

TWI Overview

Founded in 1994, The Wetlands Initiative (TWI) is a not-for-profit Illinois corporation dedicated to the restoration of wetland resources in the Upper Mississippi River Basin and Great Lakes region. Its mission is to restore wetlands in ways that provide environmental and economic benefits to society such as reduced flood damage, improved water quality, increased wildlife habitat, high quality open space and research and education. Most of its projects involve research that is conducted by university scientists and students.

Currently, TWI is implementing their *Changing the Course* project, a large-scale floodplain restoration program. Through *Changing the Course*, TWI plans to acquire 25,000 acres of riparian wetlands and backwater lakes along the Illinois River and its tributaries over the next five years. As part of this project, eight not-for-profit organizations (called ducks) affiliated with TWI will acquire the Hennepin Levee District (HLD) (Section 3.3.3). The HLD is an agricultural area south of Hennepin, Illinois managed as a Levee and Drainage District since 1920 (Figure 1-1).¹

Site Overview

Prior to recent human development, two lakes (Hennepin and Hopper), numerous marshes, and wet prairie filled the broad, 2,544-acre, Illinois River floodplain immediately south of Hennepin, Illinois. At the turn of the 20th century, the lakes were drained for agriculture and, ultimately, impounded by a levee designed to keep the river from flooding the fields (Figure 1-2). Consequently, the lakes ceased to serve as flood reservoirs and quality habitat for Illinois River Basin species.

Such lakes provided the nursery habitat that supported commercial and sport fish. They also served as habitat for world-renowned populations of migratory waterfowl and



Figure 1-1 HLD restoration project is one of the TWI's Changing the Course projects (2000) in the Illinois River watershed region.²

other migratory birds. Many of these floodplain lakes were drained or became aquatic wastelands, losing substantially all of their former productivity. With the loss of these lakes, the ecological structure of the Illinois River Basin changed significantly and the Basin no longer supports such a rich diversity of organisms.

TWI has set out to change that. It recently facilitated the purchase of the HLD from the Village of Hennepin and its private owners. TWI pursued this property to develop and test large-scale restoration techniques, and to demonstrate the benefits of floodplain restoration in the Illinois River Basin. Before the ducks could acquire the HLD, however, TWI needed to convince the nine owners to sell their land (Section 2.3.2). Some of the farmers initially resisted the mere suggestion of the transformation of their agricultural fields into wetlands and backwater lakes. Ultimately, only one landowner denied the sale of his property. Fortunately from TWI's standpoint, this owner agreed not to interfere with the restoration. Through the Hennepin floodplain restoration project, TWI will demonstrate how the creative use of Federal funding programs, aimed at setting aside marginal agricultural lands, can achieve floodplain restoration.³



Figure 1-2 A picture (taken in May, 2000) showing current agricultural uses, such as row crops, drainage ditches, the levee (on the left) and pumping station (on the right lower corner), on the HLD.

The short-term goal of the Hennepin and Hopper Lakes project is to restore habitat for native plants and wildlife. A team of scientists, from a number of state and regional universities and agencies, will help design the restoration plan. TWI will develop a detailed work plan with the help of the scientific team and local community leaders. The work plan will include development of a soil map, determination of the historic seasonal water levels and evaluation of the original vegetation of the site. It will establish areas for fishing, bird watching and boating; it will define the habitat needed to support waterfowl and other wildlife; and it will establish the nature and extent of needed management.

The long-term goals of the project include providing research and educational opportunities, improving water quality, and restoring wildlife habitat. TWI plans to conduct research at the site in collaboration with the research team. The research will document and explain changes in the aquatic ecosystem and address various practical issues arising from restoration of the floodplains, wetlands, and tributary streams. The results will help to define cost-effective, sustainable solutions to the problems of the river, such as flooding, siltation and excessive nutrients.

TWI will restore the lakes, beginning in 2001, thereby showcasing floodplain-scale restoration and its benefits. Once again, floodwater will enter the site and reestablish the backwater lakes. Native plant communities will emerge, and, with the existence of this habitat structure, native wildlife will repopulate the site. The expected benefits to Hennepin and the surrounding community include fishing, hiking, and nature appreciation. Educational and research opportunities also will be created for the local schools, state colleges and universities.

Floodplain Restoration

The object of floodplain restoration is to achieve benefits from the natural functions of a floodplain. For example, once restored, the Hennepin floodplain will serve as habitat for a variety of Illinois flora and fauna as well as a place of recreation for Hennepin residents and visitors to the area. TWI expects that the wetlands within the floodplain will reduce the nutrient pollution in the Illinois River (Section 3.3). TWI approached the School of Natural

Resources and Environment at the University of Michigan to assist in this endeavor. Our group formed around several unanswered research questions posed by this restoration. In brief, our research focus includes:

- the ecological sustainability and function of the restored floodplain contingent upon the restoration design and potential impacts of human recreation on the site;
- the creation and implementation of floodplain based environmental education;
- the ability of the floodplain to removal excess nitrogen from the Illinois River Basin; and
- the political likelihood of using the floodplain to generate nitrogen pollution credits.

Ecological Sustainability, Recreation, and Restoration Design

The Hennepin floodplain will feature environmental education and passive recreation uses such as interpretive trails, biking trails, and canoe access. The restoration plan will allow visitors to canoe through the floodplain lakes during certain times of the year and also will create a trail system to allow access for bird watchers, photographers and nature lovers, among others, to admire and learn from the site. At other times of year, when certain species are more sensitive to human intrusion, recreational use will be restricted.⁴ Additionally, the restoration plan will manage the water flow through the floodplain for nitrogen removal.

Can a restored Hennepin floodplain concomitantly provide quality habitat, provide for human recreation, and provide nitrogen removal? How will current site conditions restrict or facilitate in achieving these objectives? These questions and their answers are vital to the success of the restoration. Landscape analysis (Section 3.1) is an attempt to answer these questions. The focus of landscape analysis and restoration design includes:

- examining the opportunities and constraints for restoring wetland ecosystems in the HLD;
- designing a site plan for diverse floodplain wetland ecosystems to accommodate a variety of wildlife;
- establishing the opportunities and limitation of public access and trail systems on the HLD;

- encouraging passive recreational uses with the minimum impact on the wetland ecosystem; and
- developing strategies for employing the restored wetlands for water quality improvement.

Environmental Education

Educational opportunities involving the restored Hennepin floodplain exist at several levels, including primary and secondary schooling, site visitation, and scientific research. The environmental education created for primary and secondary school children will take the form of curricular enhancement within the local schools and an on-site interpretive program. A restored floodplain represents an outdoor laboratory, one that allows students to develop their knowledge, skills, and attitudes toward the natural world. Educating children about the project likely will lead to a greater level of awareness and interest on the part of the adults in the community.

Visitors will also be provided an opportunity to learn about ecological restoration and Illinois River floodplains. The site plan (Section 4) includes an interpretive trail detailing the natural and cultural history of the site, allowing visitors to learn about central Illinois in an experiential manner. This type of direct contact with the natural world is vital in creating a sense of empathy and stewardship toward natural resources.⁵

University level research of the biology, hydrology, archaeology, and other aspects of the site will be welcomed by TWI.⁶ Scientists from Northwestern, Western Illinois and Missouri universities will focus on environmental chemistry and microbiology (water and substrate), soil development, and macroinvertebrates and economics, respectively. State and Federal agencies will be welcome to participate in research. The staff of TWI will coordinate restoration and research, maintain the geographic information system, and conduct hydrological and botanical studies.

In this project, we want to determine how to approach the different levels of environmental education as well as how to create and implement effective educational programs. To accomplish these goals, the research objectives include:

- examining existing curricular materials for applicability and relevancy to the site;

- adapting existing education materials and/or developing new materials for educators wishing to use the HLD for educational purposes;
- demonstrating the importance of including environmental education in this and similar restoration plans;
- recommending ways to generate enthusiasm for environmental education programs, thus increasing the chances that the floodplain is used for educational purposes; and
- developing an interpretive program that imparts knowledge about the site's natural and cultural history and includes methodology, signage, and trail systems.

Nitrogen Removal

Excess nitrogen in the form of nitrate in the Illinois River Basin stems from agricultural fertilizer, leguminous plants, municipal and industrial waste effluent, and atmospheric deposition. This excess nitrate poses potential health problems for humans and livestock and is implicated in the Gulf of Mexico hypoxia situation (Section 2.2). Solutions for removing nitrate from water include changing agricultural practices, tertiary treatment at wastewater treatment plants, technological improvements in automobiles and industry, and the use of wetlands. Bacteria found in wetland soils possess the ability to convert nitrate into nitrogen gas and release it into the atmosphere. We focus on the use of wetlands to remove excess nitrate, both from a wetland design standpoint and an economic standpoint (Sections 4.1 and 3.3). The research questions include: Will a restored Hennepin floodplain function to remove excess nitrates from the Illinois River? How will this be accomplished? Is using the Hennepin floodplain to remove nitrates economically feasible? Is this plan cost effective (i.e., is this plan more cost effective than alternative nitrate reducing programs)? To answer these questions, Section 3.3 examines the following:

- the potential for nitrate reduction in the Illinois River through the use of restored floodplains;
- the economic costs of removing nitrates at the restored Hennepin floodplain; and
- the economic incentive for both farmers and municipalities to reduce their nitrate output through floodplain restoration as opposed to on-site reductions.

Watershed-Based Nutrient Trading

A working definition of a watershed could read, “ watershed: the geographic region from which water drains into a particular water body, like a bay, river, or lake. The watershed includes the land and resources as well as the water body—also called a drainage basin.”⁷ D. Hey, TWI’s senior vice president, and others have considered the establishment of a nitrogen trading system for the Illinois River watershed. The concept is based upon other trading programs such as the sulfur dioxide emission-trading program used in the United States to reduce the level of air pollution, and watershed based trading programs, like the Tar-Pamlico Nutrient Trading Program, that target phosphorus and nitrogen reductions. For nitrogen removal, the program would involve the establishment of nitrogen farms. Nitrogen farming involves using floodplains or wetlands (the nitrogen farms) to remove nitrate from polluted waters; generating pollution reduction credits in the process. However, there are questions raised by the concept of nitrogen farming. For example: are the generation of nutrient removal credits and the establishment of a watershed-based trading market politically feasible in Illinois? Should TWI advocate for the establishment of such a market or should they focus their efforts elsewhere? In Section 3.4, we examine this issue with the following objectives:

- determining the methods used in other watersheds to create nutrient trading programs, and the applicability of these methods to the state of Illinois;
- exploring the possibility of creating a nutrient trading program within the Illinois River Basin for the express purpose of reducing the nitrate loading in the Illinois River; and
- providing TWI with an understanding of the potential for using the HLD as a nitrogen farm, including an assessment of the trade-offs involved (i.e., the reduction in the ability to use the site for another purpose.

¹ TWI. 2001.

² Source: TWI.

³ Hey, D.L. 7/2000.

⁴ Ibid.

⁵ Sobel, D. 1995.

⁶ Hey, D.L. 7/2000.

⁷ National Wildlife Federation. 1999.