



## RESEARCH SERVICES

OFFICE OF POLICY ANALYSIS,  
RESEARCH & INNOVATION

## TECHNICAL SUMMARY

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### Principal Investigator:

Kurt Johnson, University of  
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### PROJECT COST:

\$109,562



Donor soil was spread by hand over the mitigation site. Because of the wet conditions of the site, soil was hauled using an ARGO amphibious off-road vehicle pulling an Otter sled.

# Using Abandoned Gravel Pits for Wetland Mitigation

## What Was the Need?

Wetland impacts are often an inevitable consequence of road construction. Federal and state “no-net-loss” wetland policies require compensatory mitigation for wetlands lost due to construction. The Minnesota Board of Water and Soil Resources predicts potential road construction related wetland impacts over the next two years to exceed 148 acres annually for the 18 counties of northeastern Minnesota. As just one example, recent reconstruction along U.S. Trunk Highway 53 resulted in approximately 84 acres of unavoidable wetland impacts. Affected vegetation included wet meadow, shrub swamp, wooded swamp, bog and other wetlands.

Wetland restoration, where the hydrology and vegetation of an impacted wetland is restored, is a common strategy to compensate for wetland losses. However, since northern Minnesota still retains more than 80 percent of the wetlands that existed prior to the European settlement of the area, this leaves few opportunities for restoration. Abandoned gravel pits seemed to have potential as sites for new wetlands, but the viability of this strategy had not been tested.

## What Was Our Goal?

The goal of this project was to create pilot wetlands using gravel pits. These would be “in-kind” mitigation wetlands, meaning that they would be representative of the natural wetlands indigenous to the area that were impacted by the road construction.

## What Did We Do?

In July 2007, two 2.5-acre wetland creation sites were established in abandoned gravel pits running adjacent to the U.S. Trunk Highway 53 reconstruction corridor. Researchers worked with Mn/DOT to evaluate a variety of techniques for wetland establishment. On one site, wet meadow and shrub swamp wetlands were attempted, while wooded swamp and bog wetlands were attempted on the other.

The reconstruction of Highway 53 had displaced an abundance of organic soil, which researchers were able to use in the wetland creation sites. Each site was broken up into treatment plots to determine the effect of soil amendments, direct seeding, tree and shrub plantings, and fertilizer. Plant species, percent vegetative cover, and tree/shrub survival and height were recorded for each plot in June and September of each year after establishment. SigmaPlot 11 software was used to conduct the statistical analyses on the collected data to determine the effects of these various treatments.

## What Did We Learn?

For the two growing seasons that researchers observed these sites, vegetation in general progressed well, with increases over time in native species richness and in percent cover. With any wetland mitigation project, control of invasive species is a primary concern. Prominent invasives at these sites—reed canary grass, narrow-leaved cattail and purple loosestrife—were effectively controlled by hand pulling and spot herbicide treatments.

*Researchers explored using abandoned gravel pits filled with soil displaced from road construction projects as sites for creating mitigation wetlands by establishing indigenous vegetation on these sites. This could be useful for creating wetlands in northern Minnesota where wetland restoration is not typically an option.*

*“Though wetland creation is often thought to be less effective than wetland rehabilitation, I believe this project went a long way in demonstrating that abandoned gravel pits can serve as wetland mitigation sites.”*

–Sarma Straumanis,  
Wetland Program  
Coordinator, Mn/DOT  
Office of Environmental  
Services

*“We wanted to create in-kind replacement wetlands within the same watershed as those impacted by the road construction. This is in keeping with the regulatory agencies’ goal of no net loss of wetland functions and values.”*

–Kurt Johnson,  
Research Fellow, Natural  
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Institute, University of  
Minnesota Duluth

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As shown in this aerial photo taken after project completion, two gravel pit basins were used, one on each side of the road. This site was chosen for its proximity to existing shrub swamp, wooded swamp and bog wetlands as well as the organic donor soil used for this project.

Due to their ease of collection and preparation, native hardwood willow cuttings were planted on the wet meadow and shrub swamp site and showed promise of providing a shrub component to the wetland vegetation. Researchers did note, however, that the potential for restoring wooded swamp and bog wetlands is not as promising as wet meadow and shrub.

Unusually wet weather in the establishment year resulted in severe flooding on one of the sites. Researchers lowered the discharge culvert and installed a bypass ditch to reduce water levels and prevent future flooding. Despite high water levels continuing into the spring and fall, these remedial actions appear to have stabilized the site to a point where plant growth was not disturbed.

Researchers noted that although construction costs for these wetland creation sites were quite high (\$34,109 per acre), integrating the restoration into an entire road construction project would lower the cost considerably. Researchers concluded that the use of abandoned gravel pits for wetland creation, when carried out in conjunction with a road construction project, is a potentially effective means of like-for-like wetland mitigation.

### **What’s Next?**

Drained wetlands are scarce in northeast Minnesota, so locating wetlands to restore is an ongoing challenge for local transportation agencies in this area. Abandoned gravel pits present a viable alternative for city and county engineers to address this problem. However, researchers recommended a 10-year observation period of the pilot restorations to ensure that the result is truly a wetland that will meet regulations.

Researchers also recommended that detailed cost studies be performed to determine the exact costs of wetland creation when integrated into a road construction project. Finally, researchers suggested that similar studies be conducted in other geographical areas within Minnesota.