

The attached guidance is a revision to the Silviculture Handbook, Chapter 22 - Artificial Regeneration. This chapter deals specifically with how to successfully establish forest tree plantings in Wisconsin. The proposed additional guidance relating to the use of exotic or non-native species is highlighted in yellow. The Silviculture Handbook is used primarily by State, County, industrial, and cooperating consultant foresters to provide appropriate silvicultural information and recommendations for managing forested lands.

This Silviculture Handbook revision was led and approved by the Wisconsin Silviculture Guidance team at its June 12-13, 2013 meeting.

Comments related to this draft guidance document should be sent to Brad Hutnik, Bradley.Hutnik@wisconsin.gov; 608-574-5642. Once the 21 day notice is complete, all comments will be considered and revisions will be made to the guidance as needed. Final guidance will be made available to appropriate internal and external stakeholders, and will be posted at: <http://dnr.wi.gov/topic/forestmanagement/silviculture.html>

Species Selection

When selecting a species it must meet your management goals and suitable sites must be available. After determining the potential positives and limitations of your site, select a species or combination of species that can emphasize the positives and overcome the limiting factors. Along with selecting the best species, you should select the best seed source and stock type for your needs. With these goals in mind, the factors that should be considered when selecting species include: growth rate, site requirements, climatic suitability, genetic variability, wood and fiber properties, aesthetics, wildlife value, biological diversity, erosion control and potential insect and disease problems.

The use of tree species not native to Wisconsin should be contingent on credible evidence confirming that the species in question is not invasive, will not create significant risk to forest health, and is from appropriate provenances that are well adapted to the site. If non-native trees are used, their provenance and the location of their use should be documented and their ecological effects monitored.

Recently conifer and hardwood mixtures have been recommended for afforestation in Wisconsin. The benefits of these conifer-hardwood mixtures include: conifers assist in capturing the site earlier, the cost of plantation establishment is less than a pure hardwood plantation, conifers improve the quality of hardwoods by shading out lower branches and forcing hardwoods to grow upwards, provide wind protection for the planting and the conifers offer a easy alternative for a first thinning. The real disadvantage to this mixture is that once established the options for chemical release of the plantation is narrowed significantly. Subsequently, initial site preparation treatments are critical for successful conifer-hardwood plantations.

[Appendix 22-A](#) contains a profile of species commonly utilized in Wisconsin's reforestation program.

Seeding vs. Planting

The first thing to decide when dealing with stand establishment is which method of artificial regeneration is appropriate. Planting is generally considered more expensive than direct seeding of conifers, but for hardwoods the reverse may be true depending on the cost and quantity of seed used. However, by using seedling several years of development are realized with a new planting.

Seeding is an excellent technique to inexpensively regenerate small areas, or to quickly reforest large acreage. Direct seeding is attractive because if successful, it will establish a more uniformly stocked stand, as opposed to a naturally regenerated stand. Direct seeding is more flexible, faster, less expensive, and since there are large numbers of seed spots per acre, successful trees will benefit from the best available microsites. It can be used where access, terrain, or soil conditions make planting difficult. Seeded trees often have better developed root systems and are often better suited to their environmental niche than planted seedlings. On old-field sites the additional benefits of planting seedlings versus direct seeding often does not justify the additional cost. Direct seeding can be an economically viable alternative to planting, although success with seeding requires knowledgeable selection of species/site combinations and proper seed handling and storage. Additionally, conifer seeds can be stored for a long time and used when needed.

The disadvantage with direct seeding is that often times it is not successful, though many of these cases can be attributed to improper planning. This uncertainty has led many to choose either natural regeneration or artificial regeneration through planting. Seeding is not an efficient use of genetically improved seed. Density is difficult to control. Losses of seeds and small seedlings can be high. Hardwood seed is difficult to obtain in most years and does not store very well. Another concern is that the likelihood of successful establishment of oaks with direct seeding is less because openings need to be large (2.5 acres), intensive site preparation is often necessary and follow up weed control is critical.

Sites to be avoided when considering direct seeding are areas where seeding has already failed. Avoid sites prone to frost or frost heaving. Avoid sites where grazing could occur, standing water may cover seed, soils are deep excessively drained sands (except for the direct seeding of jack pine), and highly erodible soils or steep slopes where seed could be washed away. Always use seed of appropriate seed sources that has been properly stored, stratified, and treated with the necessary repellents.

The ideal sites for seeding are where regeneration would have occurred if seed had been present. Direct seeding of sites can also be accomplished when planting is not feasible. Direct seeded oaks develop roots on site so there is none of the root injury associated with bareroot stock. On shallow-soiled sites direct seeding is easier than planting large bareroot stock. When seeds are purchased, those harvested in a good seed year are best. Collect from the best phenotypes. Try to use seed