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RESEARCH PROJECT TITLE

Evaluation of Successful Forested Wetland Mitigation in Iowa

SPONSORS

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Evaluation of Successful Forested Wetland Mitigation in Iowa

tech transfer summary

Improved tree-planting strategies can aid in agencies' abilities to meet regulatory requirements for successful mitigation projects to restore forested wetlands, particularly in Iowa's riparian areas.

Objectives

The objectives of the project were as follows:

- Conduct a literature review to examine theory and practice related to forested wetland mitigation and restoration, with particular attention to methods relevant for Iowa.
- Assess the degree of success achieved by existing forested wetland mitigation projects in Iowa by examining a set of project sites and areas of natural regeneration and reference forest areas.
- Evaluate the performance of different species and stock types on a relatively new experimental planting site.
- Develop recommendations for forested wetland mitigation design and implementation leading to successful compliance and timely release from mitigation permits.

Problem Statement

This project aimed to address specific concerns related to tree seedling survival by investigating site selection, project design, and performance of tree species and stock types in order to make recommendations that support timely release from US Clean Water Act Section 404 permit requirements on forested wetland mitigation sites in Iowa.



Image: William Heber and Matthew Kessler

Tree establishment in forested wetland

Background

Wetland areas throughout the US have declined dramatically due to land use conversion for activities such as intensive agriculture or urban expansion. Those losses led to US Clean Water Act regulations contained in Section 404 that require a permit for projects that impact wetland areas.

Agencies that are issued such permits are required to mitigate the damage or loss of wetlands, including through restoration, creation, enhancement, and/or preservation of additional wetlands. Permittees are typically required to meet specific requirements in terms of vegetation, soil, and hydrological characteristics to be released from interventions or continued monitoring.

Road development projects are among activities that cause unavoidable impacts to wetlands, and agencies responsible for such projects have expended considerable resources to meet the mitigation requirements to mixed success. Therefore, agencies such as the Iowa Department of Transportation (Iowa DOT) have an interest in improving strategies for forested wetland mitigation projects.

Research Description

The research team assessed 25 sites overall in central and southeastern Iowa. These included 9 Iowa DOT wetland mitigation sites, 5 Iowa Department of Natural Resources forested riparian restoration sites, 5 reference forest sites, 5 natural regeneration sites, and 1 Iowa DOT experimental planting site in Linn County, Iowa's Goose Pond Natural Area.

The researchers initially assessed 2,533 seedlings representing 22 species, including 1,994 bare root (BR) and 539 Root Production Method® (RPM) seedlings planted at those sites. A more detailed assessment of 1,050 seedlings of 7 focal species that were common among both BR and RPM seedlings on these sites indicated considerable variation in performance across species.

The researchers evaluated the performance of the different tree species and seedling stock types in relation to each other and in relation to natural regeneration and reference forests. Specifically, the research team compared survival rates for BR and RPM seedlings planted on 14 sites and evaluated species diversity and stem density on those sites, as well as on 11 additional sites (experimental mitigation, natural regeneration, and reference forests). The research expanded on the experimental planting site to include an assessment and comparison with balled-and-burlapped (B&B) plantings, which are currently rarely used in mitigation projects.

Key Findings

Current efforts to mitigate losses to forested wetlands have had mixed success. Site characteristics, stock type, and use of tree shelters influence seedling success for a range of forested wetland mitigation or restoration projects. While Iowa has seen some success compared to other states, there is room for improvement.

The researchers found that the following may improve the likelihood of success:

- Survival rates in Iowa for BR seedlings (91%) compared to RPM stock (74%) suggest BR seedlings planted at a high density are a better option for restoration projects, but RPM and B&B stock could provide useful canopy cover in early stages of BR seedling growth.
- Restoration planting projects have a higher tree survival rate on sites where seedlings are planted near lower order streams, with limited exposure to long-duration flooding, in soils with lower clay content, and that are established without use, or with limited use, of tree shelters.
- Survival and growth of planted trees are dependent on a number of additional factors, including careful matching of species to sites, their placement within sites, seedling care up to the time of planting, post-planting care, and ongoing maintenance.

Recommendations

Based on the findings, and the previous literature review, researchers recommend using bare root (BR) stock planted at high densities (e.g., 600 to 1,000 stems/acre), and with more consideration of species survival rates and site characteristics.

More specifically, to support timely release from permit requirements on mitigation sites, the research indicates the importance of the following:

1. Planning for forested wetland restoration
2. Setting a small number of realistic and site-specific goals or performance standards
3. Considering the characteristics of the proposed mitigation site within the landscape-watershed context and adjusting planting plans accordingly
4. Creating microtopographic variation on restoration sites where possible to enhance seedling survival
5. Ensuring both pre- and post-planting weed control
6. Selecting species and stock types from those known to have been successful in previous projects
7. Enhancing specifications and closely monitoring to verify proper planting and maintenance when projects are installed through contractual agreements

Implementation Readiness and Benefits

The study shows that there is potential for agencies such as the Iowa DOT, which has projects with unavoidable wetland impacts, to more quickly and more successfully meet regulatory requirements for forested wetland restoration or mitigation projects through additional planning and careful consideration of the site characteristics, species types, and planting methods.