rooted perennials is to mow the site in mid-July and again in mid-August, then broadcast apply glyphosate herbicide in the early fall while vegetation is still actively growing. On slopes where erosion is a concern, spray herbicide in 3 to 4 ft wide bands in the tree planting rows. Some hard-to-

Figure 1. *Grass and rank weeds growing in old-fields should be controlled before planting trees. Herbicides provide the most cost-effective efficient means of weed control, and can be applied using a variety of equipment depending on the size of the job.*

Figure 2. *Disking prior to tree planting alleviates surface soil compaction. Deep ripping may be needed to break up a hard pan or plow layer.*

kill, undesirable brush and tree species may require other herbicides in order to kill them. Apply a pre-emergent herbicide such as simazine or Oust® at time of planting, or shortly thereafter in the spring prior to seedling bud break. Herbicide should be applied in 3 to 4 ft bands in the tree planting rows.

Old-fields are often eroded with depleted soil fertility. Although many native hardwood species have relatively low nutrient requirements, some species show improved vigor and growth with fertilization. Fertilization, however, will not permanently overcome inherent low site productivity because of thin soils or droughty conditions. Thus, careful consideration must be given to selecting the appropriate species to plant, given the site conditions (Ponder and Pope 2003). For more information on fertilization of hardwood plantings see McKenna and Woeste (2004).

Row Crop Fields

Fields recently in row crop production usually need only a pre-emergent herbicide at or shortly following spring planting to effectively control competing vegetation. Many agricultural fields have at least a moderate degree of soil compaction. Soil compaction can be rectified by disking to a depth of 6 to 14 inches several months before planting or as early as the previous fall if spring flooding or wet soil conditions prevent spring tillage. In situations where it becomes necessary to break up a hard pan or plow layer, deep till or rip using a chisel plow or ripper. This is normally done in the fall, followed by disking in the spring before planting. This type of cultivation, normally done to a depth of 24 inches, improves soil drainage and root penetration. On wet bottomland sites, mounding the soil improves soil drainage and thus seedling survival. In some parts of the Central Hardwood Region, specialized offset discs and levee plows are used to construct mounds 1½ ft tall and 3 ft wide.

If good farming practices had been used, soil fertility and pH should already be adequate for hardwood trees in recently cropped fields. However, nitrogen fertilization may improve tree seedling vigor and growth. Be aware that fertilization at time of planting will increase weed competition if follow-up herbicide applications are not used (McKenna and Woeste 2004).

Existing Timber Stands

Harvested stands can either be regenerated naturally or by planting seedlings. With good forest management and the right timber harvesting practices, most forest stands will regenerate naturally with seeds and stump sprouts of desirable species. In order to maintain certain species known to be difficult to regenerate naturally, such as oaks, or to introduce species or genetically improved varieties not currently present in the forest, enrichment plantings may be done. Such enrichment plantings require intensive site preparation to ensure their successful establishment in an otherwise extremely competitive environment (Fig. 3).

Figure 3. *Regeneration openings must be completed in the post-harvest timber stand improvement by controlling remaining trees and shrubs.*

Site preparation for enrichment plantings should be limited to areas in the forest that will be regenerated in an upcoming timber harvest. Identify these areas 2 to 3 years prior to the harvest. Such areas include groups of mature and aged trees, poorly-stocked areas (undesirable species and poor quality trees), and areas of diseased and declining trees. These areas are called regeneration openings, and when completed have all the overstory trees removed in a harvest (Fig. 4).

Control grapevines in designated regeneration openings 2 or 3 years prior to timber harvest. Control the remaining midstory canopy saplings, pole size trees, understory trees, and brush in the post-harvest timber stand improvement. Herbicides are usually required to prevent undesirable trees and shrubs from resprouting and competing with planted seedlings and desirable natural regeneration. Saplings and poles of desirable species may be cut close to the ground without the use of herbicide, so that they produce stump sprouts. This is a particularly useful technique for regenerating oaks.

Where appropriate, and as recommended by a forester, thin the overstory trees to allow a limited amount of sunlight in through the canopy instead of cutting all overstory trees at once. This results in what foresters call a “shelterwood”. Shelterwood cuts are useful for regenerating oaks. Once the desired regeneration or your planted seedlings are well established, usually within 3 to 5 years, the remaining overstory trees must be removed. Failure to remove the overstory in a timely manner results in death of the desirable regeneration.

Prescribed burning can be an effective site preparation technique on productive sites where

Figure 4. *Site preparation may include reducing logging slash to facilitate enrichment tree planting.*

the objective is to reduce competing vegetation and logging slash prior to planting (Fig. 5). Used in conjunction with mechanical and herbicide methods it has the potential to reduce site preparation costs and improve oak regeneration establishment, under the right conditions. Fire has not yet gained wide acceptance as a forest management tool on private lands in the Central Hardwood Region.

Enrichment plantings require follow-up care that includes deer browse protection and control of competing trees and shrubs. Consult with a forester before attempting to establish enrichment plantings in the forest.

Figure 5. *Prescribed fire as a site preparation technique reduces competing vegetation and logging slash prior to enrichment plantings.*

Literature Cited

McKenna, J. and K. Woeste. 2004. *Fertilizing, pruning, and thinning hardwood plantations.* USDA Forest Service-North Central Research Station and Purdue University-Department of Forestry and Natural Resources, West Lafayette, IN. FNR-215. 8 p.

Ponder, F. and P.E. Pope. 2003. *Regenerating hardwoods in the Central Hardwood region: Soils.* USDA Forest Service-North Central Research Station and Purdue University-Department of Forestry and Natural Resources, West Lafayette, IN. FNR-211. 4 p.

Other Resources

Allen, J.A., B.D. Keeland, J.A. Stanturf, A.F. Clewell, and H.E. Kennedy, Jr. 2001. *A guide to bottomland hardwood restoration: U.S. Geological Survey, Biological Resources Division Information and Technology Report USGS/BRD/ITR-2000-0011,* U.S. Department of Agriculture, Forest Service, Southern Research Station, General Technical Report SRS-40, 132 p.

Rathfon, R.A., D.J. Kaczmarek, and P.E. Pope. 1995. Site preparation for red oak plantation establishment on old field sites in southern Indiana. In: Gottschalk, K.W. and S.L.C. Fosbroke (eds.). *Proceedings of the 10th Central Hardwood Forest Conference,* Radnor, PA, USDA Forest Service, Northeastern Forest Experiment Station, General Technical Report NE-197, p. 349-362.

Mention of a trademark, proprietary product, or vendor does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture and does not imply its approval to the exclusion of other products or vendors that also may be suitable.

EXPERT REVIEWED

Purdue Extension Knowledge to Go 1-888-EXT-INFO

This publication is printed on recycled paper using soy-based inks.

NEW 4/06

FNR-220