Tree/Shrub Establishment – Ash Replacement Planting

612 Wisconsin Guidance Document

INTRODUCTION

Emerald ash borer was first discovered in southeast Michigan in 2002. Since then it has spread quickly through much of the range of susceptible ash species. In 2008 emerald ash borer was discovered in southeast Wisconsin and has since established in pockets throughout the state. It is likely that these pockets will continue to expand and overlap until the entire state is infested. The emerald ash borer kills >99% of white ash, green ash, and black ash. This occurs as larvae feed on the vascular system of the tree, eventually cutting off transport of nutrients from the roots to the crown. They will infest trees as small as 1" in diameter. No effective control of emerald ash borer has been found for use in forested settings.

PURPOSE

- Maintain or improve desirable plant diversity, productivity, and health by establishing woody plants
- Restore or maintain native plant communities

WHERE USED

Not all stands with an ash component are equally vulnerable to emerald ash borer. Most upland stands where white ash is a component will maintain adequate stocking in other tree species to remain as viable forest habitat. The most vulnerable stands are wetland and riparian areas that are dominated by black ash and/or green ash. In particular, sites dominated by ash that have seasonally high water tables driven by snowmelt and precipitation events are most susceptible to habitat conversion. This occurs when transpiration by the ash trees is lost to emerald ash borer mortality. Without this transpiration, the water table rises and "swamps" the site, making it difficult for other tree species to regenerate. The site then converts to non-forested wetland. This has implications for hydrology and wildlife.

WI DNR recommends that stands with fewer than 40 trees/acre of non-ash acceptable growing stock (AGS) should be prioritized for silvicultural treatments that artificially establish new species of trees. Stands should be prioritized based on this level of stocking of non-ash species, with stands below this figure having a high priority for planting treatments. As most inventories are done with variable radius plots (basal area), the table below from WI DNR will help make the conversion to 40 trees/acre for common average stand diameters at breast height (DBH). To use the table, find average stand DBH from inventory data. Also from inventory data, determine the average basal area (in square feet/acre) of non-ash species. Find the average DBH of the stand in the table below (round up to the nearest two-inch

class). Read across the table to the square feet of basal area/acre that is equivalent to 40 trees/acre. If the stand has lower basal area of non-ash species than what is shown in the table, it would be a high priority for silvicultural treatments that involve planting. If the stocking of non-ash species exceeds what is shown in the table, the stand should be managed to favor and naturally regenerate the existing non-ash species.

Table 1. Equivalent Square Feet of Basal Area/Acre to 40 Trees/Acre for Selected Average Diameters at Breast Height (DBH).

Quick Reference:
Basal Area (BA) by average stand diameter to have 40 AGS per acre.

DBH	BA/Acre
6"	8 ft²
8"	14 ft²
10"	22 ft²
12"	31 ft²
14"	43 ft²
16"	56 ft²

RESOURCE MANAGEMENT SYSTEM

In areas where emerald ash borer has not caused mortality, silvicultural systems to create proper light and soil conditions will help with survival of planting stock. WI DNR and other research show that group selection, strip clearcut, and strip shelterwood systems work well. It is important on these sites to maintain transpiration by mature trees to avoid swamping out, and these systems do that well by creating a mix of openings and areas of mature trees. Use Conservation Practice Standard (CPS) Forest Stand Improvement (Code 666) to plan these treatments.

Another key consideration in the management system is control of invasive and aggressive competing vegetation. Many lowland sites, particularly riparian areas, are susceptible to invasion by aggressive species due to rich soils and frequent disturbance from flooding. Control of these species will be necessary to establish a planting. Use CPS's Brush Management (Code 314), Herbaceous Weed Treatment (Code 315), and/or Tree-Shrub Site Preparation (Code 490) to plan vegetation control treatments.

WILDLIFE

Many ash wetlands and riparian areas provide shade for headwater areas of streams, keeping water temperature cool. This is especially important for trout streams. Many neotropical birds use ash wetlands for nesting habitat. Keeping these wetlands and riparian areas forested will maintain this habitat.

PLANNING CONSIDERATIONS

Wisconsin CPS Tree/Shrub Establishment (Code 612) Planting Guide guidance document has general reference material on planning a planting, and Tree/Shrub Establishment Protection guidance document has reference material on protection of seedlings. What follows is guidance specific to ash replacement plantings.

Site Considerations: WI DNR guidelines for emerald ash borer management state that low quality sites should be given low priority for management (Appendix A of "Emerald Ash Borer Silviculture Guidelines"). Site quality can be determined in several ways. Habitat typing can be done using "Wetland Forest Habitat Type Classification System for Northern Wisconsin" by Kotar and Burger (2017). In this system, sites that are classified as "very poor" or "poor" are low quality sites.

Site index can also be used, with site index of less than 40' height in 50 years of growth generally considered low quality. However, site index can be difficult to obtain accurately on these sites, so this should be verified using other site characteristics. These characteristics include soil drainage class of very poorly drained, a deep organic/sphagnum layer (~5' in depth or deeper), and poor tree/stand vigor.

Species and Stock Selection: Recent tree planting research has been done in both black ash wetland settings and riparian settings in the Lake States. In addition, Appendix B of the WI DNR "Emerald Ash Borer Silviculture Guidelines" lists native tree species of Wisconsin, including information such as habitat type, soil drainage type, and other factors where they will thrive.

In black ash wetlands, research has shown the most success with silver maple, red maple, hackberry, balsam poplar, swamp white oak, American basswood, and American elm. Swamp white oak consistently has high survival rates in these trials. There are some species-specific considerations for this list. Red maple and silver maple are highly palatable to deer and should be protected where deer populations are high. American elm is susceptible to Dutch elm disease, and only disease resistant stock should be planted of this species (typically available in larger containers). Balsam poplar is at the southern edge of its range in northern Wisconsin and should not be planted in southern Wisconsin. Cuttings of balsam poplar may work better than seedlings. In several studies, silver maple, hackberry, river birch, and swamp white oak were planted north of their current range and had high survival rates. These species should be considered for planting in black ash wetlands state-wide. Species that were attempted in these studies that did not do well are balsam fir, yellow birch, black spruce, eastern cottonwood, northern white-cedar, and bur oak. These species may be used in ash replacement planting; however, they should be carefully matched to site conditions. Thorough site preparation and/or browse protection will help improve survival for these species.

Tamarack has generally not been successful in research trials when using smaller planting stock. However, trials at the Great Lakes Visitor Center near Ashland, WI and on the Stockbridge-Munsee Community reservation in Shawano County have shown success with tamarack plantings using larger stock in reed canarygrass infested areas. Stock should be 2-2 bareroot stock (or older) or container potted stock. Both stock types have significant root mass, which is critical to success. In this situation site preparation on the reed canarygrass is not required (although still recommended, see Site Preparation section below). When tamarack planting stock has significant root mass it can compete with reed canarygrass and overtop it. This treatment will generally be more effective in the northern half of the state where tamarack is more common.

Figure 1. Robust tamarack stock planted into reed canarygrass in fall of 2019. Photo courtesy of Paul Koll, Stockbridge-Munsee Community forester.

Figure 2. The same planting 5 years later in the summer of 2024. Trees are 10-14 feet tall. Photo courtesy of Paul Koll, Stockbridge-Munsee Community forester.

In riparian areas, research has been more limited. One study has taken place in Wisconsin that focused on re-foresting floodplains dominated by reed canarygrass in the western part of the state. This study found best results with swamp white oak, river birch, and disease-resistant American elm. Deer browse affected most species, most severely affecting silver maple and eastern cottonwood. These species may show better results when protected from deer. Willow was tried as a bareroot seedling and performed poorly. Cuttings of willow may show better performance. Species that were not tested with research and may do well in riparian areas include sycamore (southern Wisconsin), American basswood, red maple, hackberry, northern red oak, and bur oak.

In stands that have had extensive EAB mortality and water tables are higher than previous conditions, recent research has studied different tree species tolerance of flooded conditions in a lab setting. Species that exhibited high survival and sustained height growth in a 6-week period in a flooded condition include American elm, river birch, silver maple, American sycamore, red maple, tamarack, and swamp white oak. Yellow birch and northern white-cedar also did well in this experiment but have not performed as well in field research. Species that did well in a 12-week period in a flooded condition include American elm, river birch, silver maple, and American sycamore. Research has shown all these species can be planted throughout Wisconsin except for American sycamore. American sycamore should only be planted in the southern portion of the state. This research occurred in a lab setting, and to have

success with these species in the field will likely take good site preparation and, for some species, browse protection.

Native shrub species that can perform well in wetland areas, including areas with reed canarygrass that has had site preparation applied as described below, include silky dogwood, red-osier dogwood, elderberry, winterberry, nannyberry, and American highbush cranberry (do not plant European highbush cranberry). Other wetland adapted shrubs may also be successful but have not been tested in research trials.

For any type of planting to replace ash, using larger stock types (2-2 bareroot or container) may increase survival. Larger stock types generally have more root mass and reach heights above competing vegetation more quickly than smaller stock. This aids in survival and growth.

Site Preparation: See CPS Tree/Shrub Site Preparation (Code 490) to plan this practice. Below are techniques to address unique site preparation challenges that may occur on ash replacement sites.

Reed Canarygrass

Wetland and riparian sites are often rich with nutrients and moisture, making them attractive sites for competing vegetation. Reed canarygrass may be a common competitor. Recommended site preparation for reed canarygrass includes a system where it is mowed as seedheads emerge in early to mid-summer and then treated with herbicides in the fall of the same year just prior to senescence (glyphosate herbicides had the most successful results in research studies). Herbicide application on the first warm day following the first hard freeze of the fall can be especially effective. Follow-up treatment can be done with grass-specific herbicide the next spring in this system. Another method is to treat with herbicide in fall just before senescence for multiple years. Herbicides should be labeled for aquatic use on these sites.

Mounding

A site preparation technique that may work well on saturated sites is mounding. This can be done with an excavator (backhoe) or by hand for small plantings. Mounds are typically 1-3 feet in diameter and 6-12 inches in height. When using mechanical equipment in wetland/riparian settings, it is important to work only when soil conditions are dry to avoid rutting and compaction (generally late summer). The mounds provide a better-drained and warmer planting spot which is beneficial for seedling establishment. Mounds mimic natural processes in wetland forests where trees are tipped over by wind, partially pulling the roots out and above the ground surface and resulting in a depression where the roots used to be. As the roots decompose and attached soil sloughs off, mounds are formed next to the depressions. These natural mounds should also preferentially be used as planting spots. This type of site preparation in wetlands will likely require permits from WI DNR and US Army Corps of Engineers. Local permits may also be necessary.

Planting Season*:* Wetlands and riparian areas may be flooded during typical spring planting seasons. The research mentioned above experimented with different planting seasons. Spring, summer, and fall plantings were all found to be equally successful. However, it may be difficult to acquire planting stock from nurseries for planting seasons outside of spring. Planting into standing water in the spring may be necessary although it can be challenging logistically and uncomfortable for planters. Plugs and other containerized stock can be more easily planted later in the spring or early summer if available from

nurseries. Plugs (container) seedlings have been shown to be susceptible to frost-heaving in some fall plantings. However, this was not found to be an issue in these studies.

Protection: Many species recommended for planting in wetlands and riparian areas are palatable to deer, making protection necessary where deer populations are high. See CPS Tree/Shrub Establishment (Code 612) -Protection guidance document. Shelters have had variable results in wetland and riparian settings. For this reason, individual tree cages and perimeter fencing may be better options.

Competition Control – Reed Canarygrass: Competition should be controlled until seedling height is above the height of the competing vegetation. The Tree/Shrub Establishment (Code 612) Planting Guide guidance document has general reference material on common competition control methods. Specific to wetlands and riparian areas, research has shown that, if timed carefully, reed canarygrass can be controlled with herbicide without damaging seedlings. Timing is crucial, with the window in the fall after the seedlings have gone dormant for winter and before the reed canarygrass has died back. If the seedlings are not dormant the herbicide may damage or kill them. This window typically occurs sometime in October.

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