PLANTING UPLAND TREES AND SHRUBS

TECHNICAL GUIDANCE DOCUMENT

Document No.: WRG 5A-8
Publication Date: 10/4/2012

Table of Contents

INTRODUCTION

Trees and shrubs are typically planted in upland areas to increase connectivity between forests, to create wildlife habitat for forest species, and to increase other ecological functions. Trees and shrubs in upland buffer areas require sufficient planning related to planting and long term-maintenance to ensure survival.

APPLICATION

Planting Bare Root Upland Trees and Shrubs - Bare root trees and shrubs come in a wide range of sizes from six-inch tall seedlings to ten-foot tall trees. Seedlings are the most common type of bare root material planted in upland projects. Generally, 100 to 500 bare root trees/shrubs are planted per acre depending on the upland community type to be restored and the size of material installed. When planting bare root trees and shrubs, it is important to keep roots moist, to spread roots within planting holes, and to minimize air spaces around roots. Watering and planting before a rain is also recommended.

Planting Containerized and Ball and Burlap Wetland Trees and Shrubs - Containerized trees and shrubs can vary in size from one gallon containers to 25 gallons. Large plants can also be obtained as balled-and-burlapped material. Cost is a limiting factor in the use of containerized and ball-and-burlap material. Containerized material tend to have higher survival rates than bare root trees and shrubs. Holes dug for containerized plants should be 2.5 times the diameter of the container. This will ensure that the roots will have room to grow. It is most important that the hole is the widest near the surface where fibrous roots will grow. It is also beneficial to scarify the edges of the hole to create a transition from the undisturbed soil to the backfill soil..

Proper planting depth is very important with containerized plants. The “root flare”, or point where the roots flare out, should be no more than one inch below the surface after planting. Deeper placement can lead to roots that grow in a circular manner around the tree, causing tipping and constriction of the stem.

Following are guidelines for planting containerized and bare-root wetland trees and shrubs in upland restoration sites:

- Plant on a day with low wind and cool temperatures, before a rain if possible.
- Keep roots moist and protected during transport and planting.
- Dig planting holes at least twice the diameter of the root mass.
- When planting seedlings with spades or dibble bars, make holes large enough to accommodate spread-out root masses.
- Ensure the root collar of trees and shrubs is within one inch of the surface.
- Roughen the sides and bottom of the planting hole with a shovel.
- Loosen roots on the edge of containers and spread out roots of bare root material.
- After planting, add water, backfill half of the hole, add more water, and then add remaining soil.
- Lightly tamp the soil surface.
- Add mulch if possible to retain moisture and inhibit weeds.
- Protect from deer, rabbits and mice as needed

Protecting Trees and Shrubs - Upland trees such as white pine that are vulnerable to deer browsing should be protected with fencing until they reach a height of 15 feet. 14-gauge wire with 2x4 inch openings can be used to create exlosures around individual trees or larger areas. Solar powered electric fencing can also be used to protect tree plantings.

Plastic tree tubes are also used to protect tree and shrub plantings. The tubes are placed over seedlings after they are planted and protect plants from rodents and deer. The tubes tend to photodegrade over time or are removed as the trees reach the height of the tube.

Bud caps can be used on tree and shrub species to prevent browsing. They are particularly important for seedling white pine but can also protect deciduous trees and shrubs. Wire screening can also be placed around tree and shrub stems to prevent girdling from rodents.

Follow-up watering is important for establishing trees and shrubs. If soils are not saturated, plantings should be receiving approximately one inch per week at a minimum through rainfall or watering.

Direct Seeding of Upland Tree and Shrub Seeds - Contributions from Duane Oakes, Oakes Forestry

Direct seeding of upland trees and shrubs can be a cost-effective method establishing woody species. High stem densities will minimize loss due to deer and rabbits. Several tree species such as oak, walnut, ash, and maple can be planted as acorns, nuts, or seedlings. This technique is sometimes used to establish savannas but it can be a long-term effort requiring additional protection of seedlings from rodents, deer, and prescribed burning.

Seeds or nuts from trees and shrubs are often collected in and stored in feedbags to allow for air movement and to discourage the growth of mold and fungus. Species such as black walnut (Juglans nigra), white oak (Quercus alba), northern red oak (Quercus rubra), ash (Fraxinus spp.), and maple (Acer spp.) drop their seed in the fall and should be collected immediately after seed drop. As a general rule, tree and shrub seeds should be planted as soon as possible after collection. The longer tree seeds are stored, the greater the loss of viability. The following are recommended collection and treatment methods for several common tree species:

- Walnuts should be collected and then stored in small piles, preferably in shade, to prevent excess heat production. They can then be planted with husks intact. Black walnut (Juglans nigra) should be planted at 10 to 15 bushels per acre (DNR 1998).

- Acorns should be collected soon after they fall and immersed in water for 24 hours after collection. The acorns should then be placed in a cool, dry location until planting. Red oak (Quercus rubra), bur oak (Quercus macrocarpa), and shagbark hickory (Carya ovata) should be

Example Upland Tree and Shrub Direct Seeding Schedule	
Previous 1 - 2 years	Conduct site preparation to remove weeds and prepare seedbed.
Mid October	Plant large seeds (acorns, walnut, hickory) with broadcast seeder or fertilizer spreader followed by disking 2 inches deep (mechanical seeders that create furrows can also be used, eliminating the need for disking.)
Mid October after seeding large seed	Spread lighter seeds (ash, maple, cherry & shrubs) followed by light harrowing.
Year 1: Frost out -May 15	Apply Pendimethalin herbicide at 3 qt. per acre.
Year 1: July	Mow or spray grass-specific and clopyralid herbicides as needed.
Year 2: Frost out -May 15	Pre-bud swell herbicide application.
Year 2: June	Mow and/or spray grass-specific and clopyralid herbicides as needed.
Year 3: April	Pre-bud swell herbicide application
Year 3: June	Mow and/or spray grass-specific and clopyralid herbicides as needed.
Year 4	Add understory shrubs and thin boxelder as needed.
Note: seed collection should occur during the season of site preparation. Site preparation and planting strategies may vary depending on site conditions	

planted at three to four bushels an acre. White oak (Quercus alba) acorns have not been successful in direct seeding project, it may be that they cannot be held too long before seeding (Oakes 2008). It may be an option to to add white oak into a project as seedling trees.

- Ash and maple seeds should be air-dried and also stored in cool, dry conditions until planted. Green ash (Fraxinus Pennsylvania), white ash (Fraxinus americana), and hard maple (Acer spp.) should be planted at one bushel per acre.

- Cherry, sugar maple, and hickory are other species that are sometimes added as seedlings.

Seeding rates of various tree species should ultimately be bases on availability of seed, plant community goals, and the strategies that are planned for community establishment. Riparian and floodplain direct seeding can be conducted with species such as cottonwood, silver maple, and ash.

Harrowing of seedbed

A weed free, smooth seedbed is desirable for direct seeding of trees. This often involves plowing, disking, or tilling and harrowing. An additional consideration is that soil should be well tilled to a depth of six inches to prepare for planting. This is especially important for walnuts and oaks that need to be planted deeper (Oakes 2008).

Direct seeding of trees and shrubs in upland areas is typically done without planting upland forbs and grasses, as herbicides are used to remove herbaceous plants during establishment to give woody species an advantage. Forbs and grasses can be planted later, after trees and shrubs are established and can compete with herbaceous vegetation.

Some projects have been conducted by drilling tree seeds directly into untreated vegetation and then killing the vegetation with glyphosate in the spring before tree seeds germinate (Edge 2004). The effectiveness of this technique will depend on the types of weed present and the effectiveness of the herbicide treatment. As with other types of planting, site preparation techniques that most effectively control weeds will provide the greatest chance of establishment success.

Following site preparation, walnut, oak, and hickory seed should be spread over the entire area and disked into the ground so that the majority of the seed is buried one-inch deep. Ash, maple, and cherry seed should be broadcast over the site, followed by a light harrowing. The seed should ultimately be planted ¼ inch deep (DNR 1998). Cultipack typically is not necessary after seeding (Oakes 2008).

Shrubs can be incorporated into planting but are often added in later years after weeds are controlled as herbicides used for weed control can negatively affect shrub seedlings (Oakes 2008).

When planting seeds to establish trees and shrubs, weed control is important during the first two to three years. A combination of pre- and post-emergent herbicides are often used as well as mowing. Sites are commonly treated with pre-emergent herbicide the first three seasons to prevent weed germination. These herbicides should not be used in aquatic habitats. Pendimethalin at a rate of three quarts an acre is applied between frost out until May 15th (before germination the first year)(in the southern part of the state) to control weedy grasses that establish in upland restorations. Pendimethalin will not affect many broadleaf species but can control carpetweed, chickweed, lambsquarters, and pigweed (Oakes 2008). If trees and shrubs have been planted without other ground-layer plantings, grass-specific herbicides can be used to remove weedy grasses. Clopyralid herbicides can also be used to remove most broad-leaf weeds (particularly thistle,

burdock, and ragweed) without affecting tree and shrub seedlings. Mowing above the height of emerging trees can be effective to prevent weeds from seeding.

Boxelder is a common pioneer following direct seeding. Boxeldere may require thinning by clipping and treating stumps or basal-treating stems to promote planted species. Some boxelder can be tolerated in a planting as it will help minimize browsing pressure from deer, helping the desired species to grow faster (Oakes 2008).

If possible, female boxelder should be removed from the project area before site preparation is conducted (Oakes 2008).

OTHER CONSIDERATIONS

Additional tree and shrub seedlings can be added to plantings. Upland tree and shrub plantings may require herbivore control measures to protect them from deer and rabbits. Upland trees and shrubs will likely require watering during establishment. Paying attention to watering needs early on will protect the investment and prevent having to replant later.

COSTS

The costs for planting trees and shrubs can vary significantly depending on the size and type of plants and whether mulch, tree mats, or tree protection will be used. Bare root plants cost between $3.00 and $15.00 installed, while containerized plants cost between $25 and $100.00 installed. Tree protection tends to add $2.00-$10.00 per tree. As a general rule the installed cost of individual woody plants is 2-2.5 times the wholesale cost of plants. Direct seeding of trees and shrub seed (including site preparation, seed and planting) tends to be around $700-$900 per acre.

ADDITIONAL REFERENCES

Direct seeding of native hardwood trees: www.dnr.state.mn.us/treecare/maintenance/collectingseed.html

Direct Seeding of Hardwoods in Wisconsin, Edge, G.

Minnesota SWCD Tree Handbook, USDA