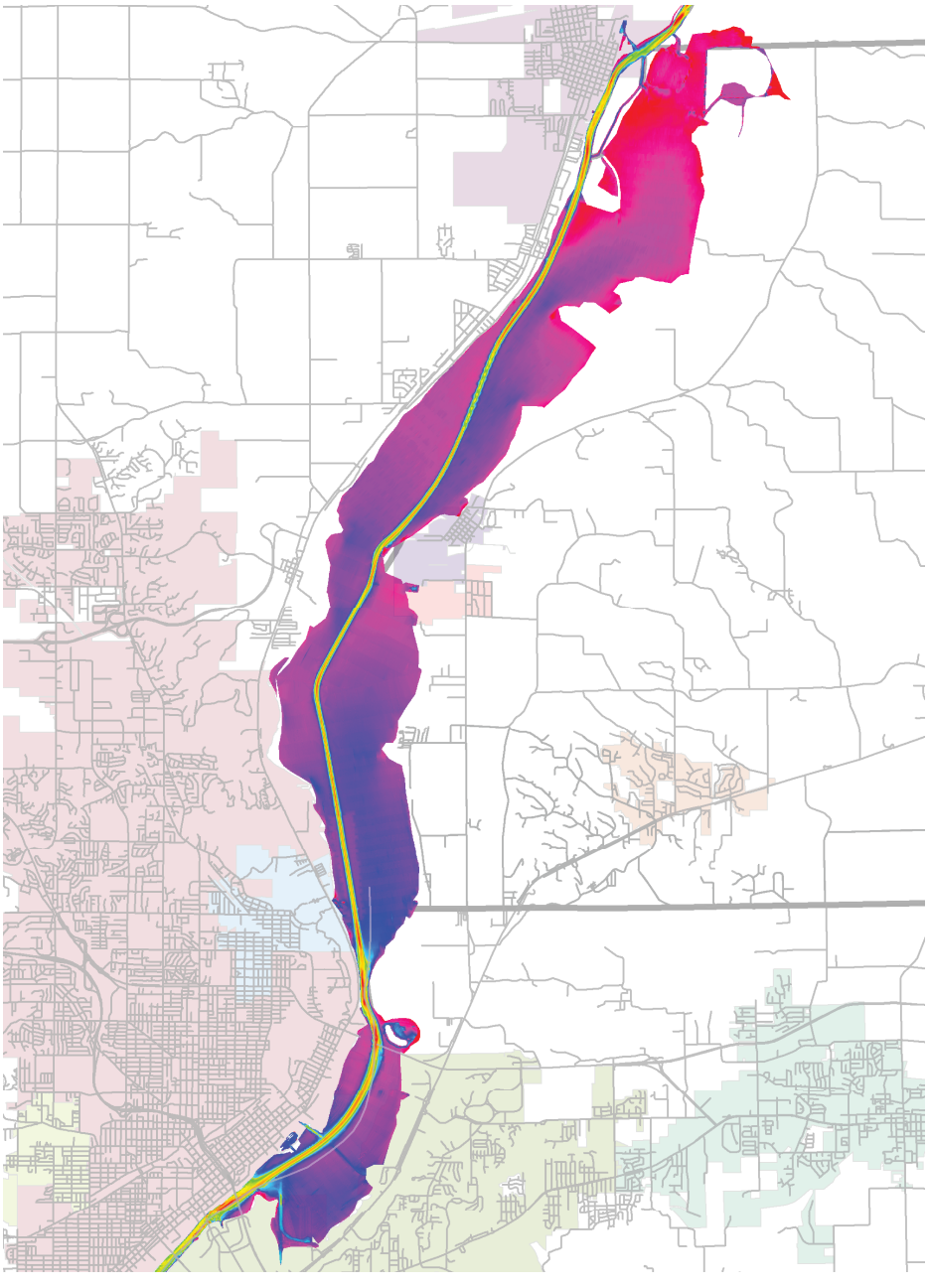
PEORIA LAKES COMPREHENSIVE CONSERVATION PLAN

OCTOBER 2018



Planning Team:

TRI-COUNTY REGIONAL PLANNING COMMISSION
PEORIA WOODFORD TAZEWELL

The Nature Conservancy

Peoria Lakes Comprehensive Conservation Plan

Planning Team

Heartland Water Resources Council
The Nature Conservancy
Tri-County Regional Planning Commission
United States Army Corps of Engineers

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Abstract

The Peoria Lakes, which refer to the widened portion of the Illinois River in the Peoria area, are natural riverine lakes that were formed by tributary deltas that narrow the valley and pinch the river to form two broad basins. The Lakes are Greater Peoria's most precious natural resource and are a significant landmark that have defined the region for thousands of years. However, over time, water quality has declined, habitat has been lost and degraded, and sedimentation has steadily filled in the Lakes due to urbanization, industrialization, and the conversion of prairie lands to agriculture. Today, the majority of the Peoria Lakes is less than three feet deep.

The purpose of this planning process was to reach a regional consensus on how to conserve the Lakes for current and future generations. Additionally, the planning team wanted to document the process to make a model that other organizations and entities can adapt to use for their own bodies of water. The planning team held two open houses, formed a Project Review Committee, and connected with numerous regional stakeholders to develop 18 recommended conservation measures and grouped into four conservation alternatives.

This document is a stepping stone towards a future implementation plan. It does outline what an implementation plan may consist of, including a multi-generational plan that provides a potential project timeline. The completion of this planning process, including the building of a solid regional network of stakeholders, is a crucial beginning for conserving the Peoria Lakes. More detailed analyses and planning will be needed prior to implementation.

Acknowledgements

This report was prepared as part of United States Army Corps of Engineers Planning Assistance to States program and the authors' regular duties at Tri-County Regional Planning Commission and USACE. A special thank you to all the active members of the Peoria Lakes Basin Alliance that were collaborators for the Peoria Lakes Comprehensive Conservation Plan. The Active Peoria Lakes Basin Alliance members are as follows:

Heartland Water Resources Council
D. Wayne Ingram
Tom Tincher
Steve Van Winkle

The Nature Conservancy
Jason Beverlin
Doug Blodgett

Tri-County Regional Planning Commission
Roy Bockler
Russ Crawford
Eric Miller

The planning team recognizes United States Army Corps of Engineers Upper Mississippi River Restoration Program Manager Marshall Plumley and former USACE staff member Dr. Jackie Veninger for their efforts in the planning process and presenting at the first public open house. A special acknowledgment for USACE Research Aquatic Ecologist Dr. Chuck Theiling for his time, expertise, passion, and enthusiasm. This report would not be at this level without Dr. Theiling's contributions.

In addition, the planning team wants to give a special acknowledgement to former Tri-County Regional Planning Commission Senior Planner Nick Hayward for spearheading this effort through his help in developing the scope of work and applying for the PAS program. Mackenzie Clauss, former TCRPC Communication Intern, was extremely helpful in planning for the first public open house and co-authoring an article on the planning process for InterBusiness Issues magazine. Tri-County Regional Planning Commission Planning Program Manager Ray Lees contributed significant time building a network of regional stakeholders and scheduling educational site visits for the planning team.

Thank you to all who attended our open houses and responded to our surveys and to the City of Peoria for supplying a room at no cost for the second public open house. A special thank you to the individuals who took time out of their busy schedules and agreed to participate on the Project Review Committee. The input received from the public and Project Review Committee was invaluable and assisted the PLBA in developing this conservation plan. Success couldn't have been achieved without their participation.

The planning team also appreciates the help of Amanda Bruner for photographing both public open houses and the Peoria Lakes and retired Caterpillar Economist Dr. Eng Seng Loh for his time and advice throughout this process. Thank you to all the news agencies that covered this planning process, and a special thank you to H. Wayne Wilson for hosting an At Issue segment, iBi for publishing an article in their October 2017 edition, and Steve Tarter for covering this topic more than once for the Peoria Journal Star.

Executive Summary

The Issue

The Peoria Lakes are Greater Peoria's most precious natural resource, and they are a significant landmark in a glacial landscape that defined the region for thousands of years. The Peoria Lakes are the two natural riverine Lakes in the widened portion of the Illinois River in the Tri-County area of Peoria, Woodford, and Tazewell counties. The Lakes were formed by tributary deltas that narrowed the valley and pinched the river to form two shallow broad basins. The natural beauty of the 16,000-acre Lakes and their bluffs continue to attract people to Greater Peoria, just as they have for centuries.

Historically, Peoria Lakes were remarkably productive, which attracted Native Americans and European settlers who benefited from abundant, river-derived resources, such as fish and wildlife, pristine water, and expansive wetlands. However, as increasing urban development, conversion of prairie lands to agricultural fields, and industrialization occurred over time, water quality declined, habitat was lost and degraded, and sedimentation has steadily filled in the Lakes. Today, most areas of the Peoria Lakes are less than three feet deep.

The Planning Team

The Peoria Lakes Basin Alliance (PLBA), comprised of Heartland Water Resources Council, The Nature Conservancy, and Tri-County Regional Planning Commission (TCRPC), led an effort to develop a Comprehensive Conservation Plan in conjunction with the US Army Corps of Engineers (USACE). On behalf of the PLBA, TCRPC applied for and received funding from the USACE Planning Assistance to States (PAS) program, which is authorized under the provision of Section 22 of the Water Resources Development Act of 1974, as amended.

The Planning Process: Key Aspects

The goal of the planning process, whose geographical scope spans from blufftop to blufftop, is to reach a regional consensus on future Peoria Lakes conservation strategies. Concurrently, the collaborative also gathered regional support to take needed action on conservation efforts. In the long run, the Greater Peoria area will be well-positioned to move forward to conserve its iconic Lakes.

The PLBA developed a vision statement to help guide potential conservation projects and studies that would help achieve the following:

> *A vibrant body of clean water with mixed water depths to sustain healthy natural habitats supporting abundant and diverse native plants and animals which contributes to our quality of life by providing increased opportunity for safe recreation, education, compatible transportation and economic development, and enjoyment by divergent constituent interests.*

To further help guide the planning process, the planning team developed a set of objectives. Please note that these objectives are in no specific order.

Objective 1: Reduce total sediment delivery to the Peoria Lakes.

Objective 2: Increase the acreage of aquatic vegetation in the Peoria Lakes.

Objective 3: Improve Peoria Lakes water quality.

Objective 4: Improve and protect wetland acres, floodplain acres, and streambank miles in the Peoria Lakes.

Objective 5: Improve and protect river bluff and steep slope areas along Peoria Lakes.

Objective 6: Improve and diversify deepwater habitat and increasing number of native fishes in Peoria Lakes.

Objective 7: Improve the quality of life in the region.

Public Outreach

Multiple advertising and outreach methods encouraged public participation and input. An open house, held on Thursday, July 13, 2017 at the Illinois Valley Yacht (IVY) Club in Peoria Heights, informed the public about the planning process and invited input from attendees. The purpose of this event was to help launch the planning process by educating the public and stakeholders about the state of the Lakes and asking for input. Participants had the opportunity to supply comments through multiple interactive stations to help the planning team gauge the public perception of the Lakes and inventory how they are used.

The planning team also established a Project Review Committee (PRC) to allow stakeholders to contribute, review public feedback, and ultimately prioritize the preferred conservation measures (specific conservation steps or actions to be considered for implementation). The PRC included stakeholders representing Peoria Lakes interest groups including: economic development organizations, environmental advocacy groups, government entities, landowners, recreation and tourism organizations, river transportation businesses, and subject matter experts.

PRC members attended their first meeting on Wednesday, November 1, 2017 in the TCRPC offices. The purpose of this meeting was to bring the newly formed PRC up to speed on the planning process, discuss their role, and ensure that all members understood the process to develop conservation measures and alternatives (logical groupings of conservation measures).

Multiple stakeholders developed fact sheets, or two-page overviews, to outline suggested conservation measures. Each fact sheet included a description, possible location, status, history, new relevant information, benefits, constraints, and operation and maintenance information. The US Army Corps of Engineers (USACE) developed the first 13 fact sheets, and at the first PRC meeting, the members were invited to add to that. From that invitation, PRC members submitted an additional 23 fact sheets.

Analysis and Review

While reviewing the original 36 fact sheets, the planning team found many of them to be redundant due to the variety of entities which had contributed. Therefore, TCRPC staff went through a consolidation process with USACE input. The final condensed list included 19 measures and a separate "Recommended Studies" category. The full and consolidated lists of measures and recommended studies can be found on the project's website, PartakeInPeoriaLakes.org, and in their own sections of this report.

On other projects, USACE Upper Mississippi and Illinois River planners have

categorized ecosystem process and function using Essential Ecosystem Characteristics (EECs): Hydrology, Geomorphology, Water Quality, Habitat, and Biota. These EECs were selected because they represent the primary river ecosystem drivers. Hydrology is often considered a "master variable" that drives geomorphology and water quality outcomes. These factors then feed to habitat characteristics that determine the biota at a site. The Peoria Lakes planning team organized the conservation measures into these EEC categories, plus a Social and Economic category to accommodate the broad range of interests required to implement this plan.

The planning team also separated the alternatives by location. Defining regions of the Lakes helps break the plan into smaller, more manageable sections and helps identify the agency or partnership most appropriate for project implementation in the long run. Based on watershed influences and in-lake characteristics, the planning team established conservation alternatives for three reaches of the Peoria Lakes and one that included the entire area. Peoria Lakes is traditionally viewed as Upper and Lower Peoria Lakes divided by the narrows at the Ten Mile Creek delta, which forms Upper Peoria Lake. However, the planning team decided to delineate a second section, Middle Peoria Lake, which separates the Upper Lake at river mile 177. This is because the uppermost reaches of Peoria Lakes can be split at the Partridge Creek delta as a logical subdivision that includes several existing conservation areas. Watershed characteristics differ among reaches with loosely defined urban, suburban, and rural characteristics affecting lower, middle, and upper sections, respectively. The list of conservation alternatives developed by the USACE subject matter experts is shown in the body of this report.

Watershed relationships are also critical to the plan, so the team considered three sediment issues: sources, pathways, and sinks. Each alternative encompassed all three, addressing the flow of sediment throughout the Peoria Lakes watershed. This way, the plan would consider the reduction of sediment sources, the interception or stabilization of sediment pathways, and the removal of material from sediment sinks in the Lakes.

Final Stages

A second open house, convened on Tuesday, June 26, 2018 at the Gateway Building on the Downtown Peoria Riverfront, updated the public on the project. The purpose of this event was to showcase the conservation alternatives and to have the public prioritize preferred conservation measures. In an interactive sticker exercise, participants were asked to prioritize conservation measures using three criteria: environmental impact, quality of life, and feasibility/sustainability.

PRC members attended a second meeting on Wednesday, July 11, 2018 at the TCRPC offices. The purpose of the meeting was to update the PRC on what was completed since the last meeting and to prioritize the identified conservation measures. The PRC used the same methods as the public, the interactive sticker exercise, to prioritize the measures. The PRC members who were unable to attend the meeting in person were encouraged to complete the activity electronically via Google Forms.

TCRPC staff considered several elements to help formulate the recommended plan: the prioritization results, Essential Ecosystem Characteristics (EECs), project objectives, conservation measures, conservation alternatives, and sediment issues (sources, pathways, and sinks). The team experimented with organizing this data in different ways:

categorizing the conservation measures based on EEC categories, classifying the objectives based on EECs, grouping the conservation measures by objectives, organizing the measures by the objectives, categorizing the measures by the sediment issue, and classifying the alternatives by the watershed areas. This process revealed considerable overlap: most measures address more than one EEC, most objectives address more than one EEC, etc. This was a positive thing, knowing that all major aspects of this plan are truly connected.

Further, to determine which measures would be highlighted in the recommended plan, the planning team compared the prioritization results from the interactive sticker exercise from the second open house and PRC meeting. Fourteen measures appeared in the top three of each criteria or overall. Below, *Figure 1* outlines the 14 measures. Note that this process does not exclude the remaining four measures from this or any future plan.

Once the 14 preferred measures were identified, the planning team reviewed each measure and connected them based on common or related benefits. Then, they were organized based on the seven objectives developed for the Comprehensive Conservation Plan. A complete list of the organized objectives can be found in the Recommended Plan section of this report.

Next Steps

Also, in the Recommended Plan section is the Implementation Plan, which outlines each measure based on potential owners and funding mechanisms. This list, from Tri-County's contact list and active stakeholders, was kept broad to accommodate future unknown issues.

Lastly, a Multi-Generational Project Plan can also be seen in the Recommended Plan section. It highlights the fact that this planning effort is a multigenerational undertaking and will not be completed "overnight." The Multi-Generational Project Plan divides the Comprehensive Conservation Plan into more manageable and logical phases or generations.

In truth, the completion of this plan does not mean that the process is done. Rather, this plan should be seen as a starting point to provide detailed options for future actions to be taken to better conserve the Peoria Lakes. It is the hope of the planning team that this process will instill a critical community interest and push towards a positive future.

Category	Measures
Sources	Agriculture Water BMPs
	Erosion Control BMPs
	Prairie & Bluff Restoration & Management
	Urban Stormwater BMPs
Pathways	Conservation & Recreation Corridors
	Floodplain Recapture
	Nutrient Farming
	Sediment Detention Basins
Sinks	Beneficial Use of Sediment
	Deepwater Creation, Dredging, and Sediment Placement
	Drawdowns
	Invasive Fish Species
	Secondary Channel
	Submersed Aquatic Vegetation

Figure 1: Prioritized Measures
(BMPs = best management practices)

Table of Contents

Table of Figures

Acronyms and Abbreviations

BIMA	Barrier Island Management Area
BMPs	Best Management Practices
CAP	Continuing Authority Programs
CASM	Comprehensive Aquatic System Model
CDFs	Confined Disposal Facility
CSO	Combined Sewer Overflow
CFS	Cubic Feet Per Second
CWA	Clean Water Act
edu	Education
EECs	Essential Ecosystem Characteristics
ESRI	Environmental Systems Research Institute (mapping organization)
FND	Foundations
GOV	Government (federal, state, or local)
GSI	Green Stormwater Infrastructure
HTRW	Hazardous, Toxic and Radioactive Waste
iBi	InterBusiness Issues
ID	Identification number

IDOT	Illinois Department of Transportation
IRBRCP	Illinois River Basin Restoration Comprehensive Plan with Integrated Environmental Assessment (IRBRCP)
IRRP	2010 Illinois River Reach Plan (Appendix D within the 2009 Upper Mississippi River System Ecosystem Restoration Objectives report)
IVY Club	Illinois Valley Yacht and Canoe Club
L	Lower Peoria Lake
LA	Load Allocation
LO	Landowner
LRS	Load Reduction Strategies
M	Middle Peoria Lake
mgmt	Management
MGPP	Multi-Generational Project Plan
Middle IL River TMDL report	2012 Middle Illinois River Total Maximum Daily Load and Load Reduction Strategies
MILP	Mixed Integer Linear Program
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer System
MWRD	Metropolitan Water Reclamation District of Greater Chicago

NAD83	North American Datum of 1983
NC	Nutrient credit
NFP	Not-for-profit organization
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PAS	Planning Assistance to States
PLBA	Peoria Lakes Basin Alliance
PLCCP	Peoria Lakes Comprehensive Conservation Plan (this document)
PRC	Project Review Committee
PRV	Private sector
R&D	Research & Development
sed	Sediment
SU	Stormwater utility
SWMP	Stormwater Management Program
TCRPC	Tri-County Regional Planning Commission
tech	Technology
TMDL	Total Maximum Daily Load
Tri-County	Peoria, Tazewell, and Woodford County, IL

U	Upper Peoria Lake
UMR	Upper Mississippi River
UMRR	Upper Mississippi River Restoration
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USGS	US Geological Survey
WIK	Work in Kind
WLA	Wasteload Allocation

Introduction

Figure 2: View of Peoria Lakes from Grandview Drive

The Peoria Lakes are Greater Peoria's most precious natural resource. The Lakes, which refer to the widened portion of the Illinois River in the Tri-County area, have supported life in the Illinois River Valley for 12,000 years. The natural beauty of the river and its bluffs continue to attract people to Greater Peoria, just as it has for centuries.

Native Americans and early European settlers enjoyed pristine water, expansive wetlands, and an abundance of fish and wildlife at the Peoria Lakes. Historically, the Peoria Lakes were lined with lush and diverse vegetation along the bluffs and ravines, which held in place the highly erodible, glacially-derived soils. However, as increasing urban development, conversion of prairie lands to agricultural fields, and industrialization occurred over time, water quality declined, habitat was lost and degraded, and sedimentation has steadily filled in the Lakes. Today, most areas of the Peoria Lakes are less than three feet deep.

A large portion of the bluffs and ravines, particularly on the western side of the Lakes, have a tremendous number of impervious surfaces such as roofs, parking lots, and streets. The impervious surfaces require stormwater infrastructure to collect, concentrate, and discharge the stormwater into gutters, ditches, streams, ravines, and ultimately the Lakes. The concentration of stormwater is a powerful force, especially on highly erodible land. Without mitigation, precipitation will continue to erode the land, contributing to the sedimentation of the Peoria Lakes and Illinois River.

To help better identify these lake-related conservation issues and take steps to address them, an interdisciplinary team formed and began a concerted planning effort. This document outlines the issues, processes, and resolutions that came about from the Peoria Lakes Comprehensive Conservation Plan (PLCCP) process.

How to Use This Document

The PLCCP is meant to be used as the first stepping stone in a larger process of implementing conservation measures that will benefit the Lakes. It identifies past and existing problems, lays out the formation of a planning team, and highlights the process used to identify and prioritize potential conservation projects. This plan is neither an implementation plan nor a feasibility study; it is

meant to set the stage. The PLCCP provides the necessary background and collaborative efforts needed to move forward to future action. It is the hope of the planning team that this document will be useful for funding organizations, community stakeholders, and the planning team to use as a jumping off point for real, positive future change in the Peoria Lakes.

Planning Team

The Peoria Lakes Basin Alliance (PLBA) was established in 2001 to coordinate efforts to rehabilitate and preserve the ecological, recreational, cultural, and economic attributes of the Peoria Lakes. Today, the PLBA consists of the Heartland Water Resources Council, The Nature Conservancy, and the Tri-County Regional Planning Commission (TCRPC). The three agencies work together to ensure a concerted and unified message for the restoration and revitalization of the Illinois River and Peoria Lakes. The PLBA partnered with the US Army Corps of Engineers (USACE) to form a planning team to develop this report, the PLCCP. The PLBA usually meets the second Wednesday of each month, unless otherwise posted, at the TCRPC offices at 456 Fulton Street, Suite 401, Peoria, IL 61602.

Project Components

Purpose and Scope

The purpose of this planning process was to reach a regional consensus on future Peoria Lakes conservation alternatives that should be pursued. The planning team aimed to marshal regional support to take action and conserve the Lakes. Further, since some conservation improvements could open the door for other entities to pursue

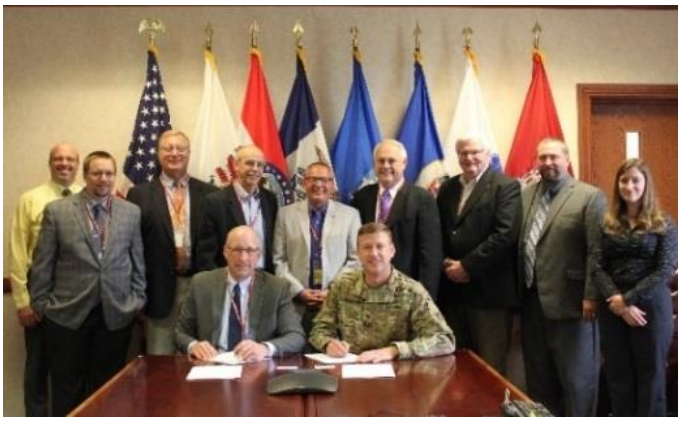

Figure 3: Signing Ceremony at USACE Rock Island District[1]

economic development, this could ultimately make the Tri-County region a greater economic resource. At the end of this planning process, the Greater Peoria area should be well positioned to move forward to conserve the Peoria Lakes and improve community well-being. The geographic scope of the plan reaches from River Mile 181 at Upper Peoria Lake and 162 at the Bob Michel Bridge, and from one blufftop to the other blufftop of the Lakes.

The Peoria Lakes are not the only water bodies that are degrading. Therefore, the planning team hopes this process serves as a model that other organizations can follow to help preserve and rehabilitate their own natural resources (see *Replication* section).

Project Authorization

On behalf of the PLBA, TCRPC applied to the USACE Planning Assistance to States (PAS) Program, which is authorized under the provisions of Section 22 of the Water Resources Development Act of 1974, as amended[2]. This section provides authority for the USACE, on a 50% federal, 50% non-federal cost share basis, to

[1] Left to right, top row: Jim Homann, Michael Bruner, Ray Lees, Wayne Ingram, Jason Beverlin, Russ Crawford, Tom Tincher, Marshall Plumley, Jackie Veninger. Bottom row: Eric Miller and Craig Baumgartner.

[2] https://www.congress.gov/bill/114th-congress/house-bill/5303

assist non-federal entities in preparing comprehensive plans for the development, utilization, and conservation of water- and land-related resources. TCRPC is the non-federal sponsor and the final deliverable is this report: the PLCCP. TCRPC and the USACE Rock Island District structured the project to include Work in Kind (WIK) Credit. Work provided by TCRPC is eligible for WIK Credit. The same is true for other PLBA members through sub-agreements with TCRPC.

Restoration Planning History

In the past, TCRPC has worked with conservation-focused stakeholders to develop watershed plans, erosion prevention manuals, and studies. Examples of these documents can be found on the TCRPC website[3].

In 2007, the USACE Illinois River Basin Restoration Comprehensive Plan with Integrated Environmental Assessment (IRBRCP) identified a declining ecosystem trajectory similar to, but more advanced than, the entire Upper Mississippi River (UMR) System (*Figure 4*). The interagency and interdisciplinary team established conceptual linkages among hydrology, sediment, nutrients, habitats, and connectivity to support problem identification. This current PLCCP study had the opportunity to use those results and progress toward a new set of restoration goals specifically tailored to the Peoria Lakes (*Figure 4*). The PLCCP can become the framework where stakeholders can see their roles and responsibilities to conserve the Peoria Lakes ecosystem.

In addition to the USACE's IRBRCP, various past projects and studies have been proposed regarding the preservation and study of Peoria Lakes. Still, there is no clear regional consensus regarding which projects and studies should be pursued moving forward to help sustain the Lakes. A list of previous Illinois River Waterway Plans and Projects is included in the appendices (*Appendix A*).

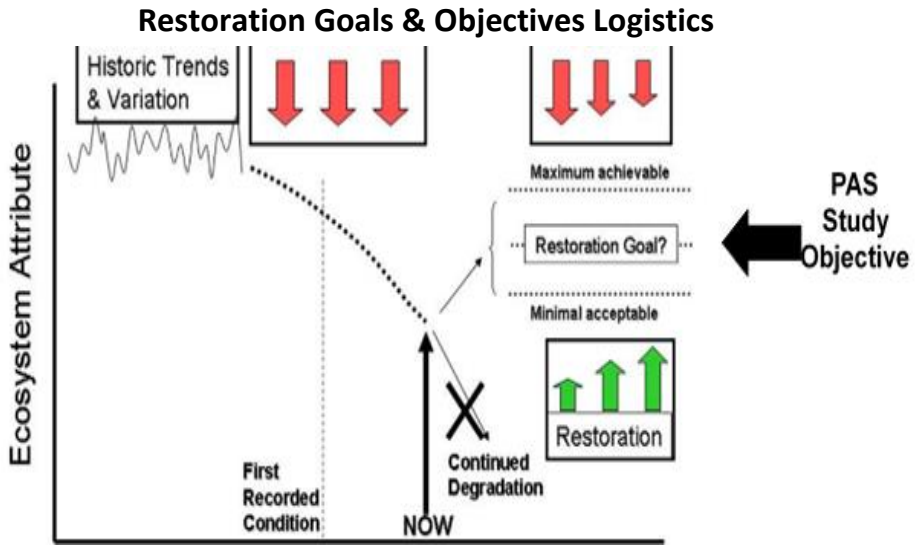

Figure 4: Environmental planning reference conditions representing historic, existing, and projected condition coupled with restoration scenarios representing socially desirable outcomes[4].

[3] https://tricountyrpc.org/land-use-environment/restoration-sustainability/

[4] Source: Adapted from Ken Lubinski, US Geological Survey, La Crosse, Wisconsin

Mission Statement

The following is the Mission Statement created by the PLBA to identify a core identity for the planning process resulting in the PLCCP:

> *The Tri-County Regional Planning Commission, Peoria Lakes Basin Alliance, and the United States Army Corps of Engineers joined forces to engage the public and regional stakeholders in the development of a Comprehensive Conservation Plan for the Peoria Lakes. The purpose of this planning process was to develop a set of strategies to address Peoria Lakes' environmental challenges and identify opportunities to preserve the Illinois River and Peoria Lakes environment for current and future generations to use.*

Vision Statement

The following is the Vision Statement for the project, created by the PLBA at the beginning of the process to set the stage for future changes:

> *A vibrant body of clean water with mixed water depths to sustain healthy natural habitats supporting abundant and diverse native plants and animals, which contributes to our quality of life by providing increased opportunity for safe recreation, education, compatible transportation, economic development, and enjoyment by divergent constituent interests.*

Objectives

The following are the seven Objectives agreed upon by the PLBA to improve the Peoria Lakes:

Objective 1: Reduce total sediment delivery to the Peoria Lakes.

Objective 2: Increase the acreage of aquatic vegetation in the Peoria Lakes.

Objective 3: Improve Peoria Lakes water quality.

Objective 4: Improve and protect wetland acres, floodplain acres, and streambank miles in the Peoria Lakes.

Objective 5: Improve and protect river bluff and steep slope areas along Peoria Lakes.

Objective 6: Improve and diversify deepwater habitat and increasing number of native fishes in Peoria Lakes.

Objective 7: Improve the quality of life in the region.

Figure 5: View of Downton Peoria from East Peoria

Study Area

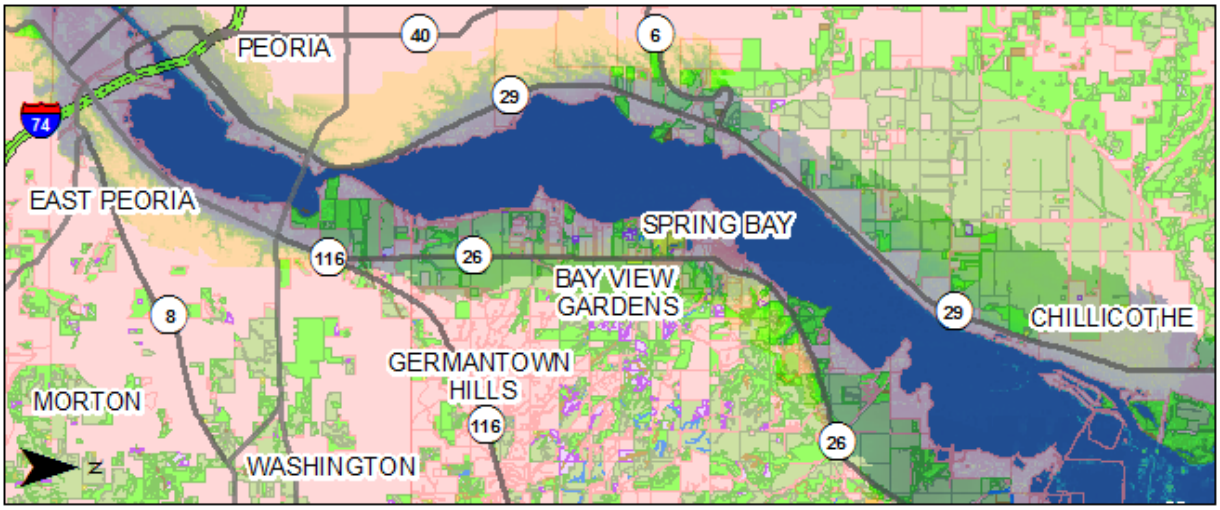

Figure 6: Land Use Map Around Peoria Lakes

History & Background of Peoria Lakes

The Peoria Lakes are a significant landmark in a glacial landscape that has defined the Peoria region for thousands of years. The natural riverine lakes were formed by tributary deltas that narrow the valley and pinch the river to form two shallow basins (see *Figure 8*) Historically, the Peoria Lakes were remarkably productive, which attracted native people and European settlers who benefited from abundant, river-derived resources. Earlier explorers remarked on the pristine abundance: "We have seen nothing like this river that we enter, as regards its fertility of soil, its prairies and woods; its cattle, elk, deer, wildcats, bustards, swans, ducks, perroquets, and even beaver. There are many small lakes and rivers. That on which we sailed is wide, deep, and still, for 65 leagues"[5] (Zurski 2016).

Figure 7: Upper Peoria Lake from Prospect Road

[5] Jacques Marquette 1674

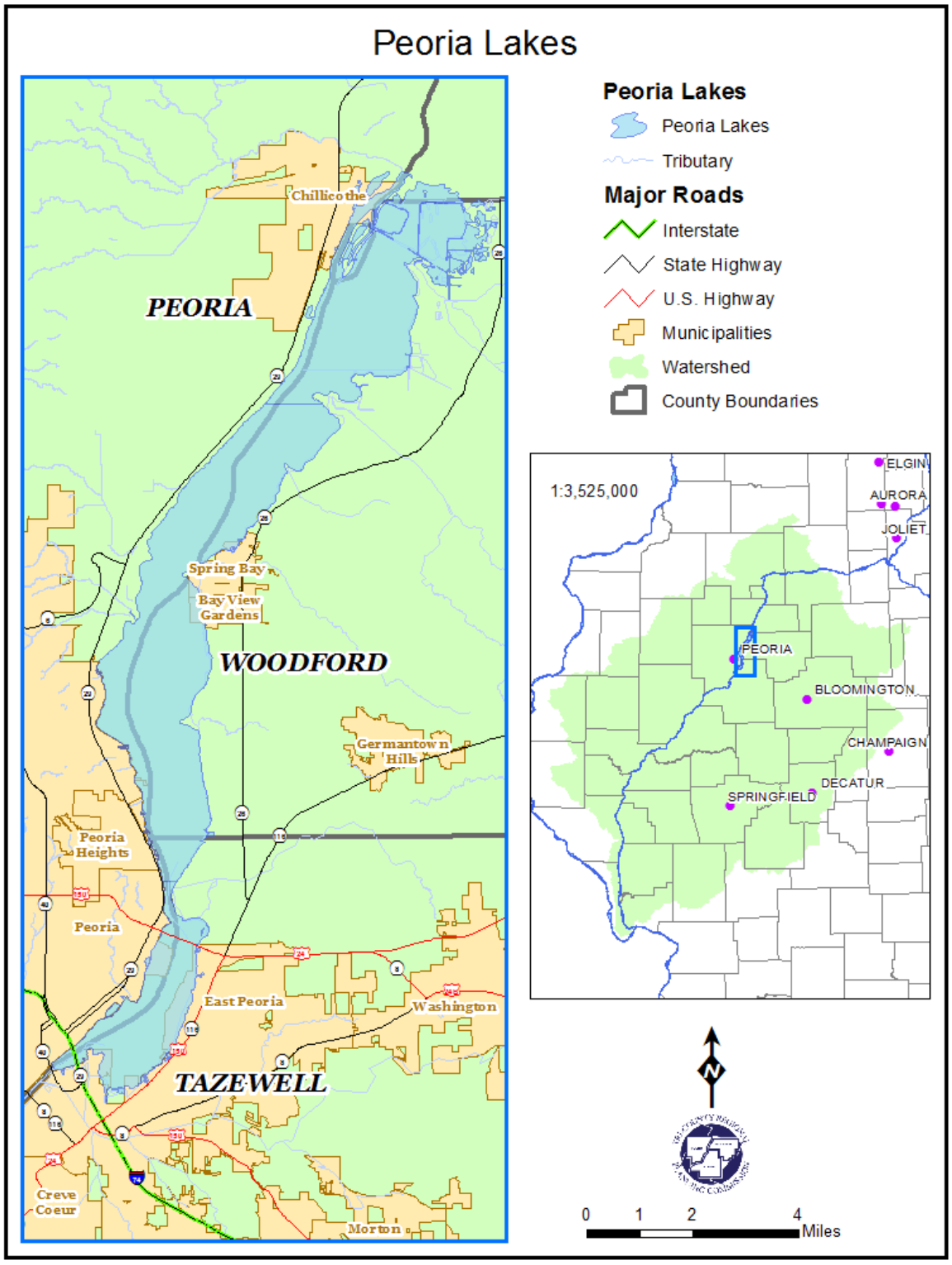

Figure 8: Map of Peoria Lakes, Illinois River, Illinois

Past Hydrology

After the last glaciation, the undeveloped Illinois River flowing through the Peoria Lakes was not connected to Lake Michigan, and it had a pronounced seasonal hydrology that supported extensive river wetlands (*Figure 10*).These river-wetlands, fueled by the "flood-pulse," or annual spring flood and summer low-flow cycle, produced fish and waterfowl that were harvested and shipped to Chicago, St. Louis, and to East Coast cities by rail car. Low water levels were as much as 15 feet lower than today's controlled river stage at the Henry, Illinois gauge, which is the best available long-term record (*Figure 11*). Flood stages were similar to today, which meant river stage spanned 25 feet and exposed hundreds of thousands of acres of floodplains to the seasonal flood pulse.

The large stage variation across a wide floodplain created diverse land, water, and floodplain features as water, sediment, and vegetation interacted at different flood stages. High flows transported the vast majority of sediment, including scour of previously deposited sediment. Heavy gravel and sand tend to stay near tributaries and channels, while fine sediment was suspended and transported to backwater lakes and floodplains. Sediment layering is common in some areas where others are more stable with consistent material accumulation. Vegetation can act as barriers by trapping sediment, which can help grow and stabilize islands. The more dynamic flows and the resulting mix of scour and material accumulation creates a much patchier and more diverse environment than seen in the modern lake.

The following unique characteristics (see *Figure 9*) are from the 2010 USACE Illinois River Reach Plan (IRRP), Appendix D within the Upper Mississippi River System Ecosystem Restoration Objectives (2009) report (Illinois River Reach Plan 2010). This influential report serves as a key reference when it comes to Illinois river history and issues. This passage explains why the Illinois River is a unique resource in the region, hence making it crucial to continue the effort to conserve the Peoria Lakes.

Unique Characteristics

The Illinois River has many unique characteristics … and ancient geomorphology that includes periods when it carried glacial Mississippi River flows that created the oversized valley below the "Great Bend" at Hennepin, Illinois. The floodplain filled with sediment through time to develop a diverse mosaic of channels, sloughs, backwaters, and wetlands that supported exceptionally high productivity of many aquatic, terrestrial, and avian communities, including massive migratory waterfowl populations and abundant fisheries.

Glacial origin and change
Underfit stream
Low gradient
Peoria backwaters
Peoria Lake
Bottomland Lakes
Large forest blocks
Historically diverse aquatic vegetation
Commercial fish harvest
Commercial waterfowl harvest
Commercial mussel harvest and recovery
Geomorphic diversity
Tributary deltas

Figure 9: Unique Characteristics from IRRP

Peoria Lakes Pre-Diversion Map, 1990

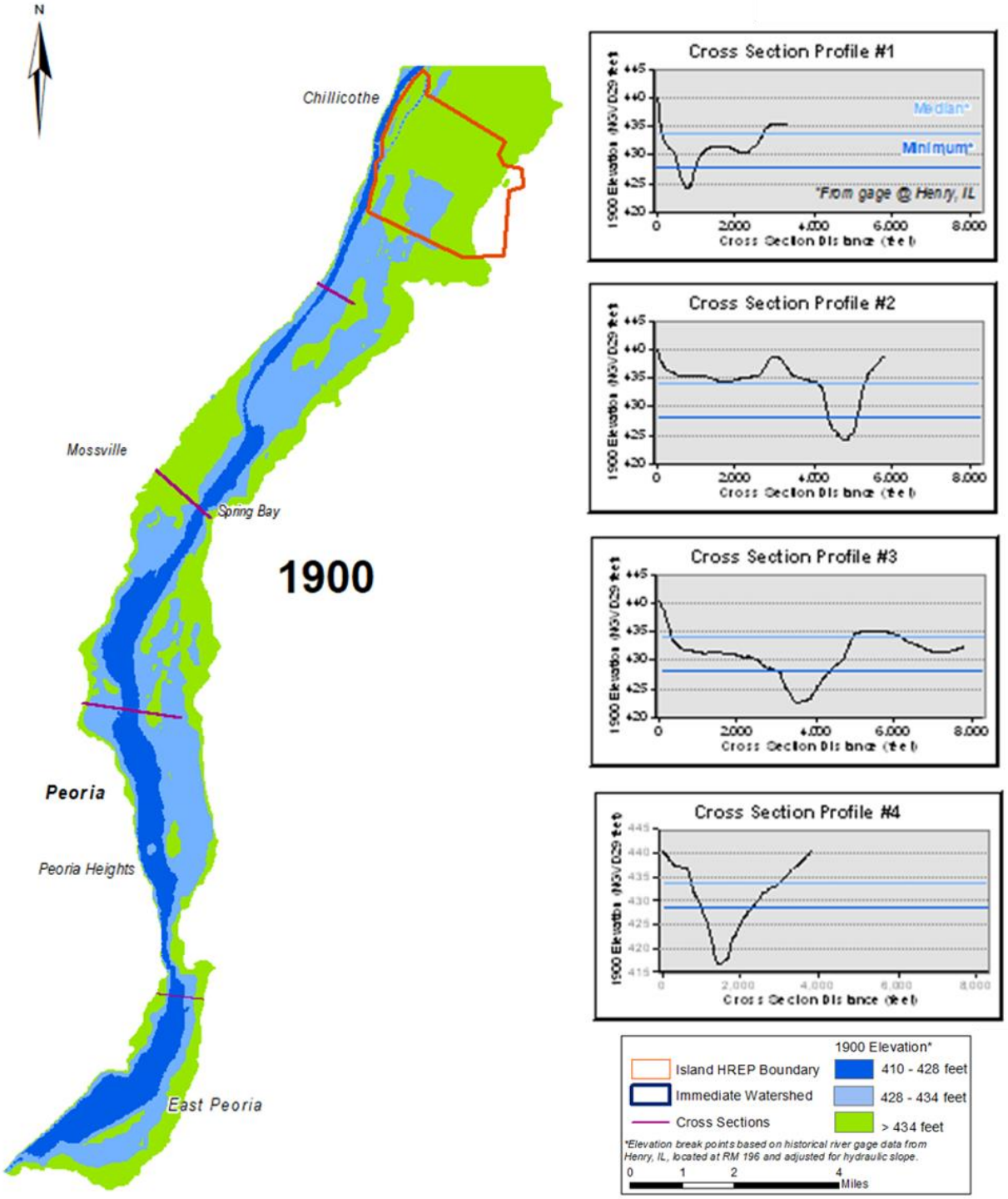

Figure 10: Peoria Lakes Pre-Diversion Map 1900

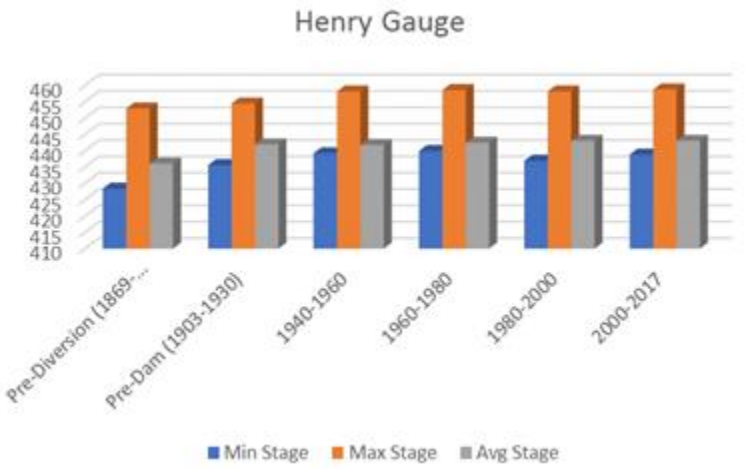

Figure 11: Illinois River Gauge near Henry, IL

The 1800s and Beyond

The watershed comprised of prairie and forest before agriculture developed in the Midwest and caused significant, well-documented landscape change (The Prairie Is Complex n.d.). The first steamboats arrived in the 1820s, and settlers began to transform the landscape. They were supported by a "Manifest Destiny" philosophy in addition to policies and funding that encouraged development.

While historic sediment transport is not documented, floodplain coring shows much higher erosion and sedimentation rates following watershed development. Excessive post-settlement sediment from local tributaries and upstream watersheds caused significant ecological changes in the entire river valley. Illinois State Water Survey research has documented that about half of the sediment in the Peoria Lakes is brought in by the Illinois River and half comes from the smaller tributaries that drain watersheds around the Lakes, which represent only approximately four percent of the total watershed (Demissie, Getahun and Keefer 2016). Sediment management has been the main restoration objective for most Peoria Lakes management plans and a major consideration for most Illinois River plans.

Diversion of the Chicago River in the Early 1900s

Growing urban populations meant growing sanitary problems. During a period between the Industrial Revolution and the 1920s, rivers were open sewers that received municipal garbage, sewage, slaughterhouse waste, and new industrial contamination. Contaminants from urban and agricultural sources were concentrated in waterways and especially in the sediment where they impacted aquatic life.

Chicago's sewage discharge into Lake Michigan fouled their water supply and caused significant public health issues. The Sanitary District of Chicago, now known as Metropolitan Water Reclamation District of Greater Chicago (MWRD), solution was to reverse the flow of Chicago River by digging a canal to cross the ridge that was the natural watershed divide separating the Great Lakes and Great Rivers watersheds. As a result, the South Branch of the Chicago River then flowed south into the Des Plaines and thence the Illinois River beginning in 1900. The volume of Lake Michigan waters diverted into the South Branch was initially high at 7,200 cubic feet per second, which raised Illinois River levels nearly 10 feet at the Henry gauge (see *Figure 11*).

People in Peoria and St. Louis fought the change, anticipating the sewage flowing from Chicago, and they sought an injunction. However, a rapid push to completion caused sewage pollution to quickly foul the river nonetheless. Illinois scientists Stephen A. Forbes and Robert E. Richardson documented the changes as the river was polluted down to Marseilles by 1911, Spring Valley by 1912, and Beardstown by 1920. Advancements in Chicago sewage treatment came at tremendous public expense, but they were successful, as water quality improved throughout the river (Tunnel and Reservoir Plan (TARP) Fact Sheet n.d.). Improvement occurred in increments throughout the following decades: Implementation of municipal sewage works like primary sewage treatment in the 1920s and secondary and tertiary treatment since the 1972 Clean Water Act. In the 1967 Supreme Court case Wisconsin v. Illinois, 388 US 426, the court issued a decree to limit the state of Illinois' water diversion to 3,200 cubic feet per second (over a 40-year running average) (Wisconsin v. Illinois 1967) (Lake Michigan Water Allocation n.d.). The Court then amended the decree in 1980 to read the following:

> *Given the relatively short period of record and the likelihood of increased runoff resulting from urbanization, it was agreed that a 15% exceedance, to a maximum of 3680 cfs, would be allowed in any year to accommodate high stormflows, and that, in any two years of the 40-year accounting period, the diversion may be increased by 20%, to a maximum of 3840 cfs, to accommodate extraordinary hydrologic conditions* (Wisconsin v. Illinois 1980).

When the diversion raised the new minimum water level to the same elevation as the median water level prior to the diversion, the Peoria Lakes were transformed from seasonal wetlands to shallow lakes. The diversion created permanent open water in the lower half of the Lake and a large seasonal lake in the Upper Lake.

The Chicago Sanitary and Ship Canal was a boost to commercial navigation because it provided higher base flows, but there were still droughts that made river transportation impractical during part of the year. The State of Illinois constructed dams to support low-flow navigation in the 1800s, but the current USACE lock and dam system was built in the late 1930s to complete the dependable nine-foot navigation channel by 1940. The Peoria dam only raised water levels a few more feet compared to median flows from the large diversion, so dam gates may be opened and/or lowered more than 50 percent of the time when river flow maintains navigable depths. The dams did increase elevations at low river stages and slowed water velocity when in operation to create the contemporary 16,214-acre lake.

Low current velocity in the lake environment transported fine silt throughout the shallow basin. It settled over time to fill deeper areas first and then uniformly across the Lakes to create a shallow, muddy basin. The loss of historic low river stages prevents the drought stage of the "flood pulse," which is necessary for physical and chemical transformations in the sediment. Elevated low river stages kept sediments from drying, creating loose, flocculent sediments that are poor for plant rooting and easily re-suspended by wind-waves, boat waves, waterfowl, and fish. Water clarity is extremely low, and aquatic plants have been nearly eliminated in Peoria Lakes and other large lakes connected to the Illinois River.

Entering the Modern Era

The modern era was defined by changes following World War II industrial and chemical innovations. The Peoria Lakes water surface area shrank slightly with delta expansion, but the depth diminished considerably with continued sedimentation (*Figure 13*). After humans disturbed the soil, ditched and drained prairie wetlands, and channelized streams, mechanization on farms became standard practice with steam and then combustion engines. Crop specialization and row-crop agriculture were the emphasis of a post WWII "Green Revolution" defined by use of chemicals to enhance crop productivity. Patchwork plots and fields on family farms were replaced by large monotypic corn and wheat fields. These were later followed by soybeans as their dominance increased and wheat dropped out of favor in the Corn Belt. Poor land use that created extremely high erosion rates during early agricultural expansion was reduced through innovation and rehabilitation to less impactful land use practices. In Illinois, however, the "legacy sediment" that is stored in streams may take 100 years to flush through the system.

As agricultural science and cropland optimization advanced, drain tiles and chemical fertilizers became more common in row crop agriculture and have progressed to the point of changing watershed hydrology and nutrient chemistry. Runoff occurs more rapidly and causes extreme water level fluctuations during any time of year rather than a smooth flood from ice-out to summer low flow that the natural river ecology adapted to (*Figure 12*).

Summer flooding in Illinois River backwater lakes after plant germination can kill wetland plants, and winter floods disturb overwintering fish that require especially low current velocity. Levee districts and impoundments alter main stem hydrology that makes the river fluctuate faster and more frequently than the predevelopment condition. Although levees are more pronounced below Peoria Lakes, urban, agricultural, and conservation levees alter the Peoria Lakes hydrology as well. Midwest agricultural nutrient enrichment is well understood, but poorly controlled.

Illinois Natural History Survey long-term electrofishing data show changes in the number of fish species and three "indicator" species through time encompassing improvements in water quality (Fritts, et al. 2017). Common carp are tolerant of poor water quality and dominant during the most polluted period. Sediment-sensitive catfish and habitat-sensitive bluegill have become more abundant since the 1990s as water quality improved and contaminated sediment is overlaid with cleaner sediment after implementation of the 1972 Clean Water Act.

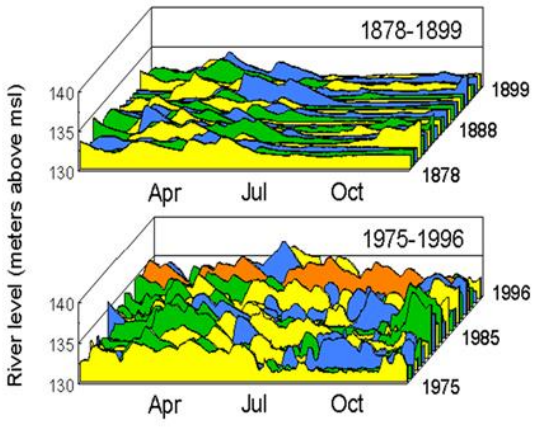

Figure 12: Pre-Modern Dam and Post-Modern Dam Hydrography (Sparks, Nelson and Yin 1998)

Peoria Lakes Current Condition Map, 1999

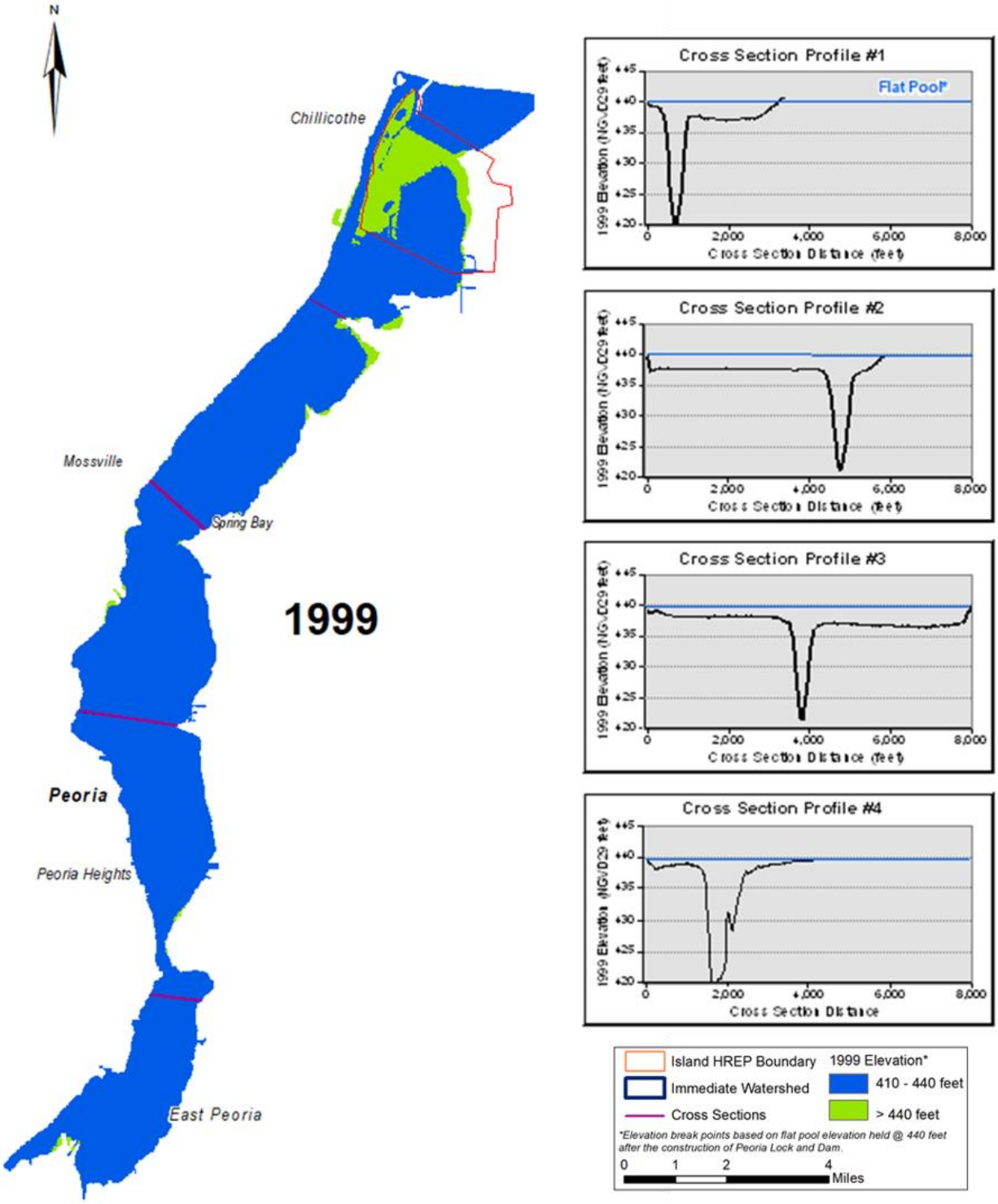

Figure 13: Peoria Lakes Existing Condition Map (1999)

Combined Sewer Overflow

The City of Peoria has a combined sewer located in the older portion of town. A combined sewer collects and transports both sanitary wastewater and stormwater to the Greater Peoria Sanitary District. During periods of heavy rain or snow melt, the combined sewer system can be overwhelmed, causing untreated sanitary wastewater mixed with stormwater to be released into the Lower Peoria Lake. This is known as a Combined Sewer Overflow, or CSO. During a heavy rain event, combined sewers require an escape route to help avoid raw sewage backup into basements and sewers.

The first sewers were installed in the City of Peoria in the 1880s to collect and transport stormwater away from the built environment (CSO Overview 2018). These sewers were constructed before indoor plumbing was common. As indoor plumbing technology became more prevalent, property owners started connecting their sewage lines to the original stormwater sewers, creating a combined sewer system. These sewer systems were discharged directly into the Peoria Lakes, which was typical for the time period.

From the 1920s to 1930s, the Greater Peoria Sanitary and Sewage District was formed and constructed a large interceptor (CSO Overview 2018), a component of a sewer network that transports sanitary wastewater and stormwater runoff to a wastewater treatment plant (Components of a Wastewater Collection System 2012). The 1948 Water Pollution Control Act went through sweeping amendments to become the 1972 Federal Clean Water Act (CWA). The CWA regulates sources of water pollution by requiring permits to discharge pollutants into waterways. This permit is known as the National Pollutant Discharge Elimination System (NPDES) (CSO Overview 2018).

In the 1980s, the City of Peoria undertook an effort to reduce sewer overflows by reducing the average annual CSO volume from 840 million gallons to 160 million gallons. This undertaking required approximately 10 million dollars in infrastructure improvements. In the early 2000s, the Municipal Separate Storm Sewer System (MS4) designation was applied to the City of Peoria. A MS4 designation requires the City to develop, implement, and enforce a stormwater management program (SWMP), which describes how it will reduce the discharge of pollutants from its sewer system. In 2006, Peoria's NPDES permit required the City to develop a Long-Term Control Plan to reduce the number of CSO events. In November 2008, the USEPA determined the Peoria CSO area as environmentally sensitive. This designation mandates a higher level of protection than previously required. This means that the Peoria CSO must be eliminated or relocated to the extent that is financially possible (CSO Overview 2018).

In 2015, the City of Peoria submitted a draft plan to the USEPA that outlines a CSO solution using 100 percent green stormwater infrastructure (GSI). The idea behind GSIs is to collect and slow down stormwater runoff from impervious surfaces such as buildings, parking lots, and roadways and allow the runoff to naturally seep into the ground (See *Figure 14*). This process helps reduce the burden of the CSO during wet weather events by reducing peak volume and velocity. It is feasible, in part, because Peoria is situated on a glacial sand terrace with high natural drainage capacity. In addition, GSIs help reduce the amount of sediment and pollutants transported into local tributaries and ultimately the Peoria Lakes. To help fund the plan, the City of Peoria looked at alternative funding sources, such as stormwater utility fees, which are dedicated funding mechanisms for stormwater

solutions. In 2017, the City Council passed the utility fee to fund stormwater improvements. The stormwater utility fee launched citywide in the summer of 2018 (CSO Overview 2018).

Figure 14: City of Peoria GSI Example

The Peoria CSO project is a substantial plan that will issue approximately $300 million in bonds to immediately fund USEPA mandated infrastructure improvements, while stormwater management fees assessed considering landowner's stormwater footprint will repay the bond over time. Rates are based on land area and land use to account for residential ($8/month) and commercial impacts from impervious surfaces like roofs, roads, and parking lots. Such plans are complex and require a long planning horizon to achieve multiple objectives. Community and business leaders have contemplated a river-supported economic revival, and they may have inadvertently been required to create a local solution to meet a federal mandate.

Total Maximum Daily Load and Load Reduction Strategy

For decades, Peoria Lakes and Illinois River water quality has declined due to human activities and urban development. Particularly, stormwater runoff from urbanized areas and agriculture fields, plus wastewater discharge from both domestic and industrial areas add nutrients and other pollutants to the river system. During rain events, stormwater runoff generated from impervious surfaces such as buildings, parking lots, driveways, and roadways transport sediment and pollutants, without proper management, which infiltrate local streams and Lakes. Ultimately, these pollutants travel down to the Mississippi River and eventually enter the Gulf of Mexico, contributing to the hypoxic zone at the Mississippi River Delta.

Nutrient-rich discharges to the Lakes have increased the severity of the degraded aquatic habitat and water quality, potentially increasing the frequency of algal blooms and low-dissolved oxygen locally and in the Gulf of Mexico. Algae blocks sunlight from providing the necessary energy that aquatic plants need to aid in their food production (photosynthesis). The CSO outfalls, which allow for nutrient-rich discharge, are shown in *Figure 15*.

The CWA requires Total Maximum Daily Loads (TMDLs) to be developed for water bodies not currently meeting the required water quality standard for their designated use (Tetra Tech 2012). A TMDL is a plan that looks at ways to obtain and maintain water quality standards (Tetra Tech 2012). In addition, TMDLs include load reduction strategies (LRSs) to address pollutants that currently do not have a quality standard.

The 2012 Middle Illinois River Total Maximum Daily Load and Load Reduction Strategies report (Middle IL River TMDL report) has the potential to help generate a nutrient credit trading system in the Greater Peoria Area. The MWRD paved the way for this approach through their support of Illinois House Bill 659, passed in August 2017. This bill amends the Metropolitan Water Reclamation District Act (70 ILCS 2605/56) to provide authority to MWRD to participate in nutrient trading in the State of Illinois for water quality standards (Metropolitan Water Reclamation District Act 2017). This system would help the Tri-County area establish a market-based engine that incentivizes the restoration or creation of wetlands for the purpose of managing nutrients. The nutrients removed from the Peoria Lakes can be measured, counted as credits, and sold to communities and industries to meet their water quality standards.

The Middle IL River TMDL report also includes an LRS for Tri-County area. This section outlines the target load reduction of total suspended solids (TSS). TSS are solids in water such as silt, decaying plant matter, industrial waste, and sewage. Like other pollutants, TSS can cause degraded water quality in aquatic habitats. High levels of TSS can block sunlight from reaching aquatic plants just like algal blooms. The reduction of suspended solids and the increase of water quality are two of the objectives for the PLCCP.

The Peoria Lakes are site D-30, or Illinois River at Peoria Intake, in the Middle IL River TMDL report (Tetra Tech 2012). Site D-30 has been placed on the State of Illinois §303(d) list (IL EPA list of impaired waters) and includes one bacteria, one total dissolved solids (TDS), one manganese impaired segment, one TSS, and two nutrient LRSs (Tetra Tech 2012). Below are TMDL and LRS tables from the 2012 Middle Illinois River TMDL report. Please note the following acronyms used in the *Figure 16* through *Figure 21*: LA - Load Allocation, WLA - Wasteload Allocation, and MOS - Margin of Safety.

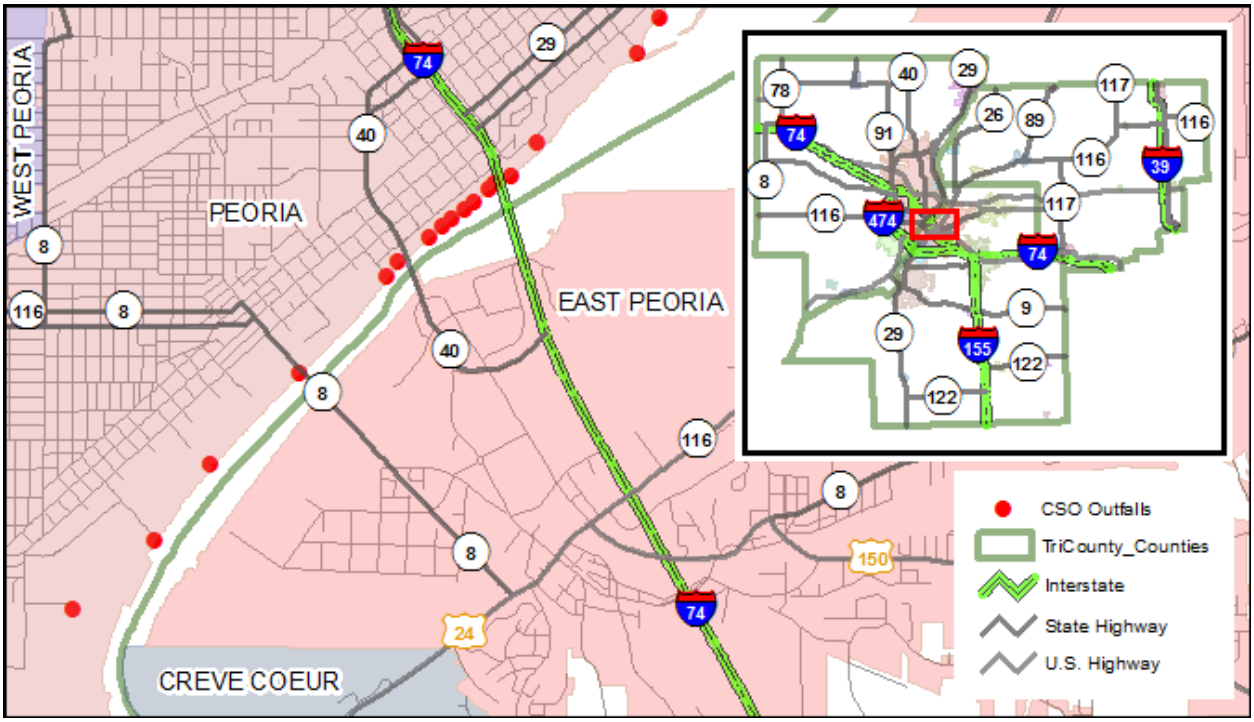

Figure 15: City of Peoria CSO outfalls

Bacteria TMDL

Station D-30 TMDL[c]		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
Pollutant	TMDL Component	0-10%	10-40%	40-60%	60-90%	90-100%
Fecal Coliform (G-org/day)	Current Load	216,822	156,993	53,217	21,437	6,835
	LA[a]	320,091	188,997	100,685	58,883	36,609
	WLA: NPDES Facilities	733	733	350	350	350
	WLA: CSOs[d]	21,762	0	0	0	0
	WLA: MS4 Communities	1,014	642	343	200	125
	Total WLA[b]	23,509	1,375	693	550	475
	MOS (10%)	38,178	21,153	11,264	6,604	4,120
	TMDL=LA+WLA+MOS	381,778	211,525	112,642	66,037	41,204
	TMDL Reduction %[e]	0%	0%	0%	0%	0%

Figure 16: Fecal Coliform TMDL, State D-30

[a] Note that the Load Allocation includes all upstream area
[b] Note that the WLA is based on point sources in the Middle Illinois River Watershed
[c] Note that the TMDL is based on the median allowable load in each flow regime and reduction is based on the observed 90th percentile load in each flow regime.
[d] Note that CSOs are only allowed to discharge at this level 4 times per year.
[e] Note that daily load reductions are based on the instantaneous water quality standard; the seasonal geometric standard also needs to be met.

Manganese TMDL

Station D-30 TMDL[c]		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
Pollutant	TMDL Component	0-10%	10-40%	40-60%	60-90%	90-100%
Total Manganese (ibs/day)	Current Load	14,157	16,788	7,830	9,735	4,906
	LA[a]	63,068	23,012	11,206	6,151	3,400
	WLA: NPDES Facilities	343	343	311	311	311
	Total WLA[b]	343	343	311	311	311
	MOS (10%)	7,046	2,595	1,280	718	412
	TMDL=LA+WLA+MOS	70,456	25,950	12,797	7,181	4,124
	TMDL Reduction %[e]	0%	0%	0%	26.24%	15.94%

Figure 17: Manganese TMDL, Station D-30

[a] Note that the Load Allocation includes all upstream area
[b] Note that the WLA is based on point sources in the Middle Illinois River Watershed
[c] Note that the TMDL is based on the median allowable load in each flow regime and reduction is based on the observed 90th percentile load in each flow regime.
[e] Note that daily load reductions are based on the instantaneous water quality standard; the seasonal geometric standard also needs to be met.

Total Dissolved Solids TMDL

Station D-30 TMDL[c]		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
Pollutant	TMDL Component	0-10%	10-40%	40-60%	60-90%	90-100%
Total Dissolved Solids (tons/day)	Current Load	44,640	36,083	15,227	11,536	N/A
	LA[a]	105,113	38,354	18,677	10,252	5,667
	WLA: NPDES Facilities	571	571	519	519	519
	Total WLA[b]	571	571	519	519	519
	MOS (10%)	11,743	4,325	2,133	1,197	687
	TMDL=LA+WLA+MOS	117,427	43,250	21,329	11,968	6,873
	TMDL Reduction %[e]	0%	0%	0%	0%	N/A

Figure 18: Total Dissolved Solids TMDL, Site D-30

[a] Note that the Load Allocation includes all upstream area
[b] Note that the WLA is based on point sources in the Middle Illinois River Watershed
[c] Note that the TMDL is based on the median allowable load in each flow regime and reduction is based on the observed 90th percentile load in each flow regime.
[e] Note that daily load reductions are based on the instantaneous water quality standard; the seasonal geometric standard also needs to be met.

Total Suspended Solids LRS

Stream	Station	Volume Weighted TSS Results (mg/L)	LRS Target (mg/L)	Reduction Needed to Achieve LRS Target
Illinois River at Peoria	D-30	63	59.3	6%

Figure 19: Total Suspended Solids LRS, Site D-30

Nutrient LRS

The nutrient LRS includes both total phosphorus and nitrate nitrogen. Below are two tables outlining the two nutrient LRSs.

Total Phosphorus

Station D-30 LRS[a]		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
Pollutant	LRS Component	0-10%	10-40%	40-60%	60-90%	90-100%
Total Phosphorus (lbs/day)	Current Load	55,370	36,734	24,266	14,628	10,720
	LRS Target	15,152	8,395	4,471	2,621	1,635
	LRS Reduction %	72.63%	77.15%	81.58%	82.08%	84.75%

Figure 20: Total Phosphorus LRS, Site D-30

[a] Note that the LRS is based on the median allowable load in each flow regime and reduction is based on median observed load in each flow regime.

Nitrate Nitrogen

Station D-30 LRS[a]		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
Pollutant	LRS Component	0-10%	10-40%	40-60%	60-90%	90-100%
NO2NO3 (lbs/day)	Current Load	1,157,994	645,579	263,768	104,502	60,787
	LRS Target	378,381	209,643	111,639	65,450	40,838
	LRS Reduction %	67.32%	67.53%	57.68%	37.37%	32.82%

Figure 21: Nitrogen LRS, Site D-30

[a] Note that the LRS is based on the median allowable load in each flow regime and reduction is based on median observed load in each flow regime.

Existing Condition of Peoria Lakes

Most of the recent surveys have just been channel surveys. The last time the Peoria Lakes (including areas outside the channel) were surveyed was 2007-2008 and 1999 (see *Figure 23* showing bathymetry data up to 1999 and *Figure 24* showing the most recent data). The data outside the navigation channel is 10 years old.

The following is a description of the data illustrated in *Figure 24*:

> *The surface represents most recent USACE survey data available for a given location, with surfaces covering the extent of navigation pools. It was created and updated as a terrain dataset using ESRI geoprocessing tools. The terrain dataset is updated on an annual basis by replacing old sounding points with newer sounding points in areas that have newer survey data. In the case of Peoria Lakes, the surface was updated in early 2018 with soundings collected through the end of calendar year 2017. If USACE has not surveyed an area recently, the surface represents the latest available survey data (sometimes this means 10-year old data exists alongside 1-year old data in the surface model). A 5' cell-size raster is extracted from the terrain dataset surface for faster viewing and analysis. Horizontal coordinates for the surfaces are in Illinois State Plane, NAD83, US Survey Feet. The zone is Illinois West. Vertical information represents depth. Flat pool level is 440 feet.*

Outside of the nine-foot navigation channel on the Illinois River, continued sedimentation in the Peoria Lakes area has reduced lake depths, deteriorated aquatic resources in the area, and increased the potential for maintenance dredging of the navigation channel. Analysis of recent survey information indicates possible trends toward sedimentation rate reduction in this river reach, but the level remains very high.

As mentioned in the introduction, land use around the Peoria Lakes has significantly changed overtime. These changes have caused the local watershed to contribute to the sediment load within the Lakes and have contributed to the decline in habitat and water quality. *Figure 25* and *Figure 26* show the land use and elevation around the Peoria Lakes to highlight the erodible areas.

Geographical Boundary

The scope of this planning project encompasses the area between the blufftops. However, the planning team recognizes that work in the watershed is needed to help rehabilitate and preserve the Lakes for current and future generations to enjoy. For the purposes of this planning project, the geographical boundary of the Peoria Lakes is from river mile 182 (north of Chillicothe, IL) to just shy of river mile 162 (Bob Michel Bridge connecting East Peoria and Peoria, IL).

To develop conservation alternatives, the Peoria Lakes were divided into three sections: Upper Peoria Lake, Middle Peoria Lake, and Lower Peoria Lake. The Upper Peoria Lake starts just north of Chillicothe at river mile 182 and extends downriver south to river mile 177 or the Partridge Creek delta. The Upper Peoria Lake is approximately 5,170 acres. The Middle Peoria Lake, which is the largest section at approximately 8,500 acres, starts at river mile 177 and extends downriver to the narrows at river mile 167 or the Ten Mile Creek Delta. Lower Peoria Lake, the smallest section at approximately 2,500 acres, starts at the narrows and extends downriver to the Bob Michel Bridge near river mile 162. The Lower

Peoria Lake is the most visible part of the Lakes due to its proximity to Downtown Peoria and two major bridges that expand across it: Murray Baker Bridge (Interstate 74) and McCluggage Bridge (US 24). Below, *Figure 27* is a location map illustrating the three sections of the Peoria Lakes and the river miles.

Figure 22: Upper Peoria Lake from Prospect Road

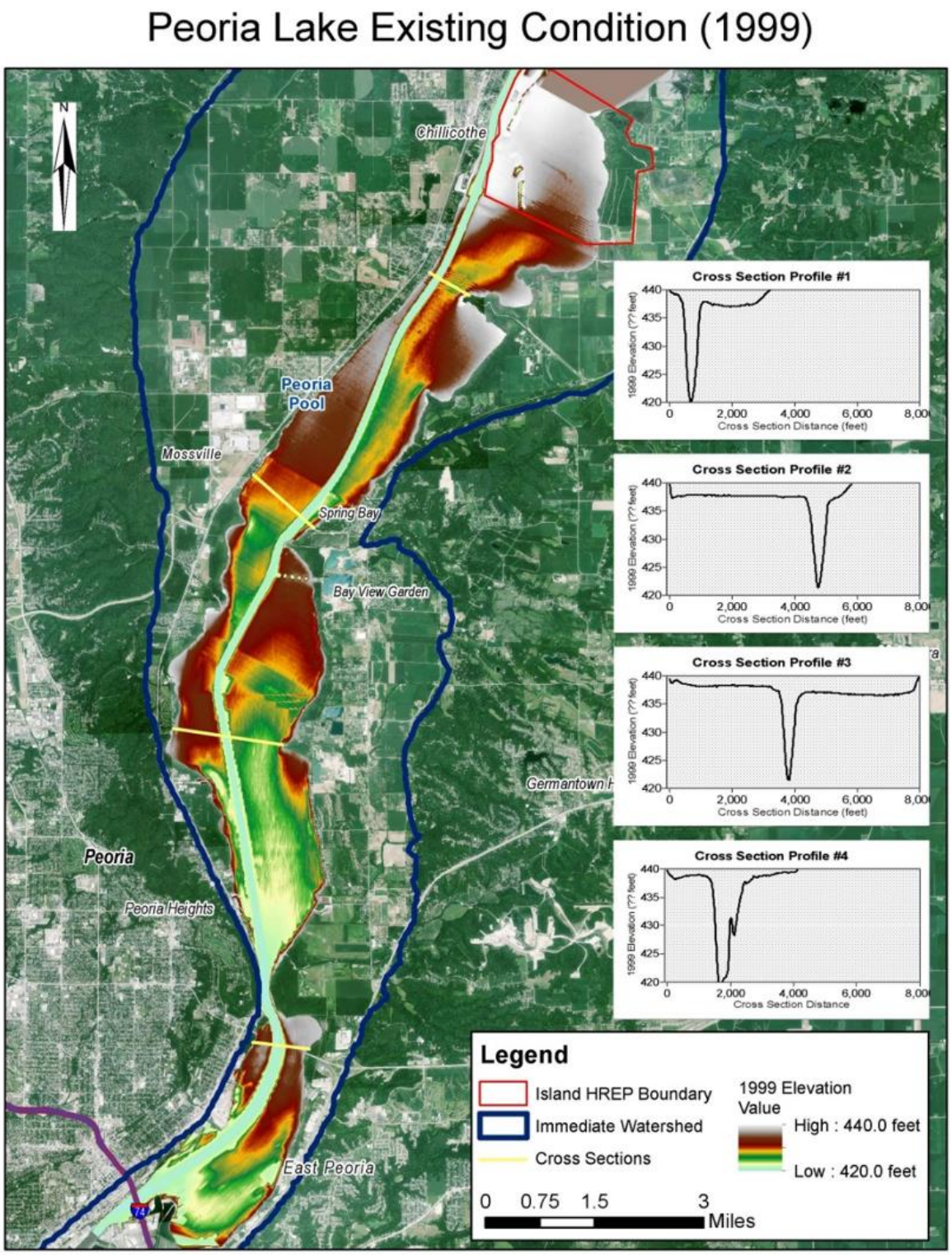

Figure 23: Peoria Lakes Bathymetry (1999)

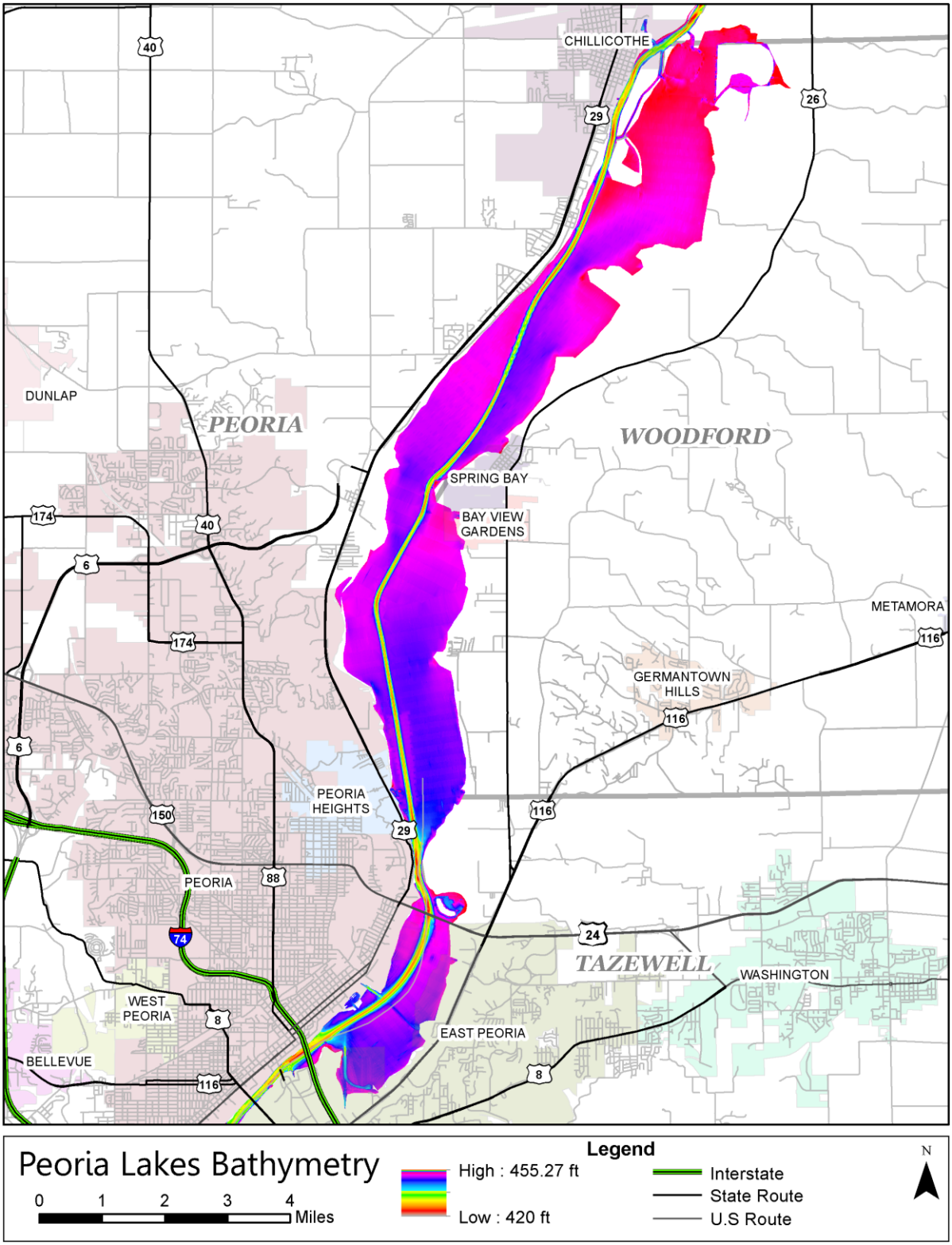

Figure 24: Peoria Lakes Most Recent Bathymetry

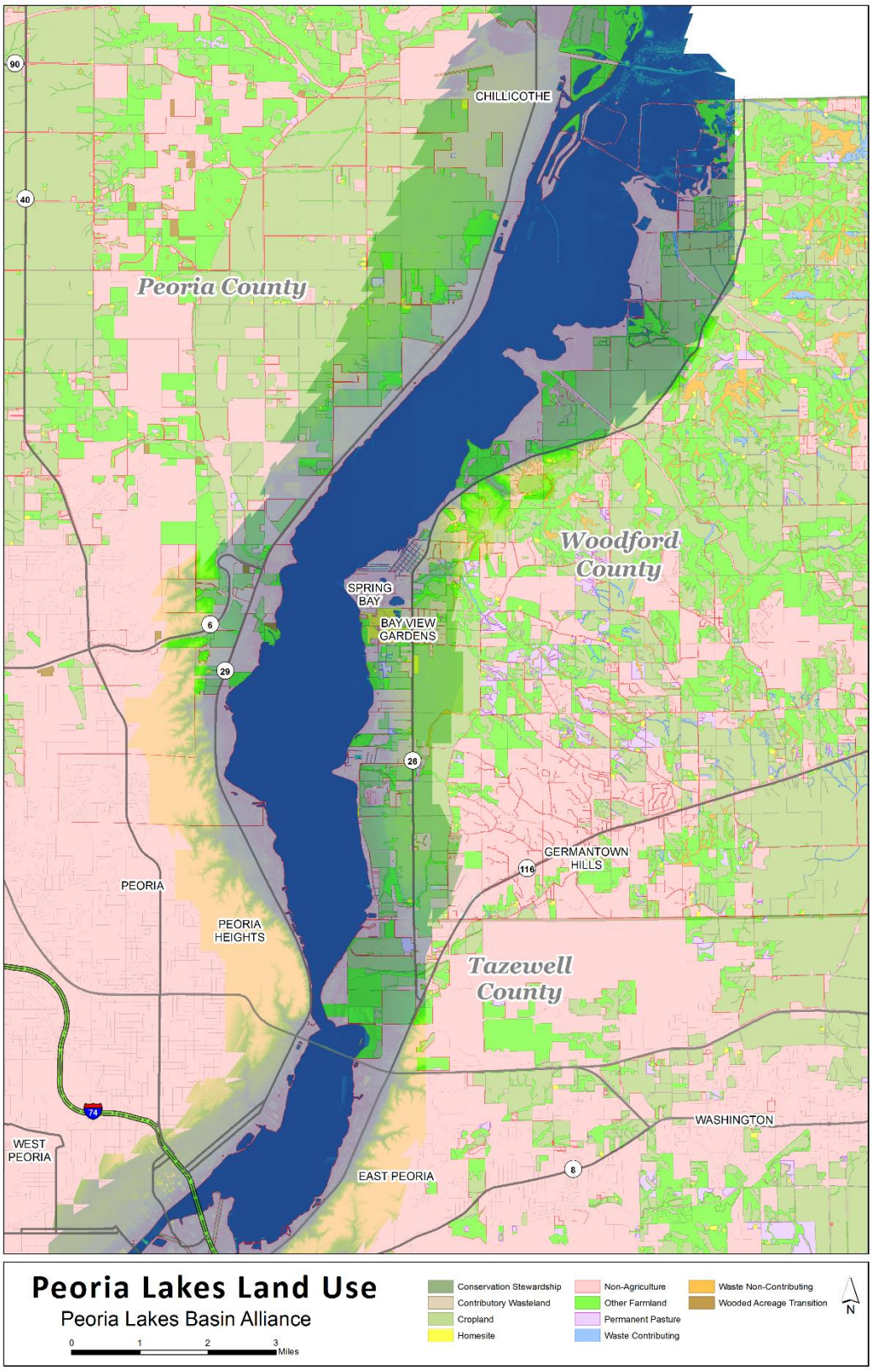

Figure 25: Peoria Lakes Land Use

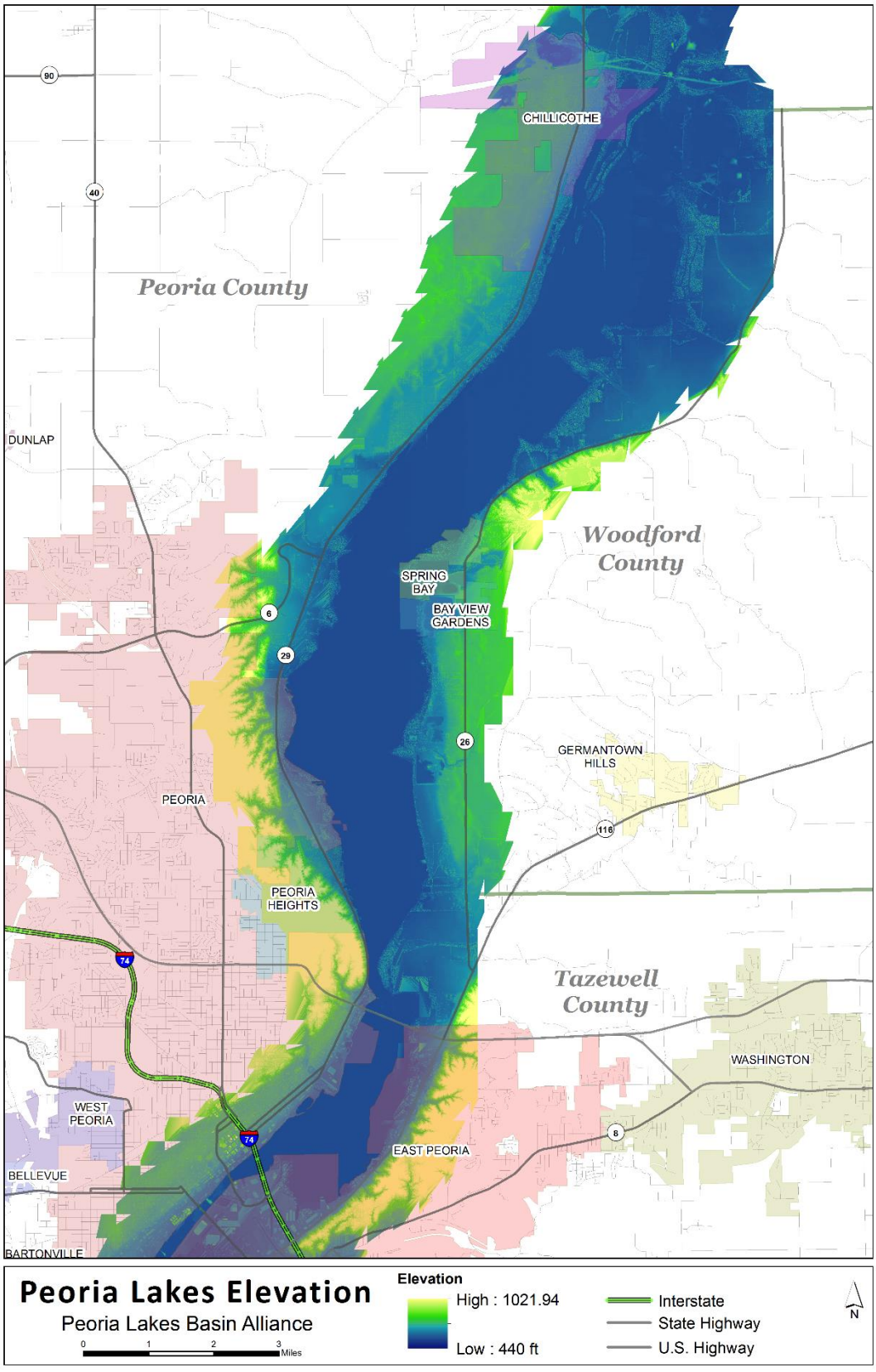

Figure 26: Peoria Lakes Elevation

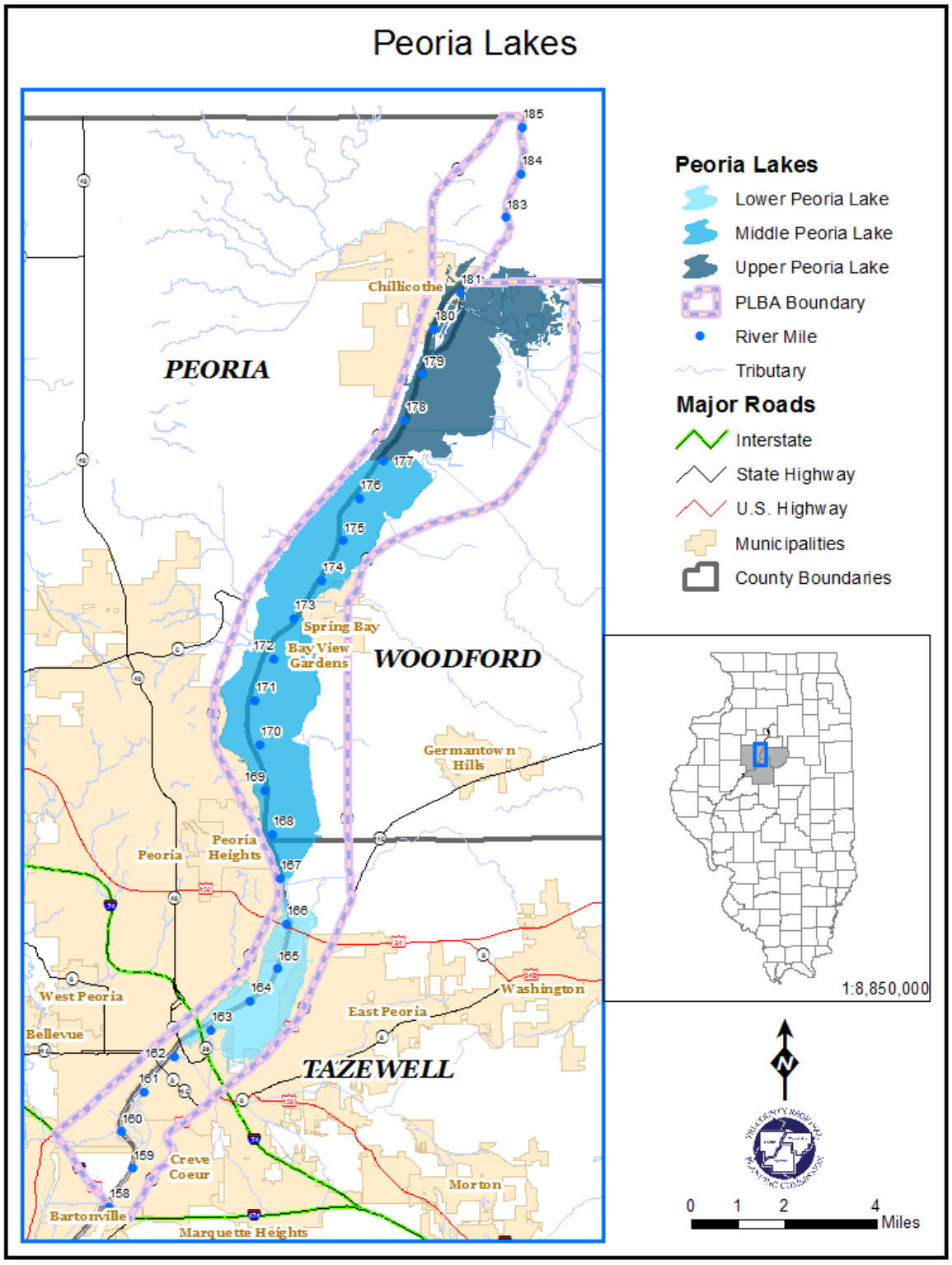

Figure 27: Peoria Lakes Location Map Illustrating the Three Sections

Problems and Opportunities

Figure 28: Ten Mile Creek Delta (Photo Credit: Ray Lees)

Problems

The following sections reference the 2010 IRRP, which is the Illinois River Reach Plan. As mentioned earlier in this report, this influential report serves as a key reference when it comes to Illinois river history and issues. This passage explains why the Illinois River is a unique resource in the region, hence making it crucial to continue the effort to conserve the Peoria Lakes.

The Illinois River Work Group, the coordinating entity of the IRRP, recognized several large-scale stressors that influence ecological processes of the Illinois River (see below bullet points outline the stressors affecting natural processes and biota in the Illinois River reach). The IRRP team assessed these stressors to identify key local and regional impact areas. Focusing on these identified areas, the Work Group sought to understand existing conditions and the natural elements responsible to preserve the status quo. Recognizing these processes opened the door for future planners, like the PLCCP team, to pinpoint specific actions to take. *Figure 28* is an example of excessive sediment entering the Peoria Lakes from the Ten Mile Creek. See *Appendix B* for additional examples.

- Excessive sedimentation
- Loss of productive backwaters, side channels, and channel border areas
- Loss of floodplain, riparian, and aquatic habitats and functions
- Loss of aquatic connectivity (fish passage) on the Illinois River and its tributaries
- Altered hydrologic regime
- Water and sediment quality (point and nonpoint sources of pollution)

The IRRP Work Group also identified environmental management objectives to address the problems degrading river habitat (see *Figure 29*). The objectives apply to the entire Illinois River, so while some were not applicable to the Peoria Lakes, most are consistent with PLCCP objectives (see the *Objectives* in the Introduction section).

Opportunities

Geomorphology • Restore aquatic habitat diversity of side channels and backwaters, including Peoria Lakes, to provide adequate volume and depth for sustaining native fish and wildlife communities • Restore and maintain side channel and island habitats • Maintain all existing connections between backwaters and the main channel (connections at the 50 percent exceedance flow duration) Compact sediments to improve substrate conditions for aquatic plants, fish, and wildlife
Hydrology/River Hydraulics • Naturalize Illinois River and tributary hydrologic regimes and conditions to restore aquatic and riparian habitat
Water Quality • Improve water and sediment quality in the Illinois River and its watershed. • Reduce sediment delivery to the Illinois River from upland areas and tributary channels with the aim of eliminating excessive sediment load • Eliminate excessive sediment delivery to specific high-value habitat both along the main stem and in tributary areas
Habitat • Improve floodplain, riparian, and aquatic habitats and functions • Restore up to an additional 150,000 acres of isolated and connected floodplains along the Illinois River main stem to promote floodplain functions and habitats • Restore up to 150,000 acres of the Illinois River Basin large tributary floodplains • Restore and/or protect up to 1,000 additional stream miles of riparian habitats • Restore aquatic connectivity (fish passage) on the Illinois River and its tributaries, where appropriate, to restore or maintain healthy populations of native species • Restore main stem to tributary connectivity, where appropriate, on major tributaries • Restore passage for large-river fish at Starved Rock, Marseilles, and Dresden Lock and Dams where appropriate
Biota • Restore and maintain ecological integrity, including habitats, communities, and populations of native species, and the processes that sustain them • Restore and conserve natural habitat structure and function

Figure 29: Objectives from the 2009 IRRP

Methods & Public Involvement

Figure 30: Former USACE archaeologist Jackie Veninger presents at the First Public Open House (Photo Credit: Amanda Bruner)

Public Engagement

The planning team used local media and social media to spread the word about the PLCCP initiative. The planning team also held two open houses to keep the public up-to-speed and solicit public input.

Marketing and Public Outreach

To advertise for the first public open house, the PLBA distributed save-the-date flyers via their email list and TCRPC posted information on its social media pages and website. The PLBA also reached out to the local public news agencies to spread the word. H. Wayne Wilson, a local journalist, interviewed three PLBA members on his show At Issue, which aired on WTVP, the local PBS (Public Broadcasting Service) station. The segment featured H. interviewing Steve Van Winkle, chair of the PLBA at the time; Russ Crawford, PLBA member and TCRPC commissioner; and TCRPC Executive Director Eric Miller, and it aired July 6-9, 2017. The video is also available online[6]. Miller and TCRPC Planning Program Manager Ray Lees discussed the state of the Peoria Lakes on Tarter Source, a podcast with journalist Steve Tarter of the Peoria Journal Star newspaper. The podcast aired on July 19, 2017 and is available online[7].

Crawford shared his memories of the Peoria Lakes and an update on the planning process with Cass Herrington of WCBU, the local NPR (National Public Radio) station. The interview aired on Peoria Public Radio on August 30, 2017, and is available online[8]. TCRPC planner, Reema Abi-Akar, and former TCRPC Communication Intern, Mackenzie Clauss, authored an article titled *Partake in Peoria Lakes* that was published in the InterBusiness Issues (iBi) October 2017 magazine and available online[9].

There was a segment on Central Illinois Proud Bob and Tom's Excellent Adventure that

[6] https://www.youtube.com/watch?v=q-PfYpuOxEE&feature=youtu.be

[7] http://podcasts.pjstar.com/2017/tarter-source-59-the-illinois-river-needs-our-help/

[8] http://www.peoriapublicradio.org/post/public-weighs-future-peoria-lakes#stream/0

[9] https://peoriamagazines.com/ibi/2017/oct/partake-peoria-lakes

showcased the Illinois River and posed questions about its future. Doug Blodgett of the Nature Conservancy was interviewed for this segment. An article and the video segment aired on May 22, 2018 and is available online[10]. To advertise for the second public open house, the PLBA distributed a newsletter via their email list, and TCRPC posted online on its social media pages and project website: PartakeInPeoriaLakes.org. The PLBA and TCRPC reached out to the local news agencies to spread the word. Steve Tarter of Peoria Journal Star attended the second Peoria Lakes Open House and published an article in the Thursday, June 28, 2018 Peoria Journal Star newspaper, and is available online[11].

Public Survey

To gauge the public's perceptions of the Lakes, the planning team developed a survey (see *Appendix C*) that was distributed via email, social media, Tri-County's website, and in person during the first Public Open House.

Forty-nine people participated in the survey. The results revealed that the participants are not satisfied with the current state of the Lakes and feel conservation efforts are important for local communities. Respondents feel there are five major problems with the Lakes: Asian carp, poor water quality, loss of depth, sedimentation, and decline of habitat. See *Appendix D* for the results.

First Public Open House

To help kick off the planning process, the planning team organized a public open house which introduced the process to community members, laid out the current state of the Lakes, and allowed attendees to supply input on what they'd like to see in the Lakes.

The public open house was held on July 13, 2017 at the Illinois Valley Yacht and Canoe (IVY) Club at two times: 2:00 - 4:00 p.m. and 6:00 - 8:00 p.m. Attendees listened to a presentation by the USACE, asked questions regarding the state of the Lakes, and supplied input through multiple interactive stations. There were 60 attendees.

Figure 31: Doug Blodgett and Kathryn Spitznagle at the First Public Open House (Photo Credit: Amanda Bruner)

Open House Stations

During the Public Open House there were a total of eleven interactive stations available for the public to learn about the Peoria Lakes and supply input. See *Appendix E* for the public input received at the first open house.

Conceptual Ecological Model

The stations included a conceptual ecological model developed by the USACE. The model included multiple posters illustrating the state of the Lakes pre-diversion (1900), pre-modern dam (1930), post-modern dam (1965), and existing conditions (1999). The purpose of the conceptual ecological model was to illustrate the evolution of

[10] https://www.centralillinoisproud.com/news/local-news/bob-tom-s-excellent-adventures-saving-the-illinois-river/1192666023

[11] http://www.pjstar.com/news/20180627/peoria-lakes-open-house-outlines-help-needed-for-illinois-river

the Lakes and provide an understanding of the interrelationships of forces acting on the Lakes.

Future Vision Station

In this area, attendees were given a handout with a map of the Peoria Lakes on the front and detailed questions on the back. Participants were asked to draw or write how they see the Peoria Lakes in 25-30 years.

Mapping Station

On a large map of the Peoria Lakes, attendees were able to identify where and how they use the Lakes using different colored stickers.

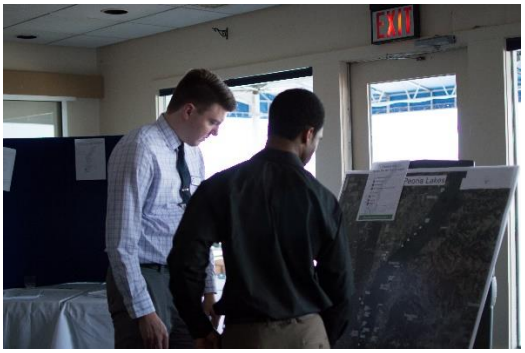

Figure 32: TCPRC Planner Ryan Harms and CityLink Planner Joe Alexander discussing the Mapping Station (Photo Credit: Amanda Bruner)

Fishing for Facts Station

At this station, attendees "went fishing" to learn Peoria Lakes facts. Using a pole and magnetic fishing line, participants "caught" a paper fish cutout, which revealed a multiple-choice question. Then, they learned about a conservation- or use-related fact about the Peoria Lakes and provide an understanding of the interrelationships of forces acting on the Lakes.

Figure 33: Fishing for Facts table (Photo Credit: Amanda Bruner)

Combined Sewer Overflow Station

A City of Peoria representative attended the open house and manned a station describing the CSO issue and proposed environmentally friendly solutions to the problem. The City's booth outlined the two-block pilot project of linear rain gardens in the rights-of-way. The purpose of GSIs is to allow rain water to naturally percolate in the ground. Thus, this natural system would reduce or prevent rain water from combining with sewer effluent and prevent the overflow into the Lakes. The City's pilot project reduces the demand on the CSO and treats the stormwater at the source naturally.

Video Stations

Attendees could watch three looped videos/slideshows. The first video, a 2003 animation developed by the Illinois State Water Survey, illustrated the natural hydrology of the Illinois River, how the river evolved over time, and how the concept of an island helps with increasing water velocity. The second video outlined the spread of Asian Carp in the United States from the beginning. The last video was a looping slideshow of Peoria Lakes pictures.

Figure 34: TCRPC Planner Reema Abi-Akar discussing one of the looping videos with an open house attendee (Photo Credit: Amanda Bruner)

SWOT Analysis

Participants had the opportunity to write out their Strengths, Weaknesses, Opportunities, and Threats on large pieces of paper. This helped the planning team understand attendees perceived existing strengths and weaknesses of the Lakes and identify future opportunities or threats.

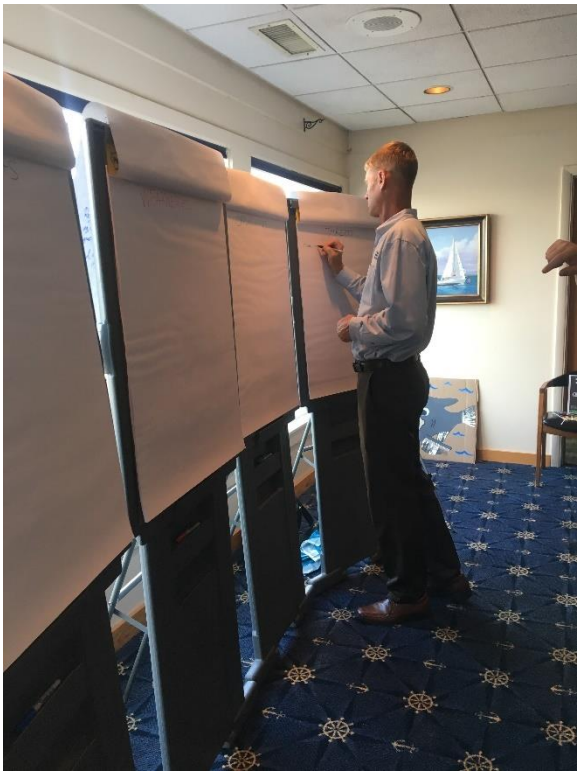

Figure 35: An attendee participates in the SWOT Analysis Station (Photo Credit: Amanda Bruner)

Innovation Board

Tri-County brought their Innovation Board, a large two-panel chalk board used to pose different questions to participants. In this case, two questions were posed: "What do the Peoria Lakes mean to you?" and "What is your favorite memory involving the Lakes?"

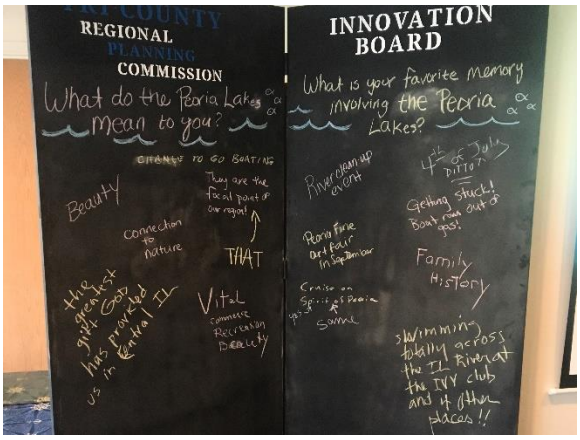

Figure 36: TCRPC Innovation Board

Photo Booth

A photo booth was available for guests to take pictures with water-themed props. The photos were shared on Tri-County's Facebook page after the event.

Figure 37: Photo Booth Props and Sign (Photo Credit: Amanda Bruner)

Figure 38: Asian Carp Prop

Figure 39: First open house attendees pose in the Photo Booth with an Asian Carp Prop (Photo Credit: Amanda Bruner)

Stakeholder Engagement Form

After the public open house, the PLBA developed a stakeholder engagement form (see *Appendix F*), which asked stakeholders to rank the issues identified in the first survey. The form split these issues for respondents to consider their ecological versus human impact. Additionally, stakeholders were asked to rank potential restoration projects considering their cost and feasibility.

Thirty-two stakeholders completed the form. Sedimentation and poor water quality were also the highest-ranked problems impacting the ecology of the Lakes. Sedimentation and poor water quality were also the highest-ranked problems impacting people using the Lakes. The two highest-ranked restoration projects focused on sediment reduction: Upland treatments and settling basins. See *Appendix G* for the results.

Second Public Open House

To help showcase the conservation alternatives developed by the USACE subject matter experts, the planning team organized a second public open house. The event was held on June 26, 2018 at the Gateway Building, Peoria Riverfront, 200 N.E. Water Street, Peoria, IL, from 3:00 to 5:30 p.m.

Fifty individuals attended the open house, including Colonel Steven Sattinger, the new Commander and District Engineer of the USACE, Rock Island District, and Mari Fournier, USACE Executive Assistant and Congressional Liaison, and Congressional staff. The open house consisted of a presentation about the planning process, what has been done thus far, the background of the Peoria Lakes, and an introduction to the conservation alternatives.

The event consisted of five stations: General comments, conservation alternatives, definitions of conservation measures, interactive prioritization station, and a sneak peek at the first rough draft of this report.

Figure 40: Attendees of the Second Public Open House listen to the presentation offscreen to the left (Photo Credit: Andrew Hendon)

General Comments

The general comment station allowed participants to supply any comments regarding the measures or process. Participants were supplied with note cards, pens, and a box to submit comments. All seven submitted comments were positive and can be found in the appendices (*Appendix H***Appendix**).

Conservation Alternatives

The two conservation alternatives stations included large poster boards. The first poster showed a map of the three divisions of the Peoria Lakes: upper, middle, and lower. This map can be found on *Figure 27* in the Study Area section under Geographical Boundary. The second poster illustrated the four conservation alternatives and their associated conservation measures. This is shown on *Figure 54* in the Formulation of Alternatives section under Definition of Alternatives.

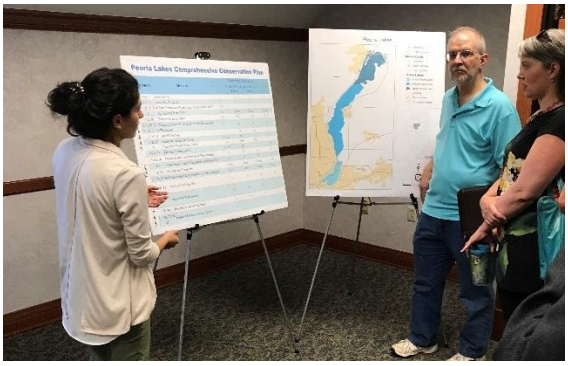

Figure 41: TCRPC Planner Reema Abi-Akar Explaining the Conservation Alternatives at the Second Public Open House (Photo Credit: Andrew Hendon)

Conservation Measures

The conservation measures station included three poster boards depicting the definitions for each measure in the context of the four conservation alternatives. The definitions presented on the poster boards can be found in the Formulation of Measures section under Definition of Measures.

Prioritization Station

At this interactive station, participants used multicolored stickers to select the measures they felt met certain criteria. This was a simple activity that allowed the planning team to identify public preferences among the conservation measures. The participants were tasked with evaluating each of the 18 measures based on three criteria: environmental impact, quality of life, and feasibility/sustainability. The definition of the three criteria are as follows:

- **Environmental impact** - possible beneficial effects caused by the implementation of a conservation alternative. These effects can include direct and indirect benefits.
- **Quality of life** - conservation efforts that increase lakefront access, recreational opportunities, and economic development in the Tri-County area. These would potentially have a substantial effect on the health, safety, or welfare of Tri-County citizens.
- **Quality of life** - conservation efforts that increase lakefront access, recreational opportunities, and economic development in the Tri-County area. These would potentially have a substantial effect on the health, safety, or welfare of Tri-County citizens.

Each criteria had a corresponding colored sticker. Each participant received four stickers for each criteria, for a total of 12 stickers. Eighteen blank pieces of paper with the name of each measure were stuck to the wall in one corner of the room. The directions given to the public were "*Place your sticker(s) on the measures you feel meet the above criteria the best. You can place all four stickers on the same measure or spread them out however you choose.*" Twenty-three participants participated in the prioritization station.

The full results from the activity can be found in the appendices (*Appendix H*). *Figure 43* shows the participants' top four preferences for each criteria and the measures with the most overall stickers.

Figure 42: Second Open House attendees participate in the interactive Prioritization Station using different colored stickers

Peoria Lakes Comprehensive Conservation Plan Prioritization Station							
Environmental Impact		Quality of Life		Feasibility/Sustainability		Total	
Measure	Sum	Measure	Sum	Measure	Sum	Measure	Sum
Prairie & Bluff Restoration & Management	12	Conservation & Recreation Corridor Anchors	22	Beneficial Use of Sediment	18	Conservation & Recreation Corridor Anchors	29
Floodplain Recapture	11	Urban Stormwater Modification BMPs	10	Deepwater Area Creation, Dredging, and Sediment Placement	9	Prairie & Bluff Restoration & Management	26
Agricultural Water BMPs	10	Invasive Fish Species	9	Nutrient Farming	9	Beneficial Use of Sediment	25
Tributary Stream Stabilization	8	Prairie & Bluff Restoration & Management	9	Floodplain Recapture	7	Floodplain Recapture	24

Figure 43: Results of the interactive sticker exercise at the second open house, sorted by criteria

Project Review Committee

The PLBA formed a Project Review Committee (PRC) comprised of stakeholders that represent a variety of Peoria Lakes interest groups. Stakeholder groups that are represented on the PRC include the following: economic development organizations, environmental advocacy groups, government entities, land owners, recreation and tourism organizations, river transportation businesses, and subject matter experts. Below, *Figure 44* lists the individuals on the PRC and organizations they represent. The purpose of the PRC was to allow for additional stakeholder input on this project's measures, to review public input, and to ultimately prioritize the preferred conservation measures.

Name	Organization
Jason Beverlin	Illinois River Scenic Byway
Nani Bhowmik, Ph.D.	Illinois State Water Survey
Doug Blodgett	The Nature Conservancy
Veera Boddu, Ph.D.	National Center for Agricultural Utilization Research
Clarence Christe	Land Owner
Russ Crawford	Peoria Lakes Basin Alliance
D. Wayne Ingram	Wood Environment & Infrastructure, Inc. (formerly called Amec Foster Wheeler, Inc.)
Chris Setti	Greater Peoria Economic Development Council
Nerissa McClelland	Illinois Department of Natural Resources
Tom Meischner	Peoria Barge Terminal
Ty Livingston	City of East Peoria
Patrick Nichting	City of Peoria
Eric Schenck	Illinois Conservation Foundation
Nancy Scott	IVY Club
Kathryn Spitznagle	Caterpillar, Inc.
Tom Tincher	Heartland Water Resources Council
Steve Van Winkle	Tri-County Regional Planning Commission
Scott Wallace	Natural Resources Conservation Service

Figure 44: Project Review Committee Members

PRC Meeting 1

The first PRC meeting was held on Wednesday, November 1, 2017 at 3:00 p.m. at the TCRPC large conference room. The purpose of this meeting was to bring the PRC members current information on the planning process, discuss their role, and ensure the members understood the process to develop conservation alternatives.

During the first PRC meeting, members were invited to supply input on screening criteria (*Appendix I***Appendix**), examine the measures developed by the USACE, add additional measures (see *Original 36 Measures* in the Formulation of Measures section below), and grade each of the 36 fact sheets based off the screening criteria (see *Appendix J*). To do this, the planning team sent the PRC a spreadsheet with questions to rate and categorize each fact sheet. After a select number of PRC members conducted this grading

process, the planning team learned that all the measures were important to the PRC; therefore, no measures would be excluded when developing the conservation alternatives.

PRC Meeting 2

PRC members attended their second PRC meeting on Wednesday, July 11, 2018 at 3:00 p.m. in the TCRPC offices. The purpose of this meeting was to update the PRC on what has been completed since the last meeting in November and to prioritize the conservation measures.

During the second meeting, PRC members participated in the same prioritization activity that members of the public completed at the second public open house (see *Prioritization Station* in the Second Public Open House section). Those who were unable to make the meeting in person had an opportunity to complete the activity electronically via Google Forms.

The full results from the activity can be found in the appendices (see *Appendix K*). *Figure 45* shows the PRC's top four preferences for each criteria and the measures with the most overall stickers.

Peoria Lakes Comprehensive Conservation Plan Prioritization Station							
Environmental Impact		Quality of Life		Feasibility/Sustainability		Total	
Measure	Sum	Measure	Sum	Measure	Sum	Measure	Sum
Deepwater Area Creation, Dredging & Sediment Placement	9	Conservation & Recreation Corridor Anchors	8	Beneficial Use of Sediment	9	Beneficial Use of Sediment	17
Drawdowns	6	Secondary Channel	8	Agricultural Water BMPs	6	Sediment Detention Basins	15
Sediment Detention Basins	5	Beneficial Use of Sediment	6	Erosion Control BMPs	6	Deepwater Area Creation, Dredging & Sediment Placement	14
Submersed Aquatic Vegetation	5	Sediment Detention Basins	5	Sediment Detention Basins	5	Secondary Channel	12

Figure 45: Results of the interactive sticker exercise at the second PRC meeting, sorted by criteria

Newsletter

The planning team developed a newsletter to update the public and stakeholders on the planning process, as well as the results from the prioritization activity at the second open house and PRC meeting. The same newsletter was submitted to the Upper Mississippi River Conservation Committee for their Summer 2018 newsletter. The newsletter can be found in the appendices (*Appendix L*).

Formulation of Objectives

Figure 46: EastPort Marina, East Peoria, Illinois

The planning team developed a set of objectives to give the PRC more guidance and understanding of the planning process. Listed in the Project Components section, these objectives were created using three sources, 1) the USACE's 2007 IRBRCP; 2) the project's Vision Statement (see *Vision Statement* in the Introduction section); and 3) the Minnesota Lake Pepin Planning Process.

The USACE's 2007 IRBRCP included several objectives that were directly relevant to the planning of waterways in Illinois including the Peoria Lakes. Therefore, staff used this document as a model for structuring PLCCP objectives. To contextualize them further to the Peoria location, staff incorporated verbiage from the PLCCP Vision Statement established early in the process. Finally, the PLCCP planning team took inspiration from Minnesota's Lake Pepin[12] due to its similarities in this Peoria Lakes process. It has a Lake Pepin Legacy Alliance, like the Peoria Lakes Basin Alliance, and it looks at several similar conservation issues related to lakes in the Midwest.

Figure 47: Upper Peoria Lake from Grandview Drive

[12] https://www.lakepepinlegacyalliance.org/solutions/

Formulation of Measures

Figure 48: Farm Creek Delta at Low Water Stage (Photo Credit: Andrew Hendon)

Original 36 Measures

A fact sheet is a two-page document that provides an overview of a potential measure or action that might be undertaken to help conserve the Peoria Lakes. This document includes a description, possible location, status, history if any, new relevant information if any, benefits, constraints, and operation and maintenance information. Fact sheets were developed by multiple entities supporting PLCCP. The USACE developed the first 13 fact sheets, and at the first PRC meeting, the members were invited to add to that list. From this request, PRC members submitted an additional 23 fact sheets. See *Figure 49* for the full initial list. *Appendix M* lists the details of each fact sheet.

To further understand each measure, the planning team developed a matrix to organize them by location and to identify potential benefits. The locations the planning team considered were system-wide, in-lake, adjacent, and upland. *Figure 49* organizes the original 36 measures by location. To identify potential benefits for each measure, the planning team reviewed each fact sheet and came up with a list of benefits. This list is not comprehensive but does represent a variety of benefits. The original matrix can be found in *Appendix N*.

System-wide	
Fact Sheet 21	Hydrogeomorphic Study
Fact Sheet 24	Educational Component
In-Lake	
Fact Sheet 1	Backwater Restoration
Fact Sheet 2	Deepwater Area Creation
Fact Sheet 3	Drawdowns
Fact Sheet 4	Dredging and Sediment Placement
Fact Sheet 6	Invasive Species-Asian Carp
Fact Sheet 7	Island Creation
Fact Sheet 8	Lower Lake Islands
Fact Sheet 9	Pool Level Drawdown
Fact Sheet 11	Secondary Channel
Fact Sheet 13	Submersed Aquatic Vegetation
Fact Sheet 14	Chevrons
Fact Sheet 23	Invasive Fish Species
Fact Sheet 28	Nutrient Farming, Backwater Restoration & Floodplain Recapture
Fact Sheet 29	Lower Lake Deepwater Creation
Fact Sheet 30	Secondary Channel & Lakefront Sediment Placement & Conservation/Recreation Corridors Establishment
Fact Sheet 31	Navigation Channel Dredging & Barrier Island Construction
Fact Sheet 32	Eastside Marinas / Docks & Deepwater Dredging
Fact Sheet 33	Westside Marina / Docks & Deepwater Dredging
Fact Sheet 34	Mud to Jobs
Adjacent	
Fact Sheet 5	Floodplain Recapture
Fact Sheet 12	Sediment Detention Basins
Fact Sheet 20	Farm Creek Flood Control Sediment Retention
Fact Sheet 35	Conservation / Recreation Corridor Anchors
Fact Sheet 36	Rivertown USA
Upland	
Fact Sheet 10	Prairie Restoration
Fact Sheet 15	Tributary Stream Stabilization
Fact Sheet 16	Bluff Area Woodland Management
Fact Sheet 17	River Bluff / Steep Slope Stormwater Management
Fact Sheet 18	Ravine and Gully Stabilization
Fact Sheet 19	Urban Stormwater Hydrologic Modification BMPs
Fact Sheet 22	Agricultural Water BMPs
Fact Sheet 25	Rain Barrels
Fact Sheet 26	Rain Gardens
Fact Sheet 27	Water Quality BMPs

Figure 49: Original 36 Conservation Measures

Conservation Measures Consolidation Process

TCRPC staff consolidated the fact sheets because the planning team and PRC found that the original list was lengthy and at times redundant, due to the variety of entities which had contributed towards fact sheet formulation. Staff did not remove any fact sheets or measures; they combined them into more succinct, clear-cut versions of how they had originally been written.

However, the USACE advised the planning team to remove Fact Sheet 14: *Chevrons* because they are designed for high flow environments, not the Peoria Lakes or Illinois River. The chevron shape was a specific hydraulic design feature to replace side channel closing structures that reduced connectivity at low flow. The Illinois River and Peoria Lakes does not have this problem. In addition, the USACE recommended moving Fact Sheet 21: Hydrogeomorphic Study to the "Recommended studies" section (See *Figure 54* in the *Definition of Alternatives* in the Formulation of Alternatives section).

Once the measures had been consolidated, the planning team updated the matrix to include objectives and color-coded Essential Ecosystem Characteristics (EECs) (See *Essential Ecosystem Characteristics* in the Definition of Alternatives section). The updated matrix can be found in *Appendix O*. The updated matrix outlines which factsheets were combined to make the consolidated list of measures outlined in *Figure 50*.

Condensed 19 Conservation Measures

Hydrology
Drawdowns
Secondary Channel
Urban Stormwater BMPs
Agricultural Water BMPs
Geomorphology
Backwater Restoration
Deepwater Area Creation, Dredging & Sediment Placement
Island Creation
Sediment Detention Basins
Tributary Stream Stabilization
Erosion Control BMPs
Habitat
Prairie and Bluff Restoration & Management
Submersed Aquatic Vegetation
Floodplain Recapture
Conservation/Recreation Corridor Anchors
Biota
Invasive Fish Species
Economic & Social
Beneficial Use of Sediment
Education Component
Nutrient Farming
Recommended Studies
Hydrogeomorphic Study

Figure 50: Condensed 19 Conservation Measures

Definition of Measures

Agricultural Water BMPs: Practices that consist of an extensive subset of best management practices (BMPs) related to water flow and erosion management in farm and rural areas.

Backwater Restoration: Enhancing existing aquatic habitats that are connected to the main channel, sometimes seasonally or periodically, characterized by slow currents, shallow water, and silt substrates.

Beneficial Use of Sediment: Exploring an innovative model to turn dredged material (fine sediment and sand) initially categorized as "waste" into engineered topsoil that is "manufactured" in the region and commercially valuable to a number of regional markets.

Conservation & Recreation Corridor Anchors: Using lakefront property to develop and connect conservation areas, lakefront parks, recreation facilities, and hiking/biking trails within the Peoria Lakes corridor.

Deepwater Area Creation, Dredging & Sediment Placement: Dredging involves removing sand and silt from the river bottom. This in turn creates deepwater areas in the Peoria Lakes, which can create more habitat for living things. Sand and silt from the river bottom, which make up the dredged material, can be used beneficially to create islands or manufacture soil, for example.

Drawdowns: Lowering water level in backwater lakes with the aid of Barrier Island Management Areas (BIMAs). Drawdowns allow for the compaction and management of sediment while providing a valuable habitat resource.

Education Component: Incorporate environmental educational lessons for both school-age children and the public at large to ensure that the community is aware of, understand them, and see human's role in local environmental issues.

Erosion Control BMPs: Practices that consist of an extensive subset of best management practices (BMPs) that manages stormwater impacts by stabilizing eroding ravines and gullies.

Floodplain Recapture: Generally, refers to levee alterations in areas within the floodplain that are not currently flooded and could be made more ecologically productive if connected with the river and restored with native plant and bottomland forest species. In Peoria Lakes, floodplain ecosystems can also be re-created in permanently flooded areas of the Peoria Lakes using BIMAs.

Invasive Fish Species: Non-indigenous species that adversely affect the habitats they invade. Common carp and the four Asian carp species (bighead, silver, black, and grass) are invasive fish species present in the Upper Mississippi River Basin, including the Peoria Lakes area.

Island Creation: Using dredged material, made up of sand and silt from the river bottom, to construct island features in the Lakes.

Nutrient Farming: A market-based strategy that creates a financial engine that restores or creates wetlands for the purpose of managing nutrients and trapping sediment. The nutrients removed from the waterway can be measured, counted as credits, and sold to communities and industries to meet water quality standards.

Prairie & Bluff Restoration & Management: Vegetation management of flat and steep slope wooded areas to reduce erosion and stormwater runoff and to restore the area to what it previously was. The ridgeline bordering Peoria Lakes was once a diverse habitat of open forest interspersed with areas of prairie.

Secondary Channel: Dredging and island construction to create multiple channels to create flow diversity in the Peoria Lakes. In addition to linking lakefront marinas and activity centers, this could also create deepwater habitat areas.

Sediment Detention Basins: Excavated areas installed on, or adjacent to, tributaries of rivers and streams to allow for the entrapment of sediment to prevent it from flowing into the Peoria Lakes.

Submersed Aquatic Vegetation: Restoring dense strands of aquatic plants, generally including rooted vascular plants that grow up to the water surface. These live-in shallow waters, where sunlight penetrates to the bottom.

Tributary Stream Stabilization: Vegetative, structural or combination treatments designed to stabilize and reduce erosion in streams.

Urban Stormwater BMPs: Practices that consist of an extensive subset of best management practices (BMPs) that address urban stormwater quantity and quality. These practices are also known as green infrastructure and low impact development.

Formulation of Alternatives

Figure 51: Rosenbohm's Farm Buffer Strip, Glasford, Illinois

Explanation of Alternatives

Ecosystem restoration and management alternatives are combinations of restoration measures structured to achieve project objectives. Alternatives can be developed using any number of project criteria, but each alternative should attempt to satisfy all project objectives. As a comparison and benchmarking point, the planning team considered a No Action alternative, which requires an understanding of Peoria Lakes conditions 50 years in the future, with no changes in the drivers creating the existing conditions. All alternatives are evaluated amongst one another based on their estimated performance and on their cost effectiveness. Since the USACE is represented on the planning team, the group decided to borrow from USACE project management concepts for this project: Each alternative would also be structured to achieve minimum standards that the Federal Water Resource Principles and Guidance criteria established for each USACE project: Completeness, Effectiveness, Efficiency, and Acceptability. *Figure 52* shows other categories that ecosystem restoration and management alternatives can also consider.

- Program(s)
- Scale
  - Physical properties
  - Composition
  - Locations
  - Timing and Duration
- Combinability
- Dependency

Figure 52: Additional Ecosystem Restoration & Management Criteria

Program

The PLCCP is structured as an umbrella plan that identifies conservation projects that would be achieved by several possible appropriate entities utilizing a variety of existing and potentially new programs. The PLCCP is program-independent as a PAS project. The PAS Program is available to help develop a plan, but it does not have implementation capacity. Specific projects or management actions will need to be further evaluated to be implemented as federal projects, but other implementation approaches are available too. Other federal programs including the USACE's Continuing Authority Programs (CAP), the US Department of Agriculture (USDA) and the USEPA watershed programs, Gulf Hypoxia, Gulf oil spill,

and US Fish and Wildlife refuges could apply to Peoria Lakes. The federal-state Upper Mississippi River Restoration (UMRR) program has completed many Illinois River projects and has authorization to work in the Peoria Lakes; that program has recently initiated the development and prioritization of a new generation of restoration projects, so completion of this PLCCP is timely. Additionally, there is renewed interest in the federal Navigation and Ecosystem Restoration Program (NESP) that has been mostly idle since 2010 but is now seeing some signs of life. For such federal programs, state fish and wildlife management areas can provide restoration opportunities and their land value can be used as a cost share.

Scale

Physical Properties

USACE projects typically manipulate watershed and waterway geomorphic design and water flow to benefit human activities in navigation, flood protection, and ecosystem restoration. The size and design of restoration and management measures have large effects on their environmental performance. UMR and Illinois River restoration experience over 30 years of the UMRR program has refined island construction, for example. Wind models are used to predict island design performance for reducing wind-generated waves and two-dimensional hydraulic models are used to evaluate changes in river flow around constructed features. Several island designs have been used on the Illinois River with various costs and levels of benefit. There is significant learning required to optimize island design for the soft sediments in Peoria Lakes.

The design of vegetative plantings is an example where island design height and plant species composition are coordinated. Higher elevation islands can grow flood-intolerant species, whereas flood-tolerant and wetland species are planted at much lower elevation. Islands can be placed strategically to partition areas of the Lakes for desired habitats including deep and shallow water areas.

There are several general types of aquatic connectivity projects: longitudinal (i.e., dams), lateral floodplain (i.e., levees), and backwater (i.e., sediment), and each has many design considerations. Longitudinal connectivity in the Lower Illinois River, including the Peoria Lakes, is high because wicket gates on the Peoria and LaGrange dams are frequently lowered to the river bottom, which allows free movement of boats and fish. Upstream movement out of Peoria Pool is more restricted by the greater and persistent elevation change created by the Starved Rock Dam (it doesn't fold down into the river bottom). Where much of the Lower Illinois River is constricted by levees, Peoria Lakes are currently more laterally connected by impounding effects of the dam than it was previously. The chronic impoundment and over-connectedness in Peoria Lakes has had significant detrimental impact on sedimentation and sediment quality, and it is an urgent concern.

Peoria Lakes projects may strive to manage connectivity to create backwaters and secondary channels, or even to restore functional qualities of seasonal flooding. They could be designed to reduce connectivity using islands to create aquatic areas that are mostly disconnected from the main channel and protected from wind and navigation waves. Alternatively, they could disconnect existing backwaters using low levees to close connecting channels and temporary pump systems to drain areas. Another physical design alternative would be temporary closures between constructed islands to drain BIMAs.

Wetland management in isolated backwaters has a long tradition in Illinois and would likely be part of future plans and studies. Island closures are the most likely mechanism for allowing

the Peoria Lakes drawdowns in limited areas because regulated pool stage affects many commercial and municipal water intakes and outflows in addition to marinas, docks, and boat ramps. This ultimately makes whole pool drawdowns difficult. Lastly, Illinois River hydrology is unpredictable and often above regulated pool stage based on discharge alone. With all the constraints, the potential for a pool-wide drawdown is limited at best.

Agricultural best management practices (BMPs) are most often implemented by individual landowners in collaboration with USDA-NRCS (Natural Resources Conservation Service). Participation in BMP incentive programs varies with the crop markets and subsidy levels but could be coordinated better through elements outlined in the PLCCP. Advanced BMP design tools like the Agricultural Conservation Planning Framework use hydrologic optimization to identify, select, and prioritize BMP locations. The PLCCP can help identify required analyses and help secure adequate funding to implement them. Similar upland-to-lake considerations were the focus of the IRBRCP which authorized watershed project integration for river habitat protection.

Measures intercepting sediment along pathways to the Lakes like sediment traps or bedload collectors must be designed to match water and sediment flow from the watershed. The general concepts for sediment stabilization and trapping are known, but each site requires physical and hydrologic information to design project features. Funding such projects is challenging and requires a watershed approach to address multiple issues in agricultural and urban watersheds.

Composition

The composition of measures refers to construction materials, project features like gates and channels to control water flow, or the vegetation composition of plantings, for example. USDA-NRCS has guidance for their authorized BMP design and construction methods in upland settings. When constructing large river islands and dredging backwaters, project designers prefer local material to expedite construction and minimize cost. Sand is a common base material in Mississippi River island restoration, but sand is not locally abundant, and PLCCP objectives seek more depth from fine sediment removal. Island construction is often a preferred alternative for environmental dredging, but it has been challenging working with the soft sediment of the Peoria Lakes. Geotextile tubes are the latest experiment in island construction, but there is significant additional work needed to determine how to build in the Peoria Lakes' soft substrates.

Locations

Measures were organized along physical gradients to achieve inundation, connectivity, flow, water quality, or any number of criteria. Some act alone and others in combination so dependency among actions is a critical factor regarding location.

As stated above, it is impractical to create environmental drawdowns using the navigation dam because navigation, water supply, recreation, and other users would be unacceptably impacted. Alternatively, deepwater area creation, dredging and sediment placement, or BIMAs, can be used to isolate and dry discrete locations in the Peoria Lakes. Cove restoration can be achieved by connecting deltas on the east side of the Lake with islands and temporary closures to permit dewatering with pumps. The cove drawdowns would simulate the seasonal flood pulse on a recurring basis, for example, annually or every three to seven years. Coordinated dredging, island construction, and drawdown closures would all be required to achieve partial-lake drawdowns.

Watershed relationships are also critical to the PLCCP, so the planning team considered sediment sources and pathways to the Lakes, which are the sink for much of the sediment from local watersheds and upstream. The scope of this planning process is from blufftop to blufftop; however, the planning team understands that there is a watershed component to the issue. Therefore, each alternative was structured to be complete, including lumping measures that reduce sediment sources, intercept or stabilize sediment pathways, and remove sediment from sediment sinks in the Lakes.

The planning team established alternatives for three reaches of the Peoria Lakes and one that included its entirety based on watershed influences and in-lake characteristics (See *Figure 27* in the Study Area section under *Geographical Boundary*). While the Peoria Lakes are traditionally viewed as an Upper and Lower Peoria Lake divided by the narrows at the Ten Mile Creek delta that forms the upper boundary of Lower Lake, for our planning, the Lake was separated at river mile 177 and designated as Middle and Upper because the uppermost reaches of Upper Peoria Lake can be split at the Partridge Creek delta as a logical subdivision of conservation areas. Watershed characteristics differ among reaches with loosely defined urban, suburban, and rural characteristics affecting Lower, Middle and Upper sections, respectively.

Timing and Duration

Many measures must be implemented seasonally for hydrologic or ecological benefits to be optimized. Drawdowns for plant growth, for instance, should coincide with the moist soil plant growing season (July – September), and if implemented slowly, create shorebird habitat at the receding water's edge. Most drawdowns conclude at the end of the growing season and management units are re-flooded to benefit migratory waterfowl. Dredging timing is not often critical unless there is ice or massive flooding, but it must coincide with sediment placement measures. Ideally, watershed measures and sediment pathway measures would precede or coincide with in-lake dredging. And, the initial dredging in the Lakes could be designed to create sediment traps where material would be easily removed for beneficial use in the future and to make them renewable.

Combinability and Dependency

Combining measures into logical combinations was discussed above and is encouraged to increase effectiveness and efficiency. Dependency on project features, i.e., one feature relying on the performance of another, is acceptable for measures within USACE projects, but they cannot be dependent on the actions of entities outside of the project. For example, dredging in the Lakes combined with upland erosion control to reduce future filling rates must be completed together in a USACE sponsored project. The upland component cannot be dependent on another entity or landowner implementing actions independent of the USACE project. Planning large comprehensive plans like the PLCCP is a separate activity from implementing restoration and management actions, so it is relatively easy to develop these alternatives. Implementation requires comprehensive feasibility studies including design, cost-benefit evaluation, compliance review, and partner coordination and is subject to the regulations under the funding authority and other USACE policy.

Definition of Alternatives

Programmatic Authority

This study recommends alternatives but does not complete alternative analysis because there is a

lack of information and programmatic authority to complete the analysis. The PLCCP outlines these alternatives and several proposed studies to provide information for a more complete feasibility study or individual projects. A complete Environmental Analysis of the comprehensive alternatives can facilitate future project implementation by completing much of the planning review and partner coordination for the anticipated measures. Both the IRBRCP (2007) and the Upper Mississippi-Illinois Waterway System Navigation Feasibility Study (2004) contained Environmental Analyses that provide programmatic authority for individual project implementation. Projects implemented must each certify their individual performance and regulatory review, but the process can be expedited when the measures have already been evaluated and approved in concept.

Essential Ecosystem Characteristics

Upper Mississippi and Illinois River planners have categorized ecosystem process and function using Essential Ecosystem Characteristics (EECs): Hydrology, Geomorphology, Water Quality, Habitat, and Biota. The following are US Geological Survey (USGS) definitions (Water Basics Glossary 2013):

- **Hydrology:** The science that deals with water as it occurs in the atmosphere, on the surface of the ground, and underground.
- **Geomorphology:** The science that treats the general configuration of the Earth's surface; the description of landforms.
- **Water Quality:** State-adopted and US Environmental Protection Agency-approved public health standards for water bodies. Standards include the use of the water body and the water quality criteria that must be met to protect the designated use or uses. Ecosystem restoration projects also strive to achieve aquatic life standards to maintain healthy native communities.
- **Habitat:** The part of the physical environment in which a plant or animal lives.
- **Biota:** All living organisms of an area.

These EECs were selected because they represent the primary river ecosystem drivers. Hydrology is often considered a "master variable" that drives geomorphology and water quality outcomes. These factors then feed to habitat characteristics that determine the biota at a site. The PLCCP measures were organized as such, and Social and Economic objectives were also included to accommodate the broad range of interests required to implement the PLCCP (see *Figure 54*).

The alternatives were separated by location as described above (see *Locations* in the Explanation of Alternatives section) because defining regions of the Lakes can help break the large PLCCP up into multiple potential projects suitable for implementation by the most appropriate agency or partnership. The feasibility level costs and benefits of alternatives can be evaluated and implemented by partners most interested in sites and capable of accomplishing objectives in a region.

Hydrology

Hydrology measures manipulate water quantity, distribution, and rate of flow.

Drawdowns

Drawdowns were conceived as site-specific actions requiring barrier islands connecting deltas to isolate and dry backwater complexes or BIMAs. Islands would be constructed from dredged material and distributed to create gaps during most seasons,

which could be filled periodically to facilitate drawdowns for sediment consolidation and wetland propagation. Considering the distribution of deltas, the vision is to have one project in Lower Peoria Lake, five through Middle Peoria Lake, and two in Upper Peoria Lake, all being independent, and creating eight for the entire Peoria Lakes. Planning such large ecosystem restoration projects would required a complex engineering design feasibility study conducted by interdisciplinary teams. They consider aspects like hydrology, dredging, pump capacity, etc. that can be integrated into a programmatic authority that would expedite similar future projects.

Secondary Channel

Secondary channel construction was one of the first large restoration projects in Upper Peoria Lake. The project has remained in place, but the flowing channels have been degraded by sedimentation like the rest of the Lake. Aquatic habitat diversity can be designed in many ways and an improved two-dimensional hydraulic model of the Peoria Lakes will help achieve sustainable project designs.

Urban Stormwater and Agricultural Water BMPs

Urban stormwater and agricultural water BMPs can reduce the volume and rate of water transport to the Peoria Lakes. The Urban Stormwater BMPs measure is only available for the Peoria municipal area and Lower Peoria Lake alternative. It offers unique program integration opportunities to use engineered soil from the river and lake to provide a drainage soil mix (see *Sediment use investigations* under Formulation of Alternatives section) for planned stormwater improvements.

As mentioned above in the *Combined Sewer Overflow* section, the City of Peoria is under a USEPA injunction and the City selected a 100 percent GSI approach or "infiltration plan" to achieve stormwater management requirements in the sandy glacial environments. Concrete, sewers, and impervious surfaces will be replaced with permeable landscapes to help reduce stormwater flow. These GSI improvements will require significant quantities of construction material that could include engineered drainage soil harvested from the Lakes. The integration improves the Lakes and reduces future impacts in a beneficial loop of material harvest, improvement, and use that creates local jobs, reduces CSO mitigation costs, and increases opportunity for environmental improvement.

Agricultural Water BMPs are distributed throughout middle and upper Peoria Pool watersheds (see *Figure 27*) unlike CSO projects which are concentrated in the lower pool urban reach. There is a suburban ring that will require one set of measures for relatively defined corridors and much larger agricultural areas that will require a different set of measures to cover a broader landscape. New spatial modeling tools can be brought into the analysis to locate agricultural BMPs on the landscape (i.e. Agricultural Conservation Planning Framework[13]) and prioritize their implementation or to predict streambank erosion at the watershed scale (USACE is currently working on this tool in Senachwine Creek). Both of these watershed erosion tools could be implemented for all the sub-watersheds around the Peoria Lakes to improve sediment source and pathway analyses.

[13] https://northcentralwater.org/acpf/

Geomorphology

USACE projects commonly adapt river geomorphology to achieve desired outcomes. Sometimes projects are subtle structures that are built and operate passively with little maintenance. Some projects, conversely, may have many structures and mechanisms to operate. Managed wetlands, for example, may require on-site personnel to operate equipment, maintain structures, and manage landscapes.

Backwater Restoration

The PLCCP proposed "Backwater Restoration" as an umbrella term for the mix of dredging measures that create deepwater habitat and provide material for islands. These measures are combined to create the BIMA potential. The planning team envisions two or three areas in the Lower Lake, five to eight in the Middle, and two to three in the Upper Lake, but many details would need to be considered in implementation plans.

Sediment Detention Basins

Sediment and stormwater detention basins are common in many urban developments and in newer restoration projects, reservoirs, and BMP construction. Older projects, however, may have considered the risk of sedimentation impacts, but not the resolution to the inevitable problems. Furthermore, landscape and hydrologic changes have increased reservoir and waterway sedimentation, filling rates, and the associated risks.

Stabilizing streams in the watershed can help manage sediment sources; building smaller sediment detention basins in the watershed and large detention basins in the floodplain tributary deltas can intercept sediment along its pathway to the Lakes. Sediment basins have not been designed for the Lakes, but they could include seasonal wetlands and crop fields subject to inundation. One US Fish and Wildlife Service refuge in Wisconsin allows a commercial landscaper to periodically harvest sediment from seasonally flooded wetland basins for commercial beneficial use (Kreiling, et al. 2012). The commercial activity restores refuge functionality at no cost to the Government. Hay and livestock grazing on the basins could be compatible agricultural uses provided animals can be removed during floods. The planning team estimated 15 potential sediment traps among the three sections of Peoria Lakes based on the number of streams entering the Lakes.

Tributary Stream Stabilization

Tributary stream bed and bank erosion may be the biggest current sediment contributors because soil erosion control efforts on uplands in the past three decades have been so successful. Sediment supply to streams is reduced, which creates greater capacity for water to grab and move sediment from other sources in and along the streams. Additionally, agricultural field tiles have changed runoff characteristics that increase erosive capacity downstream. Lastly, precipitation in the Upper Midwest has increased over the last 50 years, and there are larger summer storms and downpours exceeding six inches of rain.

New flood stage records for the Illinois River were established in 2013 with near-record levels at Peoria-area sites in 2015 and again in 2016 during an unusual winter flood. All these factors increase stream sediment transport potential and delivery of sediments to the Peoria Lakes. Stream stabilization and erosion BMPs can be very effective but may require significant work and adaptive management to stabilize dynamic streams. The planning team envisions the number of individual watershed erosion control projects will be high.

Habitat

Habitat restoration can be designed to address many stressors. Upland plantings and land management can affect discharge and material transport through the entire valley, or structures in the water can adapt river flow to change habitat as in the managed wetland example.

Prairie and Bluff Restoration and Management

Prairie and bluff restoration along the bluffs in the northeast corner of the Peoria Lakes watershed demonstrated the difference that vegetation makes on sediment transport. The forested landscape was replaced with grassland cover to help reduce erosion on 521 acres (Tri-County Regional Planning Commission 2012). The change also benefits grassland birds and creates grassland habitat that has been lost from the Peoria Lakes landscape.

Submersed Aquatic Vegetation

Submersed aquatic vegetation is another very common habitat objective because it influences and is influenced by many environmental factors. It is a sensitive indicator that is present in large abundances in healthy river backwater lakes, but often absent in degraded lakes. Aquatic vegetation has declined and recovered several times in response to urban sewage treatment to improve water quality, but it did not recover from changes due to row crop agriculture and hydrologic alteration.

Along the Illinois River today, aquatic plants are most abundant in isolated backwaters managed for wildlife and not in connected backwaters with no water management. Measures considered to promote aquatic plants in the Peoria Lakes include islands as breakwaters to reduce wind-generated waves that resuspend sediment and even uproot plants. Although they have been extremely successful at some other sites on the UMR, these measures have been tried with minimal success in prior Peoria Lakes projects, which is why the PLCCP emphasizes the need for periodic drawdown capability and an island design workshop (see *Island Design* in the In-Lake Information Needs section). The BIMA concept for backwater creation is a holistic approach to promote and sustain emergent and submersed aquatic wetland habitat in dynamic river environments.

Floodplain Recapture

Floodplain recapture and restoration in the Peoria Lakes would be a significant undertaking because changes could affect large areas and large numbers of people and industry. Alternatively, floodplain recapture can be achieved by utilizing BIMAs to shelter previously inundated areas from normal river stages to create floodplain wetlands. Lastly, there are levees along tributary streams in the floodplain that could be breached to allow floodplain recapture.

Conservation and Recreation Corridors

Conservation and recreation corridors and anchors can accommodate both wildlife populations and human activities. Because of this dual nature, this could be an important measure to achieve suburban and agricultural habitat restoration objectives. Stream corridors are sediment sources and pathways where restoration and management can achieve multiple objectives. In-stream restoration can be prioritized to reduce near-term sediment transport while watershed landscape treatments can strive to naturalize hydrology in a highly managed agricultural landscape and reduce sediment loads delivered to the Lakes.

Conservation anchors supporting high biodiversity are usually large public land areas and corridors are usually along waterways where

development and farming are generally excluded by frequent flooding. Riparian corridors, the areas immediately adjacent to streams and rivers, have always been important, providing ecological services such as nutrient and sediment processing and habitat for native plants and animals, but they are critical in the developed agricultural landscape. Stream buffers, for example, are a very effective BMP if landowners can set aside 100-foot or larger buffers that would provide greater water quality and habitat benefits. In reality, achieving any buffers has been a challenge; therefore, there is substantial room for improvement in this objective.

Biota

Managing river biota is mainly habitat-based with additional controls on access and harvest to avoid exploitation. Illinois fisheries and wildlife managers and water quality regulators consult regularly with the USACE through many project level and regional planning efforts. Wildlife habitat management in degraded Illinois River reaches depends on significant land and water management infrastructure that requires large staff and resources that have been reduced over time.

Invasive Fish Species

Federal agencies have emphasized sportfish restoration objectives and Asian carp control[14] within some of their plans. This emphasis is warranted, due to the species' potential adverse effects on native fish and aquatic habitat. Invasive carp management[15] has become a fact of life on the Illinois River, so every plan must consider them. Some concepts include using composted carp as supplements in manufactured soil. Some restoration measures in this PLCCP include objectives for target organisms and the specific criteria needed to achieve them.

Social

Large-scale regional planning for natural resource management inherently includes a significant social component that considers environmental awareness and economic factors.

Education Component

Public education takes many forms, but as outlined in the IRBRCP vision, it is best organized around watershed units where local-led plans identify problems and opportunities, and individual participants see how they fit in the watershed context. These efforts require organizational effort that some states sponsor by hiring priority watershed coordinators, and others benefit from strong nonprofit support as in the case of the PLBA.

Economic

It is necessary to examine the benefits of environmental restoration, both economic and non-monetary. Economic considerations are important to fund environmental restoration, but USACE environmental restoration benefit analyses also consider non-monetary benefits in the form of habitat units. Traditionally, environmental restoration projects do not monetize the economic development value that is derived from projects. An example of this is: Navigation and environmental dredged material harvested from the river is treated as a waste product that must be managed at great cost to the government, rather than as a resource with monetary value.

Beneficial Use of Sediment

This document proposes a mechanism to derive value from Peoria Lakes sediment by blending it

[14] https://www.asiancarp.us/Documents/MRP2018.pdf

[15] https://www.ifishillinois.org/invasive/2017ActionPlan.pdf

with other waste products. This custom-engineered drainage soil could be used in highway construction, stormwater management, and potentially other applications in Peoria or by barge to Chicago or St. Louis. The idea is that a non-profit entity could be most beneficial to coordinate contractors with sites, equipment, and interest to manufacture soil in a regional context. Soil sales and tipping fees for yard waste or biosolids management is an element of the business structure that incentivizes dredging and customer savings. Convenient, low-cost yard waste and tree trimming disposal sites could reduce operating costs and generate income for more dredging. This mechanism would be an alternative financing model for implementing parts of the PLCCP.

In the City of Peoria, drainage soil can be incorporated into GSI improvements, which would utilize large quantities of soil to replace impervious surfaces with greenscaping features, to reduce demand on the existing CSO system. This process is discussed in more detail in the *Combined Sewer Overflow* heading in the Study Area section. Mandated stormwater management improvements will be addressed through an "infiltration plan" that could use large quantities of soil to replace concrete and sewers with greenscaping features.

Nutrient Farming

The term "Nutrient Farming" was coined in the Illinois River watershed on the Des Plaines River and on Hennepin-Hopper Lakes in the Upper Peoria Pool. The concept is that river habitats can support managed aquatic connectivity and seasonal wetlands (see *Figure 53*). for an example of a seasonal wetland) to sequester nutrients that might otherwise promote algal blooms and low dissolved oxygen locally and in the Gulf of Mexico. Algae block light to aquatic plants which can drive a negative feedback loop which is common in many shallow lakes and increasingly a concern to water supplies in river in large lakes and reservoirs.

To support the implementation of the PLCCP, this document looks at an alternative financing model (see *Sediment Market for Alternative Financing* section later in this document). In addition to the alternative financing model, the PLCCP might consider the nutrient credit market concept[16] for the watersheds around and above the Peoria Lakes. For example, state legislation in 2017 provided authority for the MWRD to purchase water quality improvement credits generated anywhere in Illinois. The stormwater utility established to fund the CSO solution in metro Peoria is another example of the approach.

Figure 53: Upper Peoria Lake, Rice Pond

16 https://peoriamagazines.com/ibi/2018/sep/kickapoo-creek-its-distant-past-and-exceptionally-bright-future

Conservation Alternatives

Categories	Fact Sheets	Measures	Alternatives			
			Lower Peoria Lake	Middle Peoria Lake	Upper Peoria Lake	Entire Peoria Lake
Hydrology	3 &9	Drawdowns	1	5	2	8
	11 & 30	Secondary Channel	1		1	2
	19, 25, & 26	Urban Stormwater BMPs	CSO			
	22	Agricultural Water BMPs	Few	Some	Many	Many
Geomorphology	1 & 28	Backwater Restoration	2-3	5-8	2-3	9-14
	2, 4, 29, 30, 31, 32, 33, & 34	Deepwater Area Creation, Dredging and Sediment Placement	X	X	X	X
	7, 8, & 31	Island Creation	X	X	X	X
	12 & 20	Sediment Detention Basins	Uncertain	10	5	>15
	15	Tributary Stream Stabilization	Few	Most	Few	Many
	17 & 18	Erosion Control BMPs	Uncertain	10	5	>15
Habitat	10 & 16	Prairie and Bluff Restoration & Management	X	X	X	X
	13	Submersed Aquatic Vegetation	X	X	X	X
	5 & 28	Floodplain Recapture	None	Most	Some	Lots
	30, 35, & 36	Conservation / Recreation Corridor Anchors	None	Most	Some	Lots
Biota	6 & 23	Invasive Fish Species	X	X	X	X
Social	24	Education Component	X	X	X	X
Economic	4 & 34	Beneficial Use of Sediment	X	X	X	X
	25, 26, 27, & 28	Nutrient Farming	X	X	X	X
Recommended Studies	21	Hydrogeomorphic Study				
		Lake Sediment Characterization				
		Island Design Workshop				
		Sediment Market Transportation Optimization				
		Commercial Sediment Market Economic Analysis				
		Sediment Use Investigations/Specifications				
		Water Utility Sediment Market Analysis (CASM)				

Figure 54: Peoria Lakes Comprehensive Conservation Plan Ecosystem Restoration and Management Alternatives

Alternatives Evaluation

This PAS study was designed to develop and coordinate alternatives for a PLCCP, but it is not intended to evaluate them to the level that would be needed by an authorized Federal Project. In fact, PAS is frequently used to identify questions likely to arise in a feasibility study and perhaps implement studies to answer them. In this case, the planning team identified several studies to support in-lake restoration measures and several to support sediment market analysis and alternative funding concepts.

In-Lake Information Needs

Environmental restoration information needs to include a hydrogeomorphic study to understand the habitat potential of the Lakes in several reference periods, a sediment characterization to further identify potential use of substrates (e.g. for building islands or creating soils), and an island design workshop to identify new approaches to island design.

Hydrogeomorphic Study

A hydrogeomorphic study can help identify the habitat potential of a river reach or site. There are many specific techniques that can be applied to investigate river hydrology to understand the annual and seasonal flood cycles and river hydraulics to understand how the river flows in channels, backwater lakes, and floodplains. Many hydrologic and hydraulic modeling tools and analyses are available to begin desktop investigations while new models constructed for project design purposes would be used for advanced modeling in the future. Water levels can be visualized in computer models to evaluate existing conditions and management alternatives like drawdowns, barrier islands, or secondary channels.

Geomorphology investigations consider regional and site-specific landforms and, in the Illinois River Valley, the glacial and fluvial processes that formed them. The information helps understand river functionality through a myriad of lenses: Identifying ancient cultures' methods and locations of river usage, helping present-day engineers create structures that withstand potential catastrophic forces, recognizing the most effective placement of conservation features on the landscape, and understanding how elements mentioned in the PLCCP can dictate future planning. Illinois River geomorphology is well understood from careful archeological investigations and the development of Land Sediment Assemblage mapping techniques to identify the relative age and composition of physical landscapes in the river valley (Hajic 1990).

Peoria Lakes are in the low elevation, active floodplain of the river valley. The current extent of the Lakes is a typical two-year flood stage, so this lake extent would likely have occurred seasonally during most flood seasons before it was developed for human use. The glacial terraces are sandbars remaining from catastrophic glacial floods 18,000 years ago. They are high elevation, well-drained, and highly erosive, which explains the erosion patterns on the west side of Middle and Upper Peoria Lake. The active floodplain on the east side of Upper Peoria might be a place where floodplains can be recaptured to extend existing wildlife management areas and incorporate new restoration features.

Land Sediment Assemblage mapping was not able to assess conditions under the water surface, but other mapping methods helped simulate those conditions (see *Figure 55*). Using these data resources and analytical techniques, a "Hydrogeomorphic Assessment" could be completed at many levels. One level of analysis

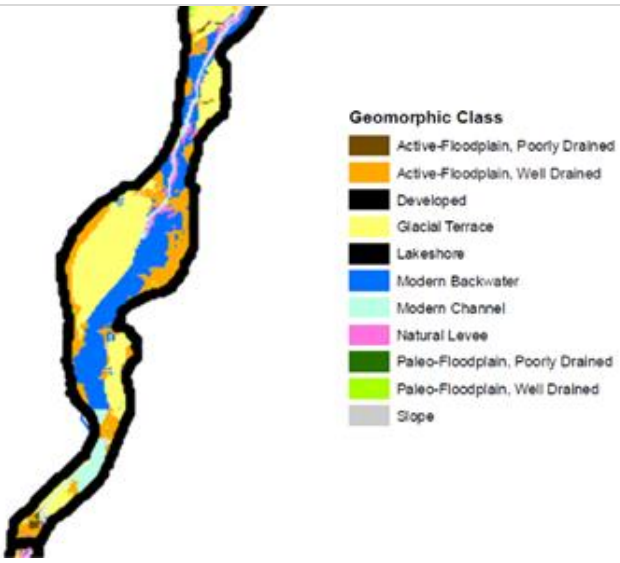

Figure 55: Peoria Lakes Land Sediment Map

could review historic and existing physical, hydrologic, and habitat conditions, present information to stakeholders, and gather feedback to develop site-based habitat management plans. Another level of analysis could carefully survey and map the river landscape to better understand soil, geology, land cover, and other characteristics. Experts can surmise the physical process and function that formed most sites from existing data and site visits, but quantifying the details is laborious. The planning team is fortunate because there are recently completed data sets and models to support most geomorphology research needs. More detailed site information will be required for projects, but the foundations for rapid alternative evaluation are in place and new spatial modeling tools will expedite investigations.

Sediment Characterization Study

Peoria Lakes sediments are complex because of their ancient hydrogeomorphic origin and dynamic seasonal flooding, but impoundment introduced a new set of hydrologic and hydraulic conditions that changed sedimentation patterns by creating a large, low-flow basin where fine sediment settles out of suspension. The existing condition of the surface sediment thus is uniform silt that is constantly stirred by wind- and boat-generated waves in very shallow water (see *Figure 13*). That movement masks the geomorphic diversity that existed during low-flow periods before the diversion and dams (see *Figure 10*).

A sediment characterization study is required to map the surficial and underlying sediment for several reasons, but primarily to support backwater complex design and island placement on firm, pre-dam clay substrate. Other reasons are to identify the geomorphic processes that formed Peoria Lakes to use them as design principles for future restoration. The aim is not necessarily to replicate former landscapes, but it is to capture the hydrogeomorphic processes supporting dynamic, productive habitat. A third reason is to map sediment sources to harvest for engineered soil, and a fourth is to document any hazardous, toxic, and/or radioactive waste (HTRW).

Island Design Considerations

Experience has shown that the soft, post-dam alluvial soils in the Peoria Lakes are not structurally sound for conventional island construction techniques. They are saturated, “fluffy” silt because they are constantly inundated. Their depth to pre-diversion, native soil depends on the pre-dam landscape, with some shallow sediment over clay where pre-diversion islands existed and some deep sediment in former lake basins (see *Figure 10*). Riprap sinks and needs to be continually replenished and experimental geotube bags rolled on the soft sediment at the island construction site where they were used. Also, geotube islands showed that the fine silt can seep through the textile mesh when continuously battered by waves. There are no cohesive properties in the surficial sediment, so they also cannot be used for construction or landscaping in their present form. It is important to know where suitable construction sites exist and what the best construction methods are prior to

initiating project planning, so a lake-wide, pre-feasibility study could support multiple project implementations.

There is much to learn about the spatial and structural diversity of the Peoria Lakes sediment that can serve as clues to their geomorphic origins. Pre-diversion (1900) maps (see *Figure 10*) will help establish expectations because former floodplains and islands have firmer clay substrates and former lake and wetland basins will have peat substrates. Neither is great foundation material, but clay is better than peat. Existing maps can help with sample design to guide detailed coring studies to support spatial analysis. Historic island soil stratigraphy may be a useful guide for island morphology that can be replicated and tested as engineering design principles. Ideally, surficial sediment can be scraped out and used beneficially to create stable construction foundations in the Lakes.

Mapping sediment will support engineered soil manufacturing activities that could help fund lake restoration because information required for restoration project design is the same geotechnical information required by soil scientists. Soil scientists may desire sediment chemistry not included in geotechnical surveys, but the information can be derived from the same cores, so the effort of sampling could be enhanced with additional parameter analysis. Similarly, HTRW sampling required for all projects could also be conducted with the sediment survey to determine the existing condition of contaminants compared to the highly polluted past. Current water quality is much improved and former polluted waters have mostly passed through the system, but sediment tends to stay in place and become covered with cleaner material. A contaminated layer of sediment in some parts of the Lakes is expected, which will affect design and execution of some projects.

Sediment Market for Alternative Financing

Prior public-funded projects failed to achieve Peoria Lakes restoration objectives. Thus, the PLCCP planning team proposed a commercial sediment market as a critical component of an alternative financing model to support implementation. Preliminary research under the USACE Regional Sediment Program demonstrated the potential for engineered soil manufacturing technology transfer from Minnesota to other river reaches. TCRPC will complete a Peoria Lakes sediment market analysis to benefit the entire PLCCP partnership by advancing the finance model. The analysis will include three phases:

1. **Market sizing** – understand the market for engineered topsoil in regional market in terms of overall expected volume in the coming years, specific requirements for different applications, competing suppliers that impact pricing and market shares, and any trends or regulatory changes that would affect future customer demand for the product.

2. **Customized business structure** – identify the potential business structure for producing engineered topsoil for sale into regional market. This would take into consideration the capabilities and resources of regional stakeholders and partners, existing regulatory hurdles and constraints, and funding requirements.

3. **Business model analysis** – identify whether there is a route to long-term profitability for the commercial sediment business entity and if so the specific recommendations for executing on this business entity.

The Alternative Finance Model will consider:

Municipal Savings	Yard waste	
	Biosolids	
	Road construction	
	Stormwater management	
State Savings	Water quality	
	Jobs/economic development	
	Sustainability	
	Regulatory/coordination	
Federal Savings	Navigation	Dredged Material Management Plan (BMMP)
		Coordination
		Real Estate
	Environmental Dredging	
	Invasive species – emerald ash borer, Asian carp	
Customer Base	Peoria CSO	
	IDOT/Illinois Tollway	
	Chicago and St. Louis	Stormwater
		Remediation
		Landscaping

Figure 56: Alternative Finance Model Considerations

A successful commercial sediment entity would generate a stream of income from ongoing operations that can be used to help fund part of the costs of restoring the Peoria Lakes. It would also work with regional stakeholders and partners on complementary business ventures to promote mutually agreed upon objectives and outcomes.

Sediment Use Investigations

Sediment use investigations will start with experience from Minnesota soil specifications and material sourcing and hopefully evolve into Illinois stormwater management regulations. Custom drainage soil blends with mixtures of 50–80 percent river sand, 10–30 percent compost, 10–30 percent nutrients, and 5–10 percent native soil have been successful for various construction, landscaping, golf course, and agricultural applications. Peoria Lakes silt will be a suitable native soil and where rich in peat, it will be high in carbon content as well. Silt will require drying but blending with sand expedites the drying. Clay lenses represent a different material with different construction qualities that could increase the inventory of soil products. Commercial interests see value in gravel harvested from deltas. Clay and gravel harvest or mining may require more coordination than other projects because it involves digging below the native land surface, which changes habitat characteristics.

Marketing sediment is a new concept in Illinois. Nonetheless, material providers understand their local markets well and appear willing to investigate new, high-value products and business processes that help their customers and increase profitability. The planning team found in their early investigations that material can be used locally by local contractors. This technology transfer initiative, however, has focused on highway construction and stormwater management applications because advisors determined they were the largest material uses.

The Illinois Tollway Authority has experience working with regulatory aspects of all the material likely to be encountered and have expressed willingness to share information. Illinois Department of Transportation (IDOT) has not reviewed their use of dredged material for many years, so there are important education and coordination opportunities. IDOT has expressed interest in the Peoria Lakes manufactured soil and is likely an important future customer. The Tollway Authority is planning a very significant 5-year I-294 reconstruction that may present an opportunity to supply their new material needs from the Peoria Lakes.

Advanced collaborative planning can match the large project incentive and stability with

partners implementing sustainable material supply operations. It may be possible to identify locations where new material is needed, implement soil manufacturing capacity, utilize expertise in advance, and ultimately stockpile material to meet demand during construction. Different soil products could be manufactured simultaneously in a small work space.

The process of working as a comprehensive team in Peoria provides opportunities to learn about many civil engineering and municipal operations concerns. The most important customer integration opportunity for an engineered soil project in Lower Peoria Lake may be the City of Peoria itself as it mitigates USEPA-mandated CSO improvements. As mentioned above in the *Combined Sewer Overflow* section, the City of Peoria has proposed a 100% GSI system to collect and allow runoff to slowly, naturally seep into the ground rather than enter the combined sewer system.

The City will use its geologic position on top of a sand terrace as a sponge to absorb runoff through more exposed soil and drainage leading to infiltration zones. A drainage soil from Peoria Lakes would provide consistent, locally-sourced, engineered material that can be customized and optimized for different project features to replace impervious surfaces. Creating drainage soil from the Lakes, using it to reduce runoff, and thus creating a highly sustainable industry could reduce costs for stormwater compliance and achieve multiple priorities for the region.

Soil feedstocks including sand, compost, nutrients, and native soil are other important factors that should be considered. These materials represent waste disposal expenses for municipalities that can serve as income to the soil industry. Sandy sediment disposal from frequent navigation dredging and fine sediment disposal from environmental dredging are the impetus for this work, but as an integrated recycling industry, there are many potential partners. Many waste disposal customers would have consistent, common seasonal material like trimmings and leaves, while others might have specialized disposal issues. Each feedstock material has specific qualities and can be used for specific physical, nutrient, or microbial properties that can be recognized and used beneficially in a blended soil. Considering other river resources, nonnative fish species can be composted for substantial nutrient and microbial value. This process will take two birds with one stone: it will include organic matter components in the engineered topsoil and aide in quelling the invasive fish species issue.

Responsible disposal of municipal yard waste and woody vegetation from utility line clearing is a substantial expense to municipalities and utilities. Historically, yard waste and kitchen waste was simply composted on farms and worked back into soil. In urban environments, such organic matter was co-mixed with other municipal waste in sanitary landfills until they began filling too fast and organics were diverted to inspire a compost industry in the mid-1980s. Collection and composting is still a significant expense for municipalities, and it might be significantly reduced if it becomes part of a high-volume soil market. Yard waste collection can be organized to deliver finished compost to blend with heavier soil constituents because it is most efficient to move the lightest material the farthest.

Soil nutrients are important to ensure vegetation has resources to grow well. Compost adds structure, water holding capacity, and carbon. Animal manure, nutrient rich soil or sediment, and processed sewage (i.e., biosolids) are all suitable nutrient sources. Peoria Lakes sediment is likely very high in nutrients and suitable as a single amendment for some uses. Biosolids add another quality and can be used in non-food applications

and construction. Hog manure is very abundant and commonly used on crop fields. Sand and sediment can also be used as soil amendments because there is an abundance of these resources available in the region. The use of biosolids is promising because they represent a municipal waste management expense that can be integrated in this cost benefit model to create savings to fund more, or less expensive, stormwater implementation.

Sediment Market Transportation Optimization

Moving sand and sediment long distances has always been a significant cost factor in federal waterway flood control, navigation, and ecosystem projects because it is usually treated as a waste product that must be managed rather than a commodity that can be used. On the other hand, in some regions, commercial river sand and gravel dredging is a significant economic and natural resource management concern. The planning team identified a network optimization group through a University of Illinois Extension exchange of information on the project. It turned out that this network optimization team had previously partnered with USACE Research and Development staff at the Construction Engineer Research Lab. In this newly formed group, they propose to develop a network optimization model for use in existing USACE software that allows decision makers to evaluate different scenarios related to alternative management options.

Similar to USACE goals, the Federal Highway Administration promotes reuse of roadway construction material, decreasing the demand for virgin materials, for the repair, reconstruction, and maintenance of roadways. Sustainable highway reconstruction has developed strategies that optimize the use of materials from multiple locations, assign material use in processes, and select fixed staging area(s) to process and ship materials at the lowest cost. Building from these strategies, the model would optimize a supply chain that makes the use of USACE dredged material desirable for the private sector.

Figure 57[17] gives a brief illustration of the overall conceptual framework. Given the materials that must be shipped from spatially-distributed

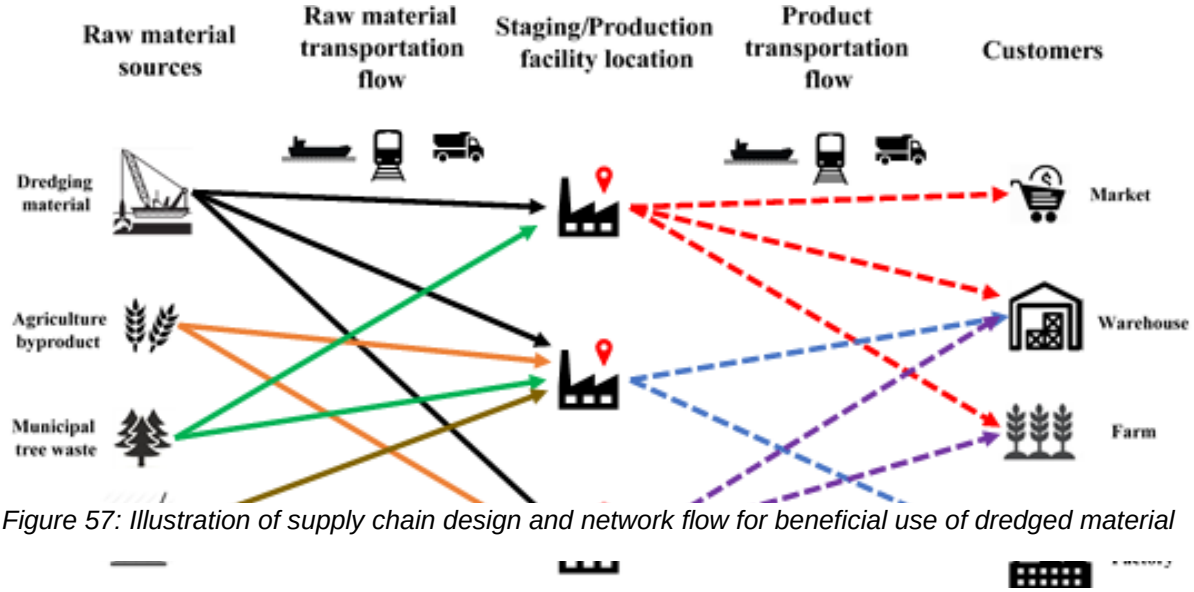

Figure 57: Illustration of supply chain design and network flow for beneficial use of dredged material

[17] Source: Yanfeng Ouyang, Ph.D., University of Illinois at Urbana-Champaign

production points to multiple types of end customers, the model must determine the best mode or multi-mode of transportation, the optimal location and capacity of staging/production facilities, and the optimal storage and routes for material/product to flow through the multimodal transportation networks.

The optimization model will systematically address many tradeoffs by simultaneously making numerous related decisions. For example, the high expense associated with bulky materials dictates that the staging/production facilities should be close to confined disposal facilities (CDFs) or potential consumers; yet factors such as the land use cost, production capacity, and environmental restrictions must be taken into account. The model plans to explicitly allow recycled use of the dredged material for management of the Peoria Lakes. While considering shipment of dredged material as well as final products, the model will consider highway networks (via freight trucks), railroad networks, waterways, as well as the possibility of multi-modal transportation. Impacts of added traffic to neighboring communities can also be addressed.

This project will formulate the dredged material reuse problem into a mixed integer linear program (MILP) that simultaneously determines the optimal locations of staging/production facilities and the best transportation/storage plan, with the goal of minimizing the total cost of staging/production facilities investment, material procurement, and transportation. Customized solution algorithms based on relaxation and decomposition will be developed from scratch to effectively solve the MILP model. The algorithm will result in stand-alone software that can be run on multiple computer platforms. Similar modeling efforts have led to success for improving material recycling and sustainability enhancement during highway construction projects to meet Federal Highway Administration requirements.

Moreover, the decision support tool allows system performance evaluations under various what-if scenarios. For example, different settings of the parameters can be tested for comparison and/or analysis. If applicable, the staging/production facilities can be given as the input to the model such that the decision makers can focus only on the transportation/storage side. The model will be completely generic; it can be applied to any districts of any geographical characteristics.

The model will not dictate the course of action; rather, it is intended as a decision support tool. It would be able to determine whether beneficial uses are initially feasible and open discussion with the private sector about how to set up a system that is mutually beneficial. Moving and storing the material is not a simple task, and delivering the material to the right spot at the right time makes a huge economic difference.

Figure 58: Sediment from Kickapoo Creek Delta

Recommended Plan

Figure 59: View of Murray Baker Bridge from Spirit of Peoria (Photo Credit: Amanda Bruner)

Formulation of Recommended Plan

Several elements were considered to help formulate the recommended plan: the prioritization results, Essential Ecosystem Characteristics (EECs), project objectives, conservation measures, conservation alternatives, and watershed areas (sources, pathways, and sinks).

The planning team first examined the primary river ecosystem drivers to understand which objective addressed which EECs, using their scientific definitions (see *Essential Ecosystem Characteristics* in the Definition of Alternatives section) and the Fact Sheet Matrix (see *Appendix O*). The planning team added a Social and Economic category here for the same reason it was added to the alternative categorization process, to accommodate different interests and because the PLCCP planning process has the potential to integrate conservation components with lakefront and community development. This process revealed that most objectives address more than one EEC.

Once the EECs were identified, the planning team then determined which conservation measures addressed which objectives. Again, there proved to be some overlap here, and most conservation measures addressed more than one objective. From there, watershed areas were identified for each measure, categorizing them as sources, pathways, or sinks.

Next, to determine which measures would be highlighted in the recommended plan, the planning team compared the prioritization results from the Second Open House and the PRC meeting. Fourteen measures appeared in the top three of each criteria or overall. A complete comparison of the results can be found in the appendices (see *Appendix P*). Below, *Figure 60* outlines the 14 measures.

Finally, to visualize the results, the planning team created a table and corresponding Sankey Diagram (a flowchart guided by arrows) to show the relationships among the objectives, EECs, measures, and watershed areas. As a point of comparison, the planning team also created a second table and Sankey Diagram to show all 18 measures. These diagrams can be found in *Appendix Q*.

Categories	Measures	Lower Peoria Lake	Middle Peoria Lake	Upper Peoria Lake	Entire Peoria Lake
Source	Agricultural Water BMPs	Few	Some	Many	Many
	Erosion Control BMPs	Uncertain	10	5	>15
	Prairie & Bluff Restoration & Management	X	X	X	X
	Urban Stormwater BMPs	X			
Pathways	Conservation & Recreation Corridor Anchors	Few	Most	Some	Lots
	Floodplain Recapture	None	Most	Some	Lots
	Nutrient Farming	X			
	Sediment Detention Basins	Uncertain	10	5	>15
Sink	Beneficial Use of Sediment	X	X	X	X
	Deepwater Area Creation, Dredging, & Sediment Placement	X	X	X	X
	Drawdowns	1	5	2	8
	Invasive Fish Species	X	X	X	X
	Secondary Channel	1		1	2
	Submersed Aquatic Vegetation	X	X	X	X

Figure 60: 14 Prioritized Measures

Recommended Plan Organized by PLCCP Objectives

Appendix R shows detailed tables connecting measures based on common themes. The purpose of this exercise was to show which measures accomplished which objectives. Note that there is significant overlap to show that some measures can accomplish more than one objective at once.

To develop the groupings of measures, the planning team took each measure and linked corresponding measures. Here is one grouping (the measures in orange are considered secondary):

- Agricultural Water BMPs
- Erosion Control BMPs
- Sediment Detention Basins
- Tributary Stream Stabilization
- Education Component
- Nutrient Farming
- Prairie and Bluff Restoration and Management
- Beneficial Use of Sediment

These linkages were based on similar processes that would overlap across measures. For example, some specific Agriculture BMPs such as tiling or buffer strips (see *Figure 51*) could also simultaneously fit into the category of Erosion Control BMPs. Therefore, if a funding organization chooses to fund one measure, Agriculture BMPs, they may also choose to fund Erosion Control BMPs to accomplish two birds with one stone.

Nutrient Farming, Prairie and Bluff Restoration and Management, and Beneficial Use of Sediment are all related to Agricultural Water BMPs, but more so in a secondary nature. Once the groupings were created, the planning team organized them based on the seven project objectives. For an example, the Agricultural Water BMP sequence fits under Objective 1: Reduce total sediment delivery to the Peoria Lakes.

Multi-Generational Project Plan

Multi-Generational Project Plans (MGPPs) are typically forward-looking documents that help guide implementation of complex projects with inter-related components. In UMRR ecosystem planning, the term Adaptive Management applies to the purposeful learning from multiple project implementations to understand and refine restoration project designs, materials, operations and maintenance, and long-term sustainability as discussed in the IRRP.

An MGPP will help integrate the compatible ecological, engineering, business, and social processes that encompass projects proposed in the PLCCP. Peoria Lakes restoration is a historic challenge requiring massive amounts of effort to manage water and sediment. The planning team hopes to demonstrate a new approach to sustainable environmental management that incorporates municipal waste management savings, material harvest from degraded ecosystems or USACE channel maintenance, and beneficial use of sediment to drive private sector participation.

PLCCP objectives are compatible and complementary to MGPP structure, and the planning process provided much of the insight to build a MGPP consisting of the following that are further described below:

- Understanding Technology – Study Area; Problems and Opportunities
- Identifying Goals – Formulation of Objectives
- Identifying Generations – "reference conditions"
- Identifying Technology – Formulation of Measures
- Categorizing Technology – Alternatives Formulation; Recommended Plan.

Understanding Technology

Problems and opportunities in the Peoria Lakes have resulted from almost 200 years of post-European settlement, population growth, and development in the Illinois River Valley and watershed. These historic changes have resulted in geomorphologic and hydrologic drivers influencing environmental quality. Hydrology and material transport are the critical "technology" or environmental functions that must be understood to improve the condition of the Peoria Lakes. Historic development and infrastructure projects relied on brute force, mechanization, and large structures to create Herculean projects like diversions, dams, and levees. Prior societal objectives, environmental understanding, and even isolated planning processes have led to single-purpose projects that may have negatively impacted other river uses. Large civil works projects employ a large-scale approach (i.e., dams and levees) when environmental impacts (i.e., sedimentation) occur at a small scale and rate, continuously over long

periods[18]. Environmental restoration can usually be implemented more efficiently with better information and models for an informed and optimized MGPP. Sediment might, for example, be managed in two ways: First, slowing or preventing it from entering the Lakes, and second, simultaneously managing it once it reaches the Lakes.

Identifying Goals

PLCCP vision and objectives provide an umbrella for many types of projects that will have site-specific or sector-specific benefits. Potential project owners will refine goals that are compatible with PLCCP objectives and through collaborative planning.

Identifying Generations

Shown in *Figure 62*, the MGPP outlines the implementation and progression of the PLCCP in manageable and logical phases, or generations. The first few generations set the stage for future progress. Generation 0 represents the current state, and 1 represents the data collection stage through feasibility plans, analyses, etc. Next, Generation 2 includes the measures that can be implemented on an ongoing basis, and 3 includes measures that require more information to be implemented based on Generation 1 studies. Generation 4 involves measures that require the implementation of those in Generation 3 before they can be executed. Finally, Generation 5 is the review phase, where the planning team will evaluate past progress and update the implementation plan dashboard found in *Figure 64*.

Identifying Technology

The PLCPP reference condition approach identified past generations of Peoria Lakes hydrology and sedimentation. Accepting those drivers as fundamental ecosystem processes, future generations of technology need to be designed within existing and future physical and social constraints. The new conservation measures and alternative plans identified in the PLCCP can be implemented with a well-developed MGPP. The island design workshop recommendation is needed to improve technology for future conservation projects built on Peoria Lakes sediment, for example. Recommended hydrogeomorphic investigations will support island design and project implementation by providing a lake-wide hydraulic model to support geomorphic modeling, project design, and sediment characterization. Alternative financing through collaboration and public-private partnerships might come about through the harvesting and selling of in-lake sediment. This initiative might help fund lake restoration. A thorough regional economic analysis is required, and because the harvest, manufacture, and distribution of engineered soils is so complex, it can be investigated using advanced transportation network optimization.

The PLCCP also presents 19 individual measures that require feasibility-level investigation followed by implementation in a structured MGPP and supported by delegated authority for project implementation.

Categorizing Technology

The PLCCP alternatives effectively define three operational strategies that achieve defined objectives. There are multiple projects in each of three regions of the lakes. The alternatives

[18] John Marlin, Illinois Sustainable Technology Center, Champaign, Illinois

consider local landscape drivers and social development impacts. All projects will have conservation and restoration objectives, and some may have economic development objectives that align with local watershed influences or in-lake conservation priorities. Potential "project owners" would implement feasibility level investigations for site-specific projects.

MGPP Implementation

The long history of Illinois River Basin development has created landscape and social influences that degrade the public's trust in environmental infrastructure (e.g., floodways, navigation systems, "natural" areas, etc.). The PLCCP envisions a more sustainable future through an MGPP that includes implementing feasible practices, adapting them to the Peoria Lakes, and developing new, creative, and efficient approaches to resolve chronic problems (such as excess sediment, shown in *Figure 58*).

Degradation of the post-dam Peoria Lakes ecosystem is vivid in the experience and memories of Peoria residents. The multiple plans to improve the region can be harnessed with a broad coalition of partners seeking new approaches and outcomes to resolve persistent social and ecological problems by creating economic opportunity. Funding is important, but success may ultimately rest on the inertia of this PLCCP and the motivation of partners. Dedicated leaders and project managers are a critical near-term need.

Figure 61: Lower Peoria Lake and USACE Island (Photo Credit: Amanda Bruner)

Peoria Lakes Comprehensive Conservation Plan (PLCCP) Multi-Generational Project Plan (MGPP)							
When	**Gen**	**0**	**1**	**2**	**3**	**4**	**5**
	Start	Current	6 Months	1 Year	3 Years	5 Years	10 Years
	Date	Nov 2018	May 2019	Nov 2019	Nov 2021	Nov 2023	Nov 2028
What	**Project**	Develop Governance		Agricultural Water Best Mgmt Practices	Backwater Restoration	Conservation/Recreation Corridor Anchors	Review
				Erosion Control Best Mgmt Practices	Deepwater Creation/Dredging /Sediment Placement	Drawdowns	
				Prairie/Bluff Restoration & Mgmt	Floodplain Recapture	Secondary Channel	
				Sediment Detention Basins	Nutrient Farming		
				Submersed Aquatic Vegetation	Tributary Stream Stabilization		
				Urban Stormwater Best Mgmt Practices	Invasive Fish Species		
				Beneficial Use of Sediment	Island Creation		

Figure 62: Multi-Generational Project Plan

Implementation Plan

Figure 64 on the following page is the PLCCP implementation plan dashboard, which will be used as a metric to show the progress of each measure and any potential obstacles that might impact its implementation. Note that due to spacing issues, the following abbreviations were used:

Abbreviation	Meaning	Abbreviation	Meaning	Abbreviation	Meaning
edu	education	LO	landowner	PRV	private sector
FND	foundations	M	middle lake	sed	sediment
GOV	government (federal, state, or local)	mgmt	management	SU	stormwater utility
ID	Identification number	NC	nutrient credit	tech	technology
L	lower lake	NFP	not-for-profit organization	U	upper lake

Figure 63: Implementation Plan Abbreviations

Peoria Lakes Comprehensive Conservation Plan (PLCCP) Implementation Plan-Dashboard														
What				How					Where	Why	Who	When		
ID	Measure	Cost	Obstacle	Communication	Edu	Tech	Legislation Regulation	Potential Funding	Lake Region	Benefit	Potential Owner	Start	Done	Status
1	Agricultural Water Best Mgmt Practices							USDA/FND/PRV	L-M-U		LO/PRV	Nov 2019		
2	Erosion Control Best Mgmt Practices							IDNR/IEPA/FND IDOT/GOV	M-U		LO/PRV/GOV	Nov 2019		
3	Prairie/Bluff Restoration & Management	$10,000 Per Acre						IDNR/IEPA/NFP/ FND	L-M-U		LO/NFP/GOV	Nov 2019		
4	Sediment Detention Basins	$72,000 Per Acre						USACE/IDNR/ FND/NFP	M-U		LO/PRV/GOV NFP	Nov 2019		
5	Submersed Aquatic Vegetation	$2,806 Leaner foot						USACE/IDNR/ FND/NFP	L-M-U		GOV/NFP	Nov 2019		
6	Urban Stormwater Best Mgmt Practices							IEPA/FND/GOV SU/NC	L		LO/GOV	Nov 2019		
13	Beneficial Use of Sediment							USACE/FND/ PRV/IDOT	L-M-U		PRV/NFP/ USACE	Nov 2019		
7	Backwater Restoration							USACE/IDNR FND/PRV	L-M-U		LO/GOV	Nov 2021		
8	Deepwater Creation/ Dredging/Sed Placement	$25 Per Cubic Yard						USACE/IDNR/ FND/NFP	L-M-U		GOV/NFP	Nov 2021		
9	Floodplain Recapture	$10,700 Per Acre						IDNR/USACE/NFP FND	M-U		GOV/NFP	Nov 2021		
10	Nutrient Farming							NFP/FND	L		LO/PRV/NFP	Nov 2021		
11	Tributary Stream Stabilization							IDNR/FND/GOV NFP/IDOT	L-M-U		LO/GOV/NFP	Nov 2021		
12	Invasive Fish Species	$1.5M Per Year						IDNR	L-M-U		GOV/NFP	Nov 2021		
16	Island Creation	$9.2M						USACE	L-M-U		GOV	Nov 2021		
14	Conservation/Recreation Corridor Anchors							IDNR/USACE/ NFP/FND/GOV	L-M-U		LO/GOV/NFP	Nov 2023		
15	Drawdowns	$18,000 Per Acre						USACE/IDNR/ NFP	L-M-U		GOV/NFP	Nov 2023		
17	Secondary Channel	$25 Per Cubic Yard						USACE/FND/ PRV	L-M-U		GOV	Nov 2023		
Use the Measure Status Scale Color (Red-Yellow-Green) at right for the far-right Status (Color) column only:											Status Scale:	< 80%	80-99%	100%

Figure 64: Implementation Plan

Next Steps

Hydrogeomorphic Study

A hydrogeomorphic study is a crucial next step to continue this planning process to understand desirable locations and design specifics for conservation measures. This study will consist of an estimation of the sediment load entering the Lakes from upstream and local tributaries. This will form a basis to determine locations for conservation measures such as: streambank stabilization, sediment detention basins, deepwater habitat, and a secondary channel. According to the hydrogeomorphic study fact sheet, located in *Appendix N*, planning and design will be optimized through detailed analyses to reduce risks of failures and ineffective efforts. Additionally, state and federal agencies are expected to require such analyses to enable issuance of permits.

Long-term sedimentation within the Peoria Lakes is a complex issue reflecting sediment sources, pathways, and sinks. Large areas of the Lakes have uniform, shallow depths making future sedimentation and flow conditions difficult to predict without detailed analyses. A two-dimensional hydrodynamic model is required to arrive at a most sustainable physical condition that best meets the intended uses and conditions of the Lakes and supports ongoing management (e.g., dredging).

Sedimentation Characterization & Island Design Workshop

In addition to understanding hydrogeomorphic processes, an analysis of lake sediment characterization needs to be completed to determine the best location for in-lake structures, such as islands. The lake sediment characterization analysis will help determine areas in the Lakes that have the sturdiest substrates to prevent in-lake structures from sinking. Also, if island creation is considered, an island design workshop must be held to learn from past construction efforts and to identify new approaches.

Collaboration and Public-Private Partnerships

This project served as a starting point, identifying and bringing together numerous individuals and organizations. However, the process is not complete, and it can only grow positively with a comprehensive network of stakeholders. Furthermore, collaboration with the USACE regarding beneficial use of dredged material and access to certain sites can help foster regional progress.

Feasibility Study

Study sponsors can seek additional PAS funding to initiate studies recommended above in the very near term. USACE feasibility studies are more involved efforts that can be implemented through existing authorized programs like UMRR or IRBRCP most easily. Specific federal studies, like the Peoria Riverfront project that built the McCluggage Bridge island, can also be authorized and funded by Congress. Federal feasibility studies and the resulting projects are typically funded at 35% cost to the local sponsor and 65% to the Federal government. Land value can be used as cost share which drives many projects to public land.

Feasibility studies are difficult to authorize outside of substantial water legislation like the Water Resources Development Act, which defines most USACE projects.

Replication

The Peoria Lakes Comprehensive Conservation Plan (PLCCP) has been managed with intention to provide subsequent organizations and other regions the opportunity to replicate both our project methodology (the *HOW*) and project work content (the *WHAT*) whenever and wherever appropriate.

How: Replication Methodology includes the following 16 elements:

1 Use commitment to success & laser focus by modifying meetings/agendas on this 1 project
2 Identify project scope (what's in and out) defined as the Peoria Lakes from Bluff to Bluff
3 Obtain public involvement through open houses and surveys to achieve ascertainment
4 Utilize project management tools and processes (Scope/Rating/I-Plan/MGPP/Replication)
5 Base solutions on a science foundation by using studies from IL scientists and current data
6 Align with regulatory authority via the US Army Corp and the IL Dept of Natural Resources
7 Benchmark information & opportunities by determining previous similar project work
8 Develop regional consensus to create awareness, understanding and buy in by stakeholders
9 Inclusive Teamwork & Partnership Collaboration within the following 3 sectors
- Private Sector: Business-Stakeholders (Develop a Stakeholder Network)
- Public Sector/Government: Federal-State-County-Municipal-Local
- Not-For- Profit: Reg Planning Commission-Water Resources Council-Nature Conservancy

10 Create a community team of subject matter experts called the Project Review Committee
11 Hold Project Review Committee (PRC) workshops to gather input and prioritize solutions
12 Analyze all public and Project Review Committee inputs to determine project solutions
13 Communicate with stakeholders and PRC to demonstrate the value of their input
14 Use media to provide opportunities to share our work with the public
15 Document project work and background data into the Final Project Report
16 Create Project Replication Statement to share what we did and how we did it

What: Replication Content includes the following 17 elements (for the operational definition see *Definition of Measures* in the Formulation of Measures section):

1 Agricultural Water Best Management Practices (BMPs)
2 Erosion Control Best Management Practices (BMPs)
3 Prairie/Bluff Restoration & Management
4 Sediment Detention Basins
5 Submersed Aquatic Vegetation
6 Urban Stormwater Best Management Practices (BMPs)
7 Backwater Restoration
8 Deepwater Creation/ Dredging/Sediment Placement
9 Floodplain Recapture
10 Nutrient Farming
11 Tributary Stream Stabilization

12 Invasive Fish Species Management
13 Beneficial Use of Sediment
14 Conservation & Recreation Corridor Anchors
15 Water Level Drawdowns
16 Island Creation
17 Secondary Channel

This PLCCPP Replication Statement is contained in our project report. The Peoria Lakes Conservation Comprehensive Plan (PLCCP) report may be found at tricountyrpc.org.

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Appendices

Appendix A: Past Illinois Waterway Plans and Projects

#	Name of document	Year	Organization(s)	Author(s)	Type of document	Geographic area
1	Groundwater in the Peoria Region	1950	Illinois State Water Survey, Illinois State Geological Survey	Horberg, Suter, Larson	Research report	The Peoria Region
2	Peoria Lake Sediment Investigation	1986	Illinois Department of Energy and Natural Resources, University of Illinois at Urbana-Champaign	Demissie, Bhowmik	Research report	Peoria Lakes
3	Hydraulic Investigation for the Construction of Artificial Islands in Peoria Lake	1988	Illinois Department of Energy and Natural Resources	Demissie, Soong, Bhowmik	Research report	Peoria Lakes
4	1993 Governor's Conference on the Management of the Illinois River System	1994	University of Illinois Water Resources Center, Illinois Department of Energy and Natural Resources	University of Illinois Water Resources Center, Illinois Department of Energy and Natural Resources	Notes on a conference	Illinois River valley and watershed
5	Integrated Management Plan for the Illinois River Watershed	1997	State of Illinois	IDNR, Illinois River Planning Team	State plan	Illinois River watershed
6	Farm Creek Watershed Management Plan	2001	Tri-County Regional Planning Commission	Tri-County Regional Planning Commission	Planning document	Farm Creek Watershed
7	Illinois Rivers Decision Support System (ILRDSS)	2002	Illinois Department of Natural Resources	Illinois State Water Survey, Illinois Natural History Survey, Illinois State Geologic Survey, Waste Management and Research Center, IDNR	Planning document	State of Illinois

#	Name of document	Year	Organization(s)	Author(s)	Type of document	Geographic area
8	Mossville Bluffs Watershed Restoration Master Plan	2002	Tri-County Regional Planning Commission, City of Peoria, Peoria County	Conservation Design Forum, Inc. and Clark Engineering, Inc.	Restoration Plan	Mossville Bluffs
9	Peoria Riverfront Development, Illinois (Ecosystem Restoration) Feasibility Study with Integrated Environmental Assessment	2003	U.S. Army Corps of Engineers, Rock Island District	U.S. Army Corps of Engineers, Rock Island District	Feasibility Study	Peoria Riverfront
10	Hydrodynamic Modeling for the Construction of Artificial Islands within Peoria Lake along the Illinois River	2004	Illinois Department of Natural Resources Division of Waste Management Research Center; Illinois State Water Survey	Bhowmik, Paramar, Lian, Demissie	Research report	Peoria Lakes
11	Hydrodynamic Modeling of the Peoria Lake: Largest Bottomland Lake on the Illinois River	2004	University of Illinois	Bhowmik, Xia, Paramar, Demissie	Research report	Peoria Lakes
12	Pekin Lake State Fish and Wildlife Area Northern Unit: Critical Restoration Project Feasibility Report	2004	US Army Corps of Engineers	Department of the Army	Feasibility Study	Pekin Lake
13	Ten Mile Creek Watershed Restoration Plan	2004	Tri-County Regional Planning Commission, IDNR	Tri-County Regional Planning Commission	Restoration Plan	Tenmile Creek
14	Partridge Creek Watershed Restoration Plan	2004	Tri-County Regional Planning Commission, IDNR	Tri-County Regional Planning Commission, Partridge Creek Watershed Planning Committee	Restoration Plan	Partridge Creek

#	Name of document	Year	Organization(s)	Author(s)	Type of document	Geographic area
15	Ackerman Creek Watershed Restoration Plan	2004	Tri-County Regional Planning Commission, IDNR	Tri-County Regional Planning Commission	Restoration Plan	Ackerman Creek
16	Illinois River Basin Restoration Comprehensive Plan with Integrated Environmental Assessment	2007	US Army Corps of Engineers; Illinois Department of Natural Resources	US Army Corps of Engineers; Illinois Department of Natural Resources	Comprehensive Plan	Illinois River
17	Mossville Bluffs Homeowners Guide to Stormwater Best Management Practices	2008	Heartland Water Resources Council, TCRPC	Heartland Water Resources Council, TCRPC	Homeowner's Guide	Mossville Bluffs
18	Upper Mississippi River System Ecosystem Restoration Objectives	2009	US Army Corps of Engineers	US Army Corps of Engineers	Planning document	Mississippi River System
19	Illinois River Reach Plan	2010	US Army Corps of Engineers?	US Army Corps of Engineers?	Research report	Mississippi River System
20	North Farm Creek and Dry Run Tributary Implementation Plan	2012	US EPA	Prepared by Tetra Tech	Implementation Plan	North Farm
21	Mississippi River and Tributaries Waterways Action Plan: Illinois Waterway Annex	2016	US Army Corps of Engineers?	US Army Corps of Engineers?	Planning document	Mississippi River/Illinois Waterway

#	Name of document	Year	Organization(s)	Author(s)	Type of document	Geographic area
22	The Sediment Budget of the Illinois River	2016	Illinois State Water Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign	Demissie, Getahun, Keefer	Research report	Illinois River Basin
23	Mississippi River and Tributaries Waterways Action Plan: Upper Mississippi River Annex	2017	US Army Corps of Engineers?	US Army Corps of Engineers?	Planning document	Mississippi River
24	Beneficial Use of Illinois River Sediment for Agricultural and Landscaping Applications	2018	University of Illinois Sustainable Technology Center	Marlin, Darmody	Research report	Illinois River Basin

Appendix B: Photo Examples of Problems in the Peoria Lakes and its Watershed

Figure 65: Lower Peoria Lake Flooding

Figure 67: Debris in Lower Peoria Lake

Figure 66: Ten Mile Creek Delta Sediment Deposit

Figure 68: Farm Creek Delta Sediment Deposit in Lower Peoria Lake (Photo Credit: Amanda Bruner)

Figure 69: Farm Creek Sediment

Figure 70: Mud Slide along Route 29 in Peoria County

Figure 71: Stormwater Runoff Erosion

Figure 72: Peoria Park District Erosion Problem

Figure 74: Steep Slope Erosion

Figure 73: Old Drainage Tile

Figure 75: Bluff Erosion

Appendix C: Public Survey (Copy of Questions)

Peoria Lakes Comprehensive Conservation Plan Survey

Thank you for participating in this survey! It should take less than 5 minutes to complete.

The Upper and Lower Peoria Lakes, which refer to the widened portion of the Illinois River near Peoria, are Greater Peoria's most precious natural resource and have supported life in the Illinois River Valley for 12,000 years. However, as increasing agricultural advancement, urban development, and industrialization occurred over time, water quality declined, habitat was lost and degraded, and sedimentation has steadily filled the Lakes, leaving some areas less than 3 feet deep. The Peoria Lakes Basin Alliance (PLBA) was established in 2001 to coordinate efforts to restore and preserve the Peoria Lakes.

PLBA and other regional stakeholders are joining forces to develop a Peoria Lakes Comprehensive Conservation Plan. The purpose of this planning process is to develop a set of strategies to address Peoria Lakes' environmental challenges and identify opportunities to preserve the natural environment of the Illinois River and Peoria Lakes for current and future generations. By answering the following questions, you can help contribute to the success of this planning process.

1. **I am satisfied with the current status of the Peoria Lakes.**
   Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

2. **I am concerned about the future status of the Peoria Lakes.**
   Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

3. **Conservation efforts for the Peoria Lakes are important for our communities.**
   Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

4. **I would be supportive of having an organized comprehensive plan for the Peoria Lakes.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

5. **Asian Carp in the Peoria Lakes are a problem.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

6. **The water quality in the Peoria Lakes is a problem.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

7. **The loss of depth of the Peoria Lakes is a problem.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

8. **Sedimentation is a problem in the Peoria Lakes.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

9. **The decline of habitat in the Peoria Lakes is a problem.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

10. **I would support the following types of conservation or restoration methods in the Peoria Lakes:**

_____

_____

_____

_____

_____

11. **I am familiar with any other (past or present) restoration efforts in the Illinois Waterway.**

Mark only one oval.

- ◯ Yes
- ◯ No

12. **If you answered yes to the above question, what are those efforts?**

_____

_____

_____

_____

_____

13. **I _____ use the Peoria Lakes.**

Mark only one oval.

- ◯ Never
- ◯ Rarely
- ◯ Sometimes
- ◯ Often
- ◯ Frequently

14. **The declined state of ecological health inhibits my usage of the Peoria Lakes.**

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

15. **If you agree to the statement above, in what way?**

_____

_____

_____

_____

_____

16. **I enjoy the Peoria Lakes.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

17. **I partake in the following activities involving the Lakes: (select all that apply)**
Check all that apply.

- ☐ Walking/biking
- ☐ Sight seeing/viewing
- ☐ Boating
- ☐ Jet skiing/water skiing
- ☐ Canoeing
- ☐ Fishing
- ☐ Hunting
- ☐ Camping
- ☐ Bird watching
- ☐ Not applicable/I do not use the lakes
- ☐ Other: _____

18. **Gender**
Mark only one oval.

- ◯ Male
- ◯ Female

19. **Race/Ethnicity**
Mark only one oval.

- ◯ White
- ◯ Hispanic or Latino
- ◯ African American
- ◯ Asian/Pacific Islander
- ◯ More than one
- ◯ Prefer not to respond
- ◯ Other: _____

20. **Education**
Mark only one oval.

- ◯ Some high school
- ◯ High school graduate/GED
- ◯ Some college
- ◯ Associate's degree
- ◯ Bachelor's degree
- ◯ Master's degree
- ◯ Professional degree
- ◯ Doctorate degree
- ◯ Other: _____

21. **Employment Status**
Mark only one oval.

- ◯ Employed for wages
- ◯ Self-employed
- ◯ Out of work and looking
- ◯ Out of work and not currently looking
- ◯ Homemaker
- ◯ Student
- ◯ Military
- ◯ Retired
- ◯ Unable to work

22. **I live in _____.**
Mark only one oval.

- ◯ Tazewell County
- ◯ Peoria County
- ◯ Woodford County
- ◯ Other: _____

23. **I am a member of the following advocacy group(s): (select all that apply)**
Check all that apply.

- ☐ Ducks Unlimited
- ☐ Friends of Riverfront Park
- ☐ Friends of the Earth
- ☐ Global Warming Solutions
- ☐ Greenpeace
- ☐ Heartland Water Partnership
- ☐ Illinois Environment Council
- ☐ Peoria Families Against Toxic Waste
- ☐ Peoria Lakes Basin Alliance
- ☐ Prairie Rivers Network
- ☐ Sierra Club
- ☐ The Nature Conservancy
- ☐ Other: _____

If you are interested in receiving updates on this planning process, please leave your information below:

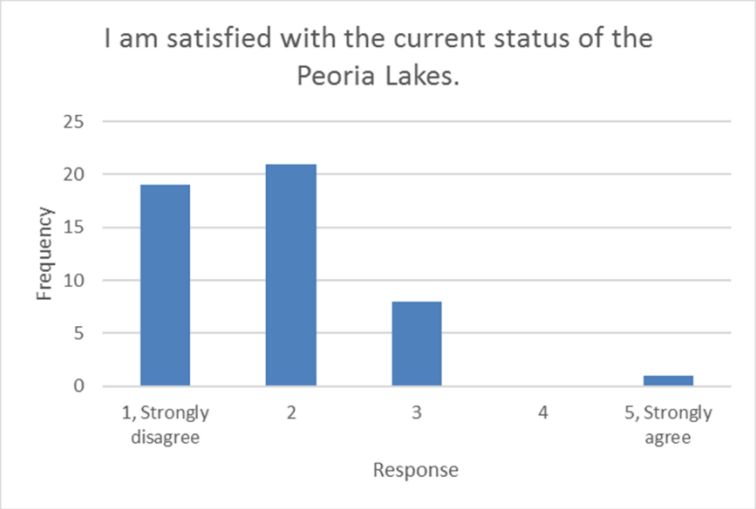
24. **Name:**

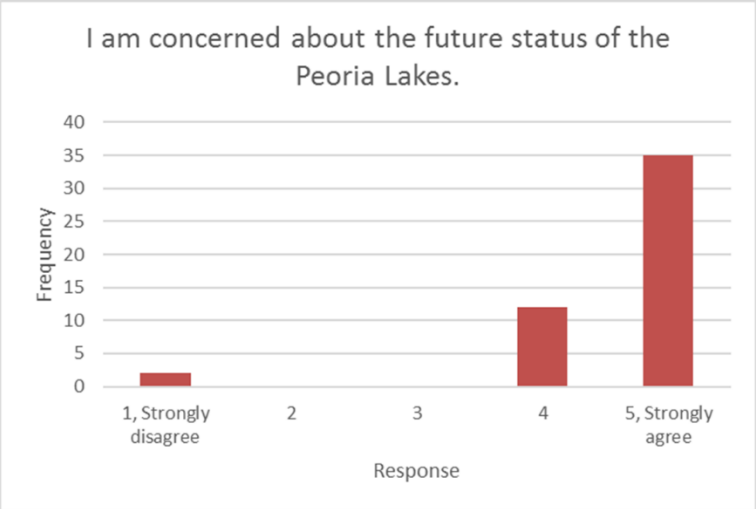
_____

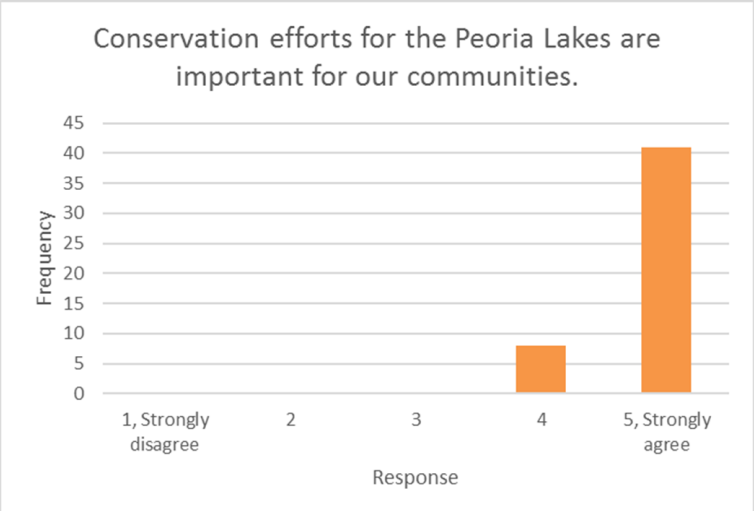
25. **Email**

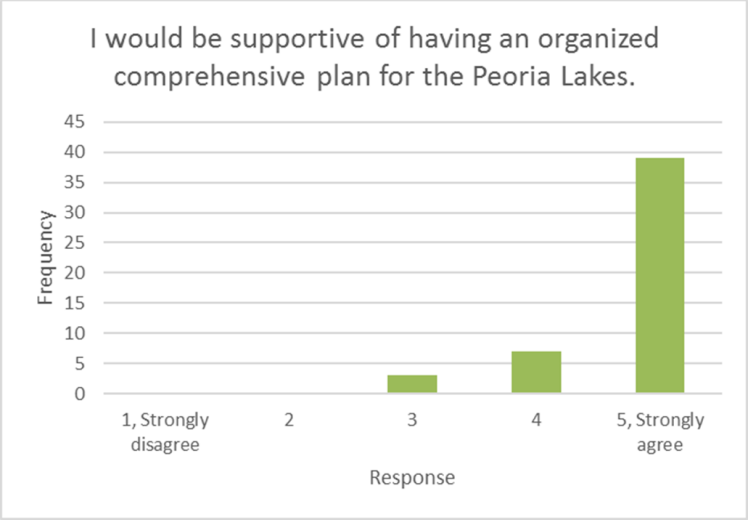
_____

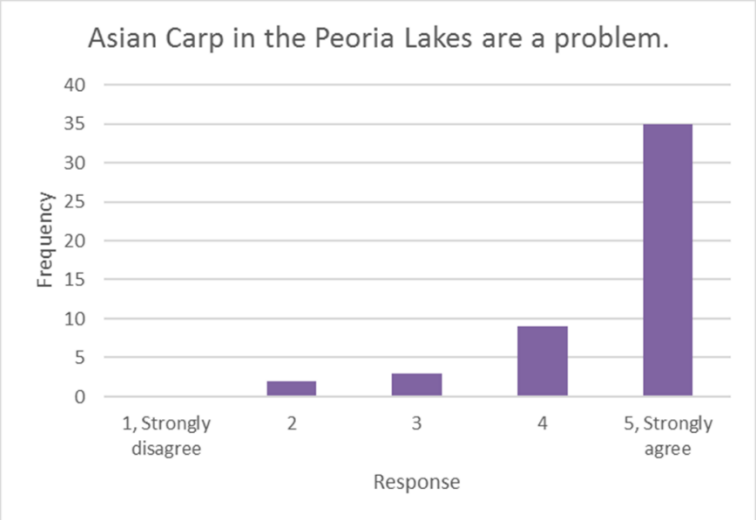
Appendix D: Public Survey (Results)

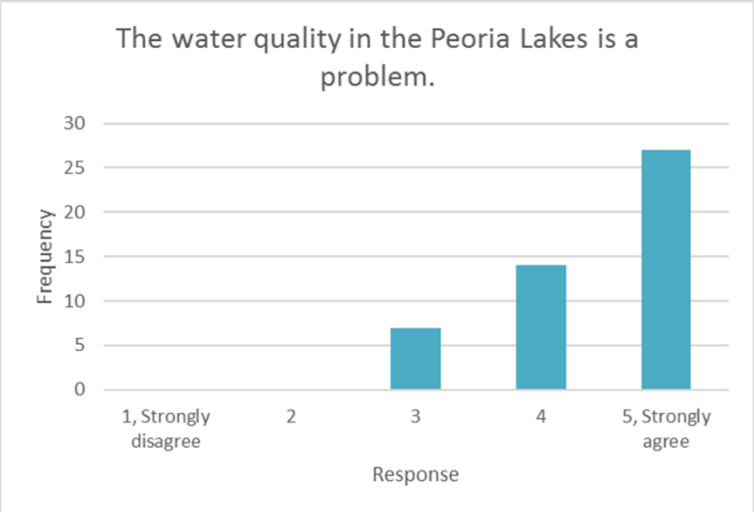


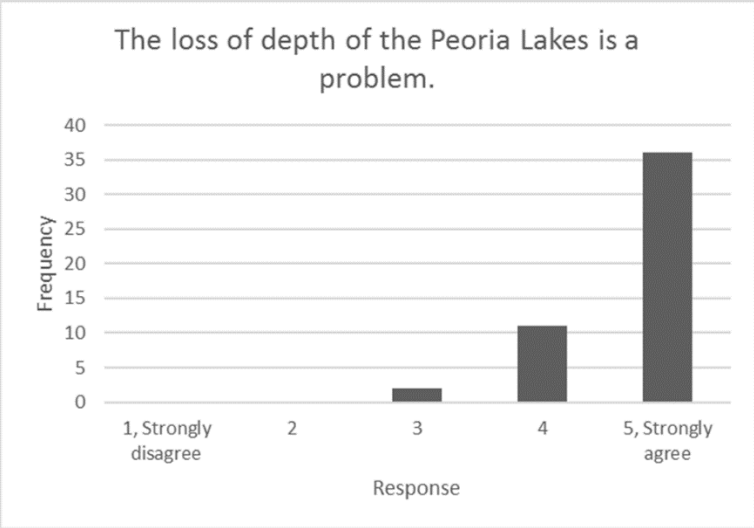


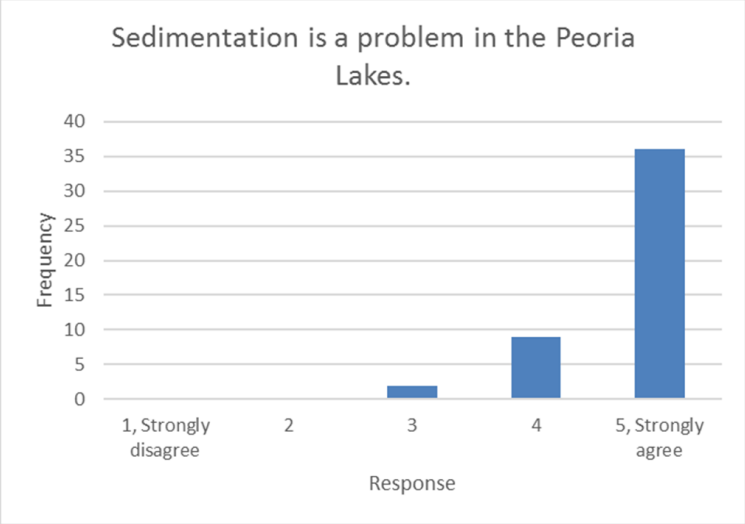


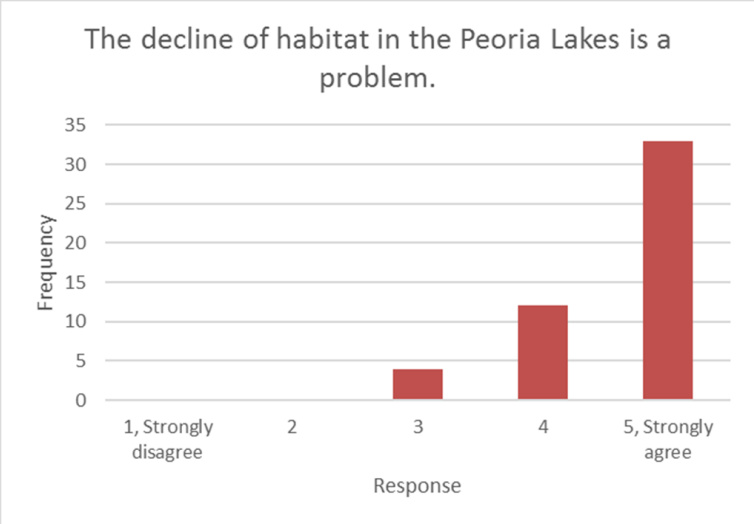

I would be supportive of having an organized comprehensive plan for the Peoria Lakes.
45
40
35
30
25
20
15
10
5
0
Frequency
1, Strongly disagree
2
3
4
5, Strongly agree
Response

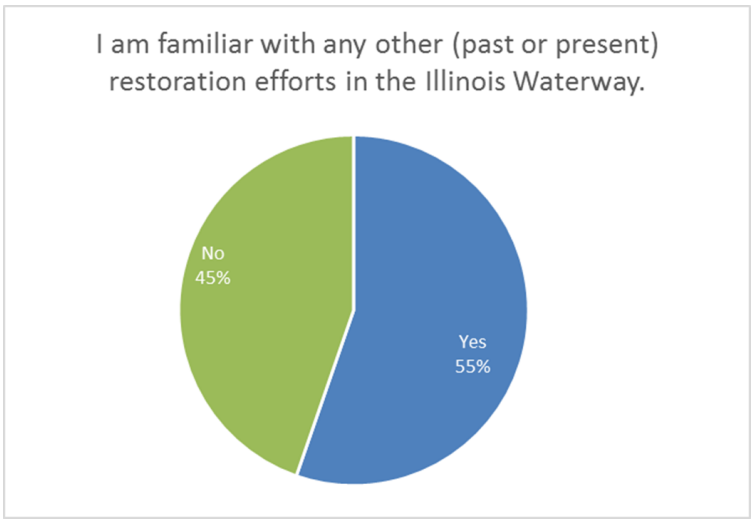

Asian Carp in the Peoria Lakes are a problem.
40
35
30
25
20
15
10
5
0
Frequency
1, Strongly disagree
2
3
4
5, Strongly agree
Response

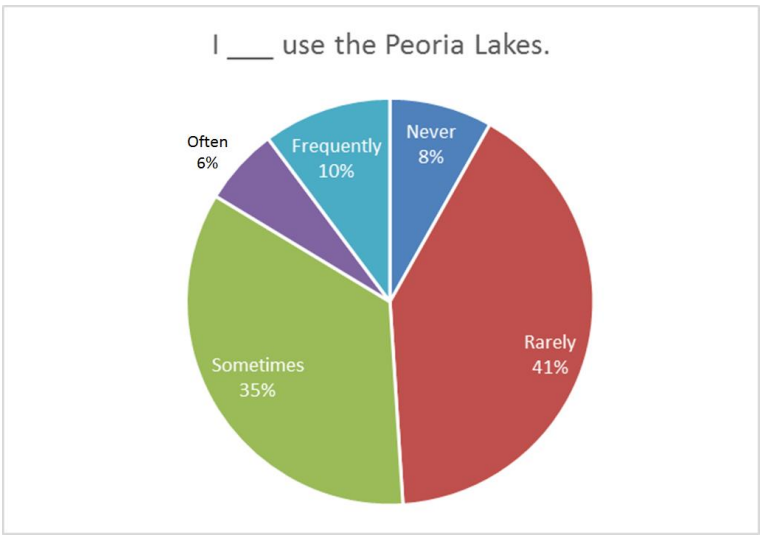

The water quality in the Peoria Lakes is a problem.
30
25
20
15
10
5
0
Frequency
1, Strongly disagree
2
3
4
5, Strongly agree
Response

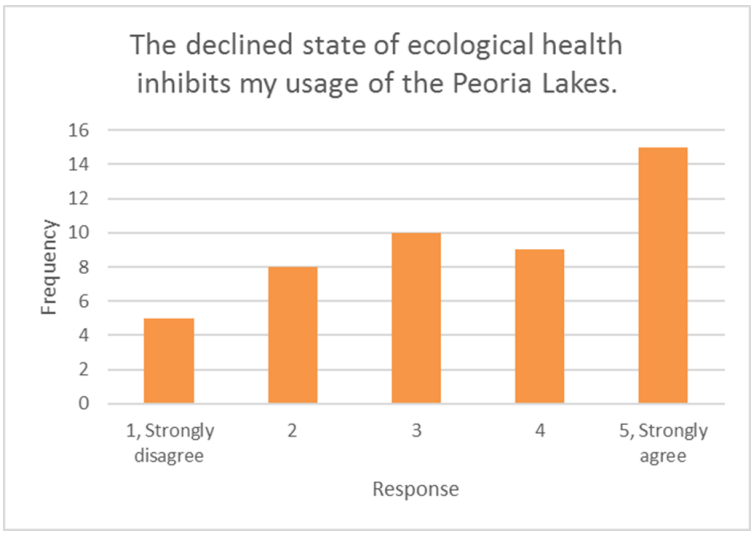

The loss of depth of the Peoria Lakes is a problem.
Frequency
40
35
30
25
20
15
10
5
0
1, Strongly disagree
2
3
4
5, Strongly agree
Response

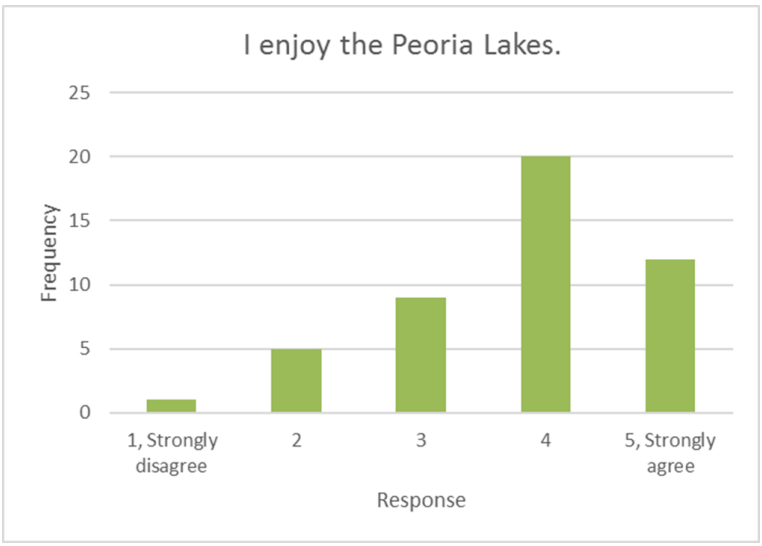

Sedimentation is a problem in the Peoria Lakes.
Frequency
40
35
30
25
20
15
10
5
0
1, Strongly disagree
2
3
4
5, Strongly agree
Response

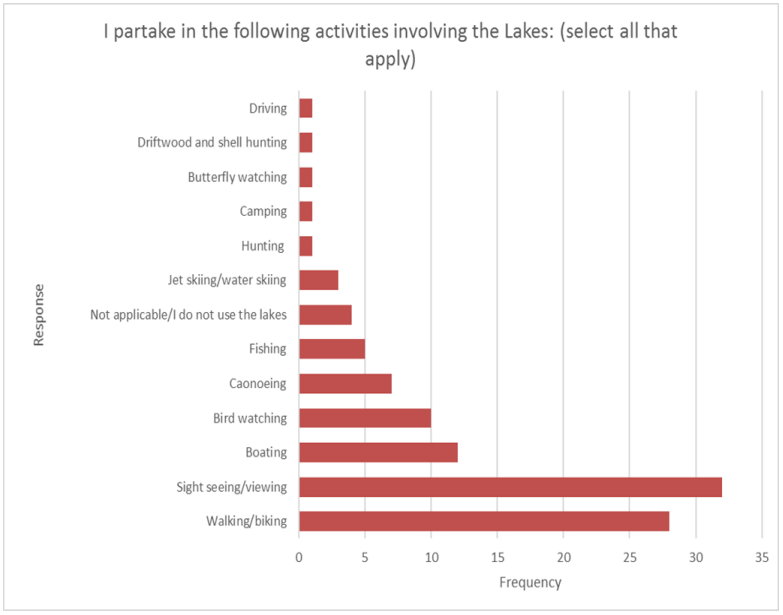

The decline of habitat in the Peoria Lakes is a problem.
Frequency
35
30
25
20
15
10
5
0
1, Strongly disagree
2
3
4
5, Strongly agree
Response

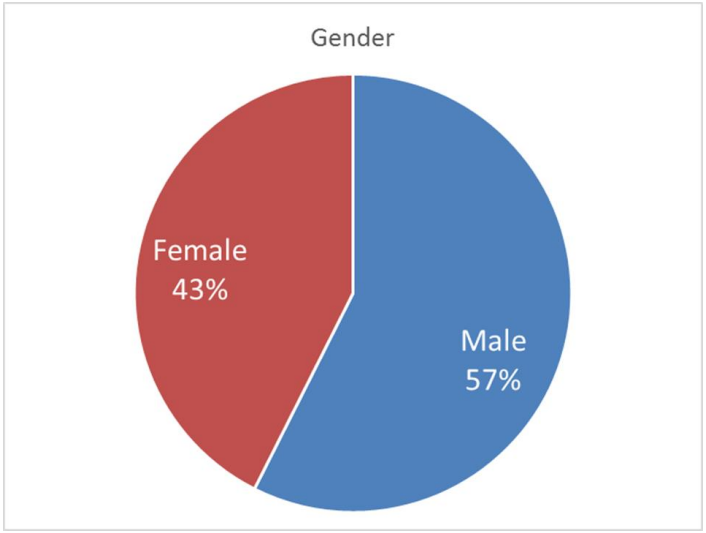

I am familiar with any other (past or present) restoration efforts in the Illinois Waterway.
No 45%
Yes 55%

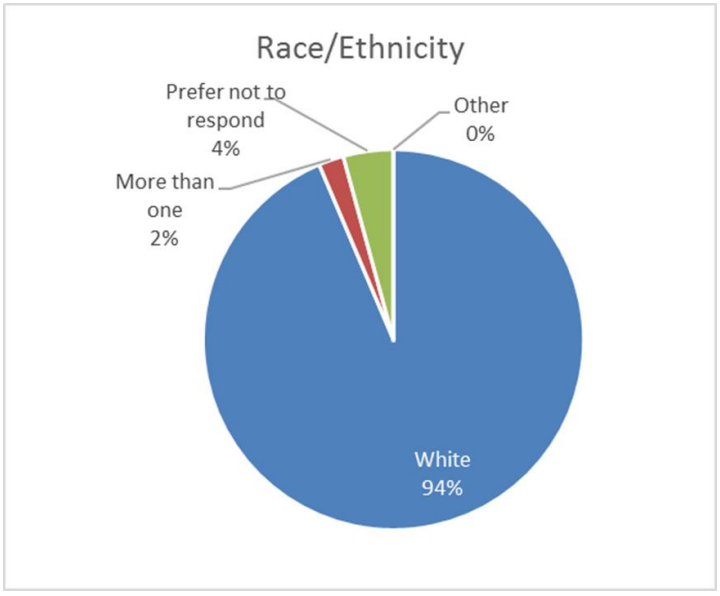

I ___ use the Peoria Lakes.
Often 6%
Frequently 10%
Never 8%
Rarely 41%
Sometimes 35%

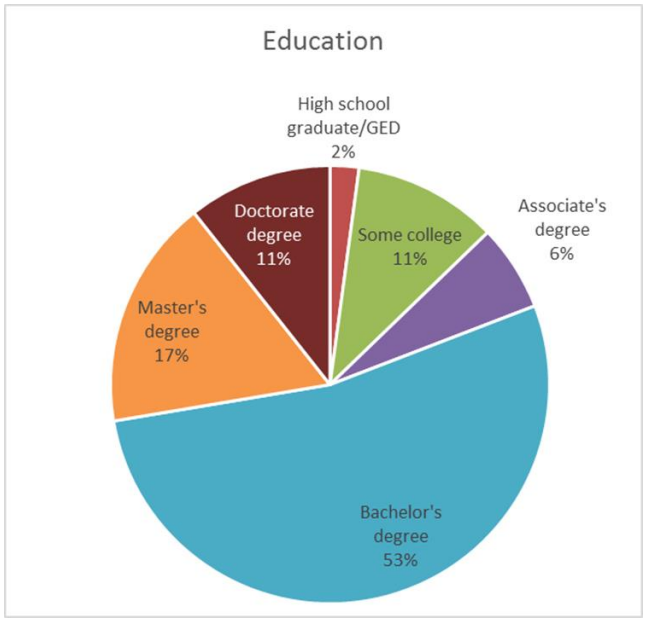

The declined state of ecological health inhibits my usage of the Peoria Lakes.
Frequency
16
14
12
10
8
6
4
2
0
1, Strongly disagree
2
3
4
5, Strongly agree
Response

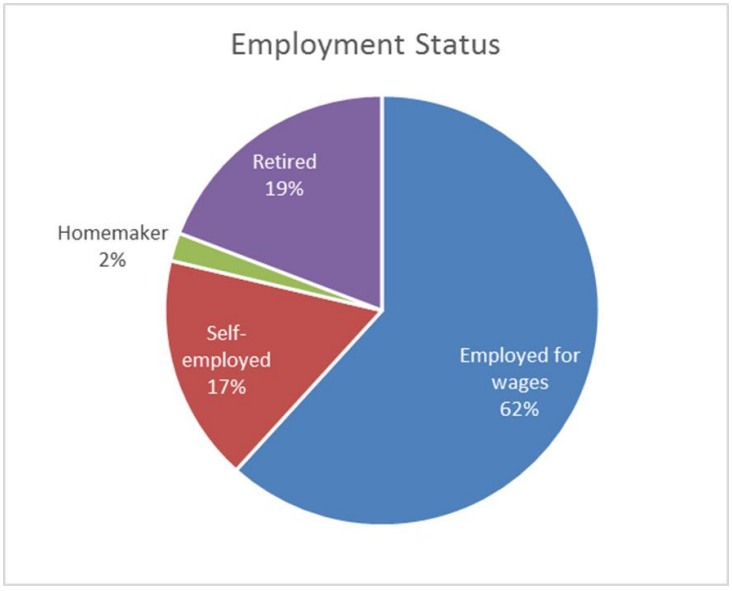

I enjoy the Peoria Lakes.
25
20
15
10
5
0
Frequency
1, Strongly disagree
2
3
4
5, Strongly agree
Response

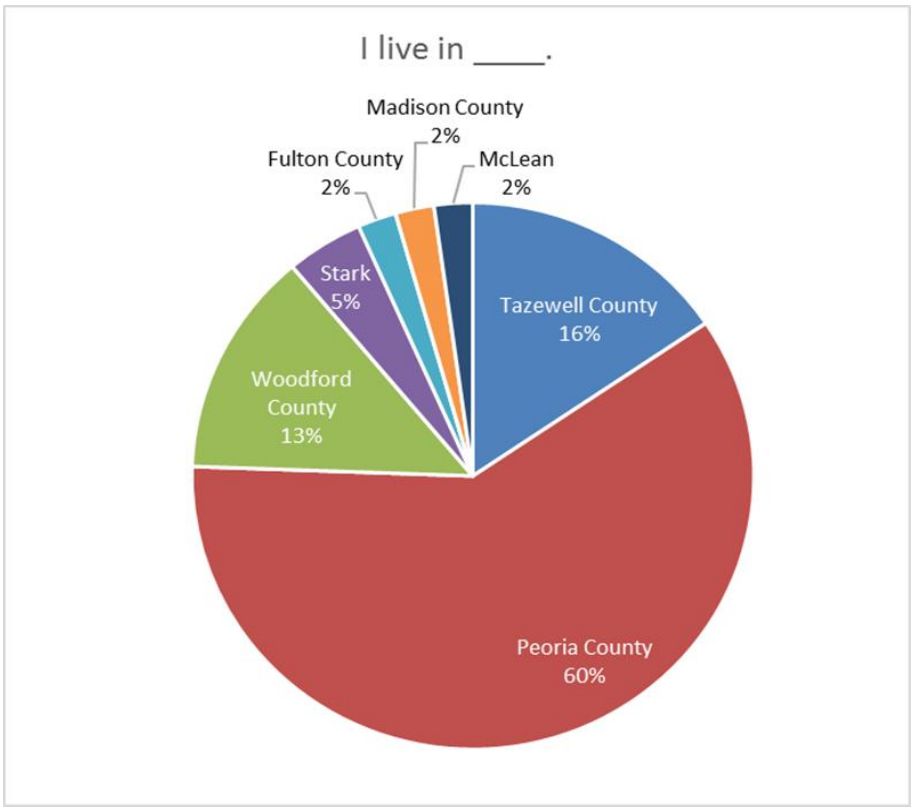

I partake in the following activities involving the Lakes: (select all that apply)
Response
Driving
Driftwood and shell hunting
Butterfly watching
Camping
Hunting
Jet skiing/water skiing
Not applicable/I do not use the lakes
Fishing
Caonoeing
Bird watching
Boating
Sight seeing/viewing
Walking/biking
0
5
10
15
20
25
30
35
Frequency


Gender
Female
43%
Male
57%


Race/Ethnicity
Prefer not to respond 4%
Other 0%
More than one 2%
White 94%


Education
High school graduate/GED 2%
Doctorate degree 11%
Some college 11%
Associate's degree 6%
Master's degree 17%
Bachelor's degree 53%


Employment Status
Retired 19%
Homemaker 2%
Self-employed 17%
Employed for wages 62%


I live in ____.
Madison County 2%
Fulton County 2%
McLean 2%
Stark 5%
Tazewell County 16%
Woodford County 13%
Peoria County 60%


I am a member of the following advocacy group(s):
The Nature Conservancy
Sierra Club
Ducks Unlimited
Friends of Riverfront Park
Global Warming Solutions
Illinois Environment Council
Prairie Rivers Network
Peoria Lakes Basin Alliance
Peoria Audubon
Trustee for Peoria Heights
East Peoria Boat Club
MIRCC
Peoria Families Against Toxic Waste
Peoria Boat Club
USACOE

Appendix E: First Public Open House Public Input

Future Vision Data

1. What is your future vision for the Peoria Lakes?
    - Asian carp have been eradicated
    - Adjacent land reserved for conservation
    - The lakes continue to be the focal point of our region
    - The CSO issue is solved, carp are managed
    - More people appreciate & use the lakes
    - Healthy, clean lake/river that supports a diverse number of native flora and fauna
    - Vital navigation
    - Clean
    - Attraction for boating/recreation
    - Sedimentation is properly managed
    - Wetland restoration
    - Increase acreage of park land
    - More walking/biking trails
    - Water quality has increased
    - Deep water
    - Thinning body of water
    - Home to a diverse set of species
    - A clean body of water for swimming
    - Carefully managed for both environmental and human needs

2. What are some future conservation/environmental project ideas?
    - Carp eradication
    - Sediment Management
    - Wetland areas
    - Some deep-water habitat
    - Are “large” barges part of the problem?
    - How can field runoff be reduced??
    - Can pollutants be prevented (regulations)?
    - Can using/harvesting Asian car be lucrative??
    - Sediment Retention basins
    - Adopt best management practices for storm water and erosion control
    - Wetland restoration
    - Creating initiatives to establish rain gardens to reduce site run off
    - Preventing combine sewer overflow
    - Erosion control
    - Planting more trees

3. What are some future project ideas for the areas bordering the Lakes?
   - Development of ecology standard for watershed development
   - Would having areas where “sea weed” can be grown help??
   - Is the dredged material helpful for farmland??
   - Can targeted planting of water absorbing plants help??
   - Increased park land
   - Increased trail network
   - Carp processing facilities
   - Bike/Ped trail
   - Erosion control
   - Planting more trees

4. What are some additional recreational activities you’d like to see on the Lakes?
   - Public carp hunting tours
   - Sightseeing along the Illinois
   - More areas for canoeing/kayaking that don’t compete with barges & speed boats
   - Boat racing
   - Pools for swimming
   - Hiking
   - Mountain biking
   - Sightseeing
   - Bird watching
   - Canoeing
   - Is swimming even possible?
   - Submarine tours

Mapping Station

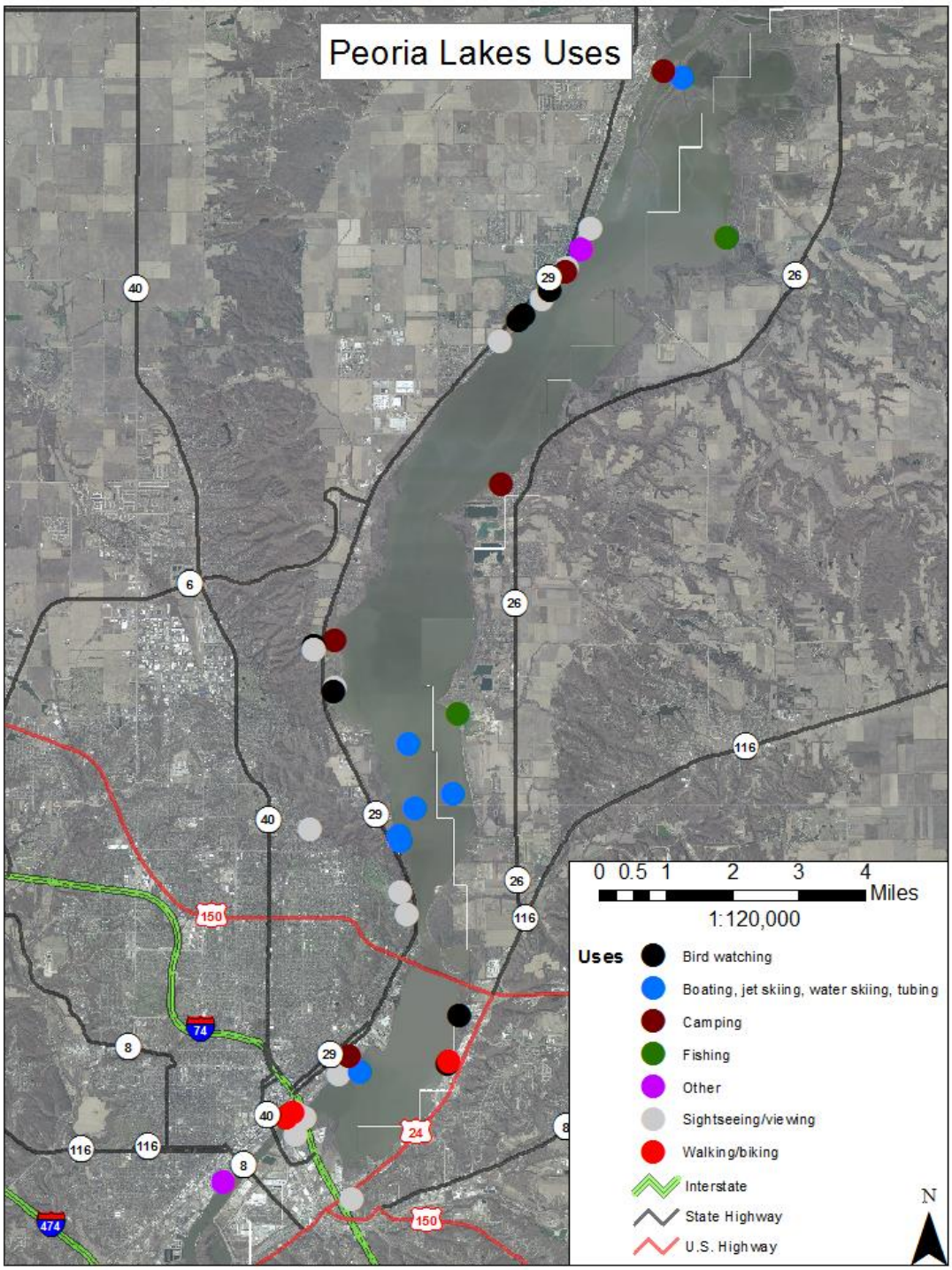


Figure 76: Peoria Lakes Inventory of Uses from First Public Open House

SWOT Analysis Data

Strengths

- Large open water
- Beaches/sand
- PWC Area
- River community identity
- strong local partnerships
- Attraction for "It Plays in Peoria!"
- Draw down can be done: target area with less impact to commercial, etc. users to show value to habitat improvement
- River community identity
- Strong local partnerships
- Visually appealing

Weaknesses

- Shallow water depth
- Tight budget (public) more likely to shrink than grow
- City of Peoria: New resident trail dev. 143 apartment units in Peoria's Riverfront Park & road bisecting park contributes to water runoff - speed of H2O. Counterproductive and development of park in floodplain is poor planning.
- Never a political or public will to have mandatory regulations with fines and enforcement to control erosion both ag, commercial, urban, etc. Why aren't stream bank set-backs, grassways, etc. enforced…
- Need modeling of 5, 10, 20 years --> if no changes --> where is river's edge? To show public of problems & to plan interventions
- Limited, declining public agency budgets
- Stranded infrastructure as lakes fill with sediment

Opportunities

- When Peoria Lock must be replaced, do so to make water management & drawdown easier
- Wetland & floodplain restoration
- Draw Downs!
- Boating
- Bird Watching
- Sedimentation Retention Ponds
- Rain Gardens
- City of Peoria green infrastructure program
- Building consensus with shoreline property owners/business owners
- "Peoria Lakes Emiquone" for Birdwatchers, Education, & Canoes
- Draw down can be done & should be planned
- Wetland, floodplain restoration
- Drawdowns to increase volume, compact sediment, re-establish plants

- Erosion control/Best management practices
- Storm water tax
- Carp processing facilities
- Must increase water flow (speed) - - once water passes the narrows, it spreads out & slows down increasing the rate of deposits in the lower lake.
- Public Interest
- Retention basin
- Someone should work with Ameren to plant prairie in their rights-of-way instead of letting invasive species like autumn olive or bush honeysuckle grow that has little soil retention properties.

Threats

- Carp
- Sprawl
- Ravines in East Peoria causing not only mosquitos loss of old grow trees, and losing sides of the ravines is causing loss of land, trees and potently homes also -- S. Hageman (694-7013)
- Impervious surfaces contributing to increase storm water runoff!
- Inputs (sediment, pollutants) from outside project area
- Greater precipitation & flow increasing flood frequency
- More frequent large storm events
- City of Peoria Riverfront Development (Please see weaknesses)
- Political Involvement
- Climate change --> more sever rains; faster run-off from urban sprawl
- More rain
- More flow
- More flooding
- Sediment in the system

Innovation Board Data

What do the Peoria Lakes mean to you?

- Beauty
- Chance to go boating
- They are the focal point of our region!
- They are the focal point of our region!
- Connection to nature
- The greatest gift God has provided us in Central IL
- Vital
- Commerce
- Recreation
- Beauty

What is your favorite memory involving the Peoria Lakes?

- River clean up event
- 4th of July
- 4th of July
- Getting stuck! Boat ran out of gas!
- Peoria Fine Art fair in September
- Family History
- Cruise on Spirit of Peoria
- Cruise on Spirit of Peoria
- Cruise on Spirit of Peoria
- Swimming totally across the IL River at the IVY Club and 4 other places!!

Appendix F: Stakeholder Engagement Form (Copy of Questions)

Stakeholder Engagement Form: Peoria Lakes Comprehensive Planning Process

You have been identified as a potential stakeholder for the Peoria Lakes Comprehensive Conservation Plan based on your expertise and/or connection to your affiliated organization. Thank you for participating in this survey, which should take about 10 minutes to complete. Please refer to the email and partakeinpeorialakes.org for more information.

* Required

Concerns/Issues

Last month, the public could take a survey that documented their perception, concerns, and usage of the Peoria Lakes. In that survey (http://bit.ly/2uBMB83), most participants felt that Asian Carp, water quality/health, loss of depth, sedimentation, and decline of habitat are a problem in the Peoria Lakes.

. **1) Please rank the list from 1-5, 1 being the biggest problem from your perspective.**

Which do you feel is MOST pressing?

Mark only one oval.

- ◯ Asian Carp
- ◯ Water quality/health
- ◯ Loss of depth
- ◯ Sedimentation
- ◯ Decline of habitat

2nd most pressing
Mark only one oval.

- Asian Carp
- Water quality/health
- Loss of depth
- Sedimentation
- Decline of habitat

3rd
Mark only one oval.

- Asian Carp
- Water quality/health
- Loss of depth
- Sedimentation
- Decline of habitat

4th
Mark only one oval.

- Asian Carp
- Water quality/health
- Loss of depth
- Sedimentation
- Decline of habitat

5th
Mark only one oval.

- Asian Carp
- Water quality/health
- Loss of depth
- Sedimentation
- Decline of habitat

2) Are there any additional problems you feel should be included in this list? Put an asterisk* next to problem(s) you feel are MORE important than those listed above.

2A) From your perspective, what are the causes of these additional problems?

2B) From your perspective, what are possible solutions to these additional problems?

3) Of the five problems identified in question 1, three are related to the health of Peoria Lakes: declining water quality, declining habitat, and invasive species (e.g. Asian Carp). From your perspective, what factors lead to the declining health of Peoria Lakes? Put an asterisk* next to the contributing factor you are most concerned about.

4) Of the five problems identified in question 1, two are related to the water depth of Peoria Lakes: loss of depth and sedimentation. From your perspective, what factors lead to the declining water depth in Peoria Lakes? Put an asterisk* next to the contributing factor you are most concerned about.

5) Has the declined state of ecological health in Peoria Lakes had a negative effect on you, your organization, or your business? If so, please elaborate.

Potential Projects: Current and Past

6) Which restoration or conservation efforts are you familiar with on the Illinois Waterway?

Potential Projects: Future

This Comprehensive Conservation Plan will lay out potential projects that could alleviate the environmental problems with the Peoria Lakes.

In Question 7 and 7A, we're asking you to rank 11 potential projects from highest to lowest importance, from your perspective. Choose the first five in drop-down menus and list the remaining six in a short answer format.

7) Please rank the following list of potential projects, from most to least important, From your perspective (which would be most helpful for the Lakes' health in the future).

Mark only one oval.

- ◯ Backwater restoration
- ◯ Creation of deepwater areas
- ◯ Creation of vegetated marsh areas
- ◯ Drawdowns
- ◯ Dredging and sediment placement
- ◯ Floodplain recapture
- ◯ Hydrology and hydraulics study
- ◯ Island development
- ◯ Sediment detention basins
- ◯ Secondary channel
- ◯ Wetlands protection

. **2nd most important**

Mark only one oval.

- ◯ Backwater restoration
- ◯ Creation of deepwater areas
- ◯ Creation of vegetated marsh areas
- ◯ Drawdowns
- ◯ Dredging and sediment placement
- ◯ Floodplain recapture
- ◯ Hydrology and hydraulics study
- ◯ Island development
- ◯ Sediment detention basins
- ◯ Secondary channel
- ◯ Wetlands protection

. **3rd**

Mark only one oval.

- ◯ Backwater restoration
- ◯ Creation of deepwater areas
- ◯ Creation of vegetated marsh areas
- ◯ Drawdowns
- ◯ Dredging and sediment placement
- ◯ Floodplain recapture
- ◯ Hydrology and hydraulics study
- ◯ Island development
- ◯ Sediment detention basins
- ◯ Secondary channel
- ◯ Wetlands protection

4th

Mark only one oval.

- ◯ Backwater restoration
- ◯ Creation of deepwater areas
- ◯ Creation of vegetated marsh areas
- ◯ Drawdowns
- ◯ Dredging and sediment placement
- ◯ Floodplain recapture
- ◯ Hydrology and hydraulics study
- ◯ Island development
- ◯ Sediment detention basins
- ◯ Secondary channel
- ◯ Wetlands protection

5th

Mark only one oval.

- ◯ Backwater restoration
- ◯ Creation of deepwater areas
- ◯ Creation of vegetated marsh areas
- ◯ Drawdowns
- ◯ Dredging and sediment placement
- ◯ Floodplain recapture
- ◯ Hydrology and hydraulics study
- ◯ Island development
- ◯ Sediment detention basins
- ◯ Secondary channel
- ◯ Wetlands protection

7A) Please rank the remaining projects from 6th to 11th importance.

Here is a list of all 11 potential projects: Backwater restoration; Creation of deep water areas; Creation of vegetated marsh areas; Drawdowns; Dredging and sediment placement; Floodplain recapture; Hydrology and hydraulics study; Island development; Sediment detention basins; Secondary channel; and Wetlands protection.

8) Are there any additional potential projects you feel should be included in this list? Put an asterisk* next to a potential project(s) you feel are MORE important than those listed above.

9) What are some future project ideas for the areas bordering the Lakes?

Future Vision

Imagine you are looking at the Lakes far into the future. What do you visualize?

10) What is your future vision for the Peoria Lakes? Use your senses (look, feel, smell) to describe what the Lakes are like in the future.

11) Describe major changes you foresee both in the lakes and involving the surrounding land use.

Future Participation

We would love to keep you in the loop! If you are interested in staying up to date on this process, please indicate here.

12) Do you have additional comments to share?

13) Would you like to receive future emails regarding the Peoria Lakes planning process? *

Mark only one oval.

- Yes
- No

14) Would you be willing to participate in future meetings regarding the Peoria Lakes? *

Mark only one oval.

- Yes
- No

Contact Information

Let us know who you are and if you are a representative of a certain organization, business, or government agency. If you represent yourself, list "myself."

Name

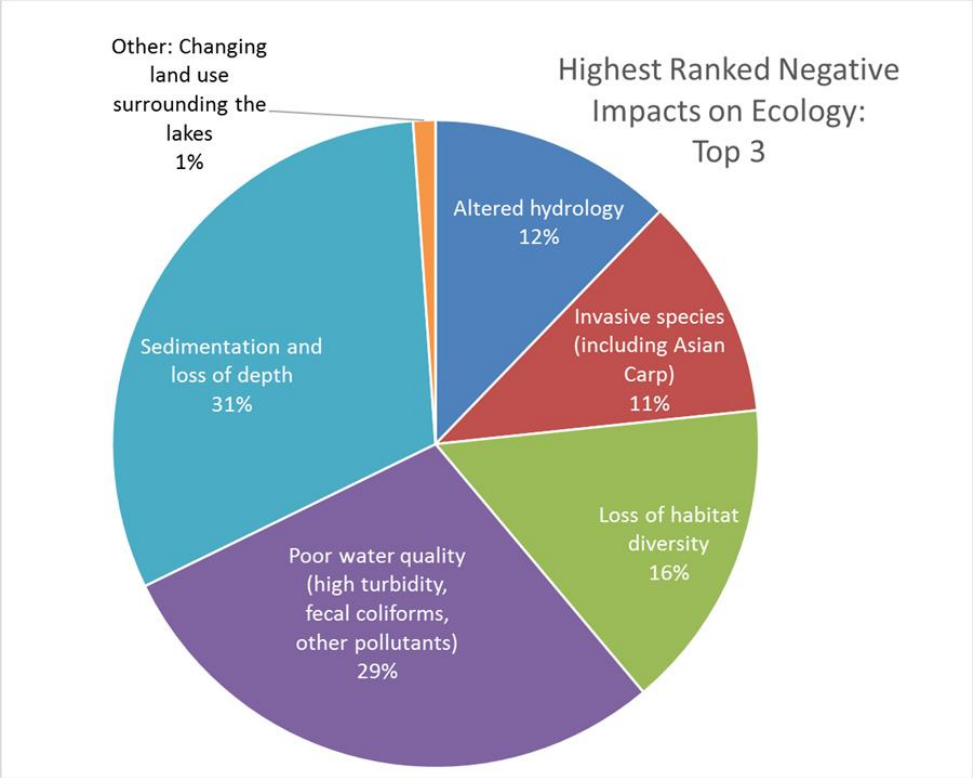
Organization/business you represent *

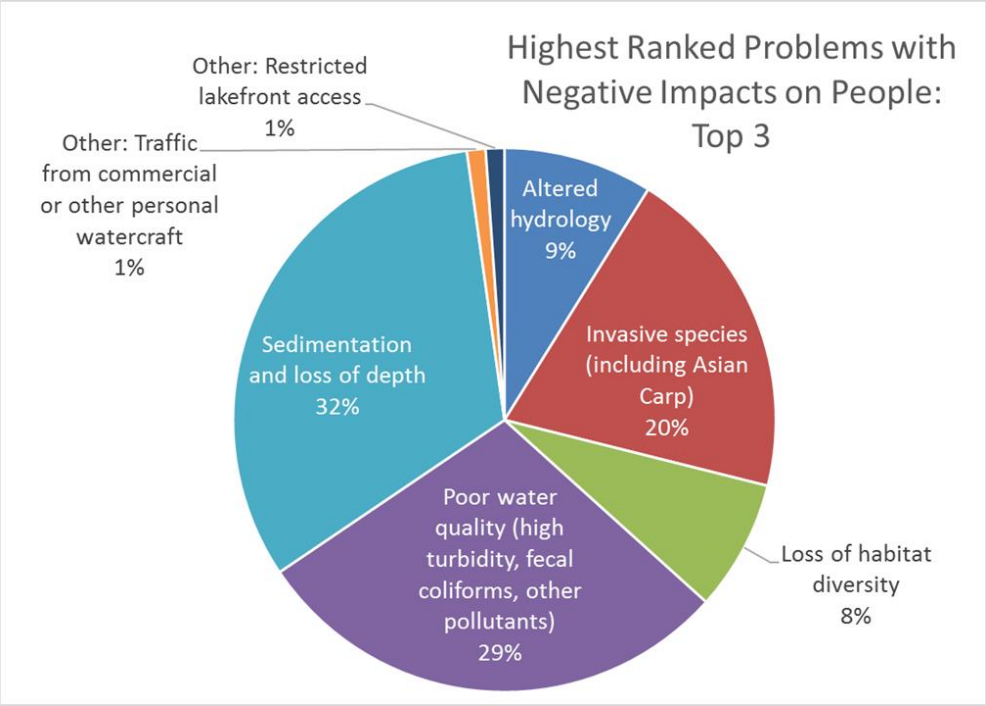
Email

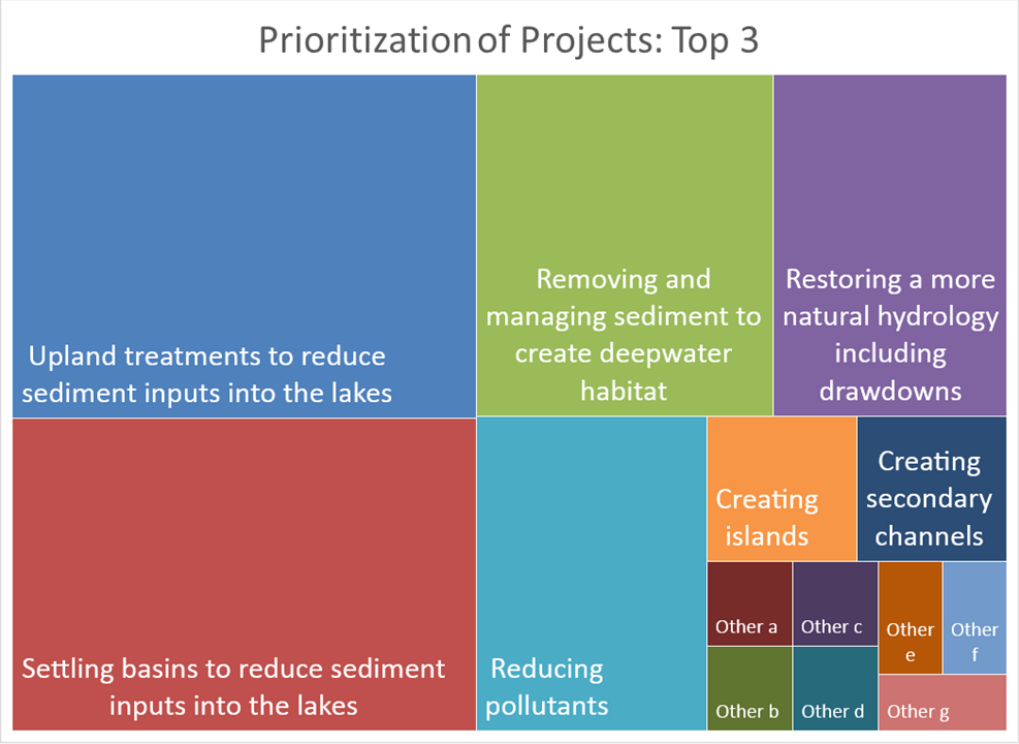
Phone

Appendix G: Stakeholder Engagement Form (Results)

Disclaimer about how to accurately read these graphs:
For the first three questions, the responses are not simply a representation of the number of people who selected each answer. Since staff pooled the responses for the top three ranked spots, these pie graphs show the **frequency** that each answer was selected — so do not read them as "29% of people ranked sedimentation as the top problem"; read them as "sedimentation was most frequently ranked as the top problem."



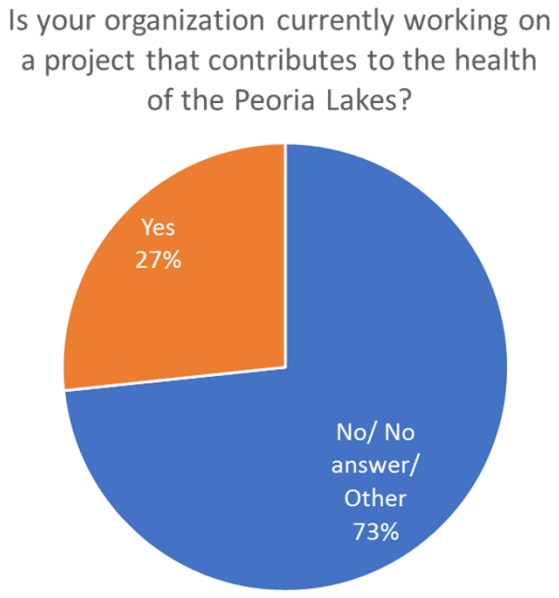

Highest Ranked Problems with Negative Impacts on People: Top 3
Other: Restricted lakefront access 1%
Other: Traffic from commercial or other personal watercraft 1%
Altered hydrology 9%
Invasive species (including Asian Carp) 20%
Loss of habitat diversity 8%
Poor water quality (high turbidity, fecal coliforms, other pollutants) 29%
Sedimentation and loss of depth 32%

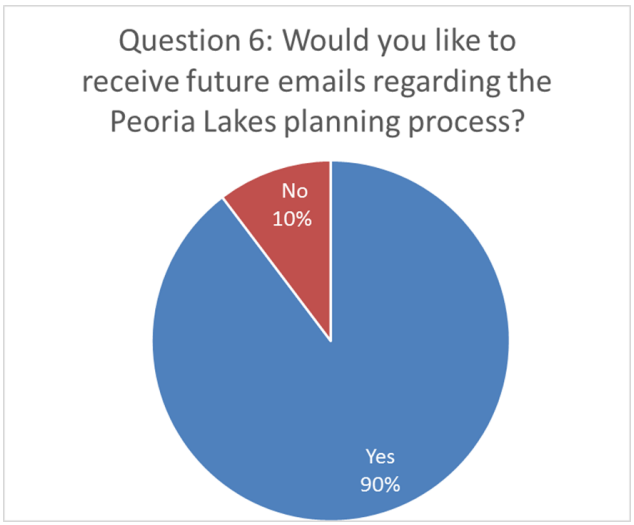

Prioritization of Projects: Top 3
Upland treatments to reduce sediment inputs into the lakes
Removing and managing sediment to create deepwater habitat
Restoring a more natural hydrology including drawdowns
Settling basins to reduce sediment inputs into the lakes
Reducing pollutants
Creating islands
Creating secondary channels
Other a
Other c
Other e
Other f
Other b
Other d
Other g

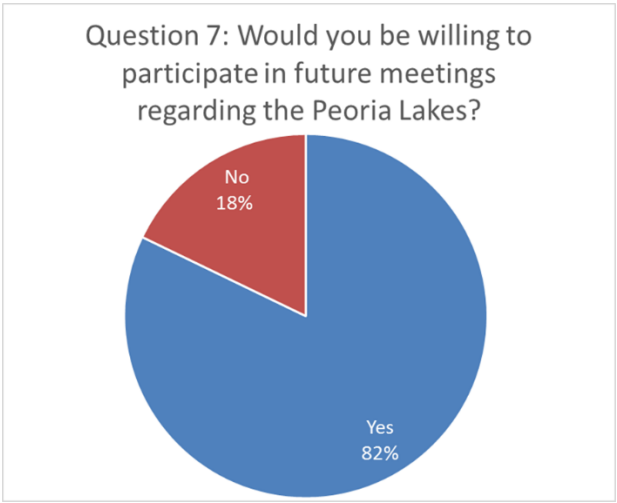
Q3: Prioritization of Projects

1.	Upland treatments to reduce sediment inputs into the lakes	24%
2.	Settling basins to reduce sediment inputs into the lakes	22%
3.	Removing and managing sediment to create deepwater habitat	16%
4.	Restoring a more natural hydrology including drawdowns	12%
5.	Reducing pollutants	11%
6.	Creating islands	3%
7.	Creating secondary channels	3%
8.	Create a marketable product(s) from our sediment	1%
9.	Bluff erosion control	1%
10.	Restoration of manageable PEM and PFO habitat	1%
11.	Determine an economic method to transport our sedimentation to areas in great need (i.e. New Orleans)	1%
12.	There are many different pollutants and one solution will not fit all	1%
13.	Promoting rain gardens to reduce runoff	1%
14.	Restoration of manageable SAV habitat	1%

Others: Write-in







Q8: Organization List

- Illinois State Water Survey
- Heartland Water Resources Council
- Bradley University
- Peoria County Farm Bureau
- Heart of Illinois Sierra Club
- Illinois State Water Survey
- The Nature Conservancy
- USDA-NRCS
- Illinois State Water Survey
- The Nature Conservancy
- Caterpillar
- PLBA/TCRPC/HWRC/Tazewell County
- Tri-County Regional Planning Commission
- Ducks Unlimited, Inc.
- City of East Peoria
- Peoria Magazines
- Illinois Nature Preserves Commission
- Greater Peoria Sanitary District

Appendix H: Second Public Open House Public Input

General Comments

1. Glad to see the efforts on Peoria Lakes. However please do not forget Pekin Lake. There were 2 district projects north and south. Please resurrect that project. – Denny Kief

2. Please include a commitment to keep the riverfront free of development and open to public. Park amenities are fine but no private buildings or apartments! Protect these lands for public open space.

3. What will be the plan impact for flooding, specially of residences near Rome, Spring Bay, East Peoria and levees around Peoria and East Peoria. (compared to last 100 years) Any purchases planned to remove residences for the Flood Plain? – John Coker

4. Since farm waters runoff is so heavily chemical laden, and since they use the tax systems t pay for farm tile systems, why not require runoff to be captured and re—used on the same farmland it ran off?!

5. If there's riverfront development, tax-special service area? - to help sustain water front river habitats that might have been negatively affected by developments, no matter how "green" a building is.

6. Concerns- Peoria Lakes and IL River (1) Need mandatory federal guidelines on farm soil erosion: voluntary compliances have helped BUT problems not solved. Mandatory Best Practices or farmers are fined/ federal payments reduced. (2) Erosion control for cities and other residential areas. Mandatory: end CSO. (3) Address NPDES weaknesses that allow excess silt and other sediment being added: try to get zero silt articulate in discharges. (4) Essential to protect riverfronts for public use: parks, greenspace- things that hold rain water like Peoria's Riverfront Park that city plans to sell for private development. Where is concern for saving this? –Joyce Blumenshine Heart of Sierra Club

7. Great keep it up. Progress! – Russ

Prioritization Station Results

Peoria Lakes Comprehensive Conservation Plan Prioritization Station	
Measures	**Environmental Impact**
Prairie & Bluff Restoration & Management	12
Floodplain Recapture	11
Agricultural Water BMPs	10
Tributary Stream Stabilization	8
Beneficial Use of Sediment	7
Erosion Control BMPs	7
Urban Stormwater Modification BMPs	6
Backwater Restoration	5
Sediment Dention Basins	5
Invasive Fish Species	4
Conservation & Recreation Corridor Anchors	3
Drawdowns	3
Submersed Aquatic Vegetation	3
Education Component	2
Nutrient Farming (Water Utility)	2
Deepwater Area Creation, Dredging, and Sediment Placement	1
Island Creation	0
Secondary Channel	0

Peoria Lakes Comprehensive Conservation Plan Prioritization Station	
Measures	**Quality of Life**
Conservation & Recreation Corridor Anchors	22
Urban Stormwater Modification BMPs	10
Invasive Fish Species	9
Prairie & Bluff Restoration & Management	9
Education Component	8
Backwater Restoration	7
Deepwater Area Creation, Dredging, and Sediment Placement	7
Floodplain Recapture	6
Drawdowns	3
Island Creation	3
Erosion Control BMPs	3
Tributary Stream Stabilization	2
Secondary Channel	1
Nutrient Farming (Water Utility)	1
Sediment Dention Basins	0
Agricultural Water BMPs	0
Beneficial Use of Sediment	0
Submersed Aquatic Vegetation	0

Peoria Lakes Comprehensive Conservation Plan Prioritization Station	
Measures	**Feasibility/Sustainability**
Beneficial Use of Sediment	18
Deepwater Area Creation, Dredging, and Sediment Placement	9
Nutrient Farming (Water Utility)	9
Floodplain Recapture	7
Backwater Restoration	5
Agricultural Water BMPs	5
Submersed Aquatic Vegetation	5
Prairie & Bluff Restoration & Management	5
Urban Stormwater Modification BMPs	4
Conservation & Recreation Corridor Anchors	4
Tributary Stream Stabilization	4
Drawdowns	3
Sediment Dention Basins	3
Education Component	3
Island Creation	2
Secondary Channel	1
Erosion Control BMPs	1
Invasive Fish Species	0

Peoria Lakes Comprehensive Conservation Plan Prioritization Station				
Measures	**Environmental Impact**	**Quality of Life**	**Feasibility/Sustainability**	**Total**
Conservation & Recreation Corridor Anchors	3	22	4	**29**
Prairie & Bluff Restoration & Management	12	9	5	**26**
Beneficial Use of Sediment	7	0	18	**25**
Floodplain Recapture	11	6	7	**24**
Urban Stormwater Modification BMPs	6	10	4	**20**
Backwater Restoration	5	7	5	**17**
Deepwater Area Creation, Dredging, and Sediment Placement	1	7	9	**17**
Agricultural Water BMPs	10	0	5	**15**
Tributary Stream Stabilization	8	2	4	**14**
Education Component	2	8	3	**13**
Invasive Fish Species	4	9	0	**13**
Nutrient Farming (Water Utility)	2	1	9	**12**
Erosion Control BMPs	7	3	1	**11**
Drawdowns	3	3	3	**9**
Sediment Dention Basins	5	0	3	**8**
Submersed Aquatic Vegetation	3	0	5	**8**
Island Creation	0	3	2	**5**
Secondary Channel	0	1	1	**2**

Appendix I: Fact Sheet Screening Criteria

Please read the below questions "**In your opinion…**" Use the rating scale strongly disagree, disagree, neutral, agree, and strongly agree to rate each question. To further explain your rating, please elaborate under "*How so?*". If you are unsure on a topic, please select "*Neutral*" and clarify this under "*How so?*".

1. Does the project element address the following issues?
    a. Altered hydrology
        ☐ Strongly disagree
        ☐ Disagree
        ☐ Neutral
        ☐ Agree
        ☐ Strongly agree

        How so?

        _____

        _____

    b. Invasive species
        ☐ Strongly disagree
        ☐ Disagree
        ☐ Neutral
        ☐ Agree
        ☐ Strongly agree

        How so?

        _____

        _____

c. Loss of habitat diversity

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

How so?

_____

_____

_____

d. River use/navigation (including quality of life)

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

How so?

_____

_____

_____

e. Sediment

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

How so?

_____

_____

_____

f. Water quality

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

How so?

_____

_____

_____

g. Other (please specify):

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

How so?

_____

_____

_____

2. The project element's maintenance would be reasonable given the resulting environmental benefits.

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

How so?

_____

_____

_____

3. The project element has high public support potential.

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

How so?

_____

_____

_____

4. The project element has high government support potential.

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

How so?

_____

_____

_____

5. The project element has high scientific/professional support potential.

   ☐ Strongly disagree

   ☐ Disagree

   ☐ Neutral

   ☐ Agree

   ☐ Strongly agree

   How so?

   _____

   _____

   _____

6. Where do you see this project element being located? (Please select all that apply)

   ☐ Entire Peoria Lakes

   ☐ Upper Peoria Lake

   ☐ Narrows

   ☐ Lower Peoria Lake

   ☐ Floodplain

   ☐ Adjacent Watershed

   How so?

   _____

   _____

   _____

Appendix J: Graded Fact Sheets Results

Peoria Lakes Comprehensive Conservation Plan - Fact Sheet Benefit Matrix

		1							2	3	4	5	6					
Fact Sheet \ Benefits		Altered Hydrology	Invasive Species	Loss of habitat diversity	River use / navigation	Sediment	Water quality	Other	Reasonable Maintenance	Public Support	Government Support	Scientific Support	Entire Peoria Lakes	Upper Peoria Lake	Narrows	Lower Peoria Lake	Floodplain	Adjacent Watershed
Fact Sheet 1	Backwater Restoriation	4.13	2.50	4.25	4.00	4.38	4.13	######	3.50	3.88	3.75	4.38	2	6	3	3	3	1
Fact Sheet 2	Deepwater Area Creation	4.25	2.75	4.38	4.38	4.13	3.75	######	3.38	4.00	4.00	4.38	5	3	1	5	1	0
Fact Sheet 3	Drawdowns	4.50	3.25	4.25	3.75	4.13	4.25	######	3.38	3.75	3.75	4.25	5	4	2	4	3	0
Fact Sheet 4	Dredging and Sediment Placement	4.13	3.00	4.25	4.25	4.50	3.88	######	3.50	3.88	4.00	4.38	6	3	1	5	3	3
Fact Sheet 5	Floodplain Recapture	4.00	2.63	4.38	3.63	3.50	4.00	######	3.75	3.50	3.38	4.00	3	3	0	1	4	1
Fact Sheet 6	Invasive Species-Asian Carp	2.88	4.38	3.00	3.88	2.50	2.88	######	3.38	4.25	3.88	3.88	7	3	3	3	1	1
Fact Sheet 7	Island Creation	4.50	2.88	4.38	4.00	4.50	3.50	######	3.50	3.75	3.88	4.38	5	4	0	5	1	0
Fact Sheet 8	Lower Lake Islands	4.13	2.88	4.38	3.88	4.38	3.75	1.00	3.13	3.13	3.29	3.88	0	1	0	8	0	0
Fact Sheet 9	Pool Level Drawdown	4.63	3.38	4.25	3.13	3.88	4.25	######	3.38	3.13	3.25	4.25	7	3	2	2	1	0
Fact Sheet 10	Prairie Restoration	3.00	3.25	4.25	3.25	4.25	4.13	######	3.75	4.00	4.00	4.13	2	1	0	0	3	6
Fact Sheet 11	Secondary Channel	3.88	3.13	4.25	4.38	4.25	3.63	######	3.75	4.00	3.88	4.25	4	4	0	2	1	0
Fact Sheet 12	Sediment Detention Basins	3.00	2.50	3.63	3.63	4.50	4.13	######	3.50	4.13	3.88	4.00	4	3	2	3	4	4
Fact Sheet 13	Submersed Aquatic Vegetation (Breakwaters)	3.38	2.50	4.38	3.38	3.75	4.38	######	3.63	3.75	3.75	4.25	4	5	1	2	1	0
Fact Sheet 14	Chevrons	3.75	2.63	3.75	3.38	4.13	3.63	######	3.88	3.50	3.75	3.88	5	5	1	3	1	0
Fact Sheet 15	Tributary Stream Stabilization	3.13	2.50	3.50	3.75	4.50	3.88	######	4.00	3.88	4.00	4.00	4	0	0	0	1	5
Fact Sheet 16	Bluff Area Woodland Management	2.88	3.25	3.38	2.63	4.38	3.88	######	3.75	3.88	4.00	4.13	2	0	0	0	0	6
Fact Sheet 17	River Bluff / Steep Slope Stormwater Management	2.25	2.25	2.75	2.88	4.00	3.75	######	3.25	3.63	3.63	3.50	1	0	0	0	0	6
Fact Sheet 18	Ravine and Gully Stabilization	3.13	2.38	3.13	2.75	4.13	4.00	######	3.75	3.75	3.50	3.88	2	0	0	0	0	6
Fact Sheet 19	Urban Stormwater Hydrologic Modification BMP	3.38	2.50	3.50	3.38	4.50	4.13	######	3.63	3.50	3.88	3.88	2	0	0	0	1	7
Fact Sheet 20	Farm Creek Flood Control Sediment Retention	3.25	2.75	3.25	3.75	4.38	4.14	######	3.63	3.38	3.38	4.00	0	0	0	4	2	3
Fact Sheet 21	Hydrogeomorphic Study	4.00	3.00	4.13	4.13	4.13	4.13	######	3.29	3.63	3.88	4.38	8	1	1	1	3	2
Fact Sheet 22	Agricultural Water Best Management Practices	3.50	2.63	3.63	3.50	4.38	4.25	######	3.88	3.88	3.88	3.88	3	0	0	0	3	6
Fact Sheet 23	Invasive Fish Species	3.00	4.50	3.63	4.00	2.38	3.13	######	3.25	4.13	3.63	3.75	8	1	1	1	2	1
Fact Sheet 24	Educational Component	3.63	3.50	3.63	3.63	3.88	3.50	######	3.88	4.13	3.88	3.63	8	1	1	1	2	3
Fact Sheet 25	Rain Barrels	3.38	2.38	3.13	3.25	3.50	3.63	######	4.00	4.00	3.75	3.63	4	0	0	0	1	6
Fact Sheet 26	Rain Gardens	3.38	2.38	3.13	3.25	4.13	3.75	######	3.75	3.88	3.75	3.63	4	0	0	0	1	6
Fact Sheet 27	Water Quality BMPs	3.43	2.57	3.43	3.14	4.00	4.00	######	3.71	3.71	4.00	3.71	3	0	0	0	1	6
Fact Sheet 28	Nutrient Farming, Backwater Restoration & Floodplain Recapture	3.50	2.88	4.00	3.88	4.25	3.88	######	3.75	3.63	3.63	4.00	5	5	1	1	7	3
Fact Sheet 29	Lower Lake Deepwater Creation	3.38	3.13	4.00	4.50	4.25	3.75	######	3.50	4.00	3.75	3.75	0	1	1	8	0	0
Fact Sheet 30	Secondary Channels & Lakefront Sediment Placement & Conservation / Recreation Corridors Establishment	3.63	3.00	4.13	4.38	4.00	3.63	######	3.75	3.88	3.50	3.75	3	1	1	4	1	0
Fact Sheet 31	Navigation Channel Dredging & Barrier Island Construction	3.50	2.75	3.63	4.38	4.00	3.38	######	3.38	3.50	3.38	3.75	4	5	1	4	0	0
Fact Sheet 32	Eastside Marinas / Docks & Deepwater Dredging	3.63	3.00	4.00	4.38	4.00	3.88	######	3.13	3.50	3.25	3.50	2	2	1	4	0	0
Fact Sheet 33	Westside Marinas / Docks & Deepwater Dredging	3.63	3.00	4.00	4.38	4.00	3.75	######	3.25	3.50	3.25	3.63	2	3	1	4	0	0
Fact Sheet 34	Mud to Jobs	3.63	3.00	3.63	4.00	3.88	3.88	######	3.25	3.50	3.38	3.50	3	4	1	4	1	1
Fact Sheet 35	Conservation / Recreation Corridor Anchors	3.38	3.00	3.50	3.88	3.63	3.63	5.00	3.38	3.75	3.25	3.25	4	3	2	3	3	2
Fact Sheet 36	Rivertowns USA	3.38	2.75	3.38	3.88	3.50	3.63	5.00	3.50	3.75	3.25	3.25	5	2	1	2	3	2

Appendix K: PRC Prioritization Results

Peoria Lakes Comprehensive Conservation Plan Prioritization Station	
Measures	**Environmental Impact**
Deepwater Area Creation, Dredging & Sediment Placement	9
Drawdowns	6
Sediment Detention Basins	5
Submersed Aquatic Vegetation	5
Tributary Stream Stabilization	4
Nutrient Farming	3
Secondary Channel	3
Agricultural Water BMPs	2
Beneficial Use of Sediment	2
Floodplain Recapture	2
Invasive Fish Species	2
Island Creation	2
Urban Stormwater Hydrologic Modification BMPs	2
Erosion Control BMPs	1
Backwater Restoration	0
Conservation & Recreation Corridor Anchors	0
Education Component	0
Prairie & Bluff Restoration & Management	0

Peoria Lakes Comprehensive Conservation Plan Prioritization Station	
Measures	**Quality of Life**
Conservation & Recreation Corridor Anchors	8
Secondary Channel	8
Beneficial Use of Sediment	6
Sediment Detention Basins	5
Prairie & Bluff Restoration & Management	4
Education Component	3
Invasive Fish Species	3
Deepwater Area Creation, Dredging & Sediment Placement	2
Island Creation	2
Drawdowns	1
Floodplain Recapture	1
Submersed Aquatic Vegetation	1
Tributary Stream Stabilization	1
Urban Stormwater Hydrologic Modification BMPs	1
Agricultural Water BMPs	0
Backwater Restoration	0
Erosion Control BMPs	0
Nutrient Farming	0

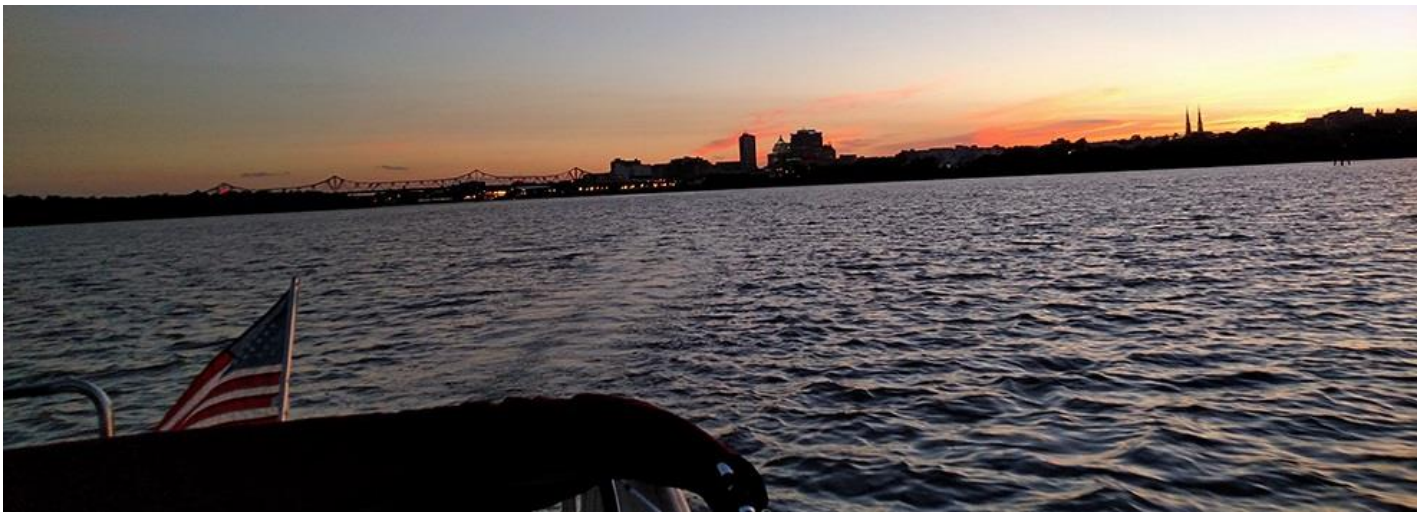
Peoria Lakes Comprehensive Conservation Plan Prioritization Station	
Measures	**Feasibility/Sustainability**
Beneficial Use of Sediment	9
Agricultural Water BMPs	6
Erosion Control BMPs	6
Sediment Detention Basins	5
Deepwater Area Creation, Dredging & Sediment Placement	3
Backwater Restoration	2
Education Component	2
Nutrient Farming	2
Tributary Stream Stabilization	2
Urban Stormwater Hydrologic Modification BMPs	2
Invasive Fish Species	1
Island Creation	1
Prairie & Bluff Restoration & Management	1
Secondary Channel	1
Conservation & Recreation Corridor Anchors	0
Drawdowns	0
Floodplain Recapture	0
Submersed Aquatic Vegetation	0

Peoria Lakes Comprehensive Conservation Plan Prioritization Station				
Measures	**Environmental Impact**	**Quality of Life**	**Feasibility/Sustainability**	**Total**
Beneficial Use of Sediment	2	6	9	**17**
Sediment Detention Basins	5	5	5	**15**
Deepwater Area Creation, Dredging & Sediment Placement	9	2	3	**14**
Secondary Channel	3	8	1	**12**
Agricultural Water BMPs	2	0	6	**8**
Conservation & Recreation Corridor Anchors	0	8	0	**8**
Drawdowns	6	1	0	**7**
Erosion Control BMPs	1	0	6	**7**
Tributary Stream Stabilization	4	1	2	**7**
Invasive Fish Species	2	3	1	**6**
Submersed Aquatic Vegetation	5	1	0	**6**
Education Component	0	3	2	**5**
Island Creation	2	2	1	**5**
Nutrient Farming	3	0	2	**5**
Prairie & Bluff Restoration & Management	0	4	1	**5**
Urban Stormwater Hydrologic Modification BMPs	2	1	2	**5**
Floodplain Recapture	2	1	0	**3**
Backwater Restoration	0	0	2	**2**

Appendix L: Newsletter

Peoria Lakes Comprehensive Conservation Plan

Planning for Regional Consensus to Conserve the Peoria Lakes



The Peoria Lakes are Greater Peoria's most precious natural resource, and they are a significant landmark in a glacial landscape that defined the region for thousands of years. The natural riverine Lakes, which refer to the widened portion of the Illinois River in the Tri-County area, were formed by tributary deltas that narrow the valley and pinch the river to form two shallow basins. The natural beauty of the 16,000-acre Lakes and its bluffs continue to attract people to Greater Peoria, just as they have for centuries.

Historically, Peoria Lakes were remarkably productive, which attracted Native Americans and European settlers who benefited from abundant, river-derived resources, such as fish and wildlife, pristine water, and expansive wetlands. However, as increasing urban development, conversion of prairie lands to agricultural fields, and industrialization occurred over time, water quality declined, habitat was lost and degraded, and sedimentation has steadily filled in the lakes. Today, most areas of the Peoria Lakes are less than three feet deep.

The Peoria Lakes Basin Alliance (PLBA), comprised of The Nature Conservancy, Heartland Water Resources Council, and the Tri-County Regional Planning Commission (TCRPC), led an effort to develop a Comprehensive Conservation Plan in conjunction with the U.S. Army Corps of Engineers (USACE). On behalf of the PLBA, TCRPC applied for and received funding from the USACE Planning Assistance to States (PAS) Program, which is authorized under the provision of Section 22 of the Water Resources Development Act of 1974, as amended.

The goal of the planning process, whose geographical scope spans from blufftop to blufftop, is to reach a regional consensus on future Peoria Lakes conservation strategies. Concurrently, the collaborative also gathered regional support to take needed action on conservation efforts. In the long run, the Greater Peoria area will be well-positioned to move forward to conserve its iconic Lakes. The planning process is expected to be completed this year.

To help further guide the process, the planning team developed a set of objectives (in no particular order):

Objective 1: Reduce total sediment delivery to the Peoria Lakes

Objective 2: Increase the acreage of aquatic vegetation in the Peoria Lakes.

Objective 3: Improve Peoria Lakes water quality.

Objective 4: Improve and protect wetland acres, floodplain acres, and streambank miles in the Peoria Lakes.

Objective 5: Improve and protect river bluff and steep slope areas along Peoria Lakes.

Objective 6: Improve and diversify deep-water habitat and increasing number of native fishes in Peoria Lakes.

Objective 7: Improve the quality of life in the region.

Multiple advertising and outreach methods encouraged public participation and input. An open house, held in July 2017, informed the public about the planning process and invited input from attendees. A Project Review Committee (PRC) was established to allow stakeholder contribution, review public feedback, and ultimately prioritize the preferred measures (specific conservation steps to be considered for implementation). The PRC included stakeholders representing Peoria Lakes interest groups including: economic development organizations, environmental advocacy groups, government entities, landowners, recreation and tourism organizations, river transportation businesses, and subject matter experts.

The PRC and planning team created 36 fact sheets that detailed these potential conservation measures—13 from USACE and 23 from PRC members. In the review phase, many of the fact sheets were redundant, due to the variety of entities which had contributed. Therefore, the planning team consolidated them into 19 measures plus a separate "recommended studies" category. The full and consolidated lists of measures and recommended studies can be found on the project's website, PartakeInPeoriaLakes.org.

A second open house, convened in June 2018, updated the public on the project. In an interactive sticker exercise, attendees and PRC members had the opportunity to prioritize conservation measures based on three criteria: environmental impact, quality of life, and feasibility/sustainability. This activity determined both the public's and the PRC's preferred measures to prioritize in the plan. Fourteen measures appeared in the top three of each criteria or overall (see list below). Note that this process does not exclude the remaining four measures from this or any future plans.

Category	Measures
Sources	Agriculture Water BMPs*
	Erosion Control BMPs*
	Prairie & Bluff Restoration & Management
	Urban Stormwater BMPs*
Pathways	Conservation & Recreation Corridors
	Floodplain Recapture
	Nutrient Farming
	Sediment Detention Basins
Sinks	Beneficial Use of Sediment
	Deepwater Creation, Dredging, and Sediment Placement
	Drawdowns
	Invasive Fish Species
	Secondary Channel
	Submersed Aquatic Vegetation
*BMP = Best Management Practice	

The planning team then categorized the conservation measures by their corresponding Essential Ecosystem Characteristics (EECs): Hydrology, Geomorphology, Water Quality, Habitat, and Biota. Hydrology is often considered a "master variable" that drives geomorphology and water quality outcomes. These factors then feed into habitat characteristics that determine the biota at a site. Since the collaborators' range of interests were so broad, the team also added a "Social and Economic" category to classify the measures.

The next step was to outline the conservation alternatives, which are groupings of measures by geographical location. Based on watershed influences and in-lake characteristics, the team specified an alternative for

three reaches of the Peoria Lakes (Upper, Middle, and Lower) and one that included the entire area. Watershed characteristics differ among reaches with loosely defined urban, suburban, and rural characteristics affecting lower, middle and upper sections, respectively. The conservation alternatives can be found online.

Watershed relationships are also critical to the plan, so the team considered three watershed areas: sediment sources, pathways, and sinks. Each alternative encompassed all three, addressing the flow of sediment throughout the Peoria Lakes watershed. This way, the plan would address the reduction of sediment sources, the interception or stabilization of sediment pathways, and the removal of material from sediment sinks in the Lakes.

The planning team is currently working with the USACE to develop a recommended plan utilizing the prioritization results, EECs, project objectives, conservation measures, conservation alternatives, and watershed areas (sources, pathways, and sinks). The team hopes to continue the process with a feasibility study of the preferred conservation measures, either funded through PAS or alternative mechanisms. For more information and regular updates, please check the project website: PartakeInPeoriaLakes.org.

During the planning process, the project received a great deal of positive media attention:

- Peoria Public Radio's Cass Herrington covered the Peoria Lakes and the USACE PAS funding announcement.
- TCRPC's Eric Miller, Steve Van Winkle, and Russ Crawford sat down with H. Wayne Wilson on an episode of PBS's "At Issue" to discuss the Peoria Lakes planning process.
- WEEK Channel 25 News covered the first public open house.
- TCRPC's Ray Lees and Eric Miller discussed Peoria Lakes issues on Peoria Journal Star's "Tarter Source" podcast, #59, with Steve Tarter.
- TCRPC's Russ Crawford shared his memories of the Peoria Lakes and an update on the planning process with Cass Herrington of Peoria Public Radio.
- TCRPC Planner Reema Abi-Akar and former Communication Intern Mackenzie Clauss authored a Peoria Lakes article published in the October 2017 issue of InterBusiness Issues (iBi) magazine.
- Central Illinois Proud's "Bob and Tom's Excellent Adventure" aired a segment on the future of the Illinois River.
- Peoria Journal Star's Steve Tarter covered the second Peoria Lakes Open House.

Peoria Lakes Comprehensive Conservation Plan

Appendix M: Conservation Measures Fact Sheets

Backwater Restoration

DESCRIPTION: Backwater restoration is a holistic approach that has the potential to address many of the problems and concerns facing the Peoria Lakes.

PROBLEM IDENTIFICATION: Peoria Lakes are subject to high sediment delivery from its 10 direct tributaries. Consequences of increased sedimentation are widespread filling of quality backwater habitat. Simultaneous erosion of natural island features has increased wave action in the backwaters, stirring up sediments that increase turbidity and prevent light penetration necessary for plant growth. The loss of backwaters has resulted in:

- Widespread loss of backwater and secondary channel depth
- Loss of fish overwintering habitat
- Loss of feeding habitat for fish and other species
- Decreases in water quality and increases in turbidity
- Significant decreases in aquatic vegetation establishment

LOCATION: TBD

GOALS AND OBJECTIVES: Without intervention, the ecological health of Peoria Lakes will continue to degrade as productive backwaters are slowly converted to mudflats and shallow water habitat. Goals and objectives of backwater restoration are to:

- Increase the number and diversity of both aquatic and terrestrial species
- Identify areas where dredged material placement creates habitat transition zones
- Provide structure for aquatic/terrestrial organisms
- Reduce wind fetch and wave action to reduce sediment resuspension

During the planning phase, it is important to establish positive feedback loops that support the sustainability of project features. For example, submersed aquatic vegetation (SAV) provides structural cover for fish and invertebrates, and forage resources for waterfowl during fall/spring migrations. Once SAV is established, it promotes the settling of suspended material by reducing water velocity, and inhibits its resuspension by damping wave energy, resulting in improved water clarity which provides more favorable light and flow conditions for further SAV establishment.

BENEFITS: Benefits of backwater restoration in Peoria Lakes include:

- Enhanced depth diversity
- Improved water quality
- Creation of overwintering fish habitat
- Creation of feeding and nursing habitat for fish and other species
- Improved habitat value for migratory waterfowl and shorebirds
- Enhanced topographic diversity by using dredged material
- Improved aquatic habitat structure and function
- Improved nutrient cycling and water storage

COSTS: Average area of backwater habitat between tributary deltas: 530 acres

CONCERNS:

- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated with continued operations and maintenance of backwaters
- Real estate issues pertaining to the ability to access, construct, and maintain the trap may be challenging in more urbanized areas
- Special considerations to ensure there are no water quality impacts or impacts to species listed under the Endangered Species Act (i.e., freshwater mussels)

OPERATIONS AND MAINTENANCE: TBD

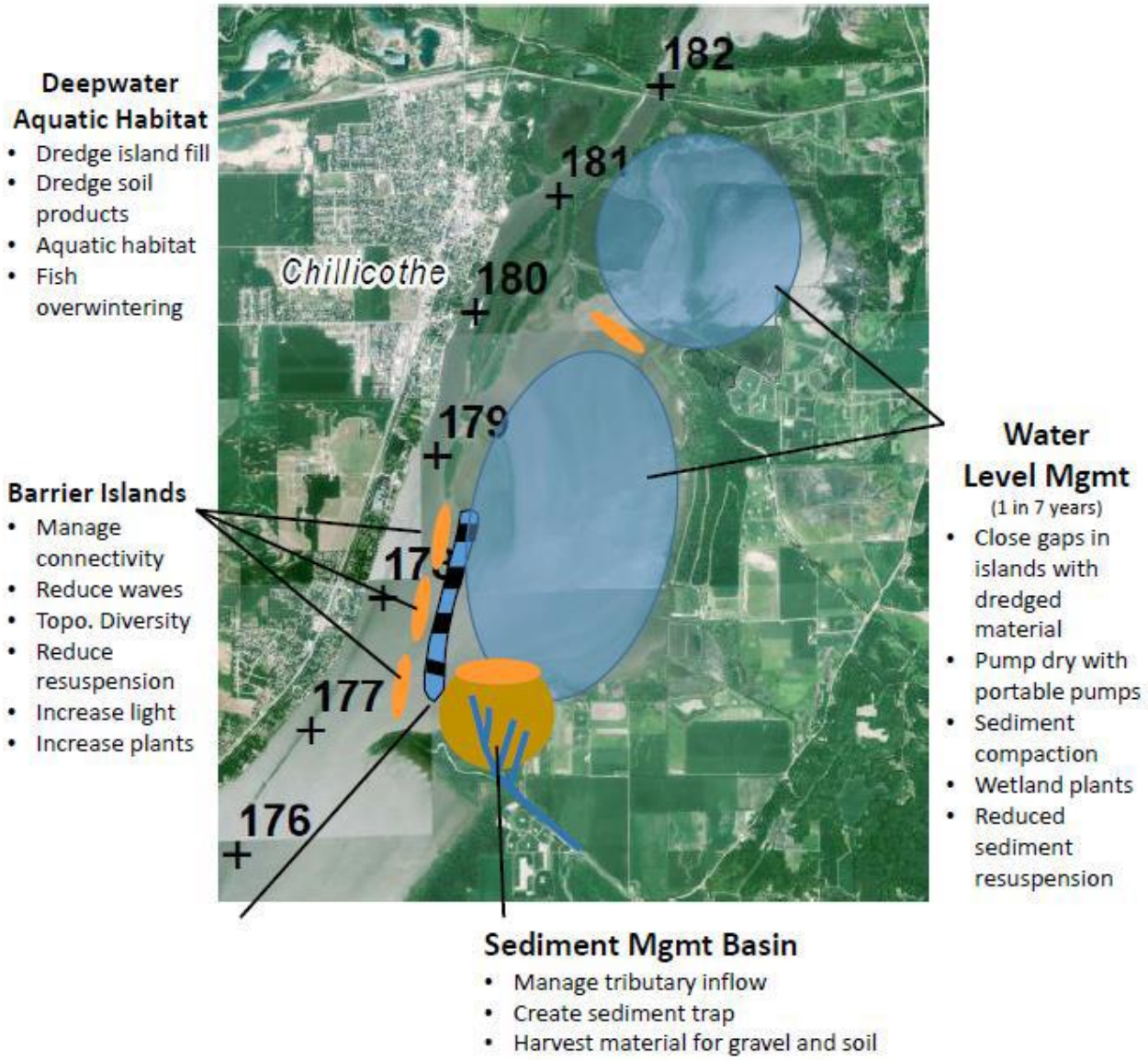


Figure 77: Potential Areas for Backwater Restoration in Upper Peoria Lake

Deepwater Area Creation

DESCRIPTION: Restoration and creation of backwater areas promotes habitat diversity and resilience and has the additional benefit of recreational opportunities depending on the method and extent of the deepwater area creation.

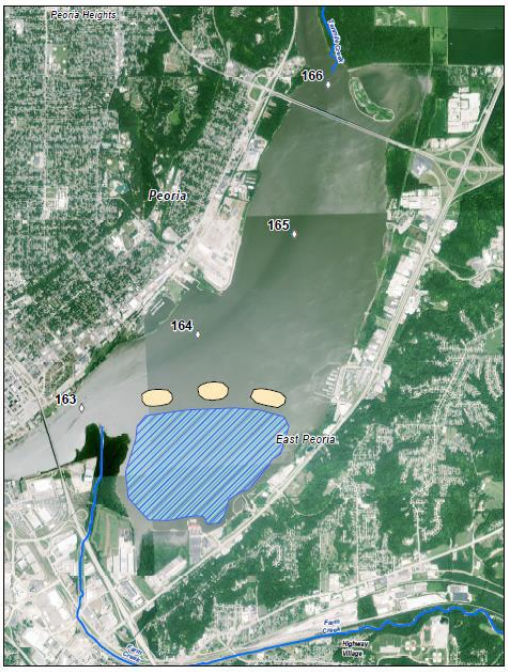


Figure 78: Lower Peoria Lake potential area for barrier island and Deepwater Habitat Creation

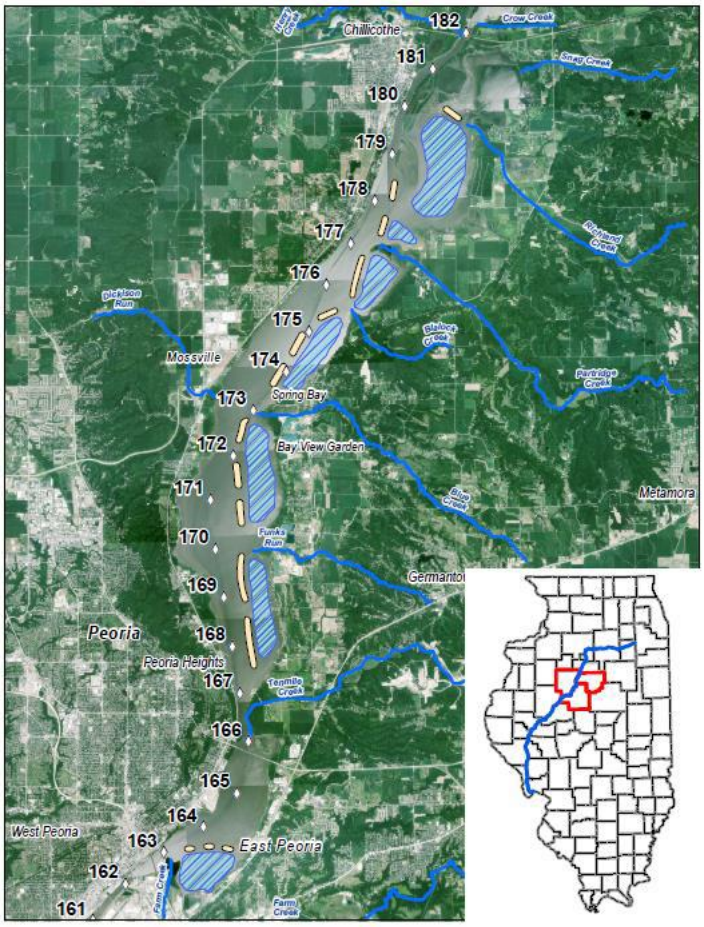


Figure 79: Potential Areas for Deepwater Habitat Creation

LOCATION: Lower Peoria Lake, although many areas of the study area present opportunities.

PROBLEM IDENTIFICATION: Peoria Lakes are subject to high sediment delivery from 10 direct tributaries. High erosion and surface water runoff is attributable both to the geology of the Peoria Lakes region and to land cover conversion to agriculture in tributary watersheds. Subsequent degradation of stream and riparian habitat adjacent to tributaries increased erosion and reduced the capacity of these buffers to trap sediment. These tributaries comprise 3% of the total drainage area of Peoria, but deliver 40% or more of the sediment deposited in the lakes. Water depths greater than five feet are currently found only in the navigation channel and this loss of backwater bathymetric diversity has resulted in:

- Widespread loss of backwater and secondary channel depth
- Loss of fish overwintering habitat
- Loss of feeding habitat for fish and other species

- Decreases in water quality and increases in turbidity
- Significant decreases in aquatic vegetation establishment

GOALS AND OBJECTIVES: Without intervention, the ecological health of Peoria Lakes will continue to degrade as productive backwaters are slowly converted to mudflats and shallow water habitat. Goals and objectives of creating deepwater areas are:

- Restore depth diversity and volume in Peoria Lakes
- Restore different habitat types to support viable populations of native species
- Create water quality conditions to support aquatic biota
- Increase longitudinal and lateral connectivity between different habitats

Measures to enhance and restore deepwater areas in Peoria Lakes may include widening the navigation channel, dredging secondary channels, dredging backwater areas, creating deep holes, and side casting material to create islands which further protect deepwater areas. Lower Peoria Lake may be one of the better areas to conduct a barrier island pilot study because it is a smaller area close to population centers that will benefit from improvements. The juxtaposition to a marina and highways eases operational concerns and improves public access.

BENEFITS: Benefits to restoring quality deepwater habitat in Peoria Lakes include:

- Enhanced depth diversity and connectivity to off-channel areas
- Creation of overwintering fish habitat
- Creation of feeding and nursing habitat for fish and other species
- Improved habitat value for migratory waterfowl and shorebirds
- Enhanced topographic diversity by using dredged material to create islands
- Improved aquatic habitat structure and function

COSTS:

Average deepwater area of all potential sites between tributaries: 530 acres. Within the Illinois Waterway the average cost of hydraulic dredging is $15 per cubic yard and mechanical dredging is $20-25 per cubic yard. These costs will vary per project and location.

CONCERNS:

- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated with continued operations and maintenance of backwaters
- Dredging is one way to deal with the sediment already in the Peoria Lakes system, but it does not address upland and tributary inputs
- Sedimentation rates will need to be analyzed on a site-by-site basis using best available data to ensure project success
- Real estate and navigation restrictions pertaining to the ability to access and maintain dredged areas may be challenging in more urbanized areas
- Special considerations to ensure there are no water quality impacts or impacts to species listed under the Endangered Species Act (i.e., freshwater mussels)

OPERATIONS AND MAINTENANCE: TBD

Drawdowns

DESCRIPTION: Drawdowns allow for the compaction and management of sediment while providing a valuable habitat resource.

LOCATION: Potential in backwater areas or between islands where temporary closing structures could be used to dewater particular areas.

PROBLEM IDENTIFICATION: The primary resource problem in Peoria Lakes is sedimentation and the resulting loss of water depth, which has degraded aquatic habitat value and diversity in several ways:

- Widespread loss of backwater and secondary channel depth diversity
- Loss of fish overwintering habitat
- Loss of feeding and nursing habitat for fish and other species
- Decreases in water quality and increases in turbidity due to wind fetch
- Significant decreases in aquatic vegetation establishment

GOALS AND OBJECTIVES: Barrier Island Management Areas (BIMAs) can be operated to achieve multiple management objectives, including deepwater habitat, island creation, and water level and sediment management areas. BIMAs could function as backwater lakes most of the time and fish and people would move freely between the river and lakes. However, these areas could also be used to manage water levels to restore natural low-water seasonal hydrology, which was removed with the completion of locks and dams. Conducting periodic drawdowns (e.g., 5 – 10 year intervals) manipulates hydrology to elicit physical biogeochemical responses to achieve the following goals and objectives:

- Optimize water level variation for submersed and emergent aquatic vegetation
- Reduce sediment re-suspension and turbidity to improve nutrient cycling and dissolved oxygen levels.
- Provide high quality habitat and food sources for migratory waterfowl and shorebirds

There are several methods managers can employ to facilitate periodic drawdowns, including floating dewatering systems, barge-mounted systems, or land-based systems. Gaps between barrier island complexes could potentially be filled with cofferdams, sand, geotextile tubes, etc. depending upon design considerations of the targeted management area.

BENEFITS: The benefits of conducting target drawdowns in Peoria Lakes include:

- Reduced sediment resuspension
- Improved water clarity and increased light penetration for plants
- Enhanced habitat structure through drying, consolidating and stabilizing sediments
- Increased habitat value for fish, invertebrate, and migratory waterfowl species

- Enhanced conditions for managers to harvest material collected in sediment traps or detention basins

COSTS:
Approximate areas for potential water level management based on average of all areas between tributary delta formations. Average area of potential habitat made available from drawdowns: 530 acres. The Pekin Lake study showed that 725 acres of moist soil units would equate to $8.123 million, another cost comparison would be the roughly $18,000 (in 2017 dollars) per acre cost detailed in the Illinois River Basin Restoration Comprehensive Plan.

CONCERNS:
- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated with continued operations and maintenance of BIMAs
- Hazardous, toxic, and radioactive waste concerns – important to select a dredging method that minimizes turbidity or runoff during discharge (e.g., positive displacement pumps, or DryDREdge™)
- Real estate issues pertaining to the ability to access, construct, and implement drawdowns may be challenging in more urbanized areas (Lower Peoria Lake)

OPERATIONS AND MAINTENANCE: While water level management projects provide a range of ecosystem responses, they are also costly to build, maintain, and operate relative to other management strategies.

Dredging and Sediment Placement

DESCRIPTION: Dredging can provide a number of features including channel connectivity and depth diversity in additional to regular navigation operation and maintenance. Dredged material can also be used beneficial to create islands or in the manufacture of soil, as an example.

LOCATION: TBD

PROBLEM IDENTIFICATION: Peoria Lakes are subject to high sediment delivery from 10 direct tributaries. High erosion and surface water runoff is attributable both to the geology of the Peoria Lakes region and to land cover conversion to agriculture in tributary watersheds. Subsequent degradation of stream and riparian habitat adjacent to tributaries increased erosion and reduced the capacity of these buffers to trap sediment. These tributaries comprise 3% of the total drainage area of Peoria but deliver 40% or more of the sediment deposited in the lake. Water depths greater than five feet are currently found only in the navigation channel and this loss of backwater bathymetric diversity has resulted in:

- Widespread loss of backwater and secondary channel depth
- Loss of fish overwintering habitat
- Loss of feeding habitat for fish and other species
- Decreases in water quality and increases in turbidity
- Significant decreases in aquatic vegetation establishment

GOALS AND OBJECTIVES: Without intervention, the ecological health of Peoria Lakes will continue to degrade as productive backwaters are slowly converted to mudflats and shallow water habitat. Goals and objectives of dredging and sediment placement are to:

- Increase longitudinal and lateral connectivity between different habitats
- Create quality feeding, nursing, and overwintering habitat for fish species
- Provide adequate volume and depth for sustaining native fish communities
- Increase bathymetric diversity
- Provide material to create islands

Barrier Island Management Areas (BIMAs) can be operated to achieve multiple management objectives, including deepwater habitat, island creation, and water level and sediment management areas. BIMAs could function as backwater lakes most of the time, providing recreational benefits as fish and people move freely between the river and lakes. Lower Peoria Lake may be one of the better areas to conduct a barrier island pilot study because it is a smaller area close to population centers that will benefit from improvements. The juxtaposition to a marina and highways eases operational concerns and improves public access.

BENEFITS: Benefits to dredging and sediment placement in Peoria Lakes include:

- Enhanced depth diversity and connectivity to off-channel areas
- Creation of overwintering fish habitat

- Creation of feeding and nursing habitat for fish and other species
- Improved habitat value for migratory waterfowl and shorebirds
- Enhanced topographic diversity by using dredged material to create islands
- Improved aquatic habitat structure and function

COSTS:
Approximate areas for potential dredging and sediment placement based on average of all areas between tributary delta formations:

- Average area of backwater habitat: 530 acres
- Average total length of sidecast material placement: 8400 ft.
- Average total area of sidecast material placement: 100 acres
- Dredging operations cost an average of $8 per cubic yard, additional associated cost would be placement or disposal of dredged material.

Within the Illinois Waterway the average cost of hydraulic dredging is $15 per cubic yard and mechanical dredging is $20-25 per cubic yard. These costs will vary per project and location.

CONCERNS:

- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated with continued operations and maintenance of backwaters
- Dredging is one way to deal with the sediment already in the Peoria Lakes system, but it does not address upland and tributary inputs
- Sedimentation rates will need to be analyzed on a site-by-site basis using best available data to ensure project success
- Real estate and navigation issues pertaining to the ability to access and maintain dredged areas may be challenging in an urbanized environment
- Special considerations to ensure there are no water quality impacts or impacts to species listed under the Endangered Species Act (i.e., freshwater mussels)

OPERATIONS AND MAINTENANCE: Project scope and location will determine the need and frequency of maintenance dredging activities.

Floodplain Recapture

DESCRIPTION: Identify areas within the floodplain that are not currently inundated that could be made more productive in terms of habitat.

LOCATION: TBD

PROBLEM IDENTIFICATION: Floodplain habitats are integral components of river ecosystems because of the seasonal flood pulse that inundates and connects them to the river. Historically, forest, prairie (grassland), and wetlands, were the dominant cover types in the Peoria area. Prairies have been almost completely eliminated from the landscape and wetlands of all types have been severely impacted by diversion, dam construction to support navigation, and conversion to agriculture due to drainage. Land-use and hydrologic changes have reduced the quantity, quality, and functions of aquatic, floodplain, and riparian habitats. Flood storage, flood conveyance, habitat availability, and nutrient exchange are some of the critical aspects of the floodplain environment that have been adversely impacted. About 75% of the historic floodplain land cover types have been lost throughout the Illinois River Basin, leading to

- Increased impervious land surfaces leading to excessive runoff and higher flows
- Loss of habitat to support diverse aquatic and terrestrial species
- Decreases in water quality and increases in turbidity
- Homogeneity of the floodplain landscape
- Introduction of exotic and invasive species

GOALS AND OBJECTIVES: Without intervention, the ecological and topographic diversity of floodplains in Peoria Lakes will become less resilient to natural disturbances over time. Goals and objectives of floodplain recapture are to:

- Increase connectivity between floodplain and main channel
- Improve water delivery and drainage
- Alter topography to mimic historic flood frequency, duration, timing and magnitude
- Restore biota
- Increase cover and abundance of native plant and bottomland forest species
- Create additional habitat in the Flyway for migratory waterfowl and shorebirds
- Manage tributary connections to allow periodic discharge to the floodplain

Measures to enhance and restore viable floodplains may include creating depressional wetlands, planting trees (timber stand improvement) and wetland species, constructing ridge and swale environments through dredging, restoring former agricultural areas, prairie restoration, and levee setbacks.

BENEFITS: Restored riparian and floodplain corridors provide great opportunities for landscape scale restoration and connectivity of remaining resource rich areas in the highly modified Peoria Lakes landscape, improving the viability of sensitive populations and species. In addition to benefiting hundreds of thousands

of waterfowl which use the Illinois River as part of the Mississippi River Flyway, benefits to floodplain recapture measures include:

- Increased flood conveyance
- Groundwater replenishment
- Decreased hydrologic loading and water velocities
- Reduced erosion and scour during storm events
- Increased species diversity
- Enhanced floodplain topographic diversity through dredged material placement
- Increased potential for recreation opportunities

COSTS:

Approximate areas based on average acreage of potential floodplain recapture between tributary delta formations:

- Average area of potential floodplain recapture/conversion: 750 acres
- Average area of alluvial fans: 150 acres

Riparian forest buffers cost $7400 per acre (2017 dollars), wetlands plantings cost $10,700 per acre (2017 dollars). Cost estimates taken from the 2007 Illinois River Basin Restoration Comprehensive Plan.

CONCERNS:

- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated with operations and maintenance in the floodplain
- Floodplain management cannot impact the navigation channel
- Existing flow regime caused by navigation infrastructure may impede efforts to restore floodplain in certain areas
- Special considerations to ensure there are no impacts under the Clean Water Act or the Endangered Species Act
- Real estate challenges to acquiring non-Federal or non-State lands for restoration
- Floodplain restoration will require high levels of stakeholder involvement in project development, educational outreach, and potential acquisition of voluntary easements and fee title to floodplain properties

OPERATIONS AND MAINTENANCE: TBD

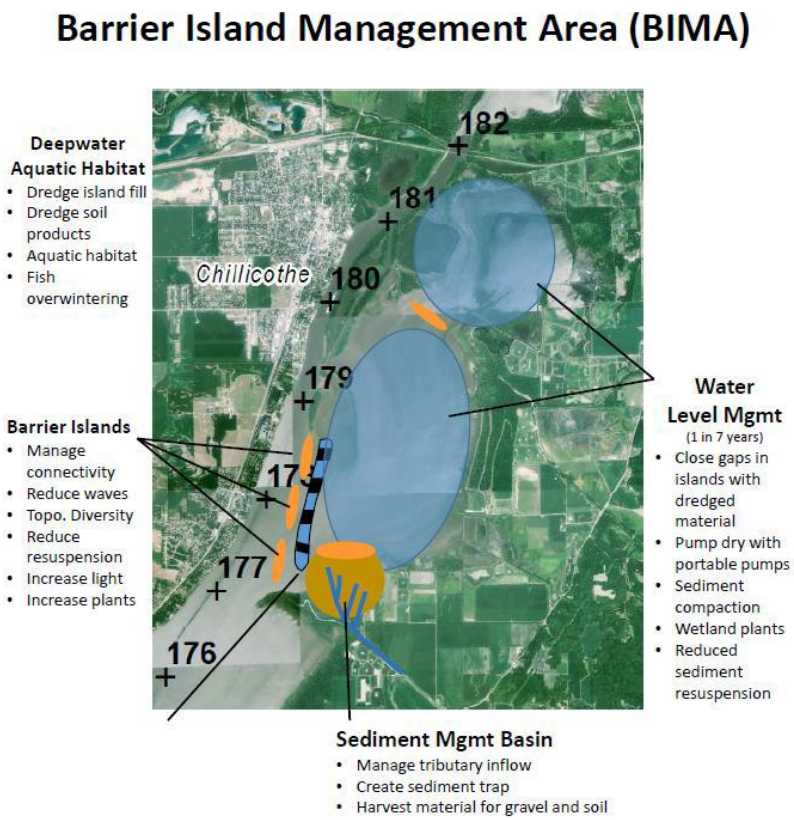


Figure 81: Barrier Island Management Area (BIMA)

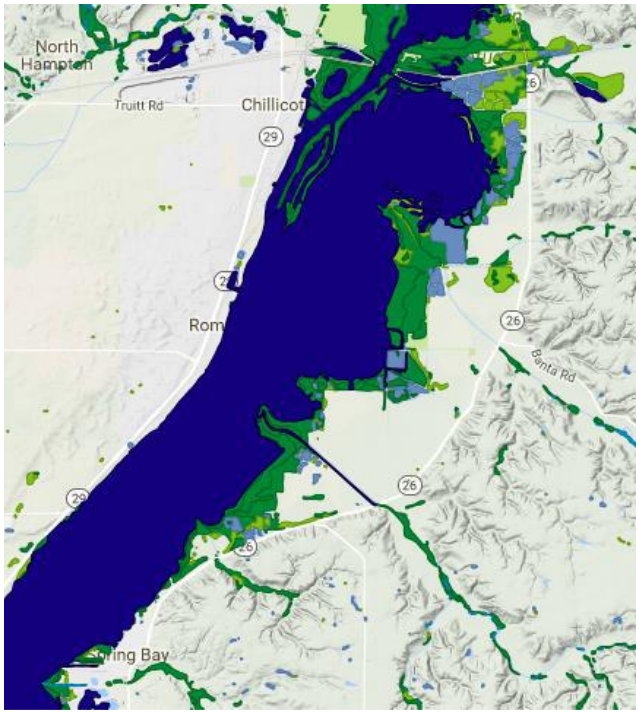


Figure 80: North Peoria Lake - Areas in Green are included in the National Wetlands Inventory

Invasive Species – Asian Carp

DESCRIPTION: Reduction of the invasive species Asian Carp could stand to improve and promote the health and proliferation of native fish species and improve the recreational quality of the lakes.

LOCATION: Entire Peoria Lakes study area.

PROBLEM IDENTIFICATION: The presence of Asian Carp in the waterways of the Upper Mississippi and the Illinois Rivers has been increasing since they were accidentally introduced in the 1970s. As a filter feeder, Asian Carp outcompete native species, they have been shown to be a menace to the native fisheries and to both recreational and commercial users of the Peoria Lakes.

- Outcompete native fisheries
- They live in the same habitat as many native fish
- Difficult to manage

GOALS AND OBJECTIVES: Without intervention, the presence of Asian Carp in Peoria Lakes and the Illinois River with continue. Goals and objectives of invasive species (Asian Carp) reduction are to:

- Increase abundance of native fish species
- Improve recreational use of the lakes
- Reduce Asian Carp population

Measures to reduce the population of Asian Carp could include the establishment of a commercial fishing operation targeted at the aggressive removal of Asian Carp from the lakes.

BENEFITS: Restored native balance, improving the viability of sensitive populations and species, promoting increased aquatic species diversity.

COSTS:
The 2017 Brandon Road Feasibility report identified that it would cost approximately $1.5 million per year for a commercial fishing program targeted at the aggressive removal of Asian Carp. Cost would vary for Peoria Pool.

CONCERNS:

- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated frequency of operation.
- Special considerations to ensure there are no impacts under the Clean Water Act or the Endangered Species Act

OPERATIONS AND MAINTENANCE:
This would be an ongoing operation.

Island Creation

DESCRIPTION: Reintroduction of islands and barrier islands to the Peoria Lakes system addresses a multitude of conservation concerns within the Peoria Lakes.

Figure 82: USACE Lower Peoria Lake Island

PROBLEM IDENTIFICATION: The primary resource problem in Peoria Lakes is sedimentation and the resulting loss of water depth, which has degraded aquatic habitat value and diversity in several ways:

- Sediment delivery from tributary streams filling in backwaters
- Loss in aquatic habitat and depth diversity
- Sediment resuspension precluding aquatic vegetation establishment
- Decreased habitat value for migratory waterfowl and shorebirds

Island erosion and loss in the Peoria Pool has degraded these resources further by increasing wind fetch and sediment resuspension the backwaters, precluding the establishment of aquatic vegetation. A review of the Woermann Maps (1903) estimated a total of 23 islands in the Peoria Pool – currently, an aerial comparison estimated that number at 9 islands, or 43% of the historic condition.

GOALS AND OBJECTIVES: Without intervention, the ecological health of Peoria Lakes will continue to degrade as productive backwaters are slowly converted to mudflats and shallow water habitat. Goals and objectives of island creation are to:

- Reduce wind fetch and wave action that stir up sediments
- Protect dredged channels and backwater habitat
- Promote the establishment of submersed and emergent aquatic vegetation
- Sequester areas for potential water level management
- Provide beneficial use of dredged material

Strategic construction of barrier islands between deltas can create Barrier Island Management Areas (BIMAs) that provide habitat for overwintering fish, reduce waves and sediment resuspension, and improve light penetration to support aquatic plant growth, which can improve water quality.

BENEFITS: Tributary delta formations within Peoria Lakes can be reconfigured for resource management. Dredged material not only creates depth diversity in the backwater, but also provides material to build barrier islands, which

- Recreates natural floodplain features
- Alters hydraulic connectivity
- Reduces wind fetch and turbidity
- Protects side channel habitat
- Provides for beneficial use of dredged material
- Increases habitat and topographic diversity

POTENTIAL LOCATIONS:
Lower Peoria Lake may be one of the better areas to conduct a barrier island pilot study because it is a smaller area close to population centers that will benefit from improvements. The juxtaposition to a marina and highways eases operational concerns and improves public access. For other potential locations see map below.

COSTS:
Approximate dimensions based on Lower Peoria Lake example:

- Avg area of island: 25 acres
- Avg length of island: 1500 ft
- Avg area between islands: 20 acres
- Avg length between islands: 900 ft
- Avg area of backwater (MSMUs): 425 acres
- Also see Lower Lake Islands factsheet
- $9.2 Million (2013 dollars)

CONCERNS:

- Legal compliance of restoration activities with all Federal, State and local regulations
- Special considerations to ensure there are no water quality impacts (Clean Water Act) or impacts to species listed under the Endangered Species Act
- Real estate pertaining to the ability to access, construct and maintain islands may be challenging in more urbanized areas
- Funding limitations associated with continued operations and maintenance of barrier islands

OPERATIONS AND MAINTENANCE: See lower lake islands factsheet.

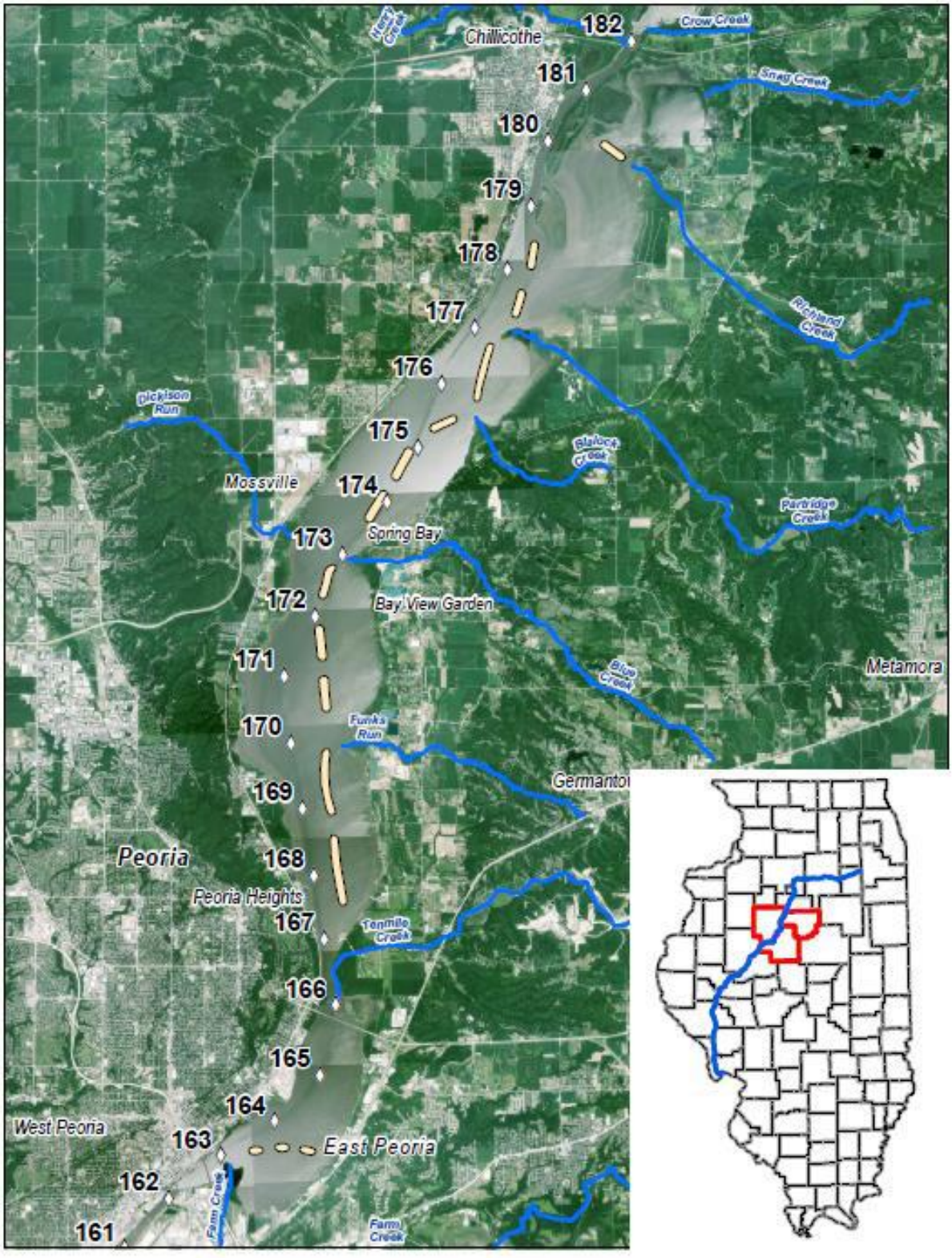


Figure 83: Possible locations for Barrier Islands

Lower Lake Islands

DESCRIPTION: This project would create 149.4 acres of off-channel deepwater aquatic habitat with varying depths. The off-channel habitat would be bottom elevation 434 feet MSL, with channels at elevation 430 feet MSL and deeper channels around the islands at elevation 424 feet MSL. The off-channel habitat is located east of the east island to protect the area from wind and wave action. The east island is approximately 3,850 feet long and 590 feet wide, creating 37 acres of terrestrial habitat. The west island is approximately 3,650 feet long and 150 feet wide, creating 17 acres of terrestrial habitat. There would be a closing structure on the east side at the upstream end of the east island.

LOCATION: Implementation of this project element would occur in Lower Peoria Lake just south of the McClugage Bridge.

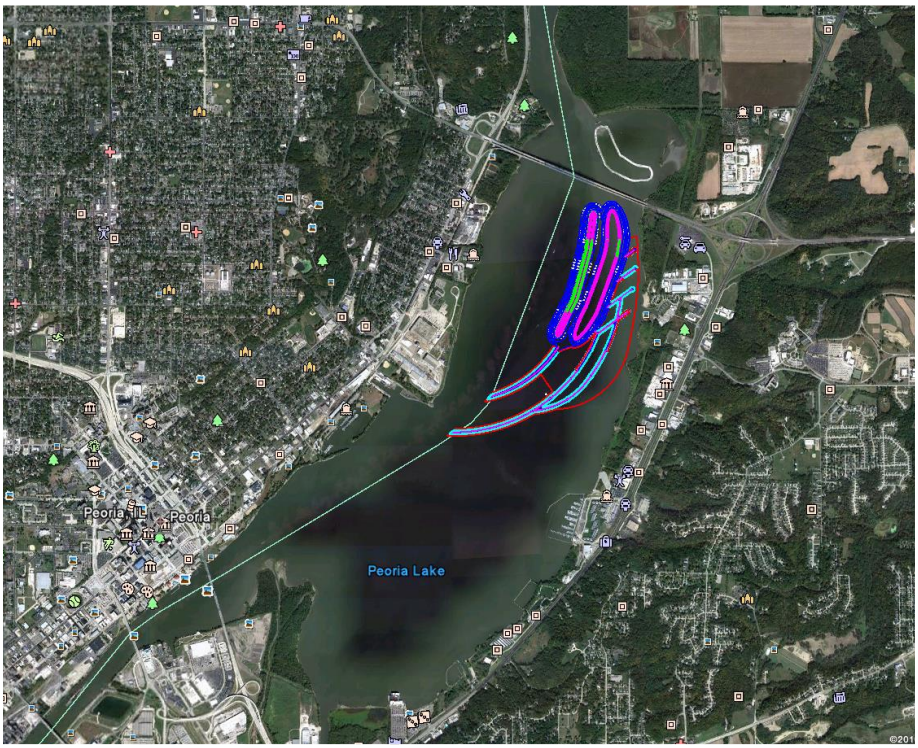


Figure 84: Authorized Lower Peoria Lake Islands

PROBLEM IDENTIFICATION: The primary resource problem in Peoria Lake is sedimentation and the resulting loss of water depth, which has reduced aquatic habitat value and diversity. Recreational opportunities have been diminished. Peoria Lake is subject to high rates of sediment delivery from its 10 direct tributaries.

GOALS AND OBJECTIVES: The principal goal of ecosystem restoration in Peoria Lake is to create, restore, or improve aquatic habitat by restoring depth diversity. The following objectives for this project element:

- **Restore depth diversity** - Sedimentation has resulted in the loss of lake depth and volume while filling the lake to a nearly uniform shallow depth outside of the navigation channel. These changes

have severely impacted a number of historic habitat types, including off-channel overwintering, spawning, and nursery habitat for fish. Increasing overall depth and variability of depth would restore fish habitat.

- **Provide structure for aquatic organisms** - Much of the lake bottom has a uniform shallow depth with a silt substrate due to excessive sedimentation and water level stabilization by the lock and dam. The introduction of additional structures (e.g., rock jetties/reefs, woody debris, etc.) would provide valuable refuge, feeding, spawning, and nursery areas for aquatic organisms.
- **Increase habitat diversity** - As part of any restoration efforts, features should be made to restore the overall habitat diversity within Peoria Lake. Providing deepwater channels and holes through shallower areas and creating islands to increase shoreline area and provide additional terrestrial habitat would restore some of the former diversity that was historically present in the lake.
- **Improve habitat value for migratory waterfowl and shorebirds** - While the Illinois River Valley is part of the Mississippi River flyway, a migration route for hundreds of thousands of waterfowl, shorebirds, and neotropical migrant birds, the study area has not been well utilized in recent times. Additional areas for waterbird resting, nesting, and feeding would improve waterfowl habitat conditions.
- **Improve water quality -** Due to the extensive lake size and shallow water depths, Peoria Lake is highly susceptible to wind-generated wave action that results in the resuspension of sediments and high turbidity, further limiting fish, aquatic vegetation, macroinvertebrate, and mussel productivity. Reducing sediment resuspension, and therefore turbidity, would provide considerable improvements to water quality.
- **Maximize sustainability of project features** - If restorative measures are implemented, considerable effort should be directed to making project features sustainable (e.g., bank protection to stabilize islands, sufficient flow to minimize sedimentation, or deflection of sediment from dredged areas).

HISTORY OF THE PROJECT: A Corps of Engineers Feasibility Study was approved in 2003 and Congress authorized construction in WRDA 2007. The Upper Island was constructed under the Illinois River Basin Restoration Program and completed in 2013. The Illinois DNR is the non-Federal Sponsor.

POTENTIAL BENEFITS: Restoring critical off channel deep water habitats and providing increased flow to the side channel between the islands.

COSTS: $24,376,000 (2016 Cost Estimate). Approximately 889,000 cubic yards of dredging and placement.

CONCERNS:

- The Administration has taken a negative position on this project. Therefore, Congress will have to provide funds outside of the President's budget for its construction.

OPERATIONS AND MAINTENANCE: $230,000 annually based on the 2003 Feasibility Report.

Peoria Pool Level Drawdown

DESCRIPTION: Using the tainter gate and wickets at Peoria Lock and Dam a series of pool level drawdowns could be implemented including:

- Attempt a 2-foot drawdown of Peoria Pool 2 years out of every 3 from Jul 1-30
- Attempt a 2-foot drawdown of Peoria Pool every 3 years from Aug 1-30
- Attempt a 2-foot drawdown of Peoria Pool 2 years out of every 5 from Jun 1- Aug 9
- Attempt a 2-foot drawdown of Peoria Pool every 4 years from Aug 1- October 9

Figure 85: Drawdown Example

LOCATION: Implementation of this project element would occur at Peoria Lock and Dam with impacts occurring throughout Peoria Pool. This project element will require advanced dredging and placement of material from the navigation channel, marinas and water users in order to maintain authorized depths.

PROBLEM IDENTIFICATION: The permanent impoundment of the Peoria Pool by the Dam at Peoria has eliminated low water events below elevation 440. The loss of naturally occurring exposure of shallow areas to sunlight and dry conditions has resulted in the:

- Loss of feeding habitat for fish and other species
- Decreases in water quality and increases in turbidity
- Significant decreases in aquatic vegetation establishment

GOALS AND OBJECTIVES: Reintroduce low water events to better manage shallow and emergent areas of the Lakes. Objectives include:

- Increased Sediment Compaction & Water Quality

- Creation of feeding and nursing habitat for fish and other species
- Improved habitat value for migratory waterfowl and shorebirds
- Improved aquatic habitat structure and function

Without intervention, the ecological health of Peoria Lake will continue to degrade as shallow water and emergent areas remain permanently impounded.

HISTORY OF THE PROJECT: The 2007 Illinois River Basin Restoration Comprehensive Plan identified periodic drawdowns of Peoria Pool as part of the recommended plan for restoration. It has not been implemented to date.

POTENTIAL BENEFITS: Pool drawdown would allow for the reestablishment of emergent vegetation (i.e. arrowhead, bulrush, and sedges) in some areas that are currently inundated and/or unable to support aquatic vegetation. Sediment compaction would also result, potentially reducing turbidity. As water levels are raised following the drawdown, these newly vegetated areas would provide food and cover for migratory waterfowl, fish, and macroinvertebrates. A 1-foot drawdown in Peoria Pool has the potential to expose 3,000 acres and 8,000 for a 2-foot drawdown. Distribution of exposed areas could conceptually resemble pre-diversion conditions.

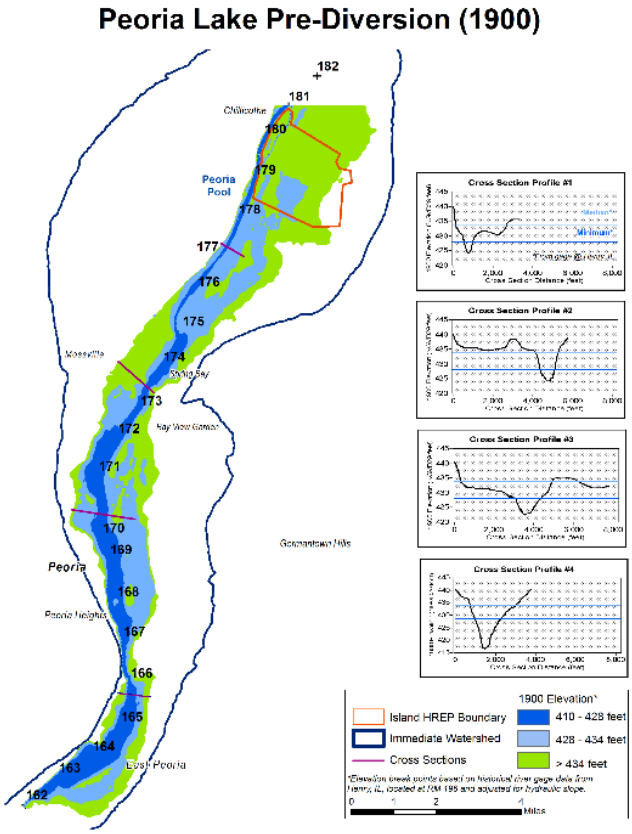


Figure 86:Peoria Lakes Pre-Diversion Conceptual Map

COSTS: $17,400,000. 470,000 cubic yards of additional channel maintenance dredging over 50 years to include 12 marinas and 20 industrial facilities. Assumes placement sites are available.

CONCERNS:

- Availability of placement sites
- Advanced dredging required every 10 years
- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated with dredging events
- While probability of success was enough to justify the project, it is possible that water precipitation events on the river may not result in successful drawdowns. This could create a perception of wasted resources.

OPERATIONS AND MAINTENANCE: The total project costs estimate is over 50 years with dredging events occurring approximately every 10 years.

Prairie Restoration

DESCRIPTION: Prairie restoration in both riparian and upland locations can significantly decrease the amount of sediment delivered into the Peoria Lakes.

Figure 87: Restored Native Prairie Vegetation

LOCATION: Would depend on landowner support, public lands could also be considered.

PROBLEM IDENTIFICATION: The alteration of the native prairie landscape adjacent to Peoria Lakes has resulted in increased sediment flow into the lakes. The ridgeline bordering Peoria Lakes was once a diverse habitat of mixed diversity open forest interspersed with areas of prairie. The forested areas that now define this location are densely forested. Sunlight is prevented from penetrating the dense canopy resulting in a forest floor that is general devoid of vegetation. Due to this during heavy rain events, without appropriate vegetation to hold the soil, large amounts of sediment erodes downhill and is deposited in the lakes.

- Absence of native upland vegetation
- Increased sedimentation
- Lack of forest diversity

GOALS AND OBJECTIVES:

- Reduce sediment delivery to Peoria Lakes
- Improve forest health
- Restore native prairie

Measures to reduce sedimentation eroding from upland areas adjacent to Peoria lakes could include: timber stand improvement, restoration of prairie grasses (research suggest that seed bank is already present in the soil), controlled burns when and where appropriate to manage upland vegetative habitat. Additionally, on a local level, rain gardens and other measures that reduce storm water and sediment deliver could be pursued.

A similar planning project was successfully implemented by TCRPC at Mossville Bluffs.

BENEFITS: Restored native balance, improving the viability of sensitive populations and species, promoting increased aquatic species diversity.

COSTS:
Timber stand improvement costs and estimated $10,000 per acre (2017 dollars). The estimated cost of prairie restoration is $6700 per acre with an associated operations and maintenance cost of $5 per acre. Riparian forest buffers cost $7,400 per acre.

CONCERNS:

- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated frequency of operation.
- Special considerations to ensure there are no impacts under the Clean Water Act or the Endangered Species Act
- Real estate acquisition
- Landowner effort

OPERATIONS AND MAINTENANCE: This will depend on the type and scale of restoration.

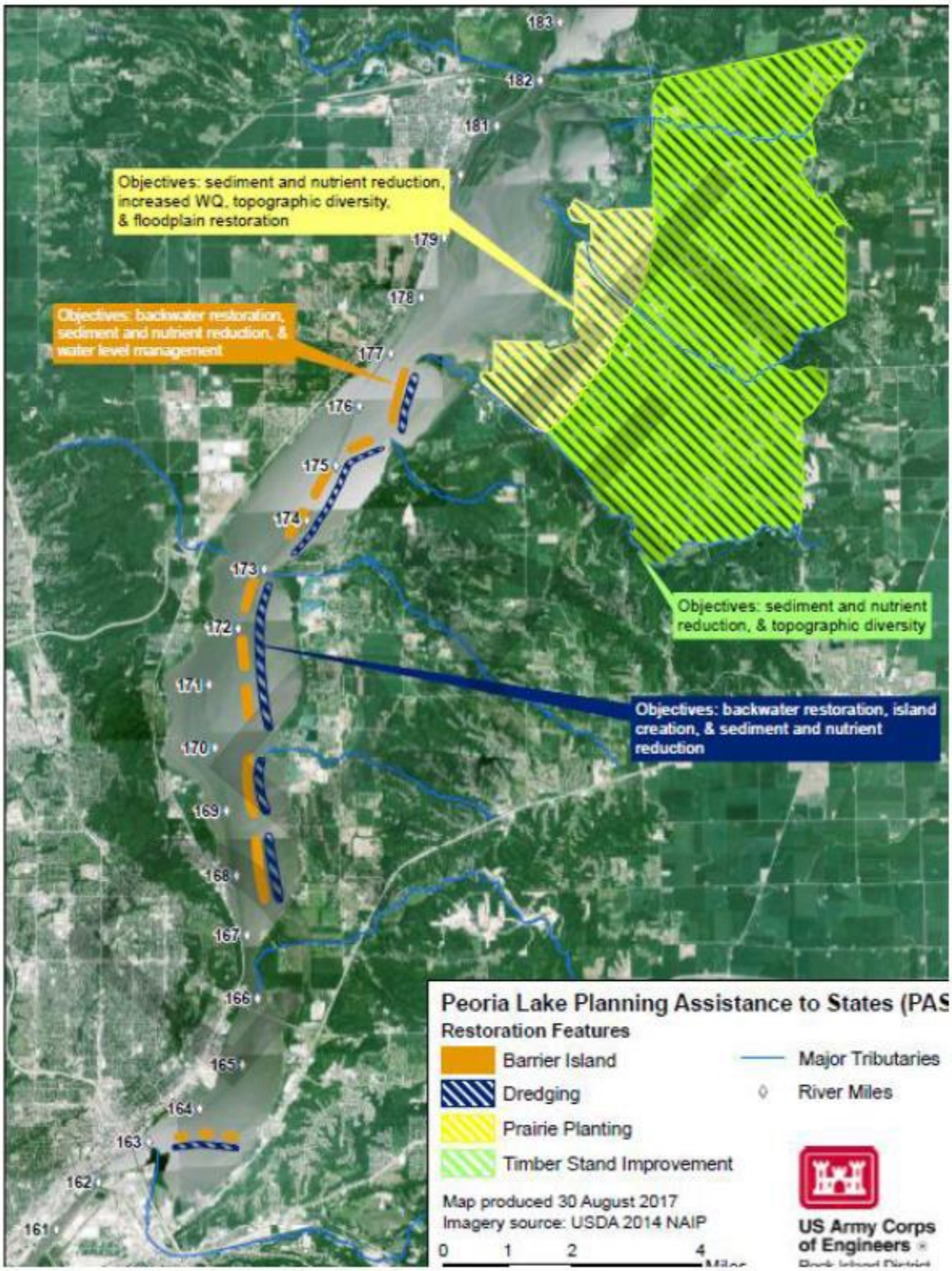


Figure 88: Location Map of Potential Prairie Restoration

Secondary Channel

DESCRIPTION: The creation of a secondary channel could among other objectives: provide enhanced connectivity to backwater overwintering habitats, enhance bathymetric diversity and add value to recreation.

LOCATION: (see example in Barrier Island Management Plan below).

PROBLEM IDENTIFICATION: Peoria Lakes are subject to high sediment delivery from 10 direct tributaries. Increased erosion and surface water runoff is attributable both to the geology of the Peoria Lakes region and to land cover conversion to agriculture in tributary watersheds. Stream and riparian habitat degradation increased erosion and reduced the capacity of these buffers to trap sediment. These tributaries comprise 3% of the total drainage area of Peoria but deliver 40% or more of the sediment deposited in the lakes. Water depths greater than five feet are currently found only in the navigation channel and this loss of side channel bathymetric diversity has resulted in

- Sediment delivery from tributary streams filling in side channels
- Loss in off-channel aquatic habitat and depth diversity
- Decreased habitat value for riverine species

Creation of islands and their side channels may require restoration and protection of both resources. A review of the Woermann Maps (1903) estimated a total length of 14.5 miles inside channels in the Peoria Pool – currently, an aerial comparison estimated that number at 7.6 miles, or 52% of the historic condition.

GOALS AND OBJECTIVES: Without intervention, the ecological health of Peoria Lakes will continue to degrade as productive side channels are slowly converted to mudflats and shallow water habitat. Goals and objectives of side channel restoration are to:

- Restore and maintain side channel and island habitats
- Increase connectivity to backwater overwintering habitats
- Provide adequate volume and depth for sustaining native fish communities
- Increase topographic diversity in off-channel areas
- Identify beneficial uses for sediments

Strategic construction of barrier islands between deltas can create Barrier Island Management Areas (BIMAs) that provide habitat for overwintering fish, reduce waves, reduce sediment resuspension, and improve light penetration to support aquatic plant growth. Dredged material not only creates depth diversity in the backwater, but also provides material to build barrier islands, which in turn protect side channels.

BENEFITS: Benefits of side channel restoration in Peoria Lakes include:

- Increased connectivity between habitat areas
- Improved aquatic habitat structure and function
- Beneficial use of dredged material (i.e., islands that further protect side channels)

- Enhanced bathymetric diversity
- Improved value for recreation and fisheries

COSTS: Approximate dimensions for side channels based on areas between tributary delta formations:

- Average side channel length: 13,500 ft, or 2.5 miles
- Average deepwater area created by side channels: 150 acres

Within the Illinois Waterway the average cost of hydraulic dredging is $15 per cubic yard and mechanical dredging is $20-25 per cubic yard. These costs will vary per project and location.

CONCERNS:

- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated with continued operations and maintenance of secondary channels
- Dredging side channel habitat is one way to deal with the sediment already in the Peoria Lakes system, but it does not address upland and tributary inputs
- Sedimentation rates will need to be analyzed on a site-by-site basis using best available data to ensure project success
- Special considerations to ensure there are no water quality impacts or impacts to species listed under the Endangered Species Act (i.e., freshwater mussels)

OPERATIONS AND MAINTENANCE:

- Maintenance dredging
- Will require placement areas or beneficial use for dredged material.

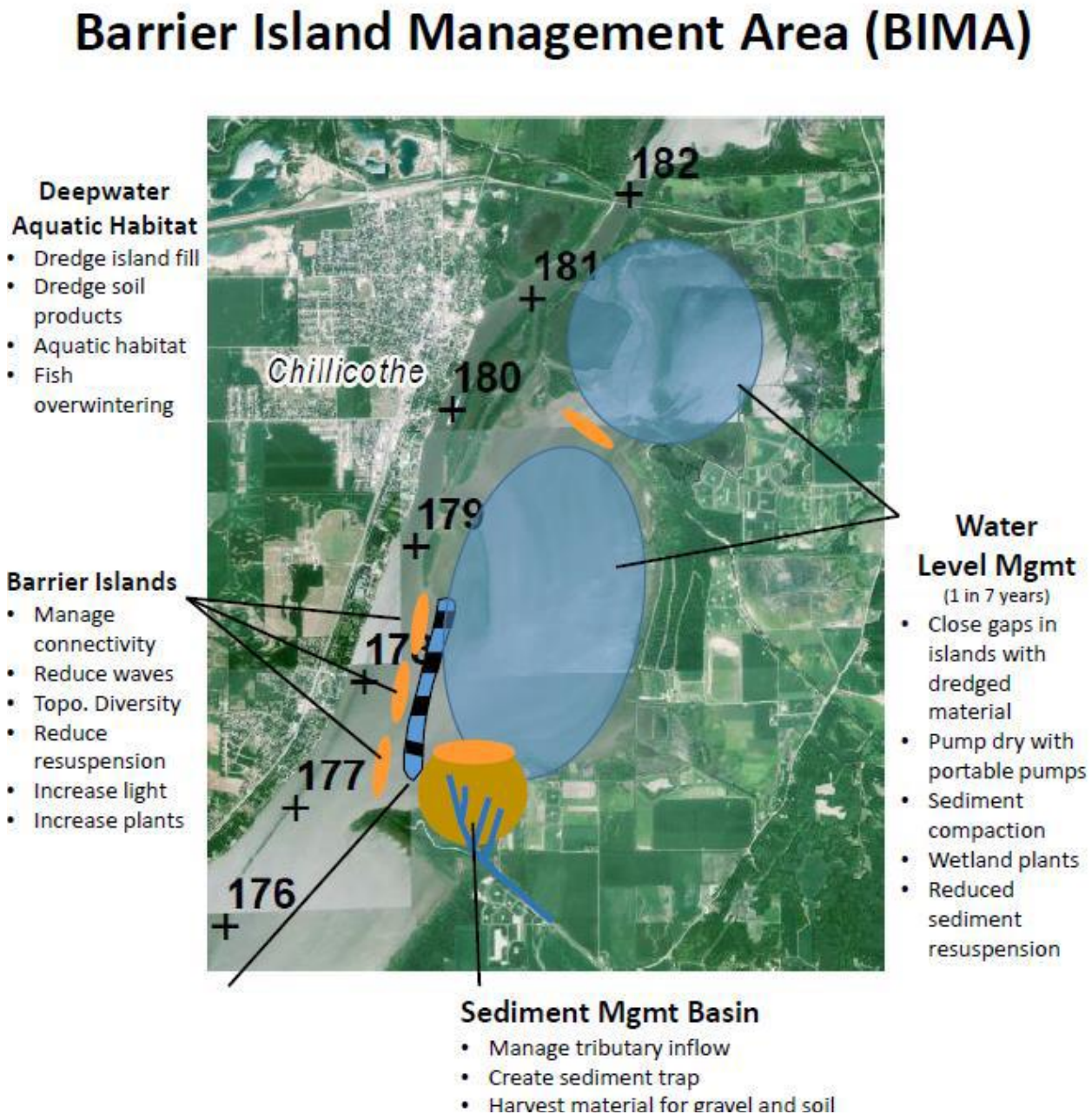


Figure 89: Map Illustrating BIMAs to establish a Secondary Channel

Sediment Detention Basins

DESCRIPTION: Moist soil management units or sediment detention basins allow for the entrapment of sediment, enabling managers to achieve the project goals and objectives outlined below.

LOCATION: TBD

PROBLEM IDENTIFICATION: Peoria Lakes are subject to high sediment delivery from 10 direct tributaries. High erosion and surface water runoff is attributable both to the geology of the Peoria Lakes region and to land cover conversion to agriculture in tributary watersheds. Subsequent degradation of stream and riparian habitat adjacent to tributaries increased erosion and reduced the capacity of these buffers to trap sediment. These tributaries comprise 3% of the total drainage area of Peoria, but deliver 40% or more of the sediment deposited in the lakes, resulting in

- Widespread loss of backwater and secondary channel depth diversity
- Loss of fish overwintering habitat
- Loss of feeding habitat for fish and other species
- Decreases in water quality and increases in turbidity
- Significant decreases in aquatic vegetation establishment

GOALS AND OBJECTIVES: Sediment detention basins consist of an earth embankment or combination ridge and channel generally constructed across the slope of a minor watercourse to form a sediment trap. Benefits to constructing sediment detention areas enable managers to achieve the following goals and objectives:

- Trap and manage sediment
- Reduce and manage onsite and downstream runoff
- Improve downstream water quality
- Intercept tributary sediments before they enter the rest of the lakes area

Barrier Island Management Areas (BIMAs) can be operated to achieve multiple management objectives, including deepwater habitat, island creation, and water level and sediment management areas. BIMAs could function as backwater lakes most of the time and fish and people would move freely between the river and lakes.

Strategic placement of sediment traps at tributary inflows can divert sediment from newly dredged channels and protect deepwater habitat. During managed drawdowns, material may also be harvested for gravel and soil for a variety of beneficial applications.

BENEFITS: Benefits to constructing sediment detention areas include:

- Increased depth diversity and longevity of dredged channels
- Increased habitat protection

- Improved water quality
- Reduced downstream sediment loads
- Improved recreation benefits in backwaters
- Provides material for beneficial use applications

COSTS:

- Average potential area to trap sediment from tributary deltas: 50 acres
- Average cost per acre = $72,000 (2017 dollars)

CONCERNS:

- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated with continued operations and maintenance of sediment detention basins
- The NRCS has expertise in designing sediment detention basins, developed through years of helping farmers and landowners reduce land erosion. Community planners may wish to partner with NRCS to address upland land management practices to help reduce overall sediment entering into the Peoria Lakes system.
- Hazardous, toxic, and radioactive waste concerns – important to select a dredging method that minimizes turbidity or runoff during discharge (e.g., positive displacement pumps, or DryDREdge™)
- Sedimentation rates will need to be analyzed on a site-by-site basis using best available data to ensure project success
- Real estate issues pertaining to the ability to access, construct, and maintain the trap may be challenging in more urbanized areas
- Sediment detention basins used in isolation only address the symptom of excessive sediment accumulation, not the root cause

OPERATIONS AND MAINTENANCE: Sediment detention basins have intensive transportation, operations & maintenance requirements. It is essential to identify sustainable uses for dredged material transport and placement to ensure ecosystem benefits continue to outweigh the environmental costs.

Submersed Aquatic Vegetation

DESCRIPTION: This project element would protect shallow water areas in Upper Peoria Lake from wind and towboat generated waves that limit the reestablishment of Submersed Aquatic Vegetation (SAV). Breakwaters could be constructed utilizing a variety of methods and located in areas that are subject to wind and towboat generated waves that re-suspend sediments and impair water quality.

LOCATION: Implementation of this project element would occur in Upper Peoria Lake in areas identified through wind fetch analysis.

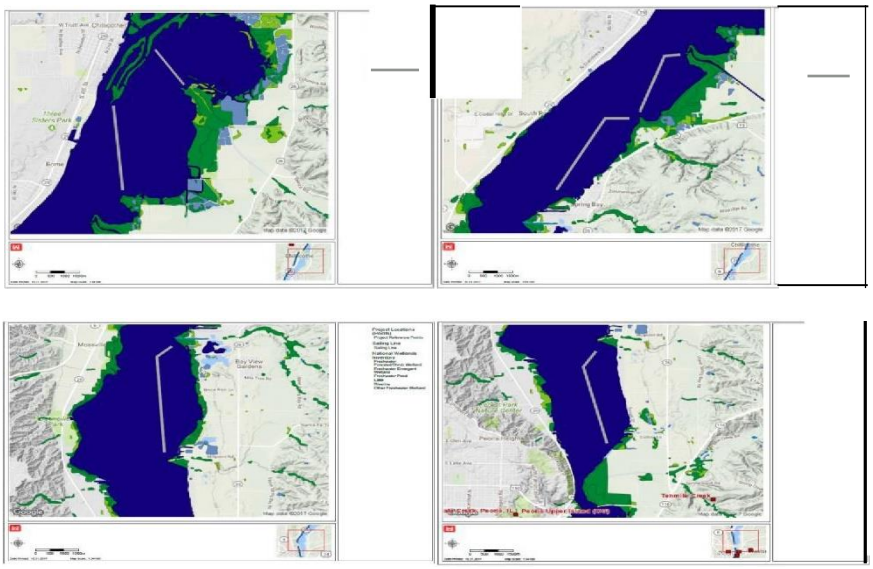


Figure 90: Wind Fetch Analysis

PROBLEM IDENTIFICATION: Submersed aquatic vegetation (SAV) is an important indicator of the ecological health of the impounded river reaches of the Illinois River. SAV provides food and structure for invertebrates, fish and waterfowl, and also serves an important function in recycling nutrients (USGS 1999).

Historically, numerous areas along the Illinois River provided suitable conditions for SAV growth. The expanded backwaters and channel borders were vegetated with about 50 percent cover of pondweeds (*Potamogeton sp*), hornwort *(Ceratophyllum sp*), bulrush (*Scirpus sp),* and wild celery (*Vallisneria)* (Sparks 1984) until organic pollution effects, between 1916 and 1922, resulted in the severe decline of aquatic plants. A majority of this was recovered from a positive response to early waste treatment efforts (Starrett 1972). From 1958 to 1961, increases in turbidity and sediment resuspension led to a further decline in aquatic vegetation in the Illinois River (Sparks *et al*. 1990). Although water quality in the Illinois River has improved significantly since the 1970s, SAV has not returned to most parts of the river.

Figure 91: Submersed Aquatic Vegetation Examples

GOALS AND OBJECTIVES: The goals of the Project are to restore Submerged Aquatic Vegetation in Upper Peoria Lakes, Increase Area and Quality of Resting and Feeding Habitat for Migratory Waterfowl, and Improve Spawning and Nursery Habitat for Native Fish.

The objectives of the Project are to:

- Reduce wind fetch lengths and provide areas that are sheltered from wind and wave action in Upper Peoria Lake.
- Increase water clarity in Upper Peoria Lake (TSS<25 mg/l, Turbidity < 20 NTU, light extinction< 3. 42 m-1, Secchi disk depth >0.5m).

HISTORY OF THE PROJECT: Previous efforts to re-establish SAV were undertaken by the IDNR by plantings alone, which proved unsuccessful. This effort could include planting but is focused on limiting the stressors of wind fetch and navigation impacts. The closest project of this type was documented in a feasibility study completed in 2013 for the Illinois River Basin Restoration Program Starved Rock Pool Critical Restoration Project.

POTENTIAL BENEFITS: The project has the potential to restore submersed aquatic vegetation, increase fish spawning potential and opportunities.

COSTS: $508 LF for Rock Breakwater Construction. $2,806 LF for Floating Islands. $590 for Floating Breakwaters.

CONCERNS: Wind fetch and towboat generated waves may not be the only limiting factor to SAV establishment in Peoria Lakes. Predation (waterfowl, turtles and grass carp) has been known to affect the establishment of viable SAV beds.

OPERATIONS AND MAINTENANCE: $230,000 annually based on the 2003 Feasibility Report.

Chevrons

DESCRIPTION: In-stream structure to deflect flow, creating deep water along outside edges and sediment deposition in the area immediately downstream for shallow water habitat.

Figure 92: Example of Chevrons

PROBLEM IDENTIFICATION: The Peoria Lakes have large, wide areas of shallow water due to sedimentation that has relatively uniform depth, subject to sediment re-suspension from wind and navigation generated waves. These normally shallow areas have not allowed development of rooted vegetation and are not beneficial habitat. These areas prevent navigation for recreational fishing, boating or other uses during the majority of the time when the river is not above normal level. The volume of sediment removed by dredging is limited due to economic and logistical limitations. The rate of sediment inflow is high and the ability to significantly reduce the inflow in the near-term is limited. Therefore, the ability to manage sediment within the Lakes is an important option.

- Lack of depth diversity due to sedimentation
- Sediment re-suspension by wind and navigation waves
- Excessive volume of sediment for management by dredging

LOCATION: To be determined based on other measures that may be used and on hydrodynamic modeling. Large areas away from the navigation channel in both the upper and lower lakes where flow conditions are sufficient to create and sustain scoured deep water areas.

GOALS AND OBJECTIVES: Create more diverse habitat with deep water and shallow areas with rooted aquatic vegetation resistant to sediment resuspension through flow diversion and concentration and shoaling.

- Create depth diversity
- Reduce sediment re-suspension by wind-generated and navigation wave sizes and break waves
- Reduce shoreline wave erosion (break waves)

BENEFITS: Uses natural river forces to move sediment to create deep water and shallow water areas. The natural forces of river flow may move sediment, creating deeper water at scour locations and shallower water, or islands with rooted vegetation, in created deposition areas. These structures also may break the wind fetch to reduce wind-generated waves and also break up navigation generated waves. Less material and cost may be required to construct a chevron than used to create an island of similar effect.

- Uses natural river flow to move sediment and form deeper and shallower areas for depth diversity
- Structure reduces wind fetch length and wind generated wave size
- Structure breaks navigation generated waves and reduced wave impact on river bank

COSTS: TBD

CONCERNS: Chevrons might be used to create a similar result as island construction, but without the benefit of using the island footprint as an area for deeper dredged sediment disposal. Floodplain impacts (increased flood level due to flow obstruction). The may be insufficient stream energy in wider open water areas to create and maintain scour channels for deep water habitat. Hydrodynamic modeling is required to determine feasibility and subsequent cost-effective design.

- Less sediment volume placement compared to island construction
- Availability of sufficient flow energy for structures to be effective

OPERATIONS AND MAINTENANCE: No operation and no anticipated maintenance.

Tributary Stream Stabilization

DESCRIPTION: Stabilization and streambank restoration for tributary streams.

PROBLEM IDENTIFICATION: Much of the sediment load from local tributaries to the Peoria Lakes is generated from streambank erosion and stream down-cutting. Stabilizing streams with these problems can reduce sediment delivered to the Lakes by reduction of down-cutting and streambank migration. This is a well-known and general problem not specific to streams tributary to Peoria Lakes. Reductions are not immediate and may be difficult to observe due to scale of the control relative to the overall stream and due to the amount of sediment active in the tributary system.

- Excessive erosion due to stream down-cutting and bank erosion resulting from increased runoff rates and volumes from watersheds
- Sediment delivered directly to streams and conveyed to Peoria Lakes
- Erosion damages land and infrastructure

Figure 93: Example of Stream Bank Erosion

LOCATION: Local streams discharging to Peoria Lakes. Most streams in the region have significant streambank erosion and down-cutting problems due to natural geomorphic condition (slope associated with river bluff topography), altered hydrology and/or stream channelization.

GOALS AND OBJECTIVES: Stabilize streams and streambanks using ecologically desirable practices to reduce erosion and sediment load, with activities prioritized by load reduction per dollar expended, land-owner cooperation, etc.

- Stabilize priority stream segments to reduce future down-cutting
- Stabilize priority stream segments to reduce future bank erosion

BENEFITS: In addition to reduced sediment load to the Peoria Lakes, this work would reduce loss of agricultural and urban land and infrastructure such as bridges, culverts, roadways, houses, utilities, etc. that are under-mined and fail or require repairs or replacement. Also, public safety can be improved by reducing risks of streambank and slope failures such as have occurred in the project area (e.g., the East Peoria slides in 2013 that resulted in condemnation and demolition of several newer homes.

- Reduced stream down-cutting
- Reduced stream bank erosion

COSTS: TBD

CONCERNS: Benefits from this to Peoria Lakes are long-term benefits because there is a large quantity of sediment in the stream systems that will continue to be transported to Peoria Lakes, making observation of benefits difficult. This measure should be targeted where stabilization is most cost-effective, relying on use in combination with other measures to optimize an overall plan for sediment load reduction to the Illinois River.

- Large amount of unstable streams that need attention
- Most stream segments are on private land requiring land owner cooperation
- Many stream segments in river bluff areas have down-cut, leaving high unstable slopes that will continue to fail sporadically in the future (raising the stream to historic elevations to buttress high slopes is needed to be most effective)

OPERATIONS AND MAINTENANCE: Ideally, using durable materials such as rock and bio-engineering with native vegetation with good design and construction will minimize need for maintenance. However, streams are naturally adjusting, and few projects are able to eliminate damaging erosion completely, sometimes resulting in potential future failure of the stabilization measures by excessive downstream degradation and/or bank migration upstream or downstream of the stabilized stream segment.

Bluff Area Woodland Management

DESCRIPTION: Vegetation management of wooded river bluff areas to reduce erosion and stormwater runoff.

PROBLEM IDENTIFICATION: Elimination of fires from the river bluff area has resulted in vegetation changes over several decades that has resulted in steep slopes that have less resistance to erosion and that generate more runoff from exposed bare soils. Sugar maples are the most well-known example of an invasive species that was prevented from establishing on the river bluffs by periodic fires. Most areas with sugar maples have essentially bare soil with limited vegetation due to the dense leaf cover. Other vegetation such as wild honeysuckle are also common invasive species that create the same problem. These lands are typically left completely unmanaged other than prevention of fires.

- Prevention of fires has allowed invasive vegetation on steep river bluff areas that is less protective of the slopes against erosion
- Steep slope areas have limited use for financially productive land uses, resulting in lack of management other than prevention of fires
- Highly erodible steep slopes generate high rates of sediment per unit area
- Lack of ground cover produces increase runoff compared to historic condition with less dense tree cover and ground cover (e.g., grasses).

Figure 94: Example of Bare Soil Bluff

LOCATION: River bluffs and larger, steeper slopes of tributaries to the Peoria Lakes.

GOALS AND OBJECTIVES: Restore native vegetation ground cover to steep woodlands by managing vegetation, resulting in reduced surface erosion and reduce surface runoff. Methods of vegetation control include controlled burns and removal of invasive species.

- Use controlled burns periodically to control invasive species such as sugar maple and wild honey-suckle
- Restore wooded areas through removal of invasive species.

BENEFITS: Reduced surface erosion and reduced surface runoff, which reduces sediment load to the Lakes from local tributaries and reduces the flashiness of runoff. Ground cover on the bluff slopes increases infiltration and contributes to improved baseflow.

- Reduced erosion from steep slopes lacking ground cover
- Reduced runoff from barren steep slopes
- Improved habitat for native fauna

COSTS:

CONCERNS: Most bluff woodland areas are privately owned and there is limited direct benefit apparent to land owners, compared to no cost and no effort typically directed at those lands. Several larger woodland bluff areas in public ownership have been managed over the past several years.

- Most bluff woodlands are under private ownership, requiring land owner cooperation and participation
- Controlled burns require care and preparation to avoid uncontrolled fires

OPERATIONS AND MAINTENANCE: On-going maintenance is required, especially in early years of isolated managed areas surrounded by areas supporting invasive species.

River Bluff and Steep Slope Stormwater Management

DESCRIPTION: Management of stormwater impacted by development requires careful planning and measures to avoid creating severe erosion hazards, including new or expanded gullies. This can be a difficult problem to address using typical stormwater management systems and practices. Structural and non-structural measures are needed to minimize erosion and sediment delivery to Peoria Lakes, but also to protect infrastructure.

PROBLEM IDENTIFICATION: Point discharges of stormwater runoff from developed areas onto steep, high soil slopes is a common problem in the areas surrounding Peoria Lakes. Historic events have included not only gully erosion, but damage failures leading to failed utilities and structures, including homes. Historic practices have led to devastating situations with homes being damaged and threatened to the point of needing to be condemned and raised, the need for expensive structural measures such as retaining walls, and other serious problems in addition to the problem of creating significant point sources of sediment delivered directly into streams to be transported to Peoria Lakes.

Figure 95: Example of a Failed Slop Near a Municipal Storm Drain Outlet

Figure 96: Failed attempt to manage ravine gully erosion from residential area stormwater runoff

LOCATION: Steep, high slopes associated with river bluffs and ravines associated with river bluffs and large tributary streams.

GOALS AND OBJECTIVES: Identify measures to avoid or minimize creation of problem areas for new development and re-development and to remedy problems at existing development.

A range of site conditions exist and a range of options to best management practices to needed.

- Identify a range of non-structural measures available to assist land owners, developers, design engineers, and others to minimize development impacts on stormwater.
- Identify a range of structural measures to manage stormwater in the vicinity of steep or high slopes to minimize impacts

BENEFITS:

- Reduced gully formation and expansion
- Reduced sediment delivery to local streams and ultimately Peoria Lakes
- Reduced damage to public and private infrastructure

COSTS: TBD

CONCERNS:

- It may be difficult to gain acceptance of adequate controls and measures to reduce stormwater impacts for new development
- Existing problems and existing development with developing problems are usually expensive to control by retrofitting measures and the cost of erosion is often viewed as relatively small.

OPERATIONS AND MAINTENANCE:

Operations may be limited to only the more elaborate stormwater measures. Maintenance will be required for most measures either as routine planned maintenance (e.g., bioswales) or as-needed maintenance in these potentially rapidly changing landscape.

Ravine Gully Stabilization

DESCRIPTION: Stabilization of eroding ravines and gullies, especially on steep slopes of river bluff areas. Down-cutting of small drainages in the bluff area is common as a result of vegetation changes on the bluff (see Bluff Woodland Management Fact Sheet), increased runoff from upland land cover and land use changes.

PROBLEM IDENTIFICATION: Down-cutting of streams in small steep watersheds along the river bluffs and tributaries is common as a result of increased runoff from upland areas due to land cover and land use changes. Down-cutting of the streams results in over-steepening of the side slopes and ultimately failure of the side slopes due to slope failures. Loose failed soil is deposited directly into the stream resulting in nearly 100% of the eroded soil being transported to Peoria Lakes.

- As streams have down-cut and upland runoff has increased, headwater gullies have formed and continue to extend into uplands, generating sediment and impairing land use and infrastructure
- Gully formation is difficult to control without addressing downstream base elevation and runoff rates and volumes

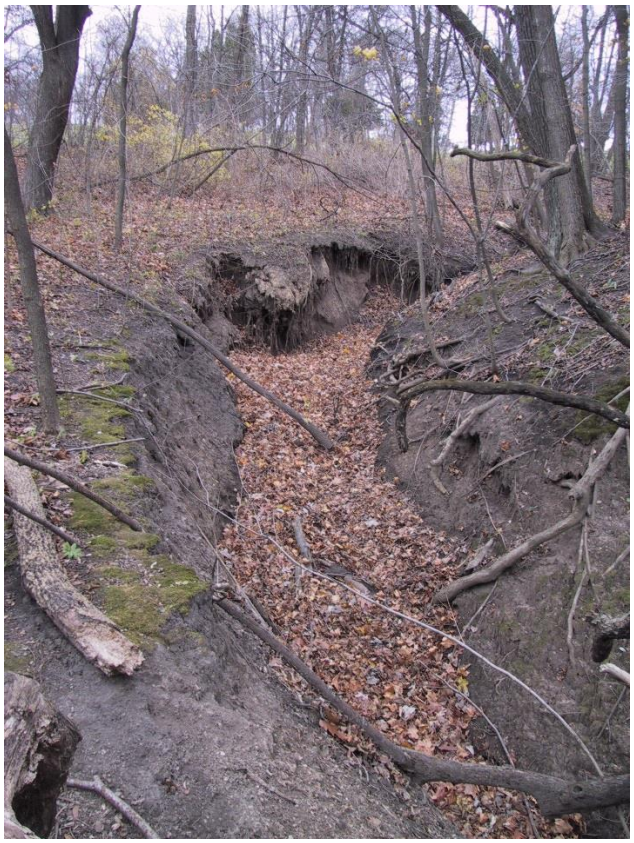


Figure 97: Gully eroded into ravine slope at Springdale Cemetery

LOCATION: TBD

GOALS AND OBJECTIVES: Stabilize these small steep streams to prevent further down-cutting or to build the level up to previous levels if practical to buttress steep slopes. This measure can often be combined with Bluff Woodland Management and/or Prairie Restoration to reduce surface runoff.

- Stabilize existing gullies against future continued down-cutting
- Control runoff rates that contribute to gully growth along with down-cutting
- Educate land owners and provide resources and motivation for land owner control of gullies

BENEFITS: In addition to reducing the sediment load to Peoria Lakes, this practice reduces future slope failures and gully extensions that damage adjacent upland land used for agriculture, residential lots, roadways, etc.

- Reduced sediment load to streams
- Reduced damage to crop land and other upland lands and public and private infrastructure

COSTS: TBD

CONCERNS:

- Most river bluff ravines are on private lands, requiring cooperation and action by private land owners
- A primary mechanism driving gully formation is base-level lowering at often distant locations on larger streams that may be difficult or impossible for the land owner at the on-going gully formation to control

OPERATIONS AND MAINTENANCE:

There would normally be no operations associated with gully stabilization. Maintenance requirements will be minimal if planning, design, and construction are successful. Some repairs are, however, likely as a result of inadequate construction or destabilizing conditions from beyond the original construction area.

Urban Stormwater Hydrologic Modification Best Management Practices

DESCRIPTION:
Urban stormwater hydrologic modification best management practices consist of an extensive subset of urban stormwater best management practices (BMPs) that have been developed in recent years. BMPs address stormwater quantity and quality. These practices are also known as green infrastructure and low impact development practices. While there is ample reason for the urban area around the Peoria Lakes to implement BMPs in general, reduction of sediment load delivered to Peoria Lakes is most directly addressed by those BMPs that reduce runoff volume and peak rates of runoff through runoff reduction, runoff retention, and runoff detention. Adoption of standards requiring use of BMPs for new development and redevelopment and as retrofitting stormwater management systems through public works projects. For governmental units with Clean Water Act National Pollutant Discharge Elimination System (NPDES) municipal stormwater system discharge permits, implementation of BMPs to the "maximum extent practical" is already a regulatory requirement.

PROBLEM IDENTIFICATION:
Urban development has greatly increased surface water runoff above natural conditions as a result of construction of impervious surfaces (roof tops, streets and roads, parking lots, etc.) and drainage improvements to minimize temporary ponding of storm runoff. The increased rate and volume of runoff de-stabilizes natural streams, causing down-cutting of the streambed, streambank erosion, and extension of the stream into uplands, often through gully formation.

- Increases in runoff volume due to development
- Increases in peak rates of runoff
- Increases energy to streams resulting in down-cutting of streambed and streambank erosion

LOCATION: Urbanized areas with residential, commercial, and industrial development.

GOALS AND OBJECTIVES:

- Utilize stormwater BMPs to reduce impacts of future development and redevelopment on stormwater runoff
- Implement stormwater management plans in targeted watersheds with priority of retrofitting practices in developed watersheds that will reduce runoff and stream erosion.

BENEFITS:

- Reduced stream erosion
- Reduced flooding
- Improved stormwater quality

COSTS: TBD

CONCERNS:

- The level, or extent, of runoff control to significantly reduce stream erosion depends on numerous factors and should be reliably determined to avoid cost and effort that may not make a significant impact.

OPERATIONS AND MAINTENANCE: There are numerous types of BMPs, including structural and non-structural. Nearly all structural BMPs require some level of maintenance.

LIST OF REPRESENTATIVE BMPs: A list of representative stormwater BMPs is below, not necessarily focused on hydrologic modification. Many stormwater BMPs addressing post-construction runoff, construction period runoff, residential, commercial, industrial, etc. are available.

- **Municipal Program Elements**
  - BMP Inspection and Maintenance
  - Ordinances for Post-construction Runoff
  - Post-construction Plan Review
  - Zoning
- **Innovative BMPs for Site Plans**
  - Alternative Turnarounds
  - Conservation Easements
  - Development Districts
  - Eliminating Curbs and Gutters
  - Green Parking
  - Green Roofs
  - Infrastructure Planning
  - Low Impact Development (LID)
  - (LID) and Other Green Design Strategies
  - Narrower Residential Streets
  - Open Space Design
  - Protection of Natural Features
  - Redevelopment
  - Riparian/Forested Buffer
  - Street Design and Patterns
  - Urban Forestry
- **Infiltration**
  - Grassed Swales
  - Infiltration Basin
  - Infiltration Trench
  - Permeable Interlocking Concrete Pavement
  - Pervious Concrete Pavement
  - Porous Asphalt Pavement

- **Filtration**
    - Bioretention (Rain Gardens)
    - Catch Basin Inserts
    - Sand and Organic Filters
    - Vegetated Filter Strip
- **Retention/Detention**
    - Dry Detention Ponds
    - In-Line Storage
    - On-Lot Treatment
    - Stormwater Wetland
    - Wet Ponds
- **Other**
    - Alum Injection
    - Manufactured Products for Stormwater Inlets

RESOURCE LINKS

https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#edu

Farm Creek Flood Control Channel Sediment Retention

DESCRIPTION: Creation of a sediment retention basin near the outlet of Farm Creek utilizing the existing concrete-lined flood control channel for secondary purpose of cost-effective sediment trapping and removal.

PROBLEM IDENTIFICATION: Farm Creek has contributed a large amount of sediment to Lower Peoria Lake. The sediment load is apparent by observation of the Farm Creek delta immediately upstream (north) of the Murray Baker Bridge. The existing concrete-lined flood control channel was constructed by the USACE in 1952 to convey the design flood peak discharge to Peoria Lake through the trapezoidal-shaped channel. Sediment is deposited along the approximately 1-mile long concrete channel because the channel cross section is oversized to carry the large flood flow. Removal of sediment from the channel is performed by the East Peoria Levee and Sanitary District in accordance with USACE requirements. However, sediment removal has historically been infrequent. More recently, increased emphasis has been placed on regular removal of sediment.

- Farm Creek has a drainage area of 60 sq mi and has extensive steep slope tributaries that generate high sediment load to Lower Peoria Lake
- Past watershed activities have significantly destabilized Farm Creek
- Construction of the Farm Creek flood control channel as a concrete-lined trapezoidal channel exacerbates sediment transport through lower Farm Creek
- The concrete-lined trapezoidal channel provides no habitat or natural water quality treatment other than sedimentation in the over-sized channel cross section
- The concrete-line trapezoidal channel is probably not aesthetically desirable to most people compared to alternatives
- While the existing flood control channel captures much of the larger sediment (sand and gravel) delivered to it, fine-grained silt and clay sediments are transported further downstream to the delta area at the river

Figure 99:Looking downstream along Farm Creek Flood Control Channel; Washington Street bridge in background

Figure 98: Looking upstream along Farm Creek Flood Control Channel under I-74 bridge

LOCATION: Farm Creek Flood Control Channel at East Peoria, upper 0.65 mile of concrete-lined channel segment.

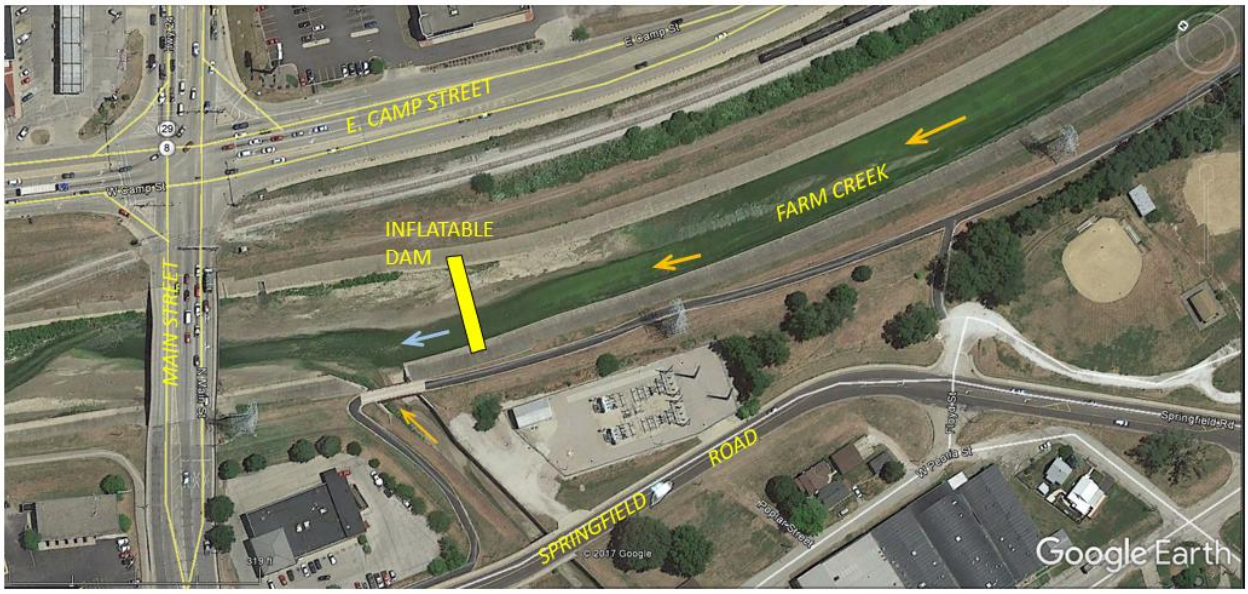


Figure 100: Potential Location of Inflatable Dam along Farm Creek

GOALS AND OBJECTIVES: Utilize the oversized Flood Control Channel with a new inflatable dam located near the downstream end to capture a higher fraction of the total sediment load passing through the channel to Peoria Lake. The existing flood control channel is believed to have poor water quality and aquatic habitat characteristics because of the wide, concrete-lined section under the sediment-free condition. An inflatable dam can be used to raise water levels in the flood control channel, reducing flow velocity and capturing a larger fraction of the sediment. Removal of sediment from the concrete-lined channel is easier, less costly, and less environmentally problematic than dredging sediment from the Lake. The inflatable dam can be lowered quickly in the event of high flow to recover the full flow conveyance capacity of the flood control channel. Sediment present in the channel at the time of lowering should be limited by regular removal of sediment as well as the sediment becoming mobilized and transported if present when the inflatable dam is lowered.

- Capture a larger fraction of the Farm Creek sediment load, especially a much larger fraction of the fine-grained sediments
- Allow for lower-cost sediment excavation from concrete-lined channel compared to river dredging
- Allow natural sorting of sediments to maximize beneficial use of removed sediments
- Provide improved stream habitat
- Create improved aesthetic conditions compared to large concrete-lined channel through East Peoria
- Avoid adverse impacts to flood control

BENEFITS: The water pooled upstream of the dam during normal times will provide improved water quality (not heated by the shallow depth on concrete during summer) and improved aesthetics compared to the empty concrete channel.

- Increased sediment trapping prior to discharge to Lower Peoria Lake
- Easier more cost-effective sediment removal by dry excavation techniques compared to river dredging
- Improved stream habitat (although still impaired by periodic dredging)
- Improved aesthetics/appearance in urban area

COSTS: $500,000 capital; on-going sediment removal and inflatable dam operation.

CONCERNS: Sediment must be removed regularly as it is deposited by high flow events. The USACE, East Peoria Levee and Sanitary District, and FEMA would need to approve of the plan which must maintain a priority of meeting the flood control capacity. Also, while the existing concrete-lined channel has limited ability for aquatic organism passage (AOP), installation of a new dam would likely require consideration for AOP.

- Dam and activities will not adversely impact flood control capacity of the channel
- Dam may need to provide an acceptable level of aquatic organism passage through structural and/or operational means

OPERATIONS AND MAINTENANCE: Sediment would need to be removed regularly to avoid excessive sediment deposition (which should be done with or without the inflatable dam). The inflatable dam would need to be operated (automatic raising and lowering based on water level sensor(s) with regular manual inspections and maintenance as needed.

Hydrogeomorphic Study

DESCRIPTION: To reliably predict the benefits and impacts of various measures that may impact the transport of sediment through the Peoria Lakes, a hydrogeomorphic study is needed. This study would build upon the previous hydrodynamic modeling of Peoria Lakes completed by the Illinois State Water Survey. The costs associated with construction and maintenance of various structures within the lakes, as well as dredging options, construction of stream stabilization measures, and implementation of watershed management plans, are large and should be based on detailed studies of sediment loading from the upstream river and local tributaries combined with sediment transport through the lakes, informed by geomorphic considerations, to make informed and reliable decisions. Planning and design will be optimized through detailed analyses to reduce risks of failures and ineffective efforts. Additionally, state and federal agencies are expected to require such analyses to enable issuance of permits.

PROBLEM IDENTIFICATION: The long-term sedimentation conditions within the Peoria Lakes is a complex process reflecting the rate of sediment inflow, sediment outflow, and flow patterns through the Lakes. Large areas of the Lakes have uniform, shallow depths making future sedimentation and flow conditions difficult to predict without detailed analyses. To arrive at a most sustainable physical condition that best meets the intended uses and conditions predicting natural processes as well as on-going management (e.g., dredging), detailed analyses are required. It is unlikely that even an optimistic scenario with reduced sediment inflow to the Lakes will result in a desirable, sustainable condition within an economically viable amount of on-going dredging. Therefore, a plan for an optimized condition, with a balance of physical conditions (bathymetry), sediment transport and maintenance efforts is needed to improve chances of success.

- How much dredging would be required for a sustainable condition?
- Where should a limited amount of dredging be focused?
- What physical configuration (bathymetry) minimizes and balances the need for dredging with intended uses?
- How sensitive is success of a comprehensive plan, consisting of a myriad of in-stream and watershed measures, to the details of design of those measures?

LOCATION: The entire project area, including hydrogeomorphic model analyses of the Lakes and local tributaries.

GOALS AND OBJECTIVES:

- Define a comprehensive long-term plan based on sediment loading and sediment transport with a reliable analysis that defines a known amount and location of initial and on-going dredging.
- Optimize the costs and benefits of construction and planning
- Define a robust plan that allows for inherent uncertainty
- Utilize detailed modeling to plan the phasing of work in conjunction with natural long-term evolution due to siltation

BENEFITS:

- Optimize complex long-term planning and cost-benefit
- Maximum chance of success and robust plan (reduce risk of failure)
- Provide an ultimate relatively sustainable plan

COSTS: TBD

CONCERNS:

- Initial measures (construction and planning) need to proceed before the hydrogeomorphic study process, including inputs and iterations to reflect comprehensive plan development, will be available
- Permitting process for initial measures will require analyses that are based on incomplete, preliminary hydrogeomorphic analyses
- Sediment loading is inherently uncertain due to complexity of processes, including land use management for private lands
- Perception of the value and need for analyses are often viewed negatively and desire to act without adequate analyses is often significant.

OPERATIONS AND MAINTENANCE: Not applicable, although the analyses will define through assumptions and predictions the amount of on-going dredging required to sustain intended uses.

Agricultural Water Best Management Practices

DESCRIPTION: Numerous recognized best management practices (BMPs) for water and erosion management have been developed by the U.S. Department of Agriculture, Natural Resources Conservation Service, known previously as the Soil Conservation Service. These practices have been implemented across the U.S. voluntarily by agricultural land owners, some with cost-sharing programs. BMPs range from structural approaches to non-structural. Additionally, programs such as the Conservation Reserve Enhancement Program (CREP) have provided alternative methods to protect water, land, and habitat resources. Historically, most emphasis has been on crop fields. However, livestock management is also important in relation to impacts to streams and runoff from feed lots.

PROBLEM IDENTIFICATION: Agricultural land use requires activities that have the potential to impact water runoff, pollutant transport to streams, and natural habitats. Drainage improvements to protect crops from excess water and tillage generally increase the rate and volume of runoff from agricultural fields. Application of fertilizers provides a source for release of nutrients through surface runoff and subsurface drainage tiles. Significant advances (reductions) in these impacts have occurred over the past several decades since the SCS was formed in the 1930s. Fertilizers are expensive and understanding of the quantities and timing have improved to reduce releases to streams. But further improvements/reductions can be made, particularly with management of runoff that impacts receiving ditches, gullies, and streams. Because the Peoria Lakes capture sediment efficiently, reduction of sediment inflows reduces the rate of siltation and amount of dredging that would be required to attempt to maintain the existing lake bathymetry.

- Increases in runoff volume
- Increases in peak rates of runoff
- Increases energy to streams resulting in down-cutting of streambed and streambank erosion
- Release of nutrients from fertilizer application
- Impacts to drainage ditches and streams from livestock access
- Runoff from feed lots and manure application

LOCATION: Row crop agricultural fields.

GOALS AND OBJECTIVES:

- Utilize stormwater BMPs to reduce impacts to stormwater runoff
- Implement stormwater management plans in targeted watersheds with priority of retrofitting practices in developed watersheds that will reduce runoff and stream erosion.
- Reduce pollutant runoff, including nutrients
- Reduce drainage ditch and stream disturbance by livestock

BENEFITS:

- Reduced stream erosion
- Reduced flooding

- Improved stormwater quality

COSTS: TBD

CONCERNS:

- The level, or extent, of runoff control to significantly reduce stream erosion depends on numerous factors and should be reliably determined to avoid cost and effort that may not make a significant impact.
- Agricultural controls are voluntary and, while farmers can be assumed to limit discharges either to save cost or save the soil resource, the level of control may be inconsistent with a increased level of protection needed for Peoria Lakes due to sediment trapping efficiency

OPERATIONS AND MAINTENANCE: There are numerous types of BMPs, including structural and non-structural. Nearly all structural BMPs require some level of maintenance.

LIST OF REPRESENTATIVE BMPs

- Grass waterways
- Ponds
- Dry Dams
- Conservation Tillage
- Vegetated Buffer Strips / Filter Strips
- Terraces
- Crop Nutrient Management
- Cover Crops
- Streambank Stabilization

RESOURCE LINKS

https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/cp/ncps/?cid=nrcs143_026849
https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=1362
http://illinoiscbmp.org/

Invasive Fish Species

DESCRIPTION: Reduction in the numbers and biomass of invasive species could potentially increase numbers and biomass of native fishes, as well as increase recreational use of the lakes.

PROBLEM IDENTIFICATION: Common carp and the four Asian carp species are invasive fish species present in the Upper Mississippi River Basin, including the Peoria lakes area. Common carp are detrimental to aquatic ecosystems through their feeding behaviors in that they stir up sediment, increase turbidity, reduce aquatic vegetation growth, and create poor habitat for native fishes. Bighead and silver carp are planktivores that filter microscopic plants and animals out of the water column. They directly compete for food with all young fish, as well as several species that continue to feed on plankton as they mature. Grass carp are vegetarians that feed on anything green in aquatic ecosystems (e.g. overhanging tree limbs, submersed aquatic vegetation, flooded terrestrial vegetation). Black carp feed on mussels and snails, many of which are threatened or endangered, and are the only Asian carp species that hasn't yet established a breeding population in the IL River Basin as of 2017. Invasive fish species can decrease habitat quality and biodiversity and compete with native fish species for food and space.

LOCATION: Entire Peoria lakes study area.

GOALS AND OBJECTIVES: Common carp and the Asian carp species are established in the Upper Mississippi River Basin, including the Peoria Lakes area. Continual harvest pressure is currently the only method of control.

BENEFITS: Reducing the number and biomass of invasive fish species can potentially increase native species numbers, biomass, and diversity, as well as improve habitat quality for native fishes and recreational use.

COSTS: The 2017 Brandon Road Feasibility Report identified that it would cost approximately $1.5 million per year for a commercial fishing program targeted at the aggressive removal of Asian Carp in the upper Illinois Waterway. Costs would vary for the Peoria Pool.

CONCERNS:

- Legal compliance of restoration activities with all Federal, State and local regulations
- Funding limitations associated with frequency of operation

OPERATIONS AND MAINTENCE:

- Ongoing

Educational Component

Description: Regardless of the specific conservation projects that will be selected for this plan, it is essential to include an educational component for both school-age children and the public at large. Education will complement any conservation project related to the lakes and ensure that the community is aware of and understands the environmental issues. This will be part of a collaborative process with existing programs, boards, schools, and organizations that already provide environmental education initiatives to the area, so it is not necessary to start from square one.

This fact sheet refers to a broad educational component; ultimately, if it is included in the final plan, it will be more defined and will specify which organizations and groups will be included as part of an environmental educational partnership.

Location: Tri-County Region

Problem Identification: There is a lack of public understanding and awareness of conservation issues involving the Peoria Lakes.

Goals and Objectives:

- Create public awareness and understanding of regional conservation issues
- Educate and excite the next generation of environmental stewards

Benefits: While the benefits may be difficult to measure,

- Continuous discussion of environmental issues outlined in the plan
- Public awareness and understanding of regional conservation issues

Cost: TBD

Concerns:

- Funding & staffing
- Logistics of lesson plans/events
- Allocation of planning responsibilities to a board or group
- Integration of state curricula regulations with desired outcome
    - While it is certainly possible, it may not be straightforward to incorporate the desired environmental education lessons with existing state curricula regulations.

Operations and Maintenance: TBD. This will likely involve continued efforts such as grant applications to ensure sustained funding. Ideally there should also be an evaluation program to learn the effectiveness and the impact of these educational initiatives.

Rain Barrels

Description: Rain barrels are containers that catch and collect water flowing from downspouts for a later use such as watering lawns and gardens.

Location: Tri-County Region

Problem Identification: During rain events, storm water runoff is generated from roof tops, collected in gutters and transported to a drain or ground level by a downspout. Without proper management, storm water runoff collected off of rooftops runs into storm sewers and local streams carrying sediment and pollutants such as chemicals, fertilizers, and petroleum products from automobiles.

- Impervious surfaces
- Increased sedimentation
- Increased pollutants

Goals and Objectives: Reduce the amount of localized runoff generated from rooftops that infiltrate the lakes. Objectives include:

- Reduce localized storm water runoff
- Reduce pollutants infiltrating the lakes
- Reduce sediment delivery to Peoria Lakes

Benefits: The use of a rain barrel will provide an alternative to using tap water for watering lawns, gardens and houseplants. Rain barrels also aid in reducing peak volume and velocity of storm water runoff reaching local streams and the Peoria Lakes. Collecting storm water runoff will help reduce the amount of pollutants and sediment transported into local streams and storm sewers.

- Reduces the amount of pollutants carried into local streams and lakes
- Reduces the volume of runoff delivered to storm sewer systems and streams
- Reduces flooding and erosion

Cost: Rain barrels are relatively inexpensive to install and maintain. Cost is dependent on size and design.

Concerns:

- Marketing and educating the public about the benefits of rain barrels
- Requires landowner effort

Operations and Maintenance: Rain barrels are relatively inexpensive to maintain. Cost is dependent on size and design.

Rain Gardens

Description: Rain gardens are shallow planted depressions that allow rain and snowmelt to be collected and slowed. The liquid then seeps naturally into the ground rather than running into storm drains and local streams.

Location: Tri-County Region

Problem Identification: Impervious surfaces such as homes, driveways, sidewalks, and roadways generate storm water runoff. Without proper management, storm water runoff transports sediment and pollutants such as chemicals, fertilizers, and petroleum products from automobiles into local streams and ultimately the Peoria Lakes.

- Impervious surfaces
- Increased sedimentation
- Increased pollutants

Goals and Objectives: Reduce the amount of localized runoff and pollutants that infiltrate the lakes. Objectives include:

- Reduce localized storm water runoff
- Reduce pollutants infiltrating the lakes
- Reduce sediment delivery to Peoria Lakes
- Introduce more water-tolerant native plants

Benefits: As the Peoria Lakes Watershed urbanizes, increased storm water runoff from impervious surfaces is infiltrating the lakes, bringing along pollutants and sediment. Slowing and detaining storm water runoff allows it to percolate into the ground and remove the pollutants during the process. Rain gardens don't only add beauty to lawns, they create habitat for birds, butterflies, and insects, they also help minimize sediment carried by runoff and localized flooding.

- Filter pollutants from runoff
- Reduce the volume of runoff delivered to storm sewer systems and streams
- Reduce flooding and erosion
- Provide habitat for wildlife

Cost: Rain gardens are relatively inexpensive to install and maintain. Cost is dependent on size and design.

Concerns:

- Marketing and educating the public about the benefits of rain gardens
- Requires landowner effort

Operations and Maintenance: Rain gardens are relatively inexpensive to maintain. Cost is dependent on size and design.

Water Quality Best Management Practices (BMPs)

Description: The introduction of water quality best management practices (BMPs) reduces pollutant discharge into the local streams and Peoria Lakes by slowing down the flow. This slower flow allows vegetation to filter suspended solids and absorb nutrients from the water. A wide variety of BMPs would enhance water quality, and they apply to an assortment of topographies across drainage ditches, wetlands, streams, or agricultural areas.

Location: Peoria Lakes Watershed

Problem Identification: Impervious surfaces such as homes, driveways, sidewalks, and roadways generate increased stormwater runoff as well as easy wash-off of pollutants accumulated on the impervious surfaces. Without proper management, stormwater runoff transports sediment and pollutants such as chemicals, fertilizers, and petroleum products from automobiles into local streams and ultimately the Peoria Lakes. In agricultural areas, tillage periodically disturbs the soil causing it to have an increase in runoff potential and erosion potential. Fertilizers are also commonly applied, creating a source of increased nutrients and other pollutants to be transported to streams.

- Impervious surfaces and other land cover changes as well as drainage improvements generate increased stormwater runoff rates and volumes
- Increased stormwater runoff creates increased erosion and sediment transport potential
- Urban and agricultural development generate a range of pollutants

Goals and Objectives: Slowing water flow and providing suitable vegetation to filter pollutants from water (a natural wetland function)

- Reduce nutrient loads
- Reduce sediment loads
- Provide stormwater retention/detention to reduce impacts of development on stormwater runoff

Benefits: As the Peoria Lakes Watershed urbanizes, increased stormwater runoff from urban and agricultural land transports pollutants and sediment. Slowing and redirecting flows into wetlands allows vegetation to extract nutrients and other pollutants. Water quality BMPs help improve water quality, restore wetlands, and improve fish and wildlife habitat.

- Filter pollutants from waterways
- Provide habitat for wildlife
- Slow down/hold sediment loads

Cost: TBD

Concerns:

- Funding
- May require landowner effort
- May hinder fish movements

Operations and Maintenance: TBD

Reference:

https://nnsa.energy.gov/sites/default/files/seis/EPA%202010c%20Stormwater%20Menu%20of%20BMPs.pdf

Nutrient Farming, Backwater Restoration, & Floodplain Recapture

DESCRIPTION: Backwater Restoration & Floodplain Recapture offer a holistic approach to addressing many challenges facing the Peoria Lakes. Incorporating nutrient farming into the mix of solutions provides significant ecological and financial benefits to the overall endeavors.

PROBLEM IDENTIFICATION: The loss of Illinois River wetlands over the years and the increases in nutrient flow into the river during that same period of time, have resulted in ever-increasing levels of nutrients in the water and carbon in the air. It is estimated that nitrate-nitrogen in the Illinois River has more than tripled in the past 100 years. Such excess nutrients in the water cause an explosive growth in algae, which, when they decompose, consume most of the oxygen in the water. This reality has negative local implications as well as national, and even international, impacts as the polluted water flows south to the Gulf of Mexico.

LOCATION:

- Upper & Middle Lake Drawdown Areas
- Selected Floodplain & Floodplain Recapture Areas
- Kickapoo Creek Conservation Area
- Senachwine Creek Conservation Area
- Farm Creek Conservation Area
- Others

GOALS & OBJECTIVES: Establish quality wetlands components that optimize ecological and recreational benefits and, at the same time, absorb nutrients from the water and carbon from the air. Pursue this collaborative effort in ways that would qualify it as a "nutrient farming" endeavor, which could generate "credits" for removing the nutrients that would be sold with the proceeds being used to help fund the development and management of the overall sites.

BENEFITS:

- Quality ecological and recreational resources
- Potentially financially self-sustaining resources
- Local entities & others already developing the model including the Nature Conservancy, Bradley University, Greater Peoria Sanitary District & The Wetlands Initiative

COSTS: TBD

CONCERNS: The project would be dependent upon securing appropriate governmental agencies approvals for the mitigating "credits" and the benefiting entities abilities to purchase them.

OPERATIONS & MAINTENANCE: TBD

Lower Lake Deepwater Creation

DESCRIPTION: Establish & Ongoing Dredging & Sediment Placement/Utilization Program for Lower Peoria Lake that includes every area except those covered by the following:

- Shoreline Village Deepwater Area Dredging
- East Peoria Secondary Channel Dredging
- Lower Lake Navigation Channel Dredging
- Peoria Marinas/Docks Dredging

PROBLEM IDENTIFICATION: Peoria Lakes are subject to high sediment delivery from 10 direct tributaries. High erosion and surface water runoff is attributable both to the geology of the Peoria Lakes region and to land cover conversion to agriculture in tributary watersheds. Subsequent degradation of stream and riparian habitat adjacent to tributaries increased erosion and reduced the capacity of these buffers to trap sediment. These tributaries comprise 3% of the total drainage area of Peoria but deliver 40% or more of the sediment deposited in the lake. Water depths greater than five feet are currently found only in the navigation channel and this loss of backwater bathymetric diversity has resulted in:

- Widespread loss of backwater and secondary channel depth
- Loss of fish overwintering habitat
- Loss of feeding habitat for fish and other species
- Decreases in water quality and increases in turbidity
- Significant decreases in aquatic vegetation establishment
- Loss of channel connectivity
- Decreases in recreational opportunities

LOCATION: Lower Peoria Lake

GOALS & OBJECTIVES: Dredge and maintain the majority of Lower Peoria Lake as a deepwater habitat and fishing and boating area. This project will be coordinated with the other Lower Peoria Lake improvements that are envisioned and be a complement to the overall Lower Peoria Lake urban focus, tourism center, and activities theme.

BENEFITS: The project will provide a major deepwater amenity for fishing, boating, fish overwintering, and river recreation and tourism opportunities. Because of its combined functions, there are various funding sources that will be pursued to help make it happen and to maintain its depth.

COSTS: TBD

CONCERNS: The scope of this development will be determined by the funding availability and the opportunities available to utilize the dredged materials in cost-effective ways.

OPERATIONS & MAINTENANCE: It is proposed an ongoing dredging & sediment utilization program be established to undertake and maintain this project as well as others.

Secondary Channels & Lakefront Sediment Placement & Conservation / Recreation Corridors Establishment

DESCRIPTION: Dredge secondary channels at selected locations to provide deepwater habitat areas, connect conservation/recreation resources to one another, and link lakefront marinas and activity centers to the navigation channel and other resources up and down the Illinois River. Use dredged material from the secondary channels to establish conservation corridors, lakefront parks, recreation facilities, and hiking/biking trails within the corridors.

PROBLEM IDENTIFICATION: Peoria Lakes are subject to high sediment delivery from 10 direct tributaries. High erosion and surface water runoff is attributable both to the geology of the Peoria Lakes region and to land cover conversion to agriculture in tributary watersheds. Subsequent degradation of stream and riparian habitat adjacent to tributaries increased erosion and reduced the capacity of these buffers to trap sediment. These tributaries comprise 3% of the total drainage area of Peoria but deliver 40% or more of the sediment deposited in the lake. Water depths greater than five feet are currently found only in the navigation channel and this loss of backwater bathymetric diversity has resulted in:

- Widespread loss of backwater and secondary channel depth
- Loss of fish overwintering habitat
- Loss of feeding habitat for fish and other species
- Decreases in water quality and increases in turbidity
- Significant decreases in aquatic vegetation establishment
- Loss of channel connectivity
- Decreases in recreational opportunities
- Decreased use of marinas & boating opportunities
- Reduced lakefront development opportunities

LOCATION: Lakefront secondary channels and conservation/recreation corridors are proposed to be developed at the following locations:

- East Peoria Secondary Channel
- Middle Lake Eastside Channels

GOALS & OBJECTIVES: Dredge the proposed secondary channels with the following goals & objectives in mind:

- Provide expanded deepwater habitat for fish and other species
- Provide fish overwintering habitat
- Provide aquatic connection between various habitat centers & the navigation channel
- Construct lakefront conservation/recreation corridors that link various terrestrial habitat areas to themselves & in-lake resources
- Link lakefront marinas & river recreation facilities to the navigation channel

- Support lakefront development opportunities & expanded conservation improvements, & generate additional funding sources

BENEFITS: The project will provide significant deepwater amenities for fishing, boating, fish overwintering, and other river recreation and tourism opportunities. In addition, they will expand lakefront conservation and recreation resources connections as well as link lakefront development opportunities to the navigation channel and, thus, access to all resources within Peoria Lakes and the entire Illinois River Corridor. Because of the project's combined functions, there are various funding sources that will be pursued to help construct and maintain the improvements.

COSTS: TBD

CONCERNS:

- Legal compliance of restoration activities with all federal, state and local regulations
- Real estate issues pertaining to the lakefront development components
- Funding timing and availability

OPERATIONS & MAINTENANCE: The plan is to generate operations & maintenance funding from adjacent developments that benefit from the improvements being provided.

Navigation Channel Dredging & Barrier Island Construction

DESCRIPTION: It is proposed that the navigation channel be dredged to its minimum standards of 9 feet deep and 300 feet wide. Dredged material from this endeavor would be used to construct the proposed barrier islands in the Middle and Upper Peoria Lakes and also be used for other purposes from the Lower Lake dredging.

PROBLEM IDENTIFICATION: To accommodate the barge traffic on the river, the navigation channel is to be maintained at 9 feet deep and 300 feet wide. Unfortunately, today these minimum dimensions are not always being maintained resulting in the navigation channel within the lake only being able to accommodate one-way traffic. This situation results in barges being delayed before entering the Peoria Lakes in order to avoid conflicts.

LOCATION: (As stated above)

GOALS & OBJECTIVES: To work with the barge industry and assess the need for improvements to the navigation channel, design said improvements, determine construction costs and funding sources, and establish an implementation strategy.

BENEFITS:

- Barge delays would be reduced
- Conflicts between barges and other boats would be reduced
- Barrier Islands would be funded and constructed
- Barrier Island benefits would be realized

COSTS: TBD

CONCERNS:

- Navigation channel funding availability

OPERATIONS & MAINTENANCE: The Barrier Islands could be maintained as conservation amenities and/or navigation channel resources.

Eastside Marinas / Docks & Deepwater Dredging

DESCRIPTION: An ongoing dredging program for the east side of the lake from Spring Bay south to improve lakefront access, to provide deep water for marinas, docks and establish and maintain deeper water for lakefront properties. All of which will also function as deepwater habitat opportunities.

PROBLEM INDENTIFICATION: Sedimentation is reducing water depth along the entire east side of the lake and adversely impacting marinas, docks, deep water habitats, and lakefront properties.

LOCATION: (Same as above)

GOALS & OBJECTIVES:

- Work with cities, marina and dock owners, and other lakefront property owners, not already included in other Eastside Lakefront Projects, and prepare dredging plans, sediment placement/utilization plans, and lakefront development strategies, and implement deepwater habitat projects.

BENEFITS: Individual projects will be developed for each segment of the Eastside Lakefront and collaborative funding programs established for only those areas where there is city/county, property owner, and other stakeholder support.

COSTS: TBD

CONCERNS:

- Potential limited participation

OPERATIONS & MAINTENANCE:

- Ongoing Dredging & Sediment Placement/Utilization Program

Westside Marinas / Docks & Deepwater Dredging

DESCRIPTION: An ongoing dredging program for the west side of the lake from Chillicothe south to improve lakefront access, to provide deepwater for marinas, and establish and maintain deeper water for lakefront properties. All of which will also function as deepwater habitat opportunities.

PROBLEM IDENTIFICATION: Sedimentation is reducing water depth along the entire west side of the lake and adversely impacting marinas, docks, deepwater habitats, and lakefront properties.

LOCATION: (Same as above)

GOALS & OBJECTIVES:

- Work with cities, marina and dock owners, and other lakefront property owners, not already included in other Westside Lakefront Projects, and prepare dredging plans, sediment placement/utilization plans, deepwater habitat plans, and lakefront development strategies and implement.

BENEFITS: Individual projects will be developed for each segment of the Westside Lakefront and collaborative funding programs established for only those areas where there is city/county, property owner, and other stakeholder support.

COSTS: (To be determined)

CONCERNS:

- Potential limited participation

OPERATIONS & MAINTENANCE:

- Ongoing Dredging & Sediment Placement/Utilization Program

Ongoing Dredging, Sediment Placement / Utilization, Deepwater Maintenance, & Detention Basins Management "Mud to Jobs"

DESCRIPTION: Public/Private Ongoing Dredging, Sediment Placement/Utilization, Deepwater Maintenance, & Detention Basins Management Program - "Mud to Jobs"

PROBLEM IDENTIFICATION: The lack of an institutional structure and operational framework to oversee the establishment and ongoing management of the "Mud to Jobs" Program as described above.

NETWORK LOCATIONS:

- "Mud to Jobs" Headquarters
    - Dredging Operations/Project Planning (Eagleview Redevelopment Project Area)
- Agriculture Topsoil Processing & Distribution Center (Eagleview Redevelopment Area)
- Lower Peoria Lakes Sediment Processing & Distribution Center (Edgewater Redevelopment Area)
- Sediment Processing & Bagging Center (Spring Bay)
- Upper Peoria Lake Sediment Processing & Distribution Center (Senachwine Creek Conservation Area)

GOALS & OBJECTIVES:

- Establish the institutional structure and operational framework required to implement the ongoing comprehensive program that is envisioned.
- Utilize lakefront development opportunities to establish ongoing funding for the "Mud to Jobs" Program.
- Use sediment placement and utilization opportunities to establish funding sources for the "Mud to Jobs" Program.

BENEFITS:

- Self-generating sources to help fund ({Mud to Jobs" projects and maintenance activities.

COSTS: TBD

CONCERNS:

- Excessive dredging, processing, & transport costs.
- Permitting challenges

OPERATIONS & MAINTENANCE:

- A key component of this overall focus.

Conservation / Recreation Corridor Anchors

DESCRIPTION: Other than the navigation channel, most of the remaining in-lake components of the Peoria Lakes Comprehensive Conservation Plan are devoted to conservation purposes. However, four specific areas of focus, involving both in-lake and lakefront improvements, standout as major anchors to improve Peoria Lakes and the region overall. These four areas are:

1. Woodford County Conservation Area & Spring Bay Conservation Corridor & Sediment Processing Center
2. Senachwine Creek Conservation Corridor & Chillicothe Lakefront Conservation Area & Sediment Processing Center
3. Edgewater Conservation Area & East Peoria Conservation Corridor & Sediment Processing Center
4. Kickapoo Creek Conservation Corridor & Peoria Sediment Processing Center & "Mud to Jobs" Headquarters

Both Spring Bay and Chillicothe are "gateways" to the substantial conservation resource that can evolve from the establishment of the Upper Lake Drawdown Areas and the adjacent Woodford County Conservation Area and the proposed Natural Resources Visitors/Interpretive Center.

Likewise, East Peoria's Lakefront Conservation/Recreation Corridor, the Edgewater Conservation Area, and the adjacent Lower Lake Deepwater/River Recreation Resource, will be a major conservation/recreation resource and visitor draw.

Finally, the Eagleview Redevelopment Project on Peoria's Southside, and the Kickapoo Creek Conservation Corridor Project that it contains, can serve as an important connection to the Illinois River Conservation Corridor to the south and Peoria Lakes to the north. The "Mud to Jobs" Program headquartered there will impact the entire Peoria Lakes endeavor with the dredging and sediment placement/utilization programs and projects that will be generated out of the operations center at this location.

PROBLEM IDENTIFICATION: The overall value of the Peoria Lakes as a conservation, recreation, and economic resource has not been appreciated because there has never been a collaborative regional effort to assess and understand that value until now. It has only been within the last twenty years that we have experienced a transitioning away from industrial development along the lakefront/riverfront resulting in a growing interest in generating other uses. During this same period of time we have also experienced the devastating impacts of sedimentation on lakefront use, barge transport, recreational boating, hunting & fishing, and deepwater and overwintering habitats. Because of the multitude of interests involved, it is imperative that the overall planning effort take each key interest and opportunity into account as a final plan is prepared.

LOCATION: (As described above)

GOALS & OBJECTIVES:

- Identify and pursue multi-faceted anchors that solidify the potential of Peoria Lakes to be a world class conservation, recreation, and tourism resource.
- Facilitate projects that have elements that can help make the conservation components sustainable.

BENEFITS: Implementation of the four anchor projects discussed above will have the following benefits:

- Reflects a holistic approach that links various components together in ways that optimize the conservation benefits while focusing on the interface with associated recreation, tourism, community development, and other development components as well.
- Uses community development as a means to help fund and maintain the conservation improvements.
- Provides a synergistic approach that helps elevate Peoria Lakes to all that it can be.

COSTS: TBD

CONCERNS:

- Keeping focused on the "big picture" which is to make a real, sustainable, and significant, difference in Peoria Lakes and the region overall through our collaborative endeavor.
- Being able to promote this model project as being of state and national significance and securing significant outside funding.

OPERATIONS & MAINTENANCE:

- Overall "Mud to Jobs" funding & management
- Overall individual components funding & management

Recreation, Entertainment, Education, & Natural Resources Tourism Network & Illinois River Corridor Economic Development Engine ("Rivertowns USA")

DESCRIPTION: The enhancement and ongoing maintenance of the Peoria Lakes, as envisioned in the Comprehensive Conservation Plan, will establish a framework for promoting significant economic development within the region as well as along the Illinois River Corridor from Peoria to Chicago and St. Louis, as well. The lake improvements, along with the complementary lakefront developments being pursued, will transform our region into a national/international visitors' attraction with Peoria Lakes, our lakefront natural resources, and the communities involved being, collectively, the centerpiece of this major public/private venture. The "Spirit of Peoria," Peoria Charter Coach, and other members of the "RiverTowns USA" Alliance that includes participating cities, activity centers, Peoria Area Convention & Visitors Bureau, the Scenic Byway organization, et. al., will carry out collaborative programming, coordinated marketing, and establish a network of opportunities that will bring the nation and world to the Peoria Area and along the entire Illinois River as a result of this exciting endeavor.

PROBLEM IDENTIFICATION: With Caterpillar's downsizing and the shifting of its world headquarters to Chicago, along with the current state and local financial challenges which need to be addressed, every effort needs to be made to find ways to grow the economy, expand the tax base, and bring new jobs and business opportunities to the region and state. "RiverTowns USA" has the potential to be an economic development engine that could bring about such results and, at the same time, generate funding to help construct and maintain the lake improvements envisioned within the Comprehensive Conservation Plan and the "Mud to Jobs," and "RiverTowns USA" programs.

LOCATION: Peoria Lakes and along the Illinois River Corridor within selected communities and natural resources sites.

GOALS & OBJECTIVIES:

- Provide lakefront developments that complement the in-lake and lakefront natural resources improvements and at the same time generate funding to help construct and maintain the natural resources improvements being made.
- Provide lakefront and in-lake improvements that contribute to the establishment of a world class water and lakefront resource that is the envy of other communities and the centerpiece of the "RiverTowns USA" multi-faceted network that brings other Illinois River communities into the tourism collaboration being established.
- Promote the overall endeavor as having state and even national significance, and solicit funding from all appropriate sources.

BENEFITS:

- Self-generating funding opportunities from economic development components to help fund natural resources improvements
- Enhanced state and federal funding opportunities
- Coordinated in-lake and lakefront improvements
- Enhanced programming, marketing, and promotion capabilities and results.

COSTS: TBD

CONCERNS:

- Establishing the institutional capability to carry out the collaborative planning, project design, and project implementation work that is required to bring about such a multifaceted endeavor.

OPERATIONS & MAINTENANCE: Many of the natural resources and recreation amenities will become integral components of the public/private ventures; thus, the private development components will have a role to play in helping fund the ongoing operations and maintenance costs.

Appendix N: Original Fact Sheet Benefit Matrix

Peoria Lakes Comprehensive Conservation Plan - Fact Sheet Benefit Matrix

Fact Sheet	Benefits	Sediment Load Reduction (Local)	Sediment Flushing	Sediment Management	Sediment Placement	Sediment Resuspension Reduction / Wave Blockage	River Bank Erosion Reduction	Deep Water Habitat Creation	Nutrient Reduction	Bacteria / Pathogen Reduction	Rooted vegetation / Marsh Habitat Creation	Invasive Species	Habitat Diversity	Upland Habitat Creation / Enhancement	Economic Development	Navigation	Recreation	Land Resource Protection	Infrastructure Protection	Reliability of Design / Optimization	TMDL / LRS Compliance	Hydroperiod Restoration	Financial / Funding	Community Awareness
	Benefit Impact	13	5	17	16	11	13	13	17	5	7	2	22	7	12	4	11	10	11	1	19	2	2	14
Systemwide																								
Fact Sheet 21	Hydrogeomorphic Study																			●	●			
Fact Sheet 24	Educational Component																				●			●
In-Lake																								
Fact Sheet 1	Backwater Restoriation			●	●	●		●			●		●											
Fact Sheet 2	Deepwater Area Creation			●	●			●					●		●		●							
Fact Sheet 3	Drawdowns			●	●	●	●		●		●		●								●			
Fact Sheet 4	Dredging and Sediment Placement			●	●	●		●					●		●		●							
Fact Sheet 6	Invasive Species-Asian Carp											●	●		●									
Fact Sheet 7	Island Creation		●	●	●	●	●	●					●											
Fact Sheet 8	Lower Lake Islands		●	●	●	●	●	●					●											
Fact Sheet 9	Pool Level Drawdown			●		●			●		●		●								●	●		
Fact Sheet 11	Secondary Channel		●	●	●	●		●					●		●	●	●							
Fact Sheet 13	Submersed Aquatic Vegetation (Breakwaters)			●	●	●	●		●		●		●						●		●			
Fact Sheet 14	Chevrons		●	●	●	●	●				●		●											
Fact Sheet 23	Invasive Fish Species											●	●		●									
Fact Sheet 28	Nutrient Farming, Backwater Restoration & Floodplain Recapture			●	●	●	●	●	●		●		●								●			●
Fact Sheet 29	Lower Lake Deepwater Creation			●	●			●			●		●		●		●							
Fact Sheet 30	Secondary Channels & Lakefront Sediment Placement & Conservation / Recreation Corridors Establishment		●	●	●			●					●		●	●	●							
Fact Sheet 31	Navigation Channel Dredging & Barrier Island Construction			●	●	●	●	●					●			●	●							
Fact Sheet 32	Eastside Marinas / Docks & Deepwater Dredging			●	●			●					●		●		●							
Fact Sheet 33	Westside Marinas / Docks & Deepwater Dredging			●	●			●					●		●		●							
Fact Sheet 34	Mud to Jobs			●	●			●					●		●	●	●						●	●
Adjacent																								
Fact Sheet 5	Floodplain Recapture	●							●				●								●	●		
Fact Sheet 12	Sediment Detention Basins	●							●												●			
Fact Sheet 20	Farm Creek Flood Control Sediment Retention	●							●				●								●			●
Fact Sheet 35	Conservation / Recreation Corridor Anchors														●		●							●
Fact Sheet 36	Rivertowns USA														●		●						●	●
Watershed																								
Fact Sheet 10	Prairie Restoration	●							●					●				●	●		●			●
Fact Sheet 15	Tributary Stream Stabilization	●					●		●									●	●		●			
Fact Sheet 16	Bluff Area Woodland Management	●							●					●				●	●		●			
Fact Sheet 17	River Bluff / Steep Slope Stormwater Management	●							●									●	●		●			●
Fact Sheet 18	Ravine and Gully Stabilization	●							●					●				●	●		●			●
Fact Sheet 19	Urban Stormwater Hydrologic Modification BMP	●					●		●	●				●				●	●		●			●
Fact Sheet 22	Agricultural Water Best Management Practices	●					●		●	●				●				●	●		●			●
Fact Sheet 25	Rain Barrels	●					●		●	●								●	●		●			●
Fact Sheet 26	Rain Gardens	●					●		●	●				●				●	●		●			●
Fact Sheet 27	Water Quality BMPs	●					●		●	●			●	●				●	●		●			●

Appendix O: Consolidated Fact Sheet Benefit Matrix

Peoria Lakes Comprehensive Conservation Plan - Fact Sheet Objective and Benefit Matrix (Consolidated)

Objectives		1		2	3				4			5			6					7		8	9
Fact Sheet \ Benefits		Sediment Load Reduction (Local)	Sediment Management	Sediment Resuspension Reduction / Wave Blockage	Flow Reduction / Percolation	Nutrient Reduction	Bacteria / Pathogen Reduction	TMDL* / LRS* Compliance	Hydroperiod Restoration	River Bank Erosion Reduction	Rooted vegetation / Marsh Habitat Creation	Land Resource Protection	Upland Habitat Creation / Enhancement	Infrastructure Protection	Sediment Flushing	Deep Water Habitat Creation	Invasive Species Management	Habitat Diversity	Navigation	Sediment Placement	Financial / Funding	Recreation	Community Awareness
Objective Impact		17		7	36				15			19			23					14		5	9
Systemwide																								
Fact Sheets 4, 34	Beneficial Use of Sediment		●			●	●									●		●	●	●	●	●	●
Fact Sheet 24	Educational Component				●			●															●
In-Lake																							
Fact Sheet 1, 28	Backwater Restoriation		●	●							●					●		●		●			
Fact Sheet 3, 9	Drawdowns		●	●		●		●	●	●	●							●		●			
Fact Sheet 2, 4, 29, 30, 31, 32, 33, 34	Dredging and Sediment Placement (Deepwater creation)		●	●							●					●		●	●	●	●	●	
Fact Sheet 7, 8, 31	Island Creation		●	●						●					●	●		●	●	●		●	
Fact Sheet 11, 30	Secondary Channel		●	●											●	●		●	●	●	●	●	
Fact Sheet 13	Submersed Aquatic Vegetation (Breakwaters)		●	●	●	●		●		●	●			●				●		●			
Fact Sheet 6, 23	Invasive Fish Species																●	●			●		
Adjacent																							
Fact Sheet 5, 28	Floodplain Recapture	●			●	●		●	●									●					
Fact Sheet 12, 20	Sediment Detention Basins	●				●		●															
Fact Sheet 30, 35, 36	Conservation / Recreation Corridor Anchors																				●	●	●
Watershed																							
Fact Sheet 10, 16	Prairie and Bluff Restoration & Management	●			●	●		●				●	●	●									●
Fact Sheet 15	Tributary Stream Stabilization	●				●		●		●		●		●									
Fact Sheet 17, 18	Erosion Control BMPs* (incl. River Bluff, Steep Slope, Ravine, & Gully Stabilization & Management)	●			●	●		●				●	●	●									●
Fact Sheet 19, 25, 26	Urban Stormwater Hydrologic Modification BMP* (incl. Rain Barrels, Rain Gardens)	●			●	●	●	●		●		●	●	●									●
Fact Sheet 22	Agricultural Water BMPs*	●			●	●	●	●		●		●	●	●									●
Fact Sheet 27	Water Quality BMPs*	●				●	●	●		●		●	●	●				●			●		●
Fact Sheet 28	Nutrient Farming	●	●	●		●	●	●		●	●	●						●			●		●

Recommended Studies	
Fact Sheet 21	Hydrogeomorphic Study
	Lake sediment characterization
	Island design Workshop
	Sediment Market Transportation Optimization
	Commercial Sediment Market Economic Analysis
	Sediment Use Investigations/Specifications
	Water Utility Sediment Market Analysis (CASM)

Hydrology
Geomorphology
Biota
Economic Development / Social

*BMP = Best Management Practices
*TMDL = Total Maximum Daily Load
*LRS = Load Reduction Strategies

Objectives
Objective 1: Reduce total sediment delivery to the Peoria Lakes (measured by reduction of annual tonnage of sediment entering the Peoria Pool).
Objective 2: Increase the acreage of aquatic vegetation.
Objective 3: Improve Peoria Lakes water quality.
Objective 4: Improve and protect wetland acres, floodplain acres, and streambank miles in the Peoria Lakes.
Objective 5: Improve and protect river bluff and steep slope areas.
Objective 6: Improve and diversify deep-water habitat and increase numbers of native fish.
Objective 7: Identify environmental and commerical use of dredged material.
Objective 8: Increase recreational use of the Peoria Lakes.
Objective 9: Improve regional awareness and support.

Appendix P: Prioritization Results Comparison

Peoria Lakes Comprehensive Conservation Plan Prioritization Station				
Measures	Environmental Impact			
	Open House		PRC	
	Number	Percent	Number	Percent
Prairie & Bluff Restoration & Management	12	18%	0	0%
Floodplain Recapture	11	17%	2	4%
Agricultural Water BMPs	10	15%	2	4%
Tributary Stream Stabilization	8	12%	4	9%
Beneficial Use of Sediment	7	11%	2	4%
Erosion Control BMPs	7	11%	1	2%
Urban Stormwater Modification BMPs	6	9%	2	4%
Backwater Restoration	5	8%	0	0%
Sediment Detention Basins	5	8%	5	11%
Invasive Fish Species	4	6%	2	4%
Conservation & Recreation Corridor Anchors	3	5%	0	0%
Drawdowns	3	5%	6	13%
Submersed Aquatic Vegetation	3	5%	5	11%
Education Component	2	3%	0	0%
Nutrient Farming	2	3%	3	7%
Deepwater Area Creation, Dredging, and Sediment Placement	1	2%	9	20%
Island Creation	0	0%	2	4%
Secondary Channel	0	0%	3	7%

Peoria Lakes Comprehensive Conservation Plan Prioritization Station				
Measures	Environmental Impact			
	Open House		PRC	
	Number	Percent	Number	Percent
Deepwater Area Creation, Dredging, and Sediment Placement	1	2%	9	20%
Drawdowns	3	5%	6	13%
Sediment Detention Basins	5	8%	5	11%
Submersed Aquatic Vegetation	3	5%	5	11%
Tributary Stream Stabilization	8	12%	4	9%
Nutrient Farming	2	3%	3	7%
Secondary Channel	0	0%	3	7%
Agricultural Water BMPs	10	15%	2	4%
Beneficial Use of Sediment	7	11%	2	4%
Floodplain Recapture	11	17%	2	4%
Invasive Fish Species	4	6%	2	4%
Island Creation	0	0%	2	4%
Urban Stormwater Modification BMPs	6	9%	2	4%
Erosion Control BMPs	7	11%	1	2%
Backwater Restoration	5	8%	0	0%
Conservation & Recreation Corridor Anchors	3	5%	0	0%
Education Component	2	3%	0	0%
Prairie & Bluff Restoration & Management	12	18%	0	0%

Peoria Lakes Comprehensive Conservation Plan Prioritization Station				
Measures	Quality of Life			
	Open House		PRC	
	Number	Percent	Number	Percent
Conservation & Recreation Corridor Anchors	22	24%	8	17%
Urban Stormwater Modification BMPs	10	11%	1	2%
Invasive Fish Species	9	10%	3	7%
Prairie & Bluff Restoration & Management	9	10%	4	9%
Education Component	8	9%	3	7%
Backwater Restoration	7	8%	0	0%
Deepwater Area Creation, Dredging, and Sediment Placement	7	8%	2	4%
Floodplain Recapture	6	7%	1	2%
Drawdowns	3	3%	1	2%
Erosion Control BMPs	3	3%	0	0%
Island Creation	3	3%	2	4%
Tributary Stream Stabilization	2	2%	1	2%
Nutrient Farming	1	1%	0	0%
Secondary Channel	1	1%	8	17%
Agricultural Water BMPs	0	0%	0	0%
Beneficial Use of Sediment	0	0%	6	13%
Sediment Dention Basins	0	0%	5	11%
Submersed Aquatic Vegetation	0	0%	1	2%

Peoria Lakes Comprehensive Conservation Plan Prioritization Station				
Measures	Quality of Life			
	Open House		PRC	
	Number	Percent	Number	Percent
Conservation & Recreation Corridor Anchors	22	24%	8	17%
Secondary Channel	1	1%	8	17%
Beneficial Use of Sediment	0	0%	6	13%
Sediment Dention Basins	0	0%	5	11%
Prairie & Bluff Restoration & Management	9	10%	4	9%
Education Component	8	9%	3	7%
Invasive Fish Species	9	10%	3	7%
Deepwater Area Creation, Dredging, and Sediment Placement	7	8%	2	4%
Island Creation	3	3%	2	4%
Drawdowns	3	3%	1	2%
Floodplain Recapture	6	7%	1	2%
Submersed Aquatic Vegetation	0	0%	1	2%
Tributary Stream Stabilization	2	2%	1	2%
Urban Stormwater Modification BMPs	10	11%	1	2%
Agricultural Water BMPs	0	0%	0	0%
Backwater Restoration	7	8%	0	0%
Erosion Control BMPs	3	3%	0	0%
Nutrient Farming	1	1%	0	0%

Peoria Lakes Comprehensive Conservation Plan Prioritization Station				
Measures	Feasibility/Sustainability			
	Open House		PRC	
	Number	Percent	Number	Percent
Beneficial Use of Sediment	18	20%	9	21%
Deepwater Area Creation, Dredging, and Sediment Placement	9	10%	3	7%
Nutrient Farming	9	10%	2	5%
Floodplain Recapture	7	8%	0	0%
Agricultural Water BMPs	5	6%	6	14%
Backwater Restoration	5	6%	2	5%
Prairie & Bluff Restoration & Management	5	6%	1	2%
Submersed Aquatic Vegetation	5	6%	0	0%
Conservation & Recreation Corridor Anchors	4	5%	0	0%
Tributary Stream Stabilization	4	5%	2	5%
Urban Stormwater Modification BMPs	4	5%	2	5%
Drawdowns	3	3%	0	0%
Education Component	3	3%	2	5%
Sediment Dention Basins	3	3%	5	12%
Island Creation	2	2%	1	2%
Erosion Control BMPs	1	1%	6	14%
Secondary Channel	1	1%	1	2%
Invasive Fish Species	0	0%	1	2%

Peoria Lakes Comprehensive Conservation Plan Prioritization Station				
Measures	Feasibility/Sustainability			
	Open House		PRC	
	Number	Percent	Number	Percent
Beneficial Use of Sediment	18	20%	9	21%
Agricultural Water BMPs	5	6%	6	14%
Erosion Control BMPs	1	1%	6	14%
Sediment Dention Basins	3	3%	5	12%
Deepwater Area Creation, Dredging, and Sediment Placement	9	10%	3	7%
Backwater Restoration	5	6%	2	5%
Education Component	3	3%	2	5%
Nutrient Farming	9	10%	2	5%
Tributary Stream Stabilization	4	5%	2	5%
Urban Stormwater Modification BMPs	4	5%	2	5%
Invasive Fish Species	0	0%	1	2%
Island Creation	2	2%	1	2%
Prairie & Bluff Restoration & Management	5	6%	1	2%
Secondary Channel	1	1%	1	2%
Conservation & Recreation Corridor Anchors	4	5%	0	0%
Drawdowns	3	3%	0	0%
Floodplain Recapture	7	8%	0	0%
Submersed Aquatic Vegetation	5	6%	0	0%

Peoria Lakes Comprehensive Conservation Plan Prioritization Station				
Measures	Total			
	Open House		PRC	
	Number	Percent	Number	Percent
Conservation & Recreation Corridor Anchors	29	11%	8	6%
Prairie & Bluff Restoration & Management	26	10%	5	4%
Beneficial Use of Sediment	25	9%	17	12%
Floodplain Recapture	24	9%	3	2%
Urban Stormwater Modification BMPs	20	7%	5	4%
Backwater Restoration	17	6%	2	1%
Deepwater Area Creation, Dredging, and Sediment Placement	17	6%	14	10%
Agricultural Water BMPs	15	6%	8	6%
Tributary Stream Stabilization	14	5%	7	5%
Education Component	13	5%	5	4%
Invasive Fish Species	13	5%	6	4%
Nutrient Farming	12	4%	5	4%
Erosion Control BMPs	11	4%	7	5%
Drawdowns	9	3%	7	5%
Sediment Dention Basins	8	3%	15	11%
Submersed Aquatic Vegetation	8	3%	6	4%
Island Creation	5	2%	5	4%
Secondary Channel	2	1%	12	9%

Peoria Lakes Comprehensive Conservation Plan Prioritization Station				
Measures	Total			
	Open House		PRC	
	Number	Percent	Number	Percent
Beneficial Use of Sediment	25	9%	17	12%
Sediment Dention Basins	8	3%	15	11%
Deepwater Area Creation, Dredging, and Sediment Placement	17	6%	14	10%
Secondary Channel	2	1%	12	9%
Agricultural Water BMPs	15	6%	8	6%
Conservation & Recreation Corridor Anchors	29	11%	8	6%
Drawdowns	9	3%	7	5%
Erosion Control BMPs	11	4%	7	5%
Tributary Stream Stabilization	14	5%	7	5%
Invasive Fish Species	13	5%	6	4%
Submersed Aquatic Vegetation	8	3%	6	4%
Education Component	13	5%	5	4%
Island Creation	5	2%	5	4%
Nutrient Farming	12	4%	5	4%
Prairie & Bluff Restoration & Management	26	10%	5	4%
Urban Stormwater Modification BMPs	20	7%	5	4%
Floodplain Recapture	24	9%	3	2%
Backwater Restoration	17	6%	2	1%

Open House Data	

Total	
1	Conservation & Recreation Corridor Anchors
2	Prairie & Bluff Restoration & Management
3	Beneficial Use of Sediment

Feasibility/Sustainability	
1	Beneficial Use of Sediment
2	Deepwater Area Creation, Dredging, and Sediment Placement
2	Nutrient Farming
3	Floodplain Recapture

Quality of Life	
1	Conservation & Recreation Corridor Anchors
2	Urban Stormwater Modification BMPs
3	Invasive Fish Species
3	Prairie & Bluff Restoration & Management

Environmental Impact	
1	Prairie & Bluff Restoration & Management
2	Floodplain Recapture
3	Agricultural Water BMPs

List of Top Open House Measures	
1	Agricultural Water BMPs
2	Beneficial Use of Sediment
3	Conservation & Recreation Corridor Anchors
4	Deepwater Area Creation, Dredging, and Sediment Placement
5	Floodplain Recapture
6	Invasive Fish Species
7	Nutrient Farming
8	Prairie & Bluff Restoration & Management
9	Urban Stormwater Modification BMPs

PRC Data

	Total
1	Beneficial Use of Sediment
2	Sediment Detention Basins
3	Deepwater Area Creation, Dredging, and Sediment Placement

	Feasibility/Sustainability
1	Beneficial Use of Sediment
2	Agricultural Water BMPs
2	Erosion Control BMPs
3	Sediment Detention Basins

	Quality of Life
1	Conservation & Recreation Corridor Anchors
2	Secondary Channel
3	Beneficial Use of Sediment

	Environmental Impact
1	Deepwater Area Creation, Dredging, and Sediment Placement
2	Drawdowns
3	Sediment Setention Basins
3	Submersed Aquatic Vegetation

	List of Top PRC Measures
1	Agricultural Water BMPs
2	Beneficial Use of Sediment
3	Conservation & Recreation Corridor Anchors
4	Deepwater Area Creation, Dredging, and Sediment Placement
5	Drawdowns
6	Erosion Control BMPs
7	Secondary Channel
8	Sediment Detention Basins
9	Submersed Aquatic Vegetation

	Overall List of Top Measures (Combined)
1	Agricultural Water BMPs
2	Beneficial Use of Sediment
3	Conservation & Recreation Corridor Anchors
4	Deepwater Area Creation, Dredging, and Sediment Placement
5	Drawdowns
6	Erosion Control BMPs
7	Floodplain Recapture
8	Invasive Fish Species
9	Nutrient Farming
10	Prairie & Bluff Restoration & Management
11	Secondary Channel
12	Sediment Dention Basins
13	Submersed Aquatic Vegetation
14	Urban Stormwater Modification BMPs

	Source
1	Agricultural Water BMPs
2	Erosion Control BMPs
3	Prairie & Bluff Restoration & Management
4	Urban Stormwater Modification BMPs

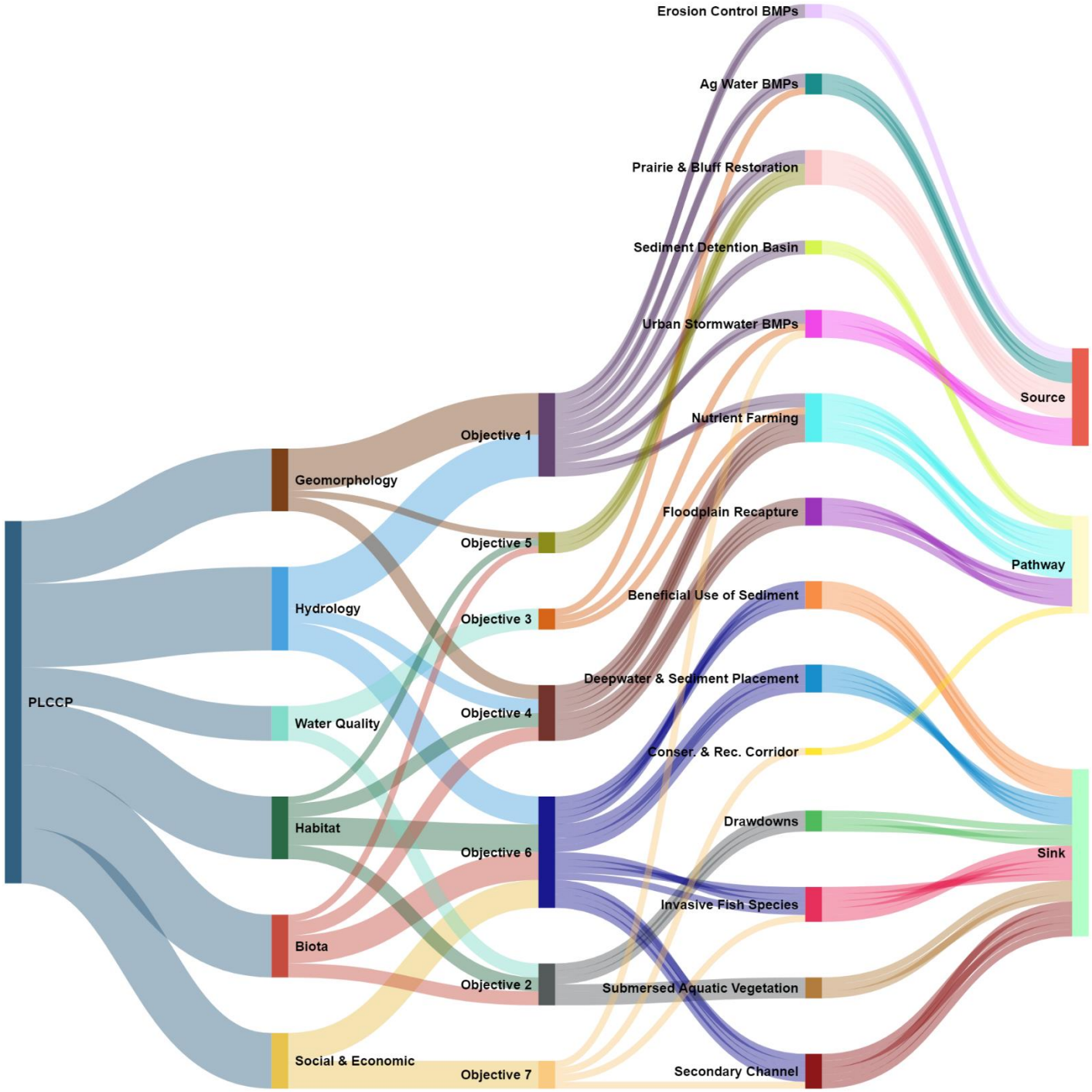
	Pathway
1	Conservation & Recreation Corridor Anchors
2	Floodplain Recapture
3	Nutrient Farming
4	Sediment Dention Basins

	Sink
1	Beneficial Use of Sediment
2	Deepwater Area Creation, Dredging, and Sediment Placement
3	Drawdowns
4	Invasive Fish Species
5	Secondary Channel
6	Submersed Aquatic Vegetation

Appendix Q: Diagrams Showing Conservation Measures Relationships

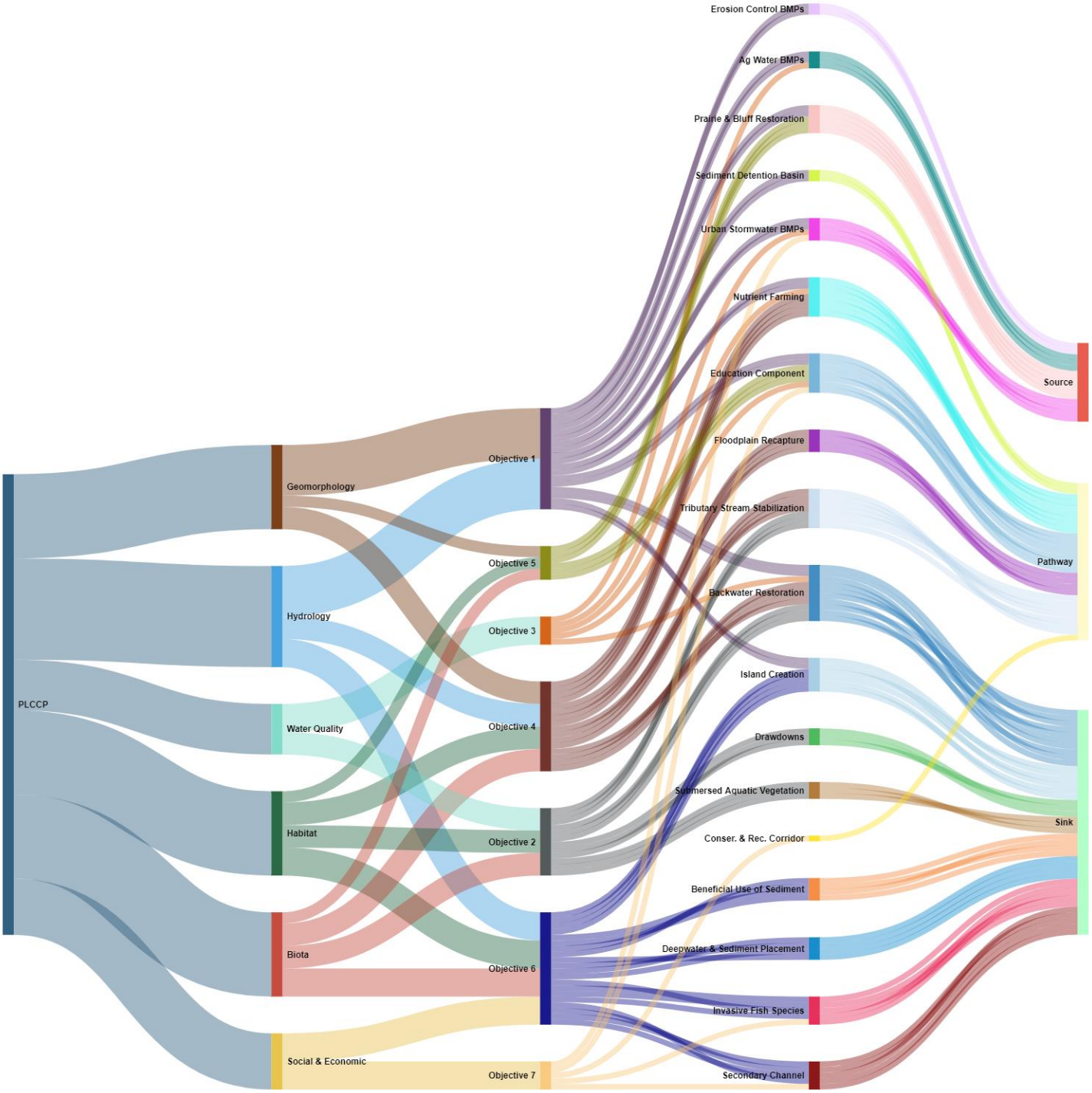
	Objectives	EECs*	Measures	Source/Pathway/Sink
1	Reduce total sediment delivery to the Peoria Lakes (measured by reduction of annual tonnage of sediment entering the Peoria Lakes).	Geomorphology	Agricultural Water BMPs	Source
			Erosion Control BMPs	Source
			Prairie & Bluff Restoration & Management	Source
			Urban Stormwater Modification BMPs	Source
			Nutrient Farming	Pathway
			Sediment Detention Basins	Pathway
2	Increase the acreage of aquatic vegetation in the Peoria Lakes.	Water Quality, Habitat, Biota	Drawdowns	Sink
			Submersed Aquatic Vegetation	Sink
3	Improve Peoria Lakes water quality.	Water Quality	Agricultural Water BMPs	Source
			Urban Stormwater Modification BMPs	Source
			Nutrient Farming	Pathway
4	Improve and protect wetland acres, floodplain acres, and streambank miles in the Peoria Lakes.	Hydrology, Geomorphology, Habitat, Biota	Floodplain Recapture	Pathway
			Nutrient Farming	Pathway
5	Improve and protect river bluff and steep slope areas along Peoria Lakes	Geomorphology, Habitat	Prairie & Bluff Restoration & Management	Source
6	Improve and diversify deep-water habitat and increase number of native fish in Peoria Lakes.	Habitat, Biota	Beneficial Use of Sediment	Sink
			Deepwater Area Creation, Dredging, and Sediment Placement	Sink
			Invasive Fish Species	Sink
			Secondary Channel	Sink
7	Improve quality of life in the region.	Social & Economic	Urban Stormwater Modification BMPs	Source
			Conservation & Recreation Corridor Anchors	Pathway
			Invasive Fish Species	Sink
			Secondary Channel	Sink

* Essential Ecosystem Characteristics


PLCCP
Geomorphology
Hydrology
Water Quality
Habitat
Biota
Social & Economic
Objective 1
Objective 5
Objective 3
Objective 4
Objective 6
Objective 2
Objective 7
Erosion Control BMPs
Ag Water BMPs
Prairie & Bluff Restoration
Sediment Detention Basin
Urban Stormwater BMPs
Nutrient Farming
Floodplain Recapture
Beneficial Use of Sediment
Deepwater & Sediment Placement
Conser. & Rec. Corridor
Drawdowns
Invasive Fish Species
Submersed Aquatic Vegetation
Secondary Channel
Source
Pathway
Sink

	Objectives	EECs*	Measures	Source/Pathway/Sink
1	Reduce total sediment delivery to the Peoria Lakes (measured by reduction of annual tonnage of sediment entering the Peoria Lakes).	Geomorphology	Agricultural Water BMPs	Source
			Erosion Control BMPs	Source
			Prairie & Bluff Restoration & Management	Source
			Urban Stormwater Modification BMPs	Source
			Nutrient Farming	Pathway
			Sediment Detention Basins	Pathway
			Backwater Restoration	Sink
			Education Component	Pathway
			Island Creation	Sink
2	Increase the acreage of aquatic vegetation in the Peoria Lakes.	Water Quality, Habitat, Biota	Drawdowns	Sink
			Submersed Aquatic Vegetation	Sink
			Backwater Restoration	Sink
			Tributary Stream Stabilization	Pathway
3	Improve Peoria Lakes water quality.	Water Quality	Agricultural Water BMPs	Source
			Urban Stormwater Modification BMPs	Source
			Nutrient Farming	Pathway
			Backwater Restoration	Sink
			Education Component	Pathway
4	Improve and protect wetland acres, floodplain acres, and streambank miles in the Peoria Lakes.	Hydrology, Geomorphology, Habitat, Biota	Floodplain Recapture	Pathway
			Nutrient Farming	Pathway
			Backwater Restoration	Sink
			Tributary Stream Stabilization	Pathway
5	Improve and protect river bluff and steep slope areas along Peoria Lakes	Geomorphology, Habitat	Prairie & Bluff Restoration & Management	Source
			Education Component	Pathway
6	Improve and diversify deep-water habitat and increase number of native fish in Peoria Lakes.	Habitat, Biota	Beneficial Use of Sediment	Sink
			Deepwater Area Creation, Dredging, and Sediment Placement	Sink
			Invasive Fish Species	Sink
			Secondary Channel	Sink
			Island Creation	Sink
7	Improve quality of life in the region.	Social & Economic	Urban Stormwater Modification BMPs	Source
			Conservation & Recreation Corridor Anchors	Pathway
			Invasive Fish Species	Sink
			Secondary Channel	Sink
			Education Component	Pathway

* Essential Ecosystem Characteristics


PLCCP
Geomorphology
Hydrology
Water Quality
Habitat
Biota
Social & Economic
Objective 1
Objective 5
Objective 3
Objective 4
Objective 2
Objective 6
Objective 7
Erosion Control BMPs
Ag Water BMPs
Prairie & Bluff Restoration
Sediment Detention Basin
Urban Stormwater BMPs
Nutrient Farming
Education Component
Floodplain Recapture
Tributary Stream Stabilization
Backwater Restoration
Island Creation
Drawdowns
Submersed Aquatic Vegetation
Conser. & Rec. Corridor
Beneficial Use of Sediment
Deepwater & Sediment Placement
Invasive Fish Species
Secondary Channel
Source
Pathway
Sink

Appendix R: Related Measures Organized by PLCCP Objectives

Objective 1

Reduce total sediment delivery to the Peoria Lakes (measured by reduction of annual tonnage of sediment entering the Peoria Lakes).

Ag BMP Grouping	Beneficial Use Grouping	Sediment Grouping
Agricultural Water BMPs	Beneficial Use of Sediment	Sediment Detention Basins
Erosion Control BMPs	Dredging and Sediment Placement	Beneficial Use of Sediment
Sediment Detention Basins	Secondary Channel	Island Creation
Tributary Stream Stabilization	Sediment Detention Basins	Agricultural Water BMPs
Educational Component	Island Creation	Nutrient Farming
Nutrient Farming	Agricultural Water BMPs	
Prairie and Bluff Restoration	Urban Stormwater BMPs	
Beneficial Use of Sediment		

Objective 2

Increase the acreage of aquatic vegetation in the Peoria Lakes.

Backwater Grouping	Drawdowns Grouping	Aquatic Vegetation Grouping
Backwater Restoration	Drawdowns	Submersed Aquatic Vegetation
Drawdowns	Backwater Restoration	Drawdowns
Floodplain Recapture	Island Creation	Nutrient Farming
Submersed Aquatic Vegetation	Submersed Aquatic Vegetation	Erosion Control BMPs
Dredging and Sediment Placement	Nutrient Farming	Floodplain Recapture
Island Creation	Conservation / Recreation Corridor Anchors	Invasive Fish Species
Erosion Control BMPs		
Nutrient Farming		
Invasive Fish Species		

Objective 3

Improve Peoria Lakes water quality.

Nutrient Farming Grouping	**Stormwater BMPs Grouping**
Nutrient Farming	Urban Stormwater BMPs
Submersed Aquatic Vegetation	Erosion Control BMPs
Drawdowns	Nutrient Farming
Backwater Restoration	Beneficial Use of Sediment
Agricultural Water BMPs	Prairie and Bluff Restoration
Urban Stormwater BMPs	Educational Component
Tributary Stream Stabilization	
Sediment Detention Basins	

Objective 4

Improve and protect wetland acres, floodplain acres, and streambank miles in the Peoria Lakes.

Floodplain Grouping	**Tributary Stream Grouping**
Floodplain Recapture	Tributary Stream Stabilization
Backwater Restoration	Erosion Control BMPs
Submersed Aquatic Vegetation	Nutrient Farming
Drawdowns	Agricultural Water BMPs
Prairie and Bluff Restoration	

Objective 5

Improve and protect river bluff and steep slope areas along Peoria Lakes.

Erosion BMPs Grouping	**Prairie & Bluff Grouping**
Erosion Control BMPs	Prairie and Bluff Restoration
Agricultural Water BMPs	Erosion Control BMPs
Prairie and Bluff Restoration	Urban Stormwater BMPs
Tributary Stream Stabilization	Floodplain Recapture
Urban Stormwater BMPs	
Educational Component	
Submersed Aquatic Vegetation	
Beneficial Use of Sediment	

Objective 6

Improve and diversify deepwater habitat and increasing number of native fishes in Peoria Lakes.

Deepwater Creation Grouping	Habitat Improvement Grouping	Island Grouping	Recreational Channel Grouping
Dredging and Sediment Placement	Invasive Fish Species	Island Creation	Secondary Channel
Backwater Restoration	Dredging and Sediment Placement	Dredging and Sediment Placement	Dredging and Sediment Placement
Beneficial Use of Sediment	Submersed Aquatic Vegetation	Sediment Detention Basins	Conservation / Recreation Corridor Anchors
Secondary Channel	Conservation / Recreation Corridor Anchors	Secondary Channel	Island Creation
Sediment Detention Basins	Beneficial Use of Sediment	Educational Component	
Conservation / Recreation Corridor Anchors			

Objective 7

Improve the quality of life in the region.

Conservation & Recreation Grouping	Educational & Outreach Grouping
Conservation / Recreation Corridor Anchors	Educational Component
Dredging and Sediment Placement	Agricultural Water BMPs
Backwater Restoration	Urban Stormwater BMPs
Prairie and Bluff Restoration	Erosion Control BMPs
Drawdowns	Island Creation
Educational Component	Conservation / Recreation Corridor Anchors