

### BACKGROUND

This Technical Note is intended to be used as a guide for planting and direct seeding tree and shrub species for reforestation, afforestation, and the establishment of wildlife habitat, windbreaks, alley cropping, recreation area improvement, and riparian forest buffers. Please refer to specific standards for practice purposes and requirements.

The species of trees and shrubs in this technical note are all native to Wisconsin; however, this note does not contain all of the native trees and shrubs for Wisconsin. Most species will do well on a range of sites. For guidance on tree and shrub species not identified here, or to develop specific recommendations for a particular site, see Wisconsin Forestry Technical Note 1 or contact the local WDNR Forester, the NRCS State Forester, or the NRCS State Resource Conservationist.

### SITE ASSESSMENT

Site resource information such as microclimate, soil type, exposure and purpose of the planting, must be gathered before deciding on species recommendations. Most county soil surveys contain information about the original vegetation for each soil type. Another good reference source is the "Original Vegetation Cover of Wisconsin" map that can be found at [www.dnr.state.wi.us/org/at/geo/map\\_gal/landcov/orgveg](http://www.dnr.state.wi.us/org/at/geo/map_gal/landcov/orgveg) or the Early Vegetation of Wisconsin map in Section I of the Field Office Technical Guide (FOTG). These references along with the tables in this technical note will allow the planner to develop sound recommendations.

### SPECIES SELECTION

The following outline should be used to develop tree and shrub recommendations for the identified site.

1. Identify the soil type(s) and drainage class(es) for the site.
2. Identify the intended use (purposes) of the planting.
3. Select species best suited.

#### **Method of Establishment (Seeding vs. Planting)**

Direct seeding, if successful, allows the establishment of more trees per acre at a comparable cost to planting seedlings. It can be particularly

useful on sites that otherwise are difficult to plant due to spring wetness or shallow soils. Areas that are difficult to plant with seedlings because of spring wetness can be seeded at a dryer time of year and areas with very shallow topsoil are easier to seed because of shallow seeding depths versus planting depths. It also allows a more natural-appearing stand of trees to develop which can be further encouraged by planting a variety of species.

Direct Seeding is not well suited for under-planting in poorly stocked stands and may not be a viable option every year because many species only produce good seed crops every 3-5 years and seed may not be available. It should not be used on slopes steeper than 6% without considering a cover crop or other measure for erosion control. Direct seeding is **not** well suited for sites that will be used for specialty plantings (Christmas trees, windbreaks, and alley cropping).

The direct seeding method is best suited to sites being converted from intensive agricultural production because of historic weed control practices. Weed control is very critical to establishment of trees and shrubs using the direct seeding method. Competition must be controlled for a minimum of 3 years after seeding and should be checked for follow up control measures until tree crowns are above the competition.

The large number of seeds per acre increases the chance that trees will benefit from the best available micro-sites. Enough trees will generally escape deer and rabbit browse to develop a stand of trees when heavily planted. Squirrels and other rodents can destroy much of the seed in years when snow cover is light.

Local genotypes can be used if the seed is locally collected and thus insure compatibility with local conditions. However, seed should only be collected from high-quality source trees and at the right time of year. If unsure about seed collecting techniques, check with local resource professionals first.

Planting of nursery stock allows for better density control (specialty plantings such as windbreaks and Christmas Trees) and is more desirable for sites that require intensive weed control, especially where mechanical control is the preferred option. By using seedlings, several years of development are realized with a new planting. Planting of seedlings is a more efficient use of genetically improved seed. Sights

that are excessively well drained are usually more successful if planted because the developed root systems have a better chance of obtaining enough moisture to become established. Nursery stock is better suited to slopes greater than 6% than is direct seeding, but additional conservation practices such as cover crops and planting on the contour should be considered when planting fields being converted from intensive agriculture (exposed soil).

For sites that have existing grass/herbaceous cover, planting seedlings is a better choice than seeding if the competing vegetation is controlled by band spraying within rows and/or by mechanical control between the rows. Nursery stock plantings produce a more uniform stand, and are well suited for underplanting in poorly stocked stands. Planting can be designed with future management/land use activities in mind.

### **Tree Planting/Direct Seeding Timeline**

1. **August/September** prior to planting nursery stock, begin site preparation on sites with existing vegetation (on row crop fields site preparation may begin after the crop is harvested). Site preparation will be site and species specific. Direct Seeding is not recommended on sites with severe competition from existing vegetation (old hay fields with dense sod and or areas of Reed Canary Grass). Identify commercial or local seed sources for sites to be direct seeded. For commercially purchased seed, make sure the supplier can confirm the seed is from the Lake States Area and purchase from a source as close to the site to be seeded as possible.
  - Order seed or begin collecting seeds in season and plant as soon after collection as possible. If buying commercially available seed, use the supplier's listing of percent sound seed, to determine final seeding rates. Most seed is very difficult to store and self-storage is not recommended.
  - For locally collected seed, collect enough seed to meet the required rates and account for defective seed. Visually inspect seed looking for proper color, form, insect and mechanical damage. Separate debris, caps and wings from seed.
  - The float test may be useful for separating good from poor acorns and nuts; floaters are removed off the top of the tub of water and discarded. However, it is not always

accurate to determine that all sinkers are viable, as other factors are also important. The husks around nuts such as Black Walnut and hickories, must be removed prior to floating. Always cut a sample of floaters and sinkers to be sure of the effectiveness of flotation to separate them. Seed embryo color should be white or creamy yellow.

- A cut test can be used to determine amount of sound seed being collected. Inspect by species, at least 10 randomly selected seeds per 3,000 seeds collected. Cut open seed to be sure that seed is filled, moist and normal colored.

### **Site Preparation**

The single most important part of planting trees is protecting them from competitive vegetation. All plants compete for light and water and many grasses produce natural chemicals that suppress tree and shrub growth. If not managed, competition from weeds, grasses and unwanted woody vegetation, will choke out the planting.

### **Mechanical Site Preparation**

Reduce the competition from a thick grass sod by moldboard plowing and disking the fall prior to planting. On slopes greater than 6%, leave strips of sod between 6' wide tilled strips and plant as near to the contour as possible to prevent erosion. For sites with a clean tilled row crop existing, address weed problems and see "Conservation Cover" Standard 327 for ground cover requirements.

### **Chemical Site Preparation**

Weed and/or grass competition can be controlled with selective herbicide use. Effective control depends on four factors:

- Timing of application
- Herbicide selected
- Weather conditions
- Application rate

A combination of chemical and mechanical site preparation may be required on very difficult, heavy sod sites. Very dry conditions will limit the effectiveness of most herbicides. Be sure to follow label directions for application rates, as rates differ depending on soil type and herbicide being used. See the forestry facts publication "Herbicides for Forest Management" published

each year and available from the University of Wisconsin Extension.

Direct Seeding

The amount of seed required for direct seeding varies by species and site conditions. Use the

following table as a guide. Rates are based on single species planting. For drilling of mixed species, the total seeds/acre should be at least 3,000. For broadcasting mixed species, the total seeds/acre should be at least 1,000. Ideal seedings contain a mix of drilled and broadcast species.

SPECIES	PLANTING METHOD	COLLECT	SOUND SEEDS/AC	LBS/AC
Northern Red Oak	Drilled	Sept-Oct	3,000	24 lbs.
White Oak	Drilled	Sept-Oct	3,000	25 lbs.
Bur Oak	Drilled	Aug-Nov	3,000	40 lbs.
Swamp White Oak	Drilled	Sept-Oct	3,000	25 lbs.
Black Walnut	Drilled	Sept-Oct	3,000	75 lbs.
Shagbark Hickory	Drilled	Sept-Oct	3,000	30 lbs.
Ash	Broadcast	Aug-Oct	1,000	.13 lb.
Sugar Maple	Broadcast	Sept-Oct	1,000	.16 lb.
Red Maple	Broadcast	Apr-July	1,000	.04 lb.
Basswood	Broadcast	Oct-Nov	1,000	.2 lb.
Black Cherry	Broadcast	Aug-Oct	1,000	.2 lb.

The following chart shows the row spacing and seed spacing combinations that will result in 3,000 seeds per acre. Adjust planting rate based on sound seed percentage from seed inspection.

- 4' row spacing = 3.6' in row spacing
- 5' row spacing = 2.9' in row spacing
- 6' row spacing = 2.4' in row spacing
- 7' row spacing = 2.0' in row spacing
- 8' row spacing = 1.8' in row spacing
- 9' row spacing = 1.6' in row spacing
- 10' row spacing = 1.5' in row spacing

Heavy seeded species, those suitable for drilling, will usually comprise the main part of the stand. Lighter seeded species, those suitable for broadcast seeding, will be used for diversity and micro-site establishment within the stand.

Plant acorns 1-3 inches deep and nuts 2-5 inches deep. A good rule of thumb is to plant to a depth that is twice the diameter of the seed. For light seeded species that are broadcast, cultipack the site after seeding. Plant seed from seed suppliers or seed collected as close to the site as possible.

White oak, bur oak, and swamp white oak acorns must be planted as soon as possible after collection. It is extremely important that the site is prepared for planting before the acorns are received or collected. These acorns sprout in the fall and begin growing before the ground freezes and do not require the cold stratification that the red oak family, the walnuts and the hickories require.

Red oak acorns can be stored, if necessary, if kept in cold damp conditions-35 to 40 degrees F. Fall seeding is preferred over storage and seeding should be done immediately after receiving or collecting seed. Immersing acorns in water prior to planting will restore any moisture lost during collection. Soak from 4 to 24 hours. If seeding is delayed more than a few days, seed will be placed in porous bags, such as onion bags, in cold storage, 35 - 40 degrees. Keep heavy seeded species moist, but not wet until planting. Keep light seeded species dry until planting. Do not allow seed to heat up and never place seed in the sun. Inspect seeds for storage losses prior to planting.

2. **October/November** of the year before planting, order nursery stock and/or begin direct seeding as appropriate for the species.

Nursery Stock Spacing

Density of Plantings will vary by species, intent of the planting, soil site conditions and other factors. For most multiple purpose plantings, use the following guides when

	7 feet	8 feet	9 feet	10 feet
6 feet	1037	908	807	726
7 feet	889	778	691	622
8 feet	778	681	605	

3. **April/May** of planting year inspect sites to be planted for weed problems and apply chemical or mechanical weed control as needed prior to planting. Inspect sites direct seeded the previous fall for weed problems and treat as necessary. Plant tree and shrub seedlings from late March until early May as soon as they arrive. Seedlings may be planted by hand using a shovel or planting bar, or with a tree planting machine. Many counties have planting machines available for rent.

Planting Information

Plant seedlings as soon as they arrive. Do not allow seedlings to lay in the sun or dry out. Do not take large amounts of seedlings to the field where they will dry out before planting. Take small amounts and store the rest in a cool, shaded location and kept moist, but not wet until planted. Do not open the shipping containers until ready to plant. If stock in bundles has been exposed to warm temperatures, the bundles should be opened to prevent heating. . Wet roots if needed. Keep tops dry.

planning the amount of planting stock required. **Specific Program requirements (CRP, Managed Forest Law, etc.) may dictate amount of stock needed and spacing.**

For specialty plantings (windbreaks, Christmas trees) consult specific standards and/or fact sheets.

Stock to be planted in a few days can be stored in a cellar, open shed, or similar cool place. Stock held over a week should be stored in a cooler.

During planting, keep roots wet. Dry roots mean dead trees/shrubs.

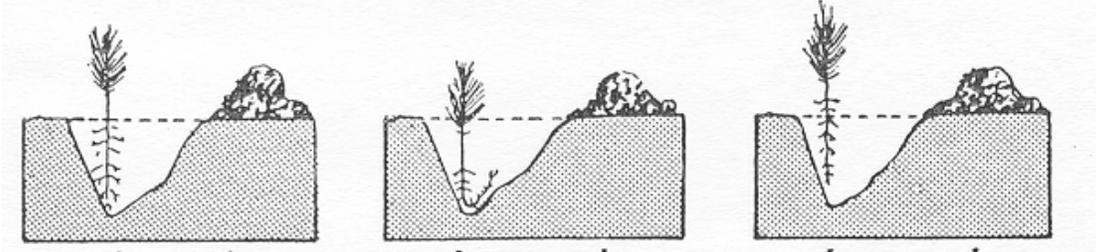
Plants developing "J" roots will die. Seedling roots should hang free and just touch the bottom of the hole.

Tree planting machines are available in most counties. If the site is suitable for machine planting, this method is usually cheaper.

Hand planting may be done with shovel, hoe, planting bar, mattock, or other hand tool. Hole should be large enough to avoid doubling of roots. Roots over 10 inches in length should be pruned prior to planting.

If cuttings are used, they must be kept moist and cool until planted. Cuttings should be buried, except for exposed tip, with at least two buds above ground.

**Correct and Incorrect Planting Depths**



**Correct**

**Incorrect**  
Too Deep  
J Root will kill tree

**Incorrect**  
Too Shallow  
Roots exposed will dry out