PEORIA RIVERFRONT DEVELOPMENT, ILLINOIS (ECOSYSTEM RESTORATION)

FEASIBILITY STUDY

WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

MAIN REPORT

MARCH 2003

US Army Corps
of Engineers ®
Rock Island District

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Executive Summary

The Peoria Riverfront Development (Ecosystem Restoration) Project area includes Lower Peoria Lake. The area lies within Peoria and Tazewell Counties, Illinois, and includes Illinois River Miles 162-167. The project is related to the Peoria Riverfront Development Project, a public and private cooperative effort that also includes revitalization of the City's downtown area. Development includes a visitor's center, city park, residential redevelopment, community center, riverboat landing, sports complex, entertainment centers, and retail development. The region has begun to reclaim its abandoned industrial riverfront, with the understanding that a healthy, attractive, and sustainable environment must be present.

The Illinois River is a symbol of the region's economic, social, and cultural history, as well as its future. Therefore, ecosystem restoration in Peoria Lake is a vital component to an overall effort and vision to develop the Peoria Riverfront in an ecologically, economically, and socially sustainable manner. This Ecosystem Restoration Feasibility Study was conducted by the U.S. Army Corps of Engineers and the Illinois Department of Natural Resources (Non-Federal Sponsor) to investigate the Federal and State interest in ecosystem restoration within Peoria Lake. In support of this resource vision, several regulatory efforts on the part of the cities and counties to address the sedimentation issue affecting the Illinois River have been adopted. Further, intergovernmental coordination among cities, counties, and non-governmental organizations related to the Illinois River ecosystem has resulted in several ongoing efforts to protect, restore, and enhance the resources present in Peoria Lake and its tributaries.

Specific authority to conduct the Peoria Riverfront Development Study is contained in Resolution 2500 of the Committee on Transportation and Infrastructure, adopted May 9, 1996. Additional authority is contained in Section 216 of the 1970 Flood Control Act and Section 519 of the Water Resources Development Act (WRDA) 2000, which authorized restoration of the Illinois River Basin.

The principal goal of the Recommended Plan is to enhance aquatic habitat through the restoration of depth diversity in Peoria Lake, with ancillary benefits to recreational boating and fishing. Peoria Lake, the largest bottomland lake in the Illinois River Valley, exhibits loss of depth similar to other Illinois River backwater lakes. The 60 backwater lakes along the Illinois River have average volumetric losses of 70% since 1903. Loss of aquatic habitat due to sedimentation is the greatest threat to the healthy function of the Illinois River, and Peoria Lake specifically.

Opportunities were explored to address these conditions, especially those that relate to the downtown Peoria Riverfront Development Project. Goals to achieve aquatic habitat restoration include: (1) restored depth diversity; (2) increased structure for aquatic organisms; (3) increased habitat diversity; (4) improved habitat value for migratory waterfowl and shorebirds;

(5) improved water quality; (6) sustainable project features; (7) reduced sediment delivery to Peoria Lake from tributary streams; and (8) riparian and wetland habitat restoration along tributary streams. Of these goals, the recommended plan does not substantially address project goals (7) and (8). Further study efforts are warranted to address the significant sedimentation delivery problem to the Illinois River at Peoria Lake.

MEASURES FOR PEORIA LAKE

The following restoration measures for Peoria Lake were considered in detail to achieve project goals and objectives:

1. No Federal action.
2. Dredging to create aquatic habitat and a small island (9-acre island and 17 acres dredged) upstream of the McClugage Bridge (U.S. Highways 24 and 150).
3. Dredging to create aquatic habitat and a mid-sized island (21-acre island and 55 acres dredged) upstream of the McClugage Bridge (U.S. Highways 24 and 150).
4. Dredging to create aquatic habitat and two islands with a flowing side channel (17- and 37-acre islands and 144 acres dredged) downstream of the McClugage Bridge (U.S. Highways 24 and 150).
5. Dredging to create aquatic habitat and a large island (46-acre island and 99 acres dredged) downstream of the McClugage Bridge (U.S. Highways 24 and 150).

MEASURES FOR FARM CREEK

Efforts were also undertaken to plan and evaluate upland restoration measures that could address the goals of sediment delivery to Peoria Lake and restoration of riparian and wetland habitats. Evaluations were conducted as part of this study that identified a site near Washington, Illinois in the Farm Creek Watershed. Alternatives were developed and analyses leading to selection of a recommended plan were completed. Following release of the public review draft of this report, results from a Hazardous, Toxic and Radioactive Waste (HTRW) Phase IIA Environmental Site Assessment (ESA) concluded that the project site for the recommended plan for tributary watershed restoration had contamination issues. Therefore, consistent with Corps of Engineers policy, the study team, in consultation with the Sponsor, decided to eliminate this element from the study's overall recommended plan. However, all data, plan formulation, design, and cost information have been included in Appendix (K) for the tributary watershed restoration portion of the project. Information originally included in the other appendices regarding tributary watershed restoration is included in additional sub-appendices to Appendix K. Cleanup of the project site by the City of Washington, Illinois, could allow for project completion under Section 206 and or Section 519 authorities.

RECOMMENDATION

It is recommended that the Secretary of the Army for Civil Works approve the proposed project to include constructing in Peoria Lake the mid-sized upper island and two lower islands with a flowing side channel. The recommended plan will create 75 acres of terrestrial habitat (islands) and restore depth diversity to nearly 200 acres of Peoria Lake.

The current working estimated cost of the Recommended Plan is $15,182,000. This total estimated project cost includes construction of the project features; planning, engineering, and design; construction management; real estate; and monitoring. Implementation would be cost shared 65% by the Federal Government and 35% by the Illinois Department of Natural Resources (ILDNR), the Non-Federal Sponsor. The Federal contribution is estimated at $9,867,774 and the non-Federal contribution is estimated at $5,313,417. It is the ILDNR's responsibility to provide the real estate and conduct operation and maintenance. The operation and maintenance of these features is estimated to cost $11,340 annually.

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Section 1

Introduction

AUTHORITY

Prior to initiating Federal involvement in addressing water resources problems, the Corps of Engineers must have authority to investigate the problem. Specific authority for conducting the Peoria Riverfront Development (Ecosystem Restoration) Study is contained in Resolution 2500 of the Committee on Transportation and Infrastructure, adopted May 9, 1996, which states:

> "Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That, the Secretary of the Army is hereby requested to review the report of the Chief of Engineers on the Peoria Lake and LaGrange Pool, Illinois River, Henry to Naples, Illinois, and other pertinent reports, with a view to determining whether the recommendations contained therein should be modified at this time, with particular reference to that portion of the Illinois River between Henry and Naples that flows next to, or directly impacts, the downtown Peoria Riverfront Development project, to determine potential flood control or other water resources impacts, if any, that may affect the development efforts, to include but not be limited to a study of the siltation problem caused by sediment deposition from Farm Creek into the Illinois River, as well as the potential use of suitable dredged material for nearby development of a public beach."

Additional authority for conducting this investigation is contained in Section 216 of the 1970 Flood Control Act and Section 519 of the Water Resources Development Act (WRDA) 2000. These additional authorities provide the opportunity to evaluate the entire Illinois River Basin and to further evaluate the Peoria Lake area. The Illinois River Ecosystem Restoration Study initiated in October of 2000 is being conducted under Section 216, which authorizes the U.S. Army Corps of Engineers to make modifications to completed projects, i.e., the Illinois Waterway, which states:

> "The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significant changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest."

Section 519 of the Water Resources Development Act (WRDA) 2000, which authorizes development of a comprehensive plan for restoring, preserving, and protecting the Illinois River Basin, states:

> "If the Secretary, in cooperation with appropriate Federal agencies and the State of Illinois, determines that a restoration project for the Illinois River Basin will produce independent, immediate, and substantial restoration, preservation, and protection benefits, the Secretary shall proceed expeditiously with the implementation of the project."

This report was conducted under the authority of Resolution 2500. However, additional restoration efforts for Peoria Lake and its tributaries may be evaluated under Section 519.

STUDY PURPOSE AND SCOPE

The purpose of ecosystem restoration activities is to restore significant ecosystem function, structure, and dynamic processes that have been degraded. Ecosystem restoration planning involves a comprehensive examination of the problems contributing to the system degradation and the development of alternative solutions. The intent of ecosystem restoration is to partially or fully re-establish the attributes of a naturalistic, functioning, and self-regulating system.

The Feasibility Study evaluates Federal and State interest in creating and restoring aquatic habitat and reducing sediment delivery and deposition within Peoria Lake. Ancillary benefits to recreational boating and fishing are also probable. The focus of the study is addressing the major problem—sedimentation of the lakes that has resulted in the loss of lake depth and volume. Tributary streams that deliver large amounts of sediment to Peoria Lake were also investigated. Opportunities were explored to address restoration of both the tributaries and lakes as they relate to the Peoria Riverfront Development Project, a public and private effort to revitalize downtown Peoria.

The study followed the Corps of Engineers' six-step planning process. This process included the: (1) identification of problems and opportunities; (2) inventory and forecast of resource conditions; (3) formulation; (4) evaluation; (5) comparison of alternative plans; and (6) selection of a recommended plan. Specific investigations included: (1) a review of past studies; (2) compilation and analysis of all complete bathymetric surveys of Peoria Lake to estimate historic sedimentation rates over time; (3) evaluation of the growth of tributary deltas; (4) numerical and physical hydraulic models to assess alternatives; (5) evaluation of sediment quality; (6) preparation and use of modified habitat evaluation procedure (HEP) models; and (7) cost effectiveness and incremental cost analyses. The Corps of Engineers and the Illinois Department of Natural Resources (ILDNR)

collaborated on the study, with both organizations conducting some of the study tasks individually while jointly working on the overall study effort.

ORGANIZATION OF FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

The study presented in this Feasibility Report has an integrated Environmental Assessment (EA) and separately bound supporting appendices. The purpose of the main report is to concisely summarize the multidisciplinary efforts of the Corps of Engineers and the ILDNR and the agency and public input that led to the final study recommendations.

This report is organized into eight sections: (1) Introduction, which highlights the study authority, purpose and scope, study area, background and history, and prior studies, reports, and existing water projects; (2) Plan Formulation, which covers a description of the study process, an assessment of problems, opportunities, and constraints, and separate summaries of the formulation and evaluation of alternatives; (3) a Description of the Selected Plan, which details various components and considerations; (4) Environmental Impacts/Effects; (5) Plan Implementation, which includes institutional requirements, division of plan responsibility, views of non-Federal sponsor(s) and any other agencies with implementation responsibilities, and compliance with environmental requirements; (6) a Summary of Coordination, Public Views, and Comments; (7) a Recommendation; and (8) concluding with the Finding of No Significant Impact.

This report has 12 appendices, as follows:

- A General
- B Hazardous, Toxic, and Radioactive Waste Phase I Environmental Assessment
- C Geotechnical Considerations
- D Hydrology and Hydraulics
- E Water Quality and Sedimentation
- F Cost Engineering
- G Environmental
- H Real Estate Plan
- I Project Performance Assessment and Monitoring Plan
- J Value Engineering Study
- K Tributary Watershed Restoration
- L Distribution List

The General Appendix includes correspondence received during the study, the Design Agreement, the draft agreement that needs to be executed by the Corps of Engineers and ILDNR if the study is to continue into the design phase, and the Section 404(b)(1) Analysis. The other appendices are Hazardous, Toxic, and Radioactive Waste (HTRW); Geotechnical Considerations, which covers physical geography, geology, subsurface explorations, material considerations, and erosion protection; Hydrology and Hydraulics, which addresses hydrology, hydraulics, climate, river hydrographs, elevation levels/frequency, project measure analyses, and erosion protection; Water Quality and Sedimentation, which addresses water quality, baseline water quality data, sediment contaminant analysis report, and sediment rate analysis; Cost Engineering, which covers cost estimates; the Environmental appendix, which details habitat evaluation species and analyses and cost effectiveness/incremental cost analyses; a Real Estate Plan appendix; and a Project Performance Assessment and Monitoring Plan appendix; a Value Engineering Study; and Tributary

Watershed Restoration, which deals exclusively with the planning, evaluation, selection and design of the Farm Creek portion of the study. The last appendix is the Distribution List.

STUDY AREA

The authorization included the Illinois River between Henry and Naples, Illinois, and the tributaries in this portion of the river. Based on the wording of the authorization, the desires of the ILDNR (sponsor), and local interest, the focus for this feasibility study was narrowed to Peoria Lake, a riverine lake encompassing nearly 14,400 acres between river mile 181.0 near Chillicothe, Illinois, to Peoria Lock and Dam at river mile 157.7. This process is more fully described in the discussion concerning the Reconnaissance Phase in the next section (Background and History).

During the Feasibility Study Phase, the decision was made to further narrow the study area to Lower Peoria Lake (river miles 162-167) and the Farm Creek Watershed (see plate 1). The decision was based upon prior studies that identified promising restoration opportunities, the close link to the authorization and the Peoria Riverfront, time and funding constraints, and the fact that the ILDNR and the Corps of Engineers were beginning work on the Illinois River Ecosystem Restoration Study, a separate study evaluating restoration options for the entire Illinois River Basin.

The lake is subdivided into Upper and Lower Peoria Lakes by a natural constriction occurring at approximate river mile 166.5. Lower Peoria Lake extends from the northern border of Tazewell County, on the east side of the Illinois River, downstream, to the City of Peoria Riverfront. The Riverfront and the southernmost boundary of Lower Peoria Lake can be generally defined by the river crossing of Interstate 74 from east to west. The City of Peoria lies to the west, while the City of East Peoria is on the east side of the Illinois River. The outlets of the Farm Creek Watershed are also located at this southern portion of the Lower Peoria Lake. Farther downstream is the Peoria Lock and Dam. The Illinois Waterway, Illinois and Indiana 9-Foot Channel was authorized by the River and Harbor Committee (January 21, 1927) and Senate Document 126, 71st Congress, 2nd session (July 3, 1930). House Document 184, 73rd Congress, authorized construction of a lock and dam at Peoria. Peoria Lock and Dam is located 4.1 miles below Peoria, Illinois. It has a width of 110 feet and a length of 600 feet. Impoundment is achieved through wicket and timber type control structures. The wicket structures allow open navigation during high flow on the river, which occurs during approximately 40% of the navigation season per year.

There are 10 direct tributaries to Peoria Lake. However, once the focus of the in-lake alternatives was determined to be Lower Peoria Lake, the tributaries draining to this area became the logical place for tributary alternatives to be investigated. In addition, fewer watershed planning activities were ongoing in the Upper Peoria Lake tributaries. Farm Creek, on the other hand, had a locally led planning effort underway, funded by the Illinois Environmental Protection Agency. This planning effort had generated a comprehensive basin inventory, agency support—both financial and technical—and a consensus on watershed restoration and management goals, objectives, and actions. These activities were occurring concurrently with the Feasibility Study. Tenmile Creek has a large grade control structure at the Caterpillar Proving Ground within the basin, helping to address sediment delivery. In addition, opportunities for the local sponsor to provide lands, easements, rights-of-way, relocations and disposal areas (LERRD) from willing landowners were not present. Therefore, the study team felt that the focus should be on Farm Creek. Further investigations and discussions with the Sponsor and the Farm Creek Watershed Planning Committee identified the upper portion of Farm Creek as having the highest level of interest from

the public. Following detailed investigation at one site, tributary restoration alternatives were dropped due to Hazardous, Toxic, and Radioactive Waste (HTRW) issues.

BACKGROUND AND HISTORY

The Illinois River has long been an important environmental and economic resource. This importance led Congress to recognize the Illinois River as part of the Upper Mississippi River System as a unique, nationally significant ecosystem and a nationally significant commercial navigation system in Section 1103 of the Water Resources Development Act of 1986 (WRDA 86).

The State of Illinois recognizes the important resource that the Illinois River represents. The Offices of the Governor and Lieutenant Governor have led efforts to focus attention on the Illinois River, including completing the *Integrated Management Plan for the Illinois River Watershed* and proposing Illinois Rivers 2020, a $2.5 billion, 20-year State and Federal initiative to restore the Illinois River. Local groups along the river basin have been very active in pursuing river restoration. In the Peoria area, the Peoria Lakes Basin Alliance is working to develop a common vision for future restoration and to increase public awareness of problems.

The National Research Council considers large floodplain-river ecosystems to be the highest priority for aquatic restoration and identified the Illinois River as one of three of these ecosystems in the United States with sufficient ecological integrity to recover. At the turn of the century, the Illinois River Valley was famous for its hunting and fishing areas, supporting over 2,000 commercial operations. Islands, backwaters, side channels, lakes, and bottomland forests allowed fish and game to flourish. In fact, in 1908, the U.S. Department of Commerce and Labor reported that the Illinois River provided 10% of all freshwater fish caught in the United States (Talkington 1991). The Illinois Valley also has international significance as a part of the Mississippi Flyway, a major migration route for hundreds of thousands of waterfowl, shorebirds, and neotropical migrants.

The Upper Mississippi River - Illinois Waterway (UMR-IWW) system is a vital part of the national economy. The navigable portions of these rivers and the locks and dams that allow waterway traffic to move from one pool to another are integral parts of a regional, national, and international transportation network. The system is significant for certain key exports and the Nation's balance of trade. For example, in 2000, approximately 52% of the Nation's corn and 41% of the Nation's soybean exports were carried on the UMR-IWW. Corn and soybeans are shipped via the waterway at roughly 60% to 70% of the cost of shipping over the same distance by rail. Other commodities shipped on the system include coal, chemicals, petroleum, crude materials (sand, gravel, iron ore, steel, and scrap), and manufactured goods. The system provides full or part time employment for over 400,000 individuals in the basin, including 40,000 manufacturing jobs.

The importance of the Upper Mississippi River-Illinois Waterway as a shipping artery is underscored by the increases in tonnage shipped on the system. Waterborne commerce on the Upper Mississippi River has more than tripled over the past 40 years—growing from about 27 million tons in 1960 to 83 million tons in 2000. On the Middle Mississippi River over the period 1960 to 2000, tonnage has grown from 30 million tons to 122 million tons. On the Illinois Waterway, the nearly 23 million tons shipped in 1960 roughly doubled over that same timeframe, growing to 44 million tons in 2000.

The Illinois River also serves as the source for public water supply systems throughout a vast region of the state. Peoria is the largest user, but the cities of Elgin, Kankakee, Pontiac, Streator, Decatur, Taylorville, Springfield, Jacksonville, and Canton also use water from tributaries of the Illinois River. Moreover, the Commonwealth Edison Company uses Illinois River water for cooling purposes.

The Peoria Riverfront Development Project is a public and private cooperative effort to revitalize the City's downtown area. Plans include a visitor's center, city park, community center, riverboat landing, sports complex, entertainment centers, and retail development. Since 1995, $75 million in public and private funds has been invested in riverfront development and another $100 million investment is planned.

The Illinois River formerly contained the flows of the much larger Mississippi River, but redirection of the Mississippi River by glaciers left the Lower Illinois River with a wide river valley. The lower reach of the Illinois, below Starved Rock, has a very gradual slope of approximately 0.1 foot per mile. The numerous bottomland lakes, side channels, and sloughs, which were slowly filling with sediment under natural conditions, have been heavily impacted by sedimentation related to changes in the watershed and along the waterway.

Peoria Lake, the largest bottomland lake in the valley, reflects changes similar to other lakes. There are 60 backwater lakes along the Illinois River. The Illinois State Water Survey has estimated that average volumetric loss of all lakes since 1903 is 70%, with several approaching 100% loss (Bellrose 1983). The oldest complete survey of the river system was done in 1903 by the Corps of Engineers. The loss of aquatic habitat due to sedimentation is viewed as the greatest threat to the Illinois River. This conclusion was reached because of the statewide planning process that resulted in the *Integrated Management Plan.* Further, the Habitat Needs Assessment conducted as part of the Upper Mississippi River System - Environmental Management Program found that the most critical need along the Illinois River was the restoration of backwater lakes and side channels to increase depth diversity. This report called for the restoration of backwaters on the Illinois River so that 25% of the backwater lakes (19,000 acres) would have an average depth of at least 6 feet. Since 1903, the volume of Peoria Lake below elevation 440 feet NGVD has decreased by approximately 61%. Elevation 440 is considered "flat pool" for Peoria Lake. The elevation is a function of the height of Peoria Lock and Dam. Areas outside of the navigation channel have experienced sedimentation that is even more rapid. The loss of backwater lake depth and volume has severely impacted off-channel overwintering, spawning, and nursery habitats for fish. Shallow water areas are subject to wave action that resuspends sediment, further limiting fish, aquatic vegetation, macroinvertebrate, and mussel production.

Demissie and Bhowmik (1986) best described the process by which Peoria Lake was formed as follows:

> "The alluvial fan from Farm Creek created the constricted stretch of the Illinois River just downstream of Farm Creek, forming Peoria Lake. Farther upstream at river mile 166.5, another alluvial fan deposited by Tenmile Creek divides the lake into two segments: Lower Peoria Lake and Upper Peoria Lake. This constricted segment of the Illinois River is referred to as the Narrow.
>
> Prior to the late 1800's, the Illinois River and thus Peoria Lake were not impacted significantly by man. The river and the lakes in the river valley were under near-natural conditions and had very few problems resulting from human activities. The

major changes on the Illinois River started on January 1, 1900, when significant amounts of water started to be diverted from Lake Michigan to the Illinois River through the Chicago Sanitary Ship Canal. This allowed the City of Chicago to flush untreated domestic sewage and industrial wastes away from Lake Michigan, which was the city's source of water supply, and into the Illinois River. From 1900 through 1938, the average amount of diversion into the Illinois River was approximately 7,200 cubic feet per second (cfs). Starting in 1939, the amount of diversion was reduced to an average of 3,200 cfs. Since the early 1970's, the quality of water diverted into the Illinois River has been improved because of more stringent water quality standards.

The diversion of water, combined with the discharge of domestic and industrial waste into the Illinois River, significantly changed the nature of the Illinois River and the bottomland lakes along its valley. Low water levels were increased, water quality degraded rapidly, and as a result fish and other aquatic organisms were either eliminated or reduced significantly in numbers.

Another major event that permanently changed the nature and character of the Illinois River and its bottomland lakes was the construction of navigation dams. Initially four low dams were built on the Illinois River to provide a 7-foot navigation channel for large steamboats from the Mississippi River to LaSalle, Illinois. The dams were built at Henry in 1872, Copperas Creek in 1877, LaGrange in 1883, and Kampsville in 1893. In 1919, construction started on the Illinois Waterway, a project designed to provide a navigation channel with a minimum depth of 9 feet and a minimum width of 300 feet from the Mississippi River to Lake Michigan. This project required the construction of five major locks and dams along the Illinois River in the 1930's.

The navigation lock and dam system on the Illinois River includes the Dresden Island Lock and Dam, the Marseilles Lock and Dam, the Starved Rock Lock and Dam, the Peoria Lock and Dam, and the LaGrange Lock and Dam…The Illinois River ceased to be a natural river all the way from its starting point at the junction of the Des Plaines and Kankakee Rivers to its mouth at the Mississippi River. It now consists of a series of six navigation pools with five locks and dams used to facilitate navigation. Under these conditions, the low flow water levels (Peoria Pool is maintained at 440 ft msl), decreased velocities, and thus increased sedimentation rates. During high flows, the dams at Peoria and LaGrange are lowered to the river bottom and thus do not have any impact on the river flow at those times."

Peoria Lake is subject to high rates of sediment delivery from its 10 direct tributaries. This high sedimentation rate is related to the geology of the Peoria Lake region, which is surrounded by highly erodible loess bluffs and moraine deposits. In addition, alternation of the tributary watersheds has resulted in degradation of riparian habitat along stream corridors. Typically, this is the result of agricultural practices. The results are increased sheet and rill erosion in formerly riparian areas that had trapped sediments before entering tributary waters.

Statewide, Illinois has lost approximately 99% of the original tall grass prairie and over 85% of pre-settlement wetlands (Noss, LaRoe and Scott 1995). Restoration of prairie and wetlands presents opportunities to restore significant habitat types that were formerly abundant in the state,

but that have been greatly reduced. This change in land cover from diverse vegetation to mostly row crop agriculture has significantly increased sheet and rill erosion and surface runoff in local tributaries.

At several locations throughout the watershed, reduced sedimentation rates suggest that a state of equilibrium is being reached in portions of the watershed and at several scales. However, from a systems function perspective, the watershed is unstable and degrading. Peoria Lake may indeed be reaching a state of equilibrium; however, no data or methodology exists to date to support such an assumption. Further, assuming the lake is approaching equilibrium does not diminish or mitigate the need for measures to address degraded or nonexistent ecosystem functions.

RECONNAISANCE STUDY

As stated in the study authority, opportunities were explored to address sediment deposition, reduce flood damages, and restore environmental conditions, especially those that relate to the Peoria Riverfront Development Project. Under the reconnaissance phase (1997), a task force composed of representatives from the following organizations was convened on several occasions to formulate the study plan and overall study direction:

- Congressional and State representatives
- Elected and appointed county officials
- City of Peoria officials
- Peoria Riverfront Development Sponsors
- Heartland Water Resources Council
- Illinois Department of Natural Resources
- Natural Resources Conservation Service
- Environmental Protection Agency
- Riverfront Action Forum
- The Nature Conservancy
- Tri-County Regional Planning Commission
- Illinois Office of Resource Conservation
- Waste Management and Research Center
- Illinois State Water Survey
- University of Illinois Cooperative Extension Service
- U.S. Army Corps of Engineers, Rock Island District

In evaluating the alternatives, consideration was given to providing solutions using existing Corps of Engineers authorities, those that are considered the responsibility of participating agencies involved with the problems, and measures preferred by local legislators and interest groups. Four broad categories of measures were considered to be most important as they affect riverfront development at Peoria: (1) measures to reduce existing sedimentation in the Upper and Lower Peoria Lakes in order to create and restore aquatic habitat; (2) measures to reduce future sediment deposition in the Farm Creek Delta and Lower Peoria Lake; (3) measures that include restoration of the aquatic and terrestrial conditions within Peoria Lake to a less degraded condition; and (4) initiatives that provide flood protection along the Downtown Peoria Riverfront.

Regarding the authorization calling for evaluating alternatives for a public beach using dredged materials, the material to be dredged was not suitable for use as beach material. Recreation is not

currently a major mission objective for the Corps of Engineers consistent with Administration Policy. Finally, the alternative identification process undertaken during the reconnaissance phase produced no interest on the part of local representatives or the sponsor to construct a public beach. Regarding flood damage reduction at the Peoria Riverfront, the issue was resolved before the execution of the Project Study Plan in November of 1998. In June 1970, the Chicago District of the U.S. Army Corps of Engineers conducted a study of local flood protection at Peoria, Illinois. At that time, the benefit-to-cost ratio of the Recommended Plan was estimated to be 1.3 to 1.0. The project was not initiated, although the City of Peoria indicated a renewed interest in a portion of the original plan in a letter dated November 20, 1997. The letter requested initiating a Section 205 reconnaissance study and not pursuing flood damage reduction measures under HR 2500, adopted May 9, 1996. The Rock Island District concurred with the City of Peoria's recommendation of proceeding under Section 205 and stated such intent in a letter sent to the City of Peoria on January 29, 1998. However, no formal request from the City of Peoria has been submitted to the Rock Island District.

It is clear that the authority for this Feasibility Study is broad in scope. However, the decision to focus the study efforts on Peoria Lake and its tributaries has its foundation in an open and inclusive process undertaken in the reconnaissance phase. At the completion of the reconnaissance study, it was determined that the ILDNR would cost share further study to address sediment deposition and ecosystem restoration.

CONCISE DISCUSSION OF STUDIES, REPORTS, AND EXISTING WATER PROJECTS

The most notable documents reviewed during this study are summarized below (listed in chronological order):

- *Sediment Yield of Streams in Northern and Central Illinois*, Adams, J. Roger, et al., Illinois State Water Survey, December 1984. This report quantifies sediment yields in Illinois streams.

- *Peoria Lake Sediment Investigation*, prepared for the U.S. Army Corps of Engineers by the Illinois Department of Energy and Natural Resources, State Water Survey Division, January 1986. This report includes bathymetric profiles, results of core samples, and impacts of human activities on sedimentation. Recommended solutions to sedimentation of Peoria Lake include controlling sediment input, managing in-lake sediment, hydraulically manipulating the Illinois River through Peoria Lake, creating artificial islands, selective dredging, and creating marshy areas.

- U.S. Army Corps of Engineers Reconnaissance Study, *Illinois River from Henry to Naples, Illinois, Peoria Lake and La Grange Pool, Illinois River Basin*, March 1987. This study, authorized in Section 109 of Section 1304 of the Supplemental Appropriations Act, made a determination of the advisability of the preservation, enhancement, and rehabilitation of Peoria Lake in the vicinity of Peoria, Illinois. No feasibility study was initiated to follow up the reconnaissance study.

- U.S. Army Corps of Engineers report, *Inventory and Analysis of Urban Water Damage Problems, City of Washington, Tazewell County, Illinois*, published August 1987. This study, conducted under Section 22 of Public Law 93-251, inventoried and analyzed urban water damage problems in the City of Washington. This document detailed the flood

problems and their underlying causes, undersized bridge openings, accumulated debris, and siltation. Recommendations included removing debris and woody vegetation from the channel and bridge structures, clearing sediment buildup within the bridge structure, removing the deck of an abandoned bridge, and increasing bridge openings as part of any future bridgework. To date, no measures have been implemented. However, in the 2003 construction season, one of the constricting bridge decks is scheduled to be replaced.

- *Hydraulic Investigation for the Construction of Artificial Islands in Peoria Lake*, July 1988, Illinois Department of Energy and Natural Resources, State Water Survey Division, Champaign, Illinois. This report investigates the best location for building islands in Upper and Lower Peoria Lakes. Modeling determined effects of islands upon water surface elevations, sedimentation patterns, and current velocities.

- U.S. Army Corps of Engineers report, *Upper Mississippi River System Environmental Management Program, Peoria Lake Enhancement*, published in July 1990. This technical publication, complete with National Environmental Policy Act documentation and engineering plans, was the authorizing document for a 16-acre barrier island in Upper Peoria Lake to enhance migratory waterfowl habitat, fish spawning, and mussel communities. Project monitoring indicates that there was an increase in the number of individuals and diversity of waterbird species using the project site.

- Daily & Associates, Engineers, Inc. report, *Preliminary Storm Water Management Study for Detention Basin Feasibility, City of Washington, Illinois*, published in November 1990. The City Council for Washington, Illinois, authorized this particular study on the feasibility of constructing up to six stormwater detention basins on creeks tributary to the city for reducing flood stages within the city. Their report indicated that five of the six sites were suitable, with varying degrees of benefits to flood reduction. No elements have been implemented to date.

- *The Illinois River: Working for Our State*, Talkington, Laurie McCarthy, Illinois State Water Survey, January 1991. This document includes descriptions of the past, current, and projected future conditions of the Illinois River. Specific portions related to this study include flora and fauna descriptions, the significance of its working role, and the many functions of the river.

- *Erosion and Sedimentation in the Illinois River Basin*, Demissie, Misganaw, et al., Illinois State Water Survey, June 1992. This report performed sediment yield calculations for Illinois River tributaries and used those relationships to construct a sediment budget for the Illinois River Valley. The report also discusses the effect of farming practices on sediment loads.

- *Source Monitoring and Evaluation of Sediment Inputs for Peoria Lake*, Bhowmik, Nani G., et al., Illinois State Water Survey, February 1993. The objectives of this report were to determine the sediment sources to Peoria Lake and to evaluate sediment loads from local tributaries to determine best management practices for the tributaries. This report also estimated the sources of sediment in Peoria Lake and what percentages of sediment in the lake are from local tributaries or the Peoria Lake. Several watershed planning efforts have been initiated on local tributary streams to address sedimentation and other issues. These include the completion of the Farm Creek Watershed Management Plan and efforts on Tenmile, Partridge, Senachwine, Kickapoo, Mossville, and Ackerman Creeks.

- *Heartland Riverfront Master Plan*, Phillips Swager Associates, Architects; EDAW, Inc., Planners; Hammer, Siler, George Associates, Economists; and Farnsworth and Wylie, Engineers, April 1994. This document describes existing and planned development of the riverfront and central business district in downtown Peoria, Illinois.

- *Section 216 Initial Appraisal, Illinois Waterway System Ecosystem Restoration and Sedimentation, Illinois*, U.S. Army Corps of Engineers, Rock Island District, August 1996. This document recommends further study of the Illinois Waterway Ecosystem in light of changed physical and economic conditions since the 9-foot navigation channel was constructed.

- *Integrated Management Plan for the Illinois River Watershed*, prepared by the Illinois River Strategy Team in cooperation with nearly 150 participants, chaired by Lt. Governor Bob Kustra, January 1997. The plan contains 34 recommendations divided into 6 sections: In the Corridor, Soil and Water Movement, Agricultural Practices, Economic Development, Local Action, and Education. Recommendations relevant to this Feasibility Study are as follows:

  1. Encourage beneficial use of sediment through three options for use of dredged materials. Create islands or increase the topographic diversity of existing islands using dredged material in support of native floodplain plant communities.
  2. Implement backwater and side channel management measures at selected locations.
  3. Build wetlands and other water retention capacity in urban and rural areas in the Illinois Basin, in collaboration with appropriate landowners and volunteering private landowners.
  4. Reduce runoff rates throughout the watershed during the next 15 years through remedial and preventative efforts.
  5. Implement regional strategies to protect, restore, and expand critical habitats in key high-quality tributaries throughout the watershed.
  6. Promote reestablishing riparian corridors along tributary streams with permanent vegetation.

- *Conservation Reserve Enhancement Program.* On March 30, 1998, Mr. Dan Glickman, U.S. Secretary of Agriculture, came to Peoria, Illinois, to announce a $400 million plus effort to improve the Illinois River with a Conservation Reserve Enhancement Program (CREP). The CREP initiative will help preserve up to 132,000 acres of sensitive land surrounding the Illinois River and its tributaries, including upland areas. As of January 4, 2002, 98,352 acres were enrolled in the Illinois River Basin. An additional 29,011 acres of land is pending contract signing.

- *Storm Water Management of the City of Washington*, City of Washington, 2000. This summary document provides facts about Washington stormwater, benefits from stormwater detention basins, the City's project plans, and the financial expenditures by the City dedicated to management of the detention basins.

- *Upper Mississippi River System Habitat Needs Assessment, Technical Report 2000.* The Habitat Needs Assessment (HNA) is an evaluation of existing habitat conditions throughout the UMRS, forecasting future habitat conditions and quantifying ecologically sustaining and socially desired future habitat conditions. The HNA addresses the system-wide, river reach, and pool levels of spatial scale and includes the bluff-to-bluff extent of the floodplain. The

primary purpose of the HNA is to help guide selection, design, and evaluation of Habitat Rehabilitation and Enhancement Projects under a reauthorized Environmental Management Program. The assessment was a cooperative effort involving the U.S. Army Corps of Engineers, United States Geological Survey, U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources, Wisconsin Department of Natural Resources, Iowa Department of Natural Resources, Illinois Department of Natural Resources, and Missouri Conservation Department.

- *Farm Creek Erosion and Sediment Investigation*, Windhorn, R. D., Natural Resources Conservation Service, February 2001. This report estimated total sediment load to the mouth of Farm Creek at the Illinois River in East Peoria. An estimate was also made as to sediment delivery within the individual stream reaches.

- *Farm Creek Watershed Implementation Plan*, October 15, 2001. This document, prepared by the Farm Creek Watershed Planning and Technical Committees, summarizes information on the watershed and its problems. It also details goals and objectives for the watershed. Areas of interest include flooding, erosion and sediment, habitat loss, and water quality.

- *Illinois River Ecosystem Restoration Feasibility Study*. The Illinois River Ecosystem Restoration Feasibility Study is a 3-1/2 year, $5.24 million effort being conducted under the authority of Section 216 of the Flood Control Act of 1970 in partnership with the State of Illinois Department of Natural Resources.

  The study will identify the Federal and State interest in addressing problems within the entire Illinois River Watershed. System problems and a draft set of goals and objectives have been developed through numerous meetings with agency representatives, local sponsors, and other stakeholders. The principal habitat problems in the Illinois River Basin are the result of sedimentation of backwaters and side channels, degradation of tributary streams, water level fluctuations, loss of floodplain and tributary connectivity, and other adverse impacts caused by human activities. Two efforts currently underway in the study: (1) a system evaluation focused on assessing overall watershed needs and general locations for restoration, and (2) identification and assessment of site-specific projects.

  A major focus of the system assessment is to conduct a Restoration Needs Assessment (RNA). The RNA will evaluate the need for restoration in the entire basin with a focus on the tributaries and subwatersheds feeding into the mainstem of the Illinois River. The RNA will provide a practical and scientific basis for assessing the large study area and identifying potential restoration project types and locations for the Illinois River and its tributaries. The RNA will define those critical assumptions controlling the ability to determine habitat needs and focus the study, planning, and construction efforts on the areas of critical need. The RNA will provide a comprehensive, basin-wide assessment of historic ecological change, existing conditions, predicted future conditions, and desired future conditions. Using selection criteria and a formulation framework developed as part of the feasibility study, the final report may recommend a multi-year program to address a larger list of projects.

  A number of evaluations to develop detailed project plans for specific sites are underway. At the request of the State, the Corps has initiated assessments for six site-specific projects in the basin. The six site-specific investigations are Iroquois River, McKee Creek, Kankakee River - Mainstem, Pekin Lake, Waubonsie Creek, and Blackberry Creek.

Section 2

Plan Formulation

DESCRIPTION OF THE STUDY PROCESS

The Peoria Riverfront Development Study follows the Corps of Engineers' six-step planning process specified in Engineering Regulation (ER) 1105-2-100. The process identifies and responds to problems and opportunities associated with the Federal objective and specified State and local concerns. The process provides a flexible, systematic, and rational framework to make determinations and decisions at each step so that the interested public and decision makers are fully aware of the basic assumptions employed, the data and information analyzed, the areas of risk and uncertainty, and the significant implications of each alternative plan.

If a Federal and State interest is identified, the process culminates in the selection of a plan to be recommended to Congress for implementation. As part of identifying the selected plan, a number of alternative plans are developed and compared with the no action alternative, allowing for the ultimate identification of the National Ecosystem Restoration (NER) Plan.

The NER Plan reasonably maximizes ecosystem restoration benefits compared to costs, considering the cost effectiveness and incremental cost of implementing other restoration options. In addition to considering the system benefits and costs, it will also consider information that cannot be quantified, such as environmental significance and scarcity, socioeconomic impacts, and historic properties information.

The steps used in the plan formulation process include:

1. Identify Problems and Opportunities: The specific problems and opportunities are identified, and the causes of the problems discussed and documented. Planning goals are set, objectives established, and constraints identified.

2. Inventory and Forecast Resource Conditions: This step characterizes and assesses conditions in Peoria Lake and the tributaries as they currently exist and forecasts the most probable without-project condition (or no action alternative) over the period of analysis. This assessment gives the basis by which to compare various alternative plans and their impacts. The without-project condition is what the river and its uses are anticipated to be like over the 25-year planning period without any restoration implemented as part of the study. The with-

project condition is what the river and its uses are anticipated to be like if restoration measures are implemented.

3. Formulate Alternative Plans: Alternative plans are developed in a systematic manner to ensure that reasonable alternatives are evaluated. In addition to the no action alternative, restoration alternatives in the lakes and tributaries were considered.

4. Evaluate Alternative Plans: The evaluation of each alternative consists of measuring or estimating the environmental benefits (habitat units), costs, technical limitations, and social effects of each plan, and determining the difference between the without- and with-project conditions. A key measure of the evaluation of alternative plans is a cost effectiveness-incremental cost analysis and evaluation of significance.

5. Compare Alternative Plans: Alternative plans are compared, focusing on the differences among the plans identified in the evaluation phase and public comment. As part of the evaluations, the best buy plans are identified—those plans that provide the greatest increase in benefits for the least increase in costs.

6. Select Recommended Plan: A Recommended Plan is selected and justification for plan selection is prepared. If a viable alternative is not identified, the Recommended Plan will be the no action alternative. In most cases, the NER plan will be selected from among the best buy plans.

The first section deals with the existing resource conditions for Peoria Lake. It is followed by a description of the Problems, Goals and Opportunities, Objectives, and Constraints pertaining to the study area as a whole. The following sections will walk through each of these remaining plan formulation steps for the alternatives in Peoria Lake. While these steps do follow a progression, they are iterative, i.e., as additional information was learned in subsequent steps, it was often necessary to back up and repeat portions of a previous step(s).

PEORIA LAKE RESTORATION

INVENTORY OF RESOURCE CONDITIONS

Existing Conditions

Peoria Lake is a roughly 14,400-acre body of water, averaging 1 mile wide by approximately 20 miles long (river miles 158 to 181), with an average depth of 16.7 feet in the navigation channel and 2.5 feet in the off-channel areas. It is the largest bottomland lake in the Illinois River Valley. Historically, the lake had a diversity of depths, habitat types, plants, and aquatic species. The lake can now be characterized as having a narrow navigation channel, with depths greater than 9 feet, running through a relatively shallow lake basin. Tributary deltas and alluvial fans are apparent along Peoria Lake. The large alluvial fan from Farm Creek (river mile 162) constricts the Illinois River, thereby creating Peoria Lake. The lake is now influenced by the operation of Peoria Lock and Dam at river mile 158. An alluvial fan at the mouth of Tenmile Creek (river miles 166-167) separates the larger Upper Peoria Lake (11,900 acres) from Lower Peoria Lake (2,500 acres).

Environmental Management Program (EMP) - Peoria Lake Project

In 1994, as part of the Upper Mississippi River - Environmental Management Program (EMP), a habitat restoration project was constructed in the upstream end of Upper Peoria Lake (see Figure 2-1). An approximately 1-mile-long, 16-acre barrier island was created to enhance migratory waterfowl habitat value and provide for more ideal fish spawning environment and establishment of mussel communities. Other measures included restoration of a 9,500-foot flowing side channel and a 168-acre forested wetland management area.

Information from post-monitoring efforts of the Upper Peoria Lake EMP project indicates that the constructed measures of that project (islands and deepwater habitat) have become an attractant to area wildlife. Pre- and post-waterfowl monitoring have shown that there are currently 14 times the number of waterfowl utilizing that area than there were before the islands were constructed. Where only a few thousand waterfowl had gathered before, now tens of thousands are utilizing that project area. The monitoring results showed that there were also twice as many waterfowl species utilizing the area. Early monitoring efforts listed 8-9 species present, whereas now 18-20 species have been documented using the Peoria EMP site.

The deepwater habitat provided by dredging the river channel and constructing the EMP islands has shown similar improvements for fish species. Monitoring efforts were conducted at nearby control sites and at project sites. Comparison with pre- and post-project construction showed greater numbers of species as well as an increased total number of fish collected during post-construction monitoring. In addition, a greater diversity of species was collected, and more unique species were found after project construction. The results of the monitoring effort for this previous project suggest that it has had a positive effect on fisheries for that section of the lake. This increase in species diversity, along with the increase in numbers of individuals, shows a success that can be anticipated for a similar project in the Lower Lake.

Hydraulic/Hydrologic

The Corps of Engineers maintains a system of locks and dams on the Illinois Waterway to facilitate inland navigation. The Corps also maintains a 9-foot channel in the Peoria navigation pool, although no dredging has been required in the main channel due to scouring caused by the hydraulic/hydrologic conditions of the channel at Peoria and high levels of barge traffic keeping sediments suspended. This is a 100% Federal responsibility as part of the operation and maintenance commitment to the 9-Foot Channel Navigation Project on the Illinois River.

The Illinois River can be divided into two sections—the upper river from Chicago, Illinois, to the town of Hennepin, Illinois, and the lower river from Hennepin to Grafton, Illinois. The hydraulic characteristics of the Illinois River downstream of Starved Rock (river mile 231.0) are complex because the river gradient is very flat, leaving it more susceptible to backwater effects and sedimentation. The river elevation drops 38 feet between Joliet (river mile 287) and Hennepin (river mile 207), Illinois; the bed slopes down only 21 more feet in the remaining 207 river miles. This equates to a slope of approximately 0.5 foot per mile in the upper river and 0.1 foot

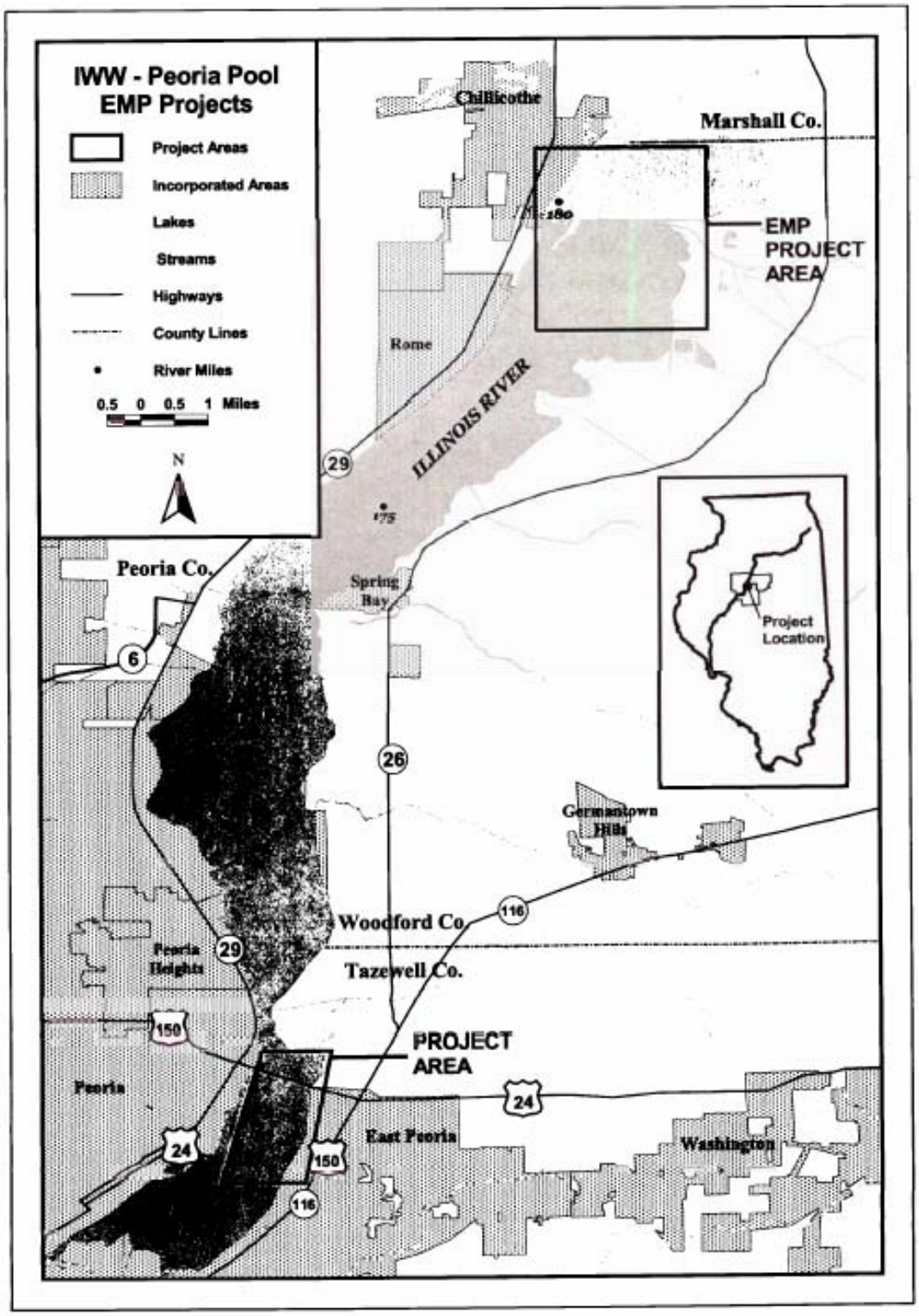


FIGURE 2-1. Peoria Pool EMP Projects

per mile in the lower river section. Despite a drainage area increase of 3,500 square miles, flood peak flows decrease between Starved Rock Lock and Dam and Peoria Lake due to large increases in storage area which attenuate flood peaks.

The stage recurrence data for Lower Lake Peoria are listed below. A flood with a 50-year recurrence interval, for instance, has a 2% chance of occurring in any given year.

Recurrence Interval	Probability of Occurrence	Elevation (ft MSL)
2-year	50%	448.2
5-year	20%	451.9
10-year	10%	454.2
25-year	4%	456.2
50-year	2%	457.6
100-year	1%	458.9
200-year	0.5%	460.0
500-year	0.2%	461.6

Duration information gives a historical representation of the percentage of time that a particular water surface elevation or flow has been equaled or exceeded. Flat or normal control pool elevation in Peoria Pool is 440.0 feet MSL.

% of Time Equaled or Exceeded	Elevation (feet)	Flow (cfs)
5%	447.3	47,990
10%	445.3	42,670
25%	441.7	29,910
50%	440.5	16,470
75%	440.2	8,950
90%	439.9	6,620
95%	439.7	5,960

The river has been significantly impacted by the diversion of water from the Chicago River, combined with the discharge of domestic and industrial waste into the Illinois River, construction of levees, agricultural practices, urbanization, and the introduction of navigation structures.

The attenuation of flood hydrographs through the Peoria reach is complicated by timing of tributary inflows as well as the flat gradient and Peoria Lake storage, as previously mentioned. The flood of December 1982 was a large flood, which illustrates the attenuation resulting in peak flows of 138,500 cfs at La Salle, 108,000 cfs at Henry, and 88,800 cfs at Kingston Mines. This attenuation and the current fluvial geomorphologic and hydrologic conditions are not attributable to the Peoria Lock and Dam or its operation.

The dam at Peoria is a wicket structure, which during higher flows, approximately 40% of the time, is lowered so that there is no dam. The dam only maintains a pool elevation above the normal flow depth for low-flow conditions. This may contribute slightly to increased sediment entrapment, but since the majority of sediment movement is during high flows, most of the sediment accumulation is a natural phenomenon associated with a natural lake such as Peoria Lake and would have occurred even without the dam. The loss of storage due to sedimentation is very significant from an aesthetic perspective, but not significant from a peak flood discharge view. The loss of storage occurs primarily below elevation 440. Large floods above this elevation still must fill huge areas of overbank storage in the Peoria reach. These floods will continue to experience essentially the same significant attenuation of flood peaks as would have occurred historically, prior to the dam construction. The accumulation of sediment has also not significantly impacted navigation through the Peoria pool, as evidenced by the lack of required dredging. This is explained by two factors. First, hydraulically, a channel for the conveyance of normal flows tends to be naturally maintained. Secondly, the regular passage of towboats in the channel tends to maintain the depth and alignment.

Sedimentation

Resource managers on the Illinois River agree that sedimentation in Peoria Lake and other off-channel areas along the river is a major problem (Bellrose 1983). The Illinois State Water Survey (ISWS) estimates that nearly 14 million tons of sediment is transported from the watershed each year. Of this, more than one-half, 8.2 million tons, remains in the Illinois River Valley. They further estimate that Peoria Lake traps roughly 2 million tons of sediment per year.

Since 1903, the volume of Peoria Lake below elevation 440 feet NGVD has decreased by approximately 61% (see Table 2-1). Off-channel areas have experienced the most rapid sedimentation. According to an ISWS report (Bhowmik et al. 1993), this is one of the highest sedimentation rates among all the large lakes and reservoirs in Illinois. Figure 2-2 shows that deeper off-channel areas generally experienced greater rates of sedimentation than did shallow areas. The original deeper parts of Peoria Lake are becoming shallower, resulting in a very flat and uniform lake bed. Figure 2-3 shows how typical cross sections of Upper and Lower Peoria Lakes have changed between 1903 and 1999.

Small tributary streams contribute significant sediment loads into Peoria Lake. Deltas have formed where these and other streams enter the Illinois River and have grown quite large over the years (Bhowmik et al. 1993).

TABLE 2-1. Peoria Lake Sedimentation Summary

Sedimentation Accumulated*	Entire Lake	Upper Lake	Lower Lake
1903 area with depth greater than 9 feet	13.5%	9.3%	29.7%
1903 off-channel area with depth greater than 9 feet	8.4%	4.7%	23.5%
1999 area with depth greater than 9 feet	7.6%	5.9%	16%
1999 off-channel area with depth greater than 9 feet	3.0%	1.5%	10.3%
Volume of accumulated sediment since 1903 – acre-feet	72,700 ac-ft	57,900 ac-ft	12,900 ac-ft
Mass of accumulated sediment since 1903 – tons	154,000,000	126,000,000	28,000,000

*** Note:** 1903 data were calculated using the 1903 low water surface (LWS). The current LWS was used for 1999 data. For the approximated mass of accumulated sediment, the density of the sediment was assumed to be 100 pounds per cubic foot.

The causes of high tributary sediment loads are varied. In all watersheds, some degree of channelization has occurred. The highest degree of channelization occurs in Farm Creek, which includes agricultural channelization as well as flood control. A type of channelization that is particular to this region and others with similar topography is that caused by transportation infrastructure. In this region, many roadways and railroad grades occupy the same or parallel corridors as streams. The result is often a straightened stream channel contained between the hardened transportation facility embankment and the more sensitive (in terms of sediment delivery) bluff areas. The erosion results in higher sediment transport by the stream.

Agricultural practices that dominate the land are another cause. Most local watersheds have achieved a tolerable rate of soil loss in terms of soil regeneration, but the agricultural uses continue to produce large quantities of sediment.

Urban development and resulting impervious surface generate substantial increases in surface water runoff rates and volumes. Due to topography and soil types, this runoff is forced exclusively onto highly erosive soils of severe slope. Again, sediment transport is immediate.

Finally, large areas of the tributary watersheds are forested. However, little or no management is underway, resulting in dense canopy with very little ground cover. During rain events, rainfall cannot infiltrate and becomes sheet flow. This surface runoff carries dislodged sediments and, due to topography, ends up in gullies or rills, further dislodging sediments.

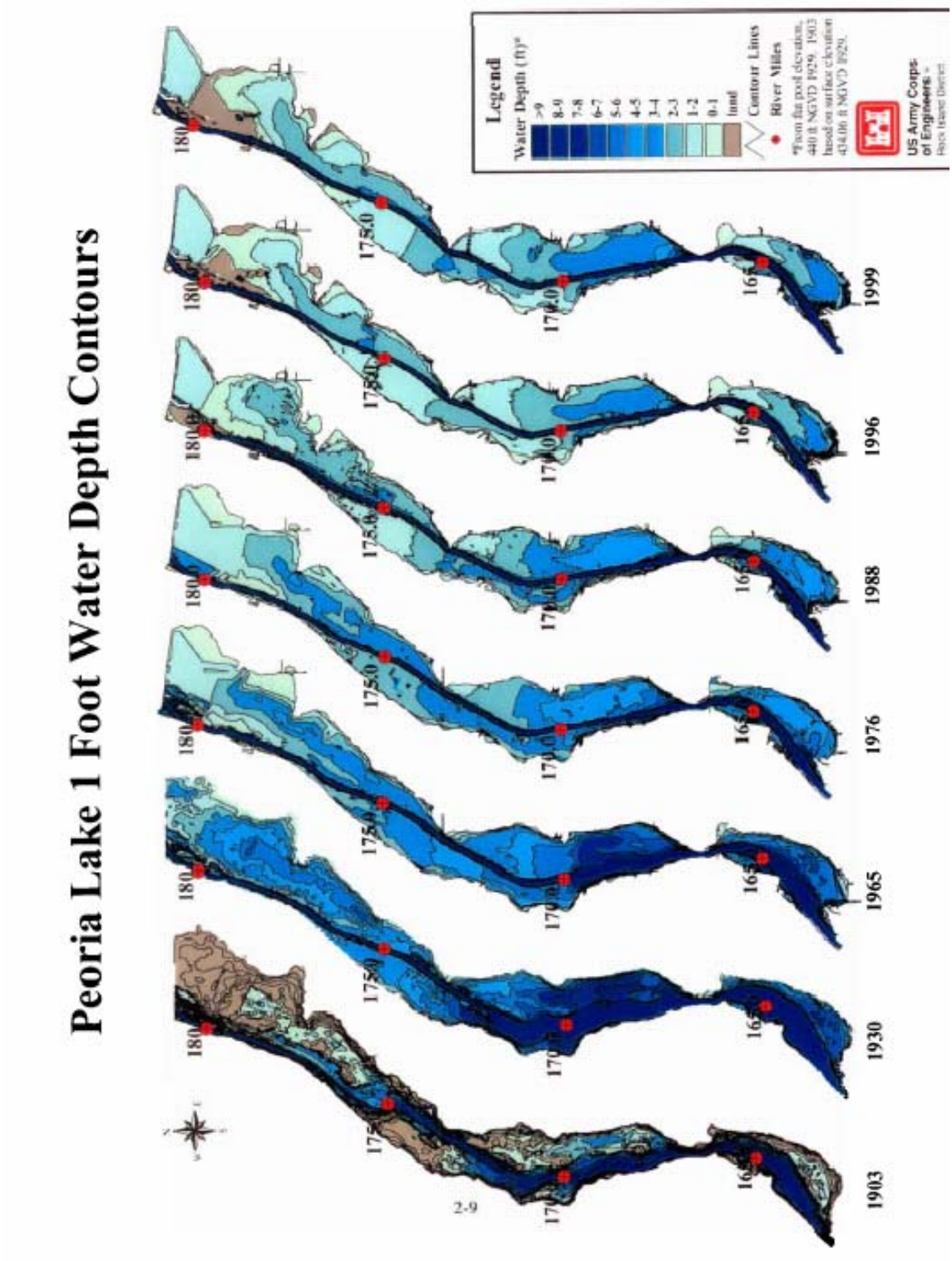
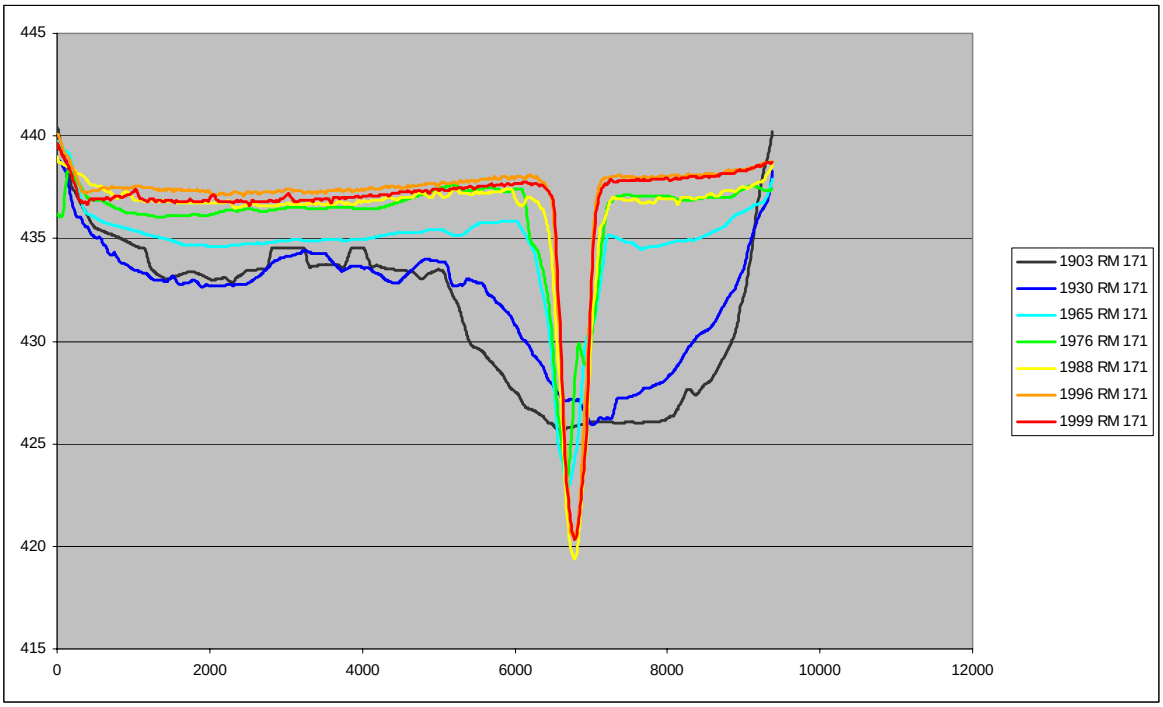


FIGURE 2-2. Peoria Lake 1-Foot Water Depth Contours



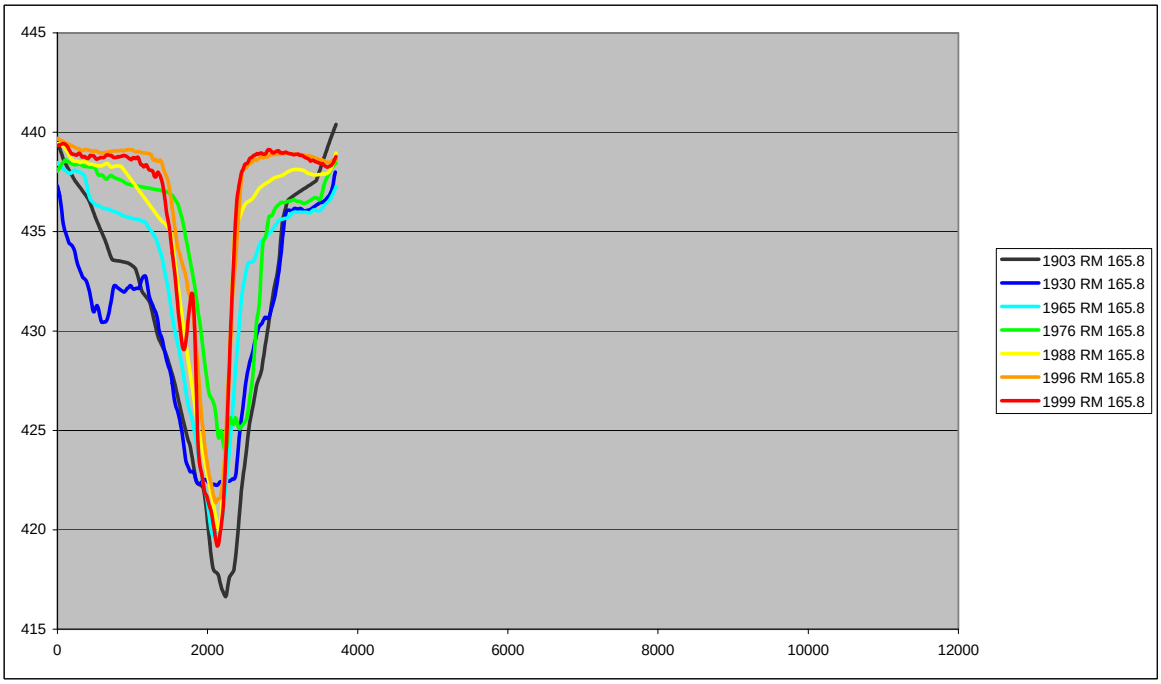


FIGURE 2-3. Typical Cross Sections of Upper and Lower Peoria Lakes

Sediment Quality. Overall, sediment quality in the project area is good. Only one chlorinated pesticide was detected; otherwise, no polychlorinated biphenyls (PCBs) or chlorinated pesticides were found. The presence of that one chlorinated pesticide, MCPP, was not confirmed by subsequent testing. Metals of regulatory concern such as chromium, copper, mercury, and zinc were above background soil levels but below the levels required for cleanup at industrial sites. Heavy metals were below the U.S. EPA regulatory limits for application of sewage biosolids to farmland. Levels of compounds in the Polycyclic Aromatic Hydrocarbons (PAH) group varied between laboratories, but in most cases were below screening values and levels of concern.

Sediment cores of varying lengths were collected and analyzed for a variety of chemicals in the project area during 1999 and 2000. Sediment removed from the project area as part of a separate access channel dredging project was also analyzed after spending 9 months weathering in a gravel pit. The results are reported in "Assessment of Sediment Quality for the Peoria Riverfront Environmental Restoration Project" by the Illinois State Geological Survey (Appendix E-3). Several laboratories analyzed the various samples and, in most cases, the lab results were in close agreement. A University of Illinois researcher conducted an agronomic evaluation of the sediment. The results are reported in "Sediments and Sediment Derived Soils in Illinois: Pedological and Agronomic Evaluation and Characterization."

There is no regulatory standard applicable for the beneficial use of river sediments. However, there are some guidelines for determining when contaminants are elevated. Some standards also exist for purposes such as cleanup, to protect human health at former industrial sites. Background levels for some chemicals in typical Illinois soils are also known.

Sediment and soil derived from several central Illinois reservoirs and Peoria Lake were evaluated to determine their potential value for use as soil or a soil amendment. The sediments are generally rich in plant nutrients and tend to be fine textured with silt and clay-sized particles dominating. Water stable aggregation data indicated the sediments have potential to develop good, stable soil structure after weathering by freezing, thawing, wetting, and drying. The physical characteristics of the evaluated dredged sediments were similar to naturally productive agricultural soils in Illinois. There was no indication that these sediments would present a problem for agricultural use given proper handling, tillage, and fertilization. The pH of the Peoria Lake samples was elevated (alkaline). This would tend to bind metals, making them less available for uptake by plants. The vegetative cover on the Illinois River islands indicates that the chemical quality of the soil is not inhibiting plant growth.

Researchers also conducted plant growth experiments with Peoria Lake sediment and Champaign County, Illinois, topsoil in a greenhouse (Darmody et al. 2000). Five garden vegetables grew equally well in the sediment and soil.

Demographic

Ninety percent of the State of Illinois population lives in the Illinois River Watershed, which meanders through 54 of the 102 counties in Illinois. The Peoria Riverfront Development Study area is located in Peoria County, Illinois, within the Peoria-Pekin Metropolitan Statistical Area (MSA). Population declined over the past two decades; however, recent census data indicate that the area has experienced a slight rebound in population (Table 2-2). Employment was historically dominated by manufacturing, but is now more balanced, primarily among manufacturing, wholesale/retail trade, and service sectors (Table 2-3).

TABLE 2-2. Population Trends*

Area	1970	1980	1990	2000
Peoria	126,963	124,160	113,822	112,936
East Peoria	18,455	22,385	22,629	22,638
Washington	6,790	10,364	10,099	10,841
Peoria County	195,318	200,466	182,827	183,433
Tazewell County	118,649	132,078	123,692	128,485
State of Illinois	11,113,976	11,427,409	11,430,602	12,419,293

* Source: U.S. Census Bureau

TABLE 2-3. Employment Trends*

	1980	1990	Projected 2000
Employment:			
Farming & Agricultural Services	5,900	5,800	6,000
Mining & Construction	9,600	10,700	11,700
Manufacturing	52,200	34,700	32,200
Transportation & Utilities	7,900	8,000	10,300
Wholesale/Retail Trade	40,200	40,400	46,300
Finance, Insurance, Real Estate	12,900	11,900	12,800
Services	37,300	54,400	68,200
Federal Government	3,100	3,400	3,300
State & Local Government	15,400	15,600	16,400
Total Employment	184,500	184,900	207,200

* Woods & Poole Economics, Inc., 1995

Environmental Resources

For much of the 20th (1900-1970's) century, water quality was in decline on the Illinois Waterway. A combination of changing agricultural practices, urbanization and industrialization along the river, and the opening of the Chicago Sanitary and Ship Canal all combined to increase sedimentation and industrial/chemical pollution on the Illinois Waterway. The increase in chemical pollution resulted in a decline of water quality in the upper reaches of the river that virtually wiped out fisheries or caused them to seek other, more agreeable habitat. Of the fish that were found, many had lesions or cancerous tumors and/or were species more tolerant of the extremely poor habitat conditions. This situation soon created pollution problems that adversely impacted fisheries downstream as well.

Mussels in the river fared no better. In the late 1800's up to the turn of the century, the Illinois River supported at least 49 mussel species and was renowned as the most productive mussel stream (per river mile) in the country. A comprehensive mussel survey on the Illinois River, conducted from 1966-69 by Starrett, found that over one-half of the unionid species once found in the Illinois River had been extirpated. Starrett attributed this decline and elimination of numerous mussel species to intense commercial harvesting, degraded water quality from various forms of pollution, and widespread degradation and destruction of mussel habitat (Whitney et al. 1997).

With the establishment of the Environmental Protection Agency and the passage of the Clean Water Act, the situation regarding chemical pollutants began to reverse. It has taken many years, but improved water quality on the river concerning pollution has begun to be noticed, along with a return of some aquatic resources. More recent mussel surveys of Whitney, Blodgett, and Sparks conducted in 1993-95 found that while species richness was still in decline in Alton, La Grange, and Peoria reaches, there was significant improvement in the Starved Rock and Marseilles reaches. In fact, some mussel species that had been eliminated from the upper reaches are starting to make a return (Whitney et al. 1997). Additionally, fish surveys in recent years have shown healthier fish (no lesions or cancerous tumors) and increased species diversity for several reaches of the Illinois Waterway based on the report by the EMP – Long Term Resource Monitoring Program.

However, while chemical and industrial pollution is being brought under control, sedimentation is still a major issue on the Illinois Waterway. Most of the project area is only 1 to 2 feet deep and the substrate in the project area is extremely soft (silt and clay). Wave action maintains turbidity in excess of levels tolerant to aquatic plant germination and growth. These problems are common throughout Illinois River backwater lakes.

The Habitat Needs Assessment conducted as part of the Upper Mississippi River - Environmental Management Program found that the most critical need along the Illinois River was the restoration of backwater lakes and side channels to increase depth diversity. This report called for the restoration of backwaters on the Illinois River so that 25% of the backwater lakes (19,000 acres) would have an average depth of at least 6 feet.

As part of the study, some biological sampling was conducted and other recent sampling efforts documented. The results of the sampling in the project area of Lower Peoria Lake, whether it was fisheries, waterfowl, mussels, or invertebrates, were indicative of poor quality habitat. The uniform, shallow depth (18 to 24 inches) silt bottom of the area does not provide much in the way of conditions suitable to a wide range of species. In fact, most of what was sampled would be considered highly tolerant species, and given the more than reasonable conditions during sampling, one would expect that few, if any, species would be present during the more extreme times of the year. For instance, during low water, high temperature conditions during summer, or in winter when ice forms and reduces water volume, there would probably be few or no fish in the area. Under current conditions, the majority of the deepwater overwintering habitat is in the main navigation channel.

However, Peoria Lake continues to support diverse aquatic and terrestrial vegetation communities in marshes and mudflats and on the margin of the pool. Wildlife species include common furbearers such as muskrat, beaver, raccoon, and mink. Many small mammals and birds, including owls, woodpeckers, pheasants, and songbirds, inhabit bottomland hardwoods in the area. Other birds of interest that can be found there include shorebirds, gulls, terns, herons, egrets, and cormorants.

Woodford County State Fish and Wildlife Area. The project site is located on the southern edge of the Woodford State Fish and Wildlife Area. The Fish and Wildlife Area is along the east side of the Illinois River near Peoria. Among the features present north of the project site in Upper Peoria Lake are many artesian wells, which make the manmade channels an excellent winter fishing area. The 2,900-acre site, of which 2,462 acres is water, is a favorite stopping point for waterfowl during migration.

The area comprises bottomland forest and backwater lakes of the Illinois River and features a wide variety of fauna and flora. Cottonwood, silver maple, and willow cover much of the low-lying land. Deer, raccoon, muskrat, mink, and beaver find this habitat to their liking and sometimes can be observed at dawn and dusk. Tall and stately great blue herons also are found in large numbers on the backwaters, and during winter, it is not unusual to see a bald eagle soaring above the frozen lakes or perched atop a snag.

A major waterfowl refuge of 1,400 acres exists on the area. While less attractive to wildlife due to heavy siltation in recent years, backwater lakes still attract large flights of waterfowl during migration. However, only wood ducks and Canada geese commonly nest and raise their young here. Hawks and owls, especially barred owls, are common to the area, as are an assortment of songbirds and woodpeckers (www.idnr.il.us.gov).

Endangered Species. Three federally threatened or endangered species are present in the Peoria Lake area: the threatened bald eagle (*Haliaeetus leucocephalus*), the threatened floodplain species decurrent false aster (*Boltonia decurrens*), and the threatened lakeside daisy (*Hymenoxys herbacea*). The Indiana bat (*Myotis sodalis*), while a federally endangered species, is not federally listed as currently found in the counties surrounding the project site. However, it is listed by Illinois as potentially occurring throughout the State of Illinois.

The bald eagle was listed in 1978 as an endangered species in 43 states and threatened in 5. In recent years, bald eagle numbers have increased dramatically. The bald eagle has expanded its distribution throughout the United States, and its protected status was changed in 1995 from endangered to threatened throughout the lower 48 states. In July 1999, the U.S. Fish and Wildlife Service announced the proposed rule to remove the bald eagle from the Federal List of Endangered and Threatened Wildlife. The bald eagle is still listed as threatened as of this writing.

The bald eagle normally migrates south to overwinter along major river systems, such as the Mississippi and Illinois Rivers. Eagles usually begin arriving in the area around late November or early December. They forage for fish where they can find open water, such as the tailwaters below the locks and dams. The eagles rest and loaf in the larger trees and snags along the shoreline. These trees provide excellent vantage points for fishing. In the evening, the eagles seek shelter in roost trees that provide protection from winter weather.

The decurrent false aster occurs along approximately 250 miles of the Illinois River and nearby parts of the Mississippi River. Decurrent false aster is an early successional species that requires either natural or human disturbance to create and maintain suitable habitat. Its natural habitat was wet prairies, shallow marshes, and shores of open rivers, creeks, and lakes. In the past, annual flood/drought cycles of the Illinois River floodplain provided the natural disturbance required by this species. Annual spring flooding created open, high-light habitat and reduced competition by killing other less tolerant, early successional species. The decurrent false aster is known to occur in Tazewell and Woodford Counties in the floodplain areas around Peoria Lake where it occupies disturbed alluvial soils. It is known to be found at the west end of McClugage Bridge and on the east side of the Lower Lake at Cooper Park. Cooper Park North is an Illinois Natural Areas Inventory (INAI) site.

The lakeside daisy is known to occur in Tazewell County, where it has been introduced. It is a perennial herb with flowering stalks, 2-10 inches tall, arising from basal tufts of leaves. When the plants are not in bloom, the small tufts of leaves are easily overlooked, but in bloom (late April-June), the plants are extremely showy, with populations simultaneously producing masses of large (1- to 1-1/2 inch in diameter) yellow flower heads. It requires full sun and can be found in dry calcareous sites, specifically in thin soils over limestone or dolomite outcrops/exposures and in dry limestone prairies.

The Indiana bat is a migratory species that occurs throughout much of the eastern United States, including Illinois. It may forage for insects along river and stream corridors in floodplain, riparian, and upland forests, old fields, crop borders, and along wooded fencerows. They have been found to forage from between 6 to 100 feet above the ground and over streams greater than 6 feet wide. The Indiana bat prefers habitat containing dead trees with loose bark to establish nursing sites. Caves are utilized in winter for hibernation.

Fish. Peoria Lake has a diverse fish population that is dominated by carp, gizzard shad, buffalo, carpsuckers, sunfish, largemouth bass, freshwater drum, and white and black crappie. More recently, with the improvement in water quality, game fish

species like sauger, walleye, and smallmouth bass have been able to reestablish and even make population gains during high river flow. However, additional population gains are limited by the lack of suitable off-channel habitat and overwintering areas.

Fish sampling was conducted in the project area utilizing standard gill nets, trap nets, and electrofishing. These sampling efforts covered large areas above and below the McClugage Bridge during September 2000. Only 278 total fish representing 17 species were collected with all methods combined. Sampling conditions were considered to be optimal—water temperature was 76 degrees and air temperature was 78 degrees. Winds were light, and the river was at elevation 442 feet MSL, the normal summer pool.

Gizzard shad (*Dorosoma cepedianum*) outnumbered all species with a count of 187. Also collected were 23 white bass (*Morone chrysops*), 15 freshwater drum (*Aplodinotus grunniens*), 11 carp (*Cyprinus carpio*), and 11 skipjack herring (*Alosa chrysochloris*). Twelve additional species comprised the remaining 31 fish captured. Of the total fish collected, 67% were gizzard shad. Few sport fish other than white bass were taken. No black bass or bluegill were sampled.

Those results are in contrast to the number of fish collected with just 1 hour of electrofishing across and upriver from the sampling area when a total of 1,198 fish representing 27 species were collected in 1995. The Narrows contain different types of habitat, including riprap, rock, stable substrate and close proximity to deep water. The sampling area in Lower Peoria Lake was shallow (18 to 24 inches) with a silt substrate.

Restoration efforts can result in dramatic improvements in fish habitat and usage as demonstrated by monitoring at the Peoria Lake EMP project. Comparisons of pre- and post-construction fish community monitoring results at the Barrier Island complex experimental sites show an increase in the number of fish species collected as well as an increase in the number of fish collected during post-construction monitoring. The comparison of pre- and post-construction results at the control sites did not show a similar increase. In addition, a greater diversity of species, as well as more unique species, was collected in post-construction sampling at sites within the Barrier Island complex.

Mussels. Professional biologists recognize that mussels (unionids) are particularly sensitive to the influence of humans on the environment and therefore make good indicators of water quality and health of aquatic ecosystems. Juveniles, once settled after their larval (glochidia) stage, are slow to grow and immobile for the duration of their (up to 100 years or more) adult lifespan. Since they are sedentary filter feeders of particulate matter from the water column, they are also susceptible to sedimentation and pollution. Therefore, sedimentation is also considered to be a factor in the decline of the mussel population in Peoria Lake. Currently, 23 species of mussels occur in Peoria Lake, with the most common being three-ridge (*Amblema plicata),* maple-leaf (*Quadrula quadrula*), pimple-back (*Quadrula pustulosa*), and floater (*Pyganodon grandis*).

Some mussels were collected at two transects in the study area as part of a different study effort concerning dredging an access channel to Spindler Marina (Bob Shanzle,

letter dated June 4, 1999). In the main sampling transect (11 sites), only three live mussels were collected. All were three-ridge (*Amblema plicata*). In the second transect (four sites), only six mussels were collected—four three-ridge and two maple-leafs (*Quadrula quadrula*).

Macroinvertebrates. Loss of aquatic vegetation and sedimentation over the past hundred years, as well as pollution, have led to reduced abundance and diversity of the invertebrate fauna in the Peoria Lake area.

In November 1998, Illinois Natural History Survey (INHS) staff collected 3 replicate samples from 30 sites in both Upper and Lower Peoria Lakes (Stephenson and Koel 1999). Six of those sites were within the study area. Substrates were entirely silt/clay. Midges, fingernail clams, and burrowing mayflies comprised 97% of all organisms collected in Peoria Lake. The lower section had an overall density of 108.93 organisms/square meter with midges (81.70 per square meter) and fingernail clams (19.61 per square meter) accounting for 93% of all organisms collected. The authors considered these catches to be low and attributed the lower densities of these organisms to the "higher sediment loads and continuous re-suspension of the sediments."

Waterfowl. The Illinois River Valley is part of the Upper Mississippi River Flyway, a critical migration corridor for waterfowl and other migratory birds. Waterfowl such as ducks and geese are most abundant in the spring and fall, but they can be found on the lakes year round. The Illinois River Valley is also considered to be an important breeding ground for the wood duck.

Waterfowl usage of Peoria Lake area was documented from data collected by the INHS aerial waterfowl census program. INHS staff fly transects at various times of the year, and waterfowl are counted from historic locations. For this study, data were taken from the Illinois Waterfowl Surveys and Investigations and include data from the fall of 1999 and again from the spring of 2000. Aerial inventories were conducted weekly from September 1, 1999, through January 5, 2000, and again from February 7 through April 6, 2000.

Of the 21 separate aerial counts taken in Lower Peoria Lake, only 6 had notations of waterfowl usage, and then the numbers were very low compared to other areas in the Illinois River census area. For example, on February 28, 2000, while the areas sampled contained as many as 290,935 total ducks and 3,795 total geese, there were no waterfowl found in Upper or Lower Peoria Lakes on that particular day.

Information from post-monitoring efforts of the Upper Peoria Lake EMP project has shown that the construction of islands and deepwater habitat has dramatically increased species diversity and number of individuals using that area. Four years after island construction, waterfowl use of that area has increased 14-fold.

Monitoring of spring and fall waterfowl usage of the EMP project in the Upper Lake varies somewhat; however, the total annual counts show a steady increase over the 4-year span of the post-project monitoring. Results of the aerial census, combined with numerous observations of waterbirds at the site during spring and summer months by ILDNR site managers, INHS staff and Corps of Engineers staff, provide evidence that

the EMP island measures are enhancing aquatic habitat. The same dramatic increases hold true for fish usage of the aquatic habitat created by dredging to construct the islands and placement of riprap for the closing structure.

The results of the monitoring efforts at the Upper Lake EMP sites illustrate the success of the natural resource enhancement aspects of that project. Also, because the EMP islands are still relatively new, waterfowl and fish counts over the next several years could very likely increase to even greater numbers. These results suggest that similar success in the Lower Lake is possible if islands and channels are constructed.

Historic Properties

The Rock Island District queried the most updated Illinois Geographic Information Systems (GIS) site file database and reviewed the reports: (1) *An Investigation of Submerged Historic Properties in the Upper Mississippi River and Illinois Waterway* (Custer and Custer 1997); (2) *Landform Sediment Assemblage (LSA) Units in the Illinois River Valley and the Lower Des Plaines River Valley* (Hajic 2000); and (3) *The Historic Properties Management Plan for the Illinois Waterway System, Rock Island District, Corps of Engineers: Volumes I and II (*Roberts et al. 1999). No previously reported or recorded underwater or submerged historic properties were reported or recorded.

The District sent letters dated November 7, 2000, and October 5, 2001, concerning the absence of documented historic properties and the Corps' determination of No Historic Properties Affected by the proposed island creation. The Illinois Historic Preservation Agency (IHPA) concurred with the District by letters dated December 4, 2000, and October 30, 2001, that no historic properties are affected by the proposed island creation element of the project, including the rock jetties and closing structures (IHPA Log No. 0011090020K-P, Appendix A-1).

Future Without-Project Conditions

It has generally been accepted that outside of the 9-foot navigation channel on the Illinois River, continued sedimentation in the Peoria Lake area will continue to reduce lake depths, deteriorate the aquatic resources in the area, and increase 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. Whether sedimentation continues at historic rates or even if relative equilibrium is established, it is very unlikely that the existing degraded habitat would see measurable improvements in the near future.

The result of sedimentation has been the loss of deeper, off-channel parts of the lake from an estimated maximum of 8 feet to 1-2 feet in recent years. While currently the channel is self sustaining, it is uncertain if navigation flows will be adequate to transport sediment in the future. In particular, sediment deposition into the Farm Creek and Tenmile Creek deltas is likely to continue to expand the deltas into the navigation channel. At these delta locations, it is possible that some maintenance dredging will be required in the future of no changes are made. Off-channel areas will remain shallow and subject to resuspension of sediment by waves. This transformation of Peoria Lake into a narrow navigation channel with bordering shallow, wind-swept areas will negatively impact fish and wildlife habitat and also reduce aesthetic values and recreation opportunities.

Regarding the expected future environmental condition of Peoria Lake, continued limitations or potential further decline in fish and wildlife populations is likely. The Illinois River's sediment load, diminished water quality, resuspension of sediment, and resultant elevated turbidity levels will likely lead to continued limited habitat values and could ultimately cause a more drastic decline in important fish and wildlife populations and aquatic vegetation. The exact future condition of the lake is somewhat unclear. The lake may continue filling, with associated conversion to mudflats and land, or experience reduced sedimentation rates, helping to maintain its current shallow depths. In either case, a highly degraded state of aquatic habitat quality exists in the project area. This poor aquatic habitat condition will not improve in the near future due to continued lack of depth and diversity, and potential conversion from aquatic to terrestrial habitat types.

TRIBUTARY WATERSHED RESTORATION

Similar to the alternatives considered in Peoria Lake, the first step was to identify the general locations and broad categories of potential improvement. There are 10 direct tributaries to Peoria Lake. However, once the focus of the in-lake alternatives was determined to be Lower Peoria Lake, the tributaries draining to this area or a relatively short distance upstream became the logical place for tributary alternatives to be investigated. This narrowed the focus to Farm Creek and Tenmile Creek. Since Tenmile Creek has a large grade control structure at the Caterpillar Proving Ground within the basin, which helps to address sediment delivery, the study team felt that Farm Creek should be the focus. Further investigations and discussions with the Sponsor identified the upper portion of Farm Creek as having the highest level of interest from public involvement.

Following release of the public review draft of this report, results from an HTRW Phase II analysis concluded that the project site for the recommended plan for tributary watershed restoration had contamination issues. Therefore, consistent with Corps of Engineers policy, the study team, in consultation with the Sponsor, decided to eliminate this element of the study's overall recommended plan. However, all data, plan formulation, design, and cost information have been included in Appendix K for this portion of the project. Information originally included in the other appendices regarding tributary watershed restoration can also be found in Appendix K. If the site is cleaned to meet applicable standards, it could be considered for restoration efforts at a future date.

ASSESSMENT OF PROBLEMS, OPPORTUNITIES, AND CONSTRAINTS

PROBLEM

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. Many Peoria Lake tributary streams have been altered through channelization and land use practices and are now conveying high sediment loads, thereby aggravating the sedimentation problem in Peoria Lake. The causes of high tributary sediment loads are varied. In all watersheds, some degree of channelization has occurred. In some watersheds, Farm Creek being one, urban development and resulting impervious surface generate substantial increases in surface water runoff rates and volumes. Finally, large areas of the tributary watersheds are forested. However, little or no management is underway, resulting in dense canopy with very little ground cover.

Peoria Lake is subject to high rates of sediment delivery from its 10 direct tributaries. This high sedimentation rate is related to the geology of the Peoria Lake region, which is surrounded by highly erodible loess bluffs and moraine deposits. In addition, alternation of the tributary watersheds has degraded riparian habitat along stream corridors. Typically, this is the result of agricultural practices. The results are increased sheet and rill erosion in formerly riparian areas that had trapped sediments before entering tributary waters. Statewide, Illinois has lost approximately 99% of the original tall grass prairie and over 85% of pre-settlement wetlands (Noss, LaRoe and Scott 1995). Restoration of prairie and wetlands present opportunities to restore significant habitat types that were formerly abundant in the state, but that have been greatly reduced. This change in land cover from diverse vegetation to mostly row crop agriculture has significantly increased sheet and rill erosion and surface runoff in local tributaries.

GOALS AND OPPORTUNITIES

The principal goal of ecosystem restoration in Peoria Lake is to create, restore, or improve aquatic habitat by restoring depth diversity and reducing sediment delivery and deposition in Peoria Lake, with ancillary benefits to recreation. Opportunities were explored to address these conditions. The Peoria Riverfront Development Project is a public and private cooperative effort to revitalize the City's downtown area. It is fundamental to the success of the development project that the Illinois River at Peoria and Peoria Lake are healthy, functioning, and sustainable resources. Historically, the riverfront area on both sides of the river developed as a function of the transportation and aquatic resources of the Illinois River. While these same needs exist today, the need for more diversified housing, business, and industry exists along the riverfront. Much as aquatic and terrestrial habitat diversity attracts greater numbers and types of aquatic and terrestrial species, people are attracted to an area that is healthy and diverse. The goal of restoring and protecting the Illinois River at Peoria is as much in the State and local interest as it is in the Federal interest. It is supported locally by regional efforts to reduce sediment delivery, control stormwater runoff, and improve tributary water quality entering the Illinois River at Peoria. Therefore, opportunities to enhance the health, function, and sustainability of the Illinois River and Peoria Lake are by definition consistent with local efforts and vital to the success of the Peoria Riverfront Development Project. The study objectives and constraints are summarized below.

OBJECTIVES

The following objectives for the Feasibility Study were developed by an interagency study team to address the specified problems, goals, and opportunities. Following the objectives, Table 2-4 relates the study goals and objectives with potential measures. These measures were further developed and investigated as part of the Feasibility Study and are addressed in the following sections of this chapter in greater detail.

- **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).

- **Reduce sediment delivery to Peoria Lake from tributary streams** - The direct tributaries to Peoria Lake compose 3% of the total drainage area at Peoria and deliver 40% or more of the sediment deposited in the lake. Reducing sediment transport from this relatively small area would result in considerable reductions in total sediment rates in the lake (see Appendix K).

- **Create riparian and wetland habitat along tributary streams** - Restoration of prairie and wetlands along tributaries presents opportunities to restore significant habitat types that were formerly abundant in the state, but that have been greatly reduced (see Appendix K).

TABLE 2-4. Potential Measures to Address Study Goals and Objectives

Goals	Objectives	Measures
Restore aquatic habitat	Restore depth diversity	Areas with water depth of >6 feet for overwintering fish
		Areas with water depth of ~4 feet for fish spawning and nursery habitat
		Flowing side channel
	Provide structure for aquatic organisms	Rock jetties/reefs, riprap, and root wads
	Increase habitat diversity	Create islands within Peoria Lake to provide additional shoreline and terrestrial habitat
	Improve habitat value for migratory waterfowl and shorebirds	Provide areas for waterbird resting, nesting, and feeding
	Improve water quality	Provide flow and depth necessary to maintain dissolved oxygen levels of 5 mg/l
		Create islands or breakwaters to lower turbidity levels by reducing wind-/wake-generated waves
		Create sediment traps, retention ponds, and wetland areas to filter and trap sediments before they enter Farm Creek
	Maximize sustainability of project features	Align islands to minimize deposition and increase potential for depth sustaining scour
		Bank protection to reduce island erosion
		Closing structures to minimize sediment delivery to restored deepwater areas
Reduce sediment delivery and deposition *	Reduce sediment delivery to Peoria Lake from tributary streams	Sediment traps and retention ponds on tributaries
		Streambank and bed stabilization
	Create riparian and wetland habitat along tributary streams	Create wetlands and improve riparian buffers

* The goals to reduce sediment delivery and deposition were not met. See Appendix K for information regarding study investigations.

CONSTRAINTS

The following constraints were identified during the study process:

- **No impacts on flood elevations as required by Illinois law** - Illinois state law specifies that any action in the floodplain that increases flood heights is not allowable or must be accompanied by mitigation of adverse effects. Due to the potential high cost associated with these actions, efforts were made to avoid this threshold.

- **No significant impact on navigation channel flows** - The Corps of Engineers currently operates and maintains the 9-Foot Channel Navigation Project on the Illinois Waterway. At the present time, dredging is not required to maintain the existing navigation channel in the project area. The project should avoid any changes that would result in the potential for increased sedimentation in the main channel or require main channel maintenance dredging.

- **No impacts to the foundation of the McClugage Bridge (U.S. Highways 24 and 150)** - The Illinois Department of Transportation (IDOT) requested that there be no impacts to the foundation of the McClugage Bridge and that islands and dredging do not approach the bridge due to safety concerns and the potential for increased maintenance costs.

- **Uncertainty regarding future sedimentation rate** - The rate of sedimentation in the Lakes since 1903 has averaged 1.5 inches per year. While it is possible to over dredge to a certain extent to maintain the desired project depth over a 25-year period of analysis, it is not feasible to over dredge to allow for a 50-year period of analysis. To over dredge sufficiently for a 50-year period of analysis would require excavation of lake bottom parent material. Finally, to have a 50-year period of analysis without sufficient initial over dredging would require the local sponsor to maintenance dredge, an activity they do not support.

- **Sponsor limitations – funding, land ownership/or ability to acquire, and desire for limited Operation and Maintenance** - As the Non-Federal Sponsor, the ability of the State of Illinois to afford various features or acquire the lands, easements and rights-of-way represented potential limiting factors. At this time, a final legal determination has not been made as to ownership of submerged lands in the Illinois River Basin. In addition, the Sponsor desires more natural and sustainable alternatives that avoid high operation and maintenance costs.

IDENTIFY MEASURES AND FORMULATE ALTERNATIVE PLANS FOR PEORIA LAKE

Before specific measures or alternative plans were formulated, the first step was to identify general locations and broad categories of potential improvement. The study area stretches roughly 130 miles from Henry to Naples, Illinois. As part of the study, various locations within the study area, including both Upper and Lower Peoria Lakes, were considered. Early in the study process, the interagency study team agreed that due to degradation of the lakes and loss of depth and diversity, restoration in either Upper or Lower Peoria Lake would provide very similar benefits. It was then decided that restoration alternatives would focus on Peoria Lake, based on the study authority (which specifically references the Peoria Riverfront), previous studies identifying suitable locations within the Lower Peoria Lake, and sponsor and local interest.

The potential categories of actions to provide off-channel depth diversity are listed below and followed by the results of initial evaluation.

1. **Dredging to create aquatic habitat and islands** - The reconnaissance study, 905(b) analysis, discussed the potential for dredging aquatic habitat and using the material to restore historic islands. However, based on initial evaluations of the historic locations and prior studies, it was determined that more sustainable locations would be located farther upstream. The Illinois State Water Survey identified the most promising areas within Lower Peoria Lake as part of their report, *Hydraulic Investigation for the Construction of Artificial Islands in Peoria Lake* (1988). These areas were in the upper

portion of Lower Peoria Lake where current velocities are higher through the Narrows. Their study highlighted the potential for these flows to help maintain deepwater habitat. In addition, the State of Illinois currently owns a refuge in the upper portion of Peoria Lake, which is part of the Woodford County State Fish and Wildlife Area.

2. **Dredging to create aquatic habitat with sediment placement outside of the lake** - Dredging with the removal of material from the lakes for placement on adjacent uplands, transport to brownfields, or other beneficial uses outside the immediate study area was also evaluated.

   Early analysis showed that transporting dredged material longer distances was considerably more costly than island construction, while placement on adjacent uplands could be accomplished at a similar cost to island construction. However, real estate acquisition costs are significantly higher in the upland areas and the availability of willing landowners is limited. Hydrodynamic modeling (see Appendix D-3) demonstrated that construction of islands adjacent to deepwater dredging aided in the sustainability of the deepwater habitat by increasing current velocities and limiting flows and sediment movements into the created deepwater areas. As a result of the higher costs of the upland placement and greater habitat benefits of island creation, detailed evaluations focused on dredging with island alternatives.

FORMULATION CRITERIA

Prior to developing the specific alternatives, the study team developed the formulation criteria listed below. Consideration was also given to the specific constraints listed previously (no impacts to flood elevations, sponsor funding limits, land issues, no significant impacts on navigation channel flows, and no impacts on the foundation of the McClugage Bridge).

- The measures should be designed to meet identified biological goals – primarily focused on creating aquatic habitat for fish (overwintering, spawning, nursery, and feeding), while maximizing habitat diversity to benefit waterfowl, shorebirds, invertebrates, and plants.
  - Overwintering habitat – depth of greater than 6 feet optimal
  - Spawning and nursery habitat – varies by species; however, firm substrate preferred
- Measures must be acceptable to the wide range of interested local and state parties (acceptability – effects on views, recreational use potential).

POTENTIAL PROJECT MEASURES FOR PEORIA LAKE

The following project measures to achieve the project goals and objectives and to meet the stated formulation criteria were considered in detail:

- **Dredge off-channel areas to greater than 6 feet to serve as overwintering fish habitat** - The average depths of off-channel areas, outside of the navigation channel, in much of Peoria Lake are only 1-2 feet. The proposed restoration measure includes creating areas greater than 6 feet deep by dredging. This is proposed to be done as a series of potholes and connecting channels. Potholes are simply areas of deep water that vary the overall depth characteristics and habitat of the dredged area. Due to relatively high historic sedimentation rates, some level of over dredging is necessary to maintain

the project through the 25-year period of analysis. The amount is the anticipated annual sedimentation rate (2.0-2.5 inches per year) plus the desired depth for habitat. Therefore, the total depth will be approximately 10-11 feet.

- **Dredge areas to at least 4 feet to increase diversity of aquatic habitat** - Due to relatively high historic sedimentation rates, some level of over dredging is necessary. This shallow depth will roughly follow historical lake contours and acreage to roughly 6 feet to allow for sedimentation rates.

- **Dredge with island construction to create flowing side channel habitat adjacent to island placement - create flowing habitat for riverine aquatic species, separated from navigation channel -** The flow within a created side channel also has the potential to minimize sedimentation and creates the potential for continuous scouring, helping to maintain the deepwater habitat created.

- **Island Creation** - The construction of islands would increase habitat diversity by providing shoreline and terrestrial habitat for migratory birds. Islands can serve as a low-cost placement area for dredged materials from other project features, as well as wind and wave breaks to reduce the resuspension of sediments, thereby improving water quality.

- **Aquatic Structure** - Much of the lake currently is a uniform shallow depth with a soft substrate. The addition of firm structure, such as rock jetties/reefs, rock riprap, or root wads, would provide additional habitat diversity.

- **Closing Structures** - In areas where there is little potential for higher current velocities to maintain water depth, deepwater habitat created by dredging has the potential to fill rapidly with sediments. Closing structures can help to minimize flow into these deepwater areas, reducing sediment delivery and increasing sustainability. Rock closing structures also provide aquatic structure.

- **Bank Protection** - In order to maximize sediment removal, it is preferable to construct the entire islands out of the river substrate. The fine silt clay that composes this material would require some bank protection to reduce the potential for island erosion due to wind- and wake-generated waves. Rock riprap was chosen as a preferred material due to the additional aquatic structure it provides.

DESCRIPTION OF ALTERNATIVES

All of the measures listed above met the goals and objectives of this project. They were evaluated in various combinations to achieve project goals. A wide range of dredging areas and island sizes and shapes was evaluated, but preliminary technical evaluations reduced the number of viable options to the four alternatives listed below. At a series of public meetings in November 2000, one additional alternative of even larger islands was presented. This alternative was subsequently dropped due to the high cost and lack of sponsor interest. During the preliminary evaluations, it also become apparent that most of the measures were required as part of any alternative and were not optional increments. For example, the dredged volume had to match the island volume. Due to the focus on aquatic habitat, all of the alternatives included the overwintering habitat, spawning and nursery habitat, and aquatic structure. Closing structures and bank protection also were included to maximize the life of the project features.

Figures 2-4 through 2-7 show the plan form changes proposed by the various alternatives. The area being considered for dredging and island construction is in the vicinity of the McClugage Bridge (U.S. Highways 24 and 150) in the upper northeastern portion of Lower Peoria Lake. The island (or islands) would be created within an area owned by the ILDNR. Most of the area considered for island creation has water only 1 to 2 feet deep with a substrate of 4 feet (or greater in some areas) of soft mud and silt. Biological investigations of this area show that it has only marginal habitat value for most aquatic species.

Dredging to construct the island(s) would range from 6 to 16 feet below flat pool and incorporate side channels and deep holes to provide depth diversity, overwintering habitat, and "edge" for fish species. The islands would be constructed to approximately 10 feet above flat pool at their highest (elevation 450 feet MSL). Additional structures, such as riprap along the island shore and jetties out into the water, would stabilize the islands and add additional habitat value.

Alternatives A2 and B1 were reformulated to reduce costs and reduce construction time. These adjustments include: (1) reduce dredging depths; (2) reduce riprap layer thickness and use Corps riprap gradation; (3) build islands in lifts similar to stepped mounds; (4) reduce the widths of the lower islands; and (5) use a design build type contract. The adjustments were relatively minor in terms of habitat and sustainability. Therefore, the habitat evaluation and hydraulic analysis was not re-done.

A1. Dredging to create aquatic habitat and a small island - This alternative consists of converting 27 acres of shallow, open water upstream of the McClugage Bridge (U.S. Highways 24 and 150). Sediments would be dredged over a 17-acre area to construct an island with 9 acres of terrestrial habitat. In order to create a diverse aquatic habitat, dredge depths would vary from 6 feet to 16 feet, including holes and connecting channels. Rock riprap would be placed along the channel side of the island to provide erosion control. Rock jetties would be placed every 250 feet around the island to provide additional structure and edge habitat. An emergent closure structure would be constructed at the upstream end to minimize sediment movements to the non-channel side of the island.

A2. Dredging to create aquatic habitat and a mid-sized island - This alternative consists of converting 76 acres of shallow, open water upstream of the McClugage Bridge (U.S. Highways 24 and 150). Sediments would be dredged over a 55-acre area to construct an island with 21 acres of terrestrial habitat. In order to create a diverse aquatic habitat, dredge depths would vary from 6 feet to 16 feet, including holes and connecting channels. Rock riprap would be placed along the channel side of the island to provide erosion control. Rock jetties would be placed every approximately 250 feet around the island to provide additional structure and edge habitat. An emergent closure structure would be constructed at the upstream end to minimize sediment movements to the non-channel side of the island.

B1. Dredging to create aquatic habitat and two islands with a flowing side channel - This alternative consists of converting 198 acres of shallow, open water just downstream of the McClugage Bridge (U.S. Highways 24 and 150). Sediments would be dredged over a 144-acre area to construct a pair of islands with 54 acres of terrestrial habitat (37 and 17 acres, respectively). A 3,650-foot flowing side channel would be created between the two islands. In order to create a diverse aquatic habitat, dredge

depths would vary from 6 feet to 16 feet, including holes and connecting channels. Rock riprap would be placed along the channel side of the island to provide erosion control. Rock jetties would be placed approximately every 250 feet around the islands to provide additional structure and edge habitat. An emergent closure structure would be constructed on the east side of the east island to minimize sediment movements in that area.

B2. Dredging to create aquatic habitat and a large island - This alternative consists of converting 145 acres of shallow, open water just downstream of the McClugage Bridge (U.S. Highways 24 and 150). Sediments would be dredged over a 99-acre area to construct an island with 46 acres of terrestrial habitat. In order to create a diverse aquatic habitat, dredge depths would vary from 6 feet to 16 feet including holes and connecting channels. Rock riprap would be placed along the channel side of the island to provide erosion control. Rock jetties would be placed every 250 feet around the islands to provide additional structure and edge habitat. An emergent closure structure would be constructed on the east side of the island to minimize sediment movements in that area.

EVALUATE AND COMPARE PLANS FOR PEORIA LAKE

The alternatives and process used to determine the potential cost, habitat benefits, incremental cost/cost effectiveness, significance, hydrologic/sustainability, and public acceptability are outlined below. Due to uncertainties regarding the long-term sustainability of the projects in an aggrading river reach, a 25-year period of analysis was used for the analysis of habitat benefits.

The proposed 25-year period of analysis meets Corps of Engineers requirements outlined in ER 1105-2-100. The project is being designed to primarily provide overwintering habitat for fisheries benefits for 25 years (maintain depths greater than 6 feet). The 25-year period is the period, over which ecosystem benefits were calculated, construction costs annualized, and operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) estimated. The sponsor will be responsible for OMRR&R of the project and the associated costs for as long as the project remains authorized. At the end of 25 years, the project is estimated to begin having diminished benefits as sedimentation begins to reduce depths below 6 feet.

FIGURE 2-4. Alternative A1 - Dredging to create aquatic habitat and a small island

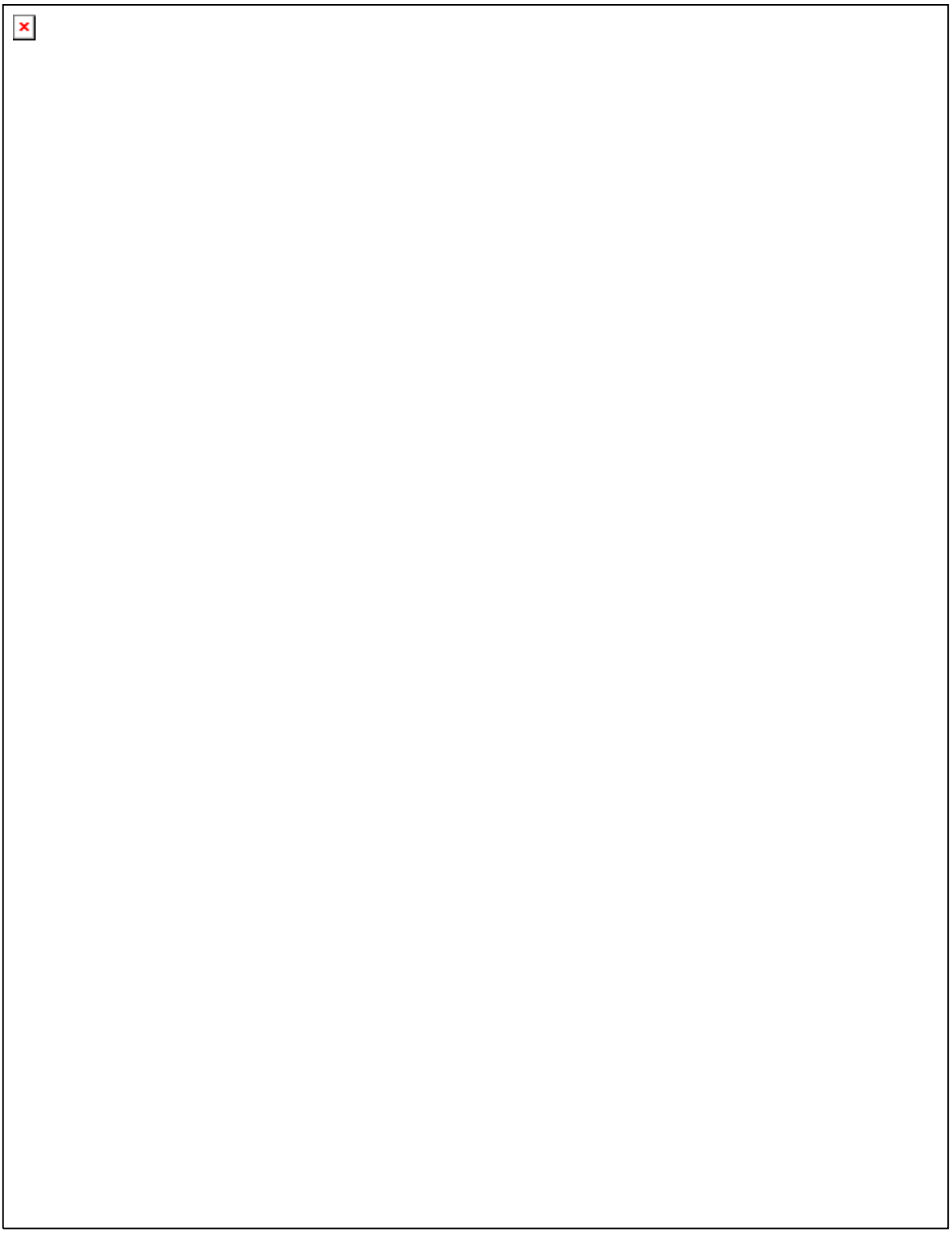


FIGURE 2-5. Alternative A2 - Dredging to create aquatic habitat and a mid-sized island

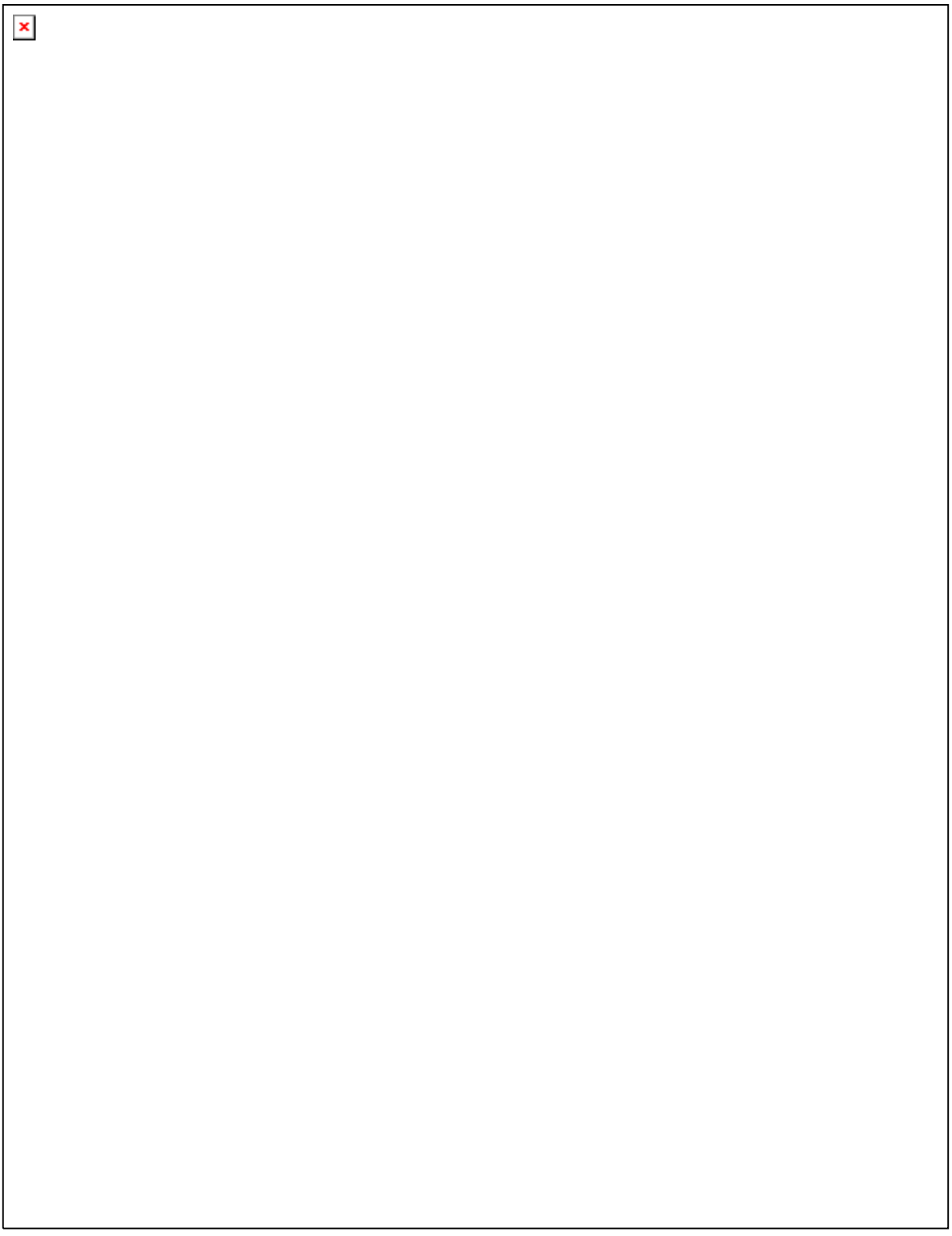


FIGURE 2-6. Alternative B1 - Dredging to create aquatic habitat and two islands with a flowing side channel

FIGURE 2-7. Alternative B2 - Dredging to create aquatic habitat and a large island

INCREMENTAL COST/COST EFFECTIVENESS ANALYSIS PROCESS

Cost effectiveness analysis was used to determine what project features should be built based on habitat benefits (outputs) that meet the goals and objectives of the project and at the same time are the most cost effective. The Corps of Engineers has incorporated cost effectiveness analysis into its planning process for all ecosystem restoration planning efforts. A cost effectiveness analysis is conducted to ensure that least-cost alternatives are identified for various levels of output. After the cost effectiveness of the alternatives has been established, incremental cost analysis is conducted to reveal and evaluate changes in cost for increasing levels of environmental output.

Cost effectiveness and incremental analysis is a three-step procedure: (1) calculate the environmental outputs of each feature; (2) determine a cost estimate for each feature; and (3) combine the features to evaluate the best overall project alternative based on habitat benefits and cost. While cost and environmental output are necessary factors, other factors such as the ability to construct, significance of the resources, sustainability of the project, and acceptability to the sponsor are very important in deciding on the preferred alternative.

Environmental outputs were calculated as average annual habitat units (AAHUs). The annualized costs were calculated by applying a 5-7/8% annual interest rate to the construction costs over the 25-year period of analysis. The incremental analysis for each feature was accomplished using the Corps of Engineers Institute for Water Resources methodology described in Robinson et al. (1995). Further information on the analysis can be found in Appendix G of this report.

The outputs, costs, and average cost per AAHU are presented in Table 2-5 on page 2-35 for the island restoration. The incremental analysis for restoration evaluated island alternatives A0, A1, A2, B0, B1, B2 and various other combinations of project features.

HABITAT EVALUATION

Habitat analyses were completed for the in-lake alternatives to assess their likelihood to achieve the goal of enhancing aquatic, wetland, and terrestrial habitat. These analyses employed a multi-agency team approach with representatives from the Corps of Engineers and the ILDNR. The U.S. Fish and Wildlife Service was supplied with copies of all related documentation and reviewed the analysis after it was completed.

The benefits to be derived from habitat restoration projects are not readily convertible to actual monetary units as is customarily required for traditional projects utilizing benefit-cost analyses. A method of quantification is needed to adequately evaluate project features. Quantification of habitat restoration project outputs can then be utilized as a project performance evaluation tool, a project ranking tool, and/or a project planning tool. This application for project output quantification was used as a project planning tool.

Analysis of existing study area conditions, future conditions without the project, and impacts of several proposed measures and alternatives was completed using the Wildlife Habitat Appraisal Guide (WHAG) procedures developed by the Missouri Department of Conservation and the USDA Natural Resources Conservation Service. The WHAG is a numerical habitat appraisal methodology based on USFWS Habitat Evaluation Procedures (HEP).

The WHAG procedures evaluate the quality and quantity of particular habitats for animal species selected by the WHAG team members. The qualitative component of the analysis is known as the

Habitat Suitability Index (HSI) and is rated on a 0.1 to 1.0 scale. The quantitative component of the WHAG analysis is the measure of acres of habitat that are available for the selected evaluation species. From the qualitative and quantitative determinations, the standard unit of measure, the Habitat Unit (HU), is calculated using the formula (HSI x Acres = HUs).

Changes in the quality and/or quantity of HUs will occur as a habitat matures naturally or is influenced by development. These changes influence the cumulative HU derived over the life of the project. Cumulative HUs are annualized and averaged. This determines what is known as the Average Annual Habitat Units (AAHUs). AAHUs are used as an output measurement to compare all the measures and project as a whole.

Although a set list of species is used within the WHAG program, each species represents a guild of other similar species that utilize the same habitat in similar ways. In essence, each species represents an array of habitat variables for the species being evaluated. These species represent key goals and objectives for the proposed project.

Seven fish species were used to evaluate the aquatic habitat (dredging) improvements proposed by the project. Project designs for Lower Peoria Lake would produce a wide diversity of aquatic habitat that currently does not exist. Channel catfish (*Ictalurus punctatus)* and gizzard shad (*Dorosoma cepedianum)* are fish that commonly inhabit main channel and channel border habitats. Largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), and crappie (*Pomoxis spp*) are centrarchids that inhabit side channels and backwaters, and are important sport fish species. Carp (*Cyprinus carpio*) and black bullhead (*Ameiurus melas*) are common and abundant in backwater habitats. All seven species utilize backwater areas as spawning habitat.

Five wildlife species were used to evaluate the terrestrial component (island construction) of the project. Mallard (*Anas platyrhynchos*) is a migratory waterfowl that utilizes early successional wetland habitat and has socioeconomic importance as a game species. Lesser yellowlegs (*Tringa flavipes*) is a wading bird found in initial successional wetland habitat. King rail (*Rallus elegans*) is a rare species of wading bird that prefers permanent sedge dominant wetland habitat. Green-backed heron (*Butorides striatus*) is a wading bird found in mid-successional herbaceous and shrub-dominated wetland habitat. The muskrat (*Ondatra zibethicus*) is a resident furbearing mammal that utilizes mid-successional herbaceous wetland habitat.

Because the WHAG is evaluating future conditions with and without the project, assumptions must be made about what, in the opinion of the team, is likely to happen under anticipated conditions. Discussions weighing various factors and project components are undertaken and potential future conditions are documented as being likely to occur. These assumptions deal with current conditions, model performance, changes in habitat conditions over time, and anything else judged to be important that would be considered to help direct the evaluation to the most likely conclusion.

In the case of Peoria Lake, the water level within the lake frequently fluctuates. An elevation for differentiating terrestrial and aquatic components needed to be established. Therefore, since flat pool is 440 feet MSL (mean sea level) and is the lowest regulated water level that Peoria Lake would be allowed to reach, that elevation was selected as the dividing line between the terrestrial and aquatic habitat components proposed by the project.

Another assumption that was made concerned current habitat value of the lake. Current conditions within most areas of Peoria Lake provide limited habitat value for most species associated with open-water habitats. The majority of the area is covered in 12-18 inches of water with a substrate

of up to 4 feet that is best described as "pudding." There is essentially no aquatic plant life supported by this substrate. Wind and wave action keep the bottom stirred up and any plants that might start to root are uprooted by water currents. Water quality in the lake is frequently poor and has high turbidity. Even with the generally poor habitat quality of the proposed project area, there is still some minor habitat value, and some species can be found to survive under the minimal conditions provided. However, for the purposes of the evaluation, the team determined that the lowest habitat value of 0.1 (in essence a "0" value) should be used as the baseline, or current existing condition of habitat for the project area.

Another area that needed consideration was sedimentation. Recent Corps studies indicate that a trend toward reduced sedimentation rates or even equilibrium may be developing within Peoria Lake. If such is the case, the prospect for dramatic changes or naturally occurring habitat improvements within the lake over the next 25 years is very low. It was therefore assumed that after 25 years "without-project" conditions would not appreciably improve, so habitat value within the project area was still likely to be at or near "0".

The WHAG was designed to be applied to many different types of habitat. In order to evaluate potential project aquatic benefits, a field data sheet was prepared using the aquatic (MOFISH) matrix for overflow water habitat. The non-forested wetland field data sheet was used in order to evaluate the island construction or wetland component of the project. It was felt that the questions asked by these types of habitat evaluation field sheets would best cover the range of habitat characteristics proposed by the project.

Some questions on the field sheets did not precisely address changes proposed by the project. However, because habitat benefits of a similar nature would be provided by the project, the values of those benefits were considered and counted (i.e., considering riprap as comparable to natural bank structure). In addition, because of the broad nature of the model, it is not sensitive enough in some instances to account for natural resource benefits that the project is anticipated to provide. Therefore, a few of the answers on the field sheets were weighted to show benefits from project features that would not have otherwise shown up in the WHAG analysis.

In addition, there were some project changes that would provide habitat benefits but that the WHAG evaluation was too broad to pick up. An example would be large areas that the project proposes to dredge 4 to 6 feet. Since the model looks for overwintering habitat for fish, it only addresses depths of 8 feet or greater. To account for other habitat benefits provided by dredging over larger areas but not to 8 feet of depth, an adjustment to the model data was made. That adjustment allowed a 10-acre area dredged 4 to 6 feet to be considered to have a similar value of 5 acres dredged to 8 feet. In other words, 4 to 6 feet of dredging would produce at least one-half the habitat value of the same area dredged to 8 feet.

Generally speaking, habitat conditions are not usually static over time. (Our assumption about Peoria Lake over the next 25 years being an exception.) Either through natural processes or through human activity, habitat generally evolves and may change in quality and/or quantity. Imbedded in each cover type evaluation, change was added to the model. To assess the change over the period of analysis, target years were defined. Target years of 0 (baseline condition), 1, 5, and 25 (future "without-project" and future "with-project" conditions) are sufficient to analyze HUs and characterize habitat changes over the estimated project life. Hydrologic flow models and sedimentation rate models were run to indicate sustainability of project features and provide support for the project assumptions.

Four alternatives were considered feasible for this project. These alternatives are: A1, a small island above the bridge with minor dredging; A2, a mid-sized island above the bridge with larger scale dredging; B1, two larger islands below the bridge with large-scale dredging; and B2, a single large island below the bridge with large-scale dredging. (For more description on these alternatives, see Section 3, Plan Components.)

The results of the habitat analysis for individual species are expressed in total AAHUs. Those AAHUs were calculated using the WHAG and for each alternative were determined to be:

- Project Alternative A1 39.8 AAHUs
- Project Alternative A2 134.8 AAHUs
- Project Alternative B1 665.1 AAHUs
- Project Alternative B2 341.1 AAHUs

It is anticipated that the natural characteristics, and thus the habitat, of the project islands would change over time. This would occur as vegetation establishes itself and gradually develops into a forestry component on the island(s). This change would be most noticeable with the largest islands construction or Alternative B1. This is understandable, as the development of trees on the islands would reduce the habitat requisites for some of the target species used by the WHAG model.

Changes over time in the aquatic reaches of the project were also considered in the WHAG model. Sedimentation in the lake is not going to stop. However, island orientation and configuration were considered to provide the most sustainable channel options with the most favorable aquatic habitat for the life of the project. Over dredging of the deep and shallow water areas was incorporated to maintain these areas so that there would still be 4 to 8 feet of water depth at the end of the 25-year period of analysis. Because of this, HSI values for target species changed very little or not at all.

After the AAHUs for the selected alternatives were determined, a comparison of those alternative designs or combinations of features was accomplished through cost effectiveness evaluation and incremental analysis. Cost effectiveness evaluation is used to identify the least costly solution to achieve a range of project benefits. Incremental cost analysis is a tool that can be used to scale the size of the project or of individual features by determining changes in cost associated with increasing levels of benefits.

The specific numbers generated by this process are less important than the relative relationships among potential solutions provided by the analyses; which one will produce the greater output or which one is more likely to be more costly. While these analyses do not usually lead (nor are they intended to lead) to a single best solution, they help improve the quality of the decision making by ensuring that a rational, supportable, focused, and traceable approach is used for considering and selecting alternative methods to produce environmental outputs.

COST ESTIMATES FOR HABITAT IMPROVEMENT MEASURES

Rough cost estimates were developed to conduct the cost effectiveness and incremental cost analysis of the various alternatives. These cost estimates were only done for the cost of construction for dredging and island construction. Based on preliminary analysis, features such as rock riprap bank protection, jetties, and closing structures, operations and maintenance, and real estate costs were comparable for the various alternatives, and as a result were not necessary to include for the evaluation. Table 2-5 summarizes the outputs and costs associated with each proposed measure.

TABLE 2-5. Environmental Output and Costs of Each Measure

Proposed Measures	Symbol	Output*	First Cost Construction**	Annualized Cost***
Above the McClugage Bridge	**A**			
No Action	A0	0	$0	$0
Small Island (9-acre island, 17 acres increased depth diversity)	A1	39.8	$2,102,000	$162,500
Mid-Sized Island (21-acre island, 55 acres increased depth diversity)	A2	134.8	$3,750,000	$289,900
Below the McClugage Bridge	**B**			
No Action	B0	0	$0	$0
Two Islands with Side Channel (17- and 37-acre islands, 144 acres increased depth diversity)	B1	665.1	$9,957,000	$769,700
Large Island (46-acre island, 99 acres increased depth diversity)	B2	341.1	$6,252,000	$483,300

* Outputs are calculated as Average Annual Habitat Units (AAHUs).
** Represents initial construction costs for dredging islands and Real Estate, but does not include rock structures, etc.
*** Annualized cost is initial construction cost based on a 25-year period of analysis, 5-7/8% interest rate.

SUMMARY OF ALTERNATIVE PLANS

Nine alternative plans were formed from all possible combinations of the four proposed island alternatives. The number of options was limited because only one island alternative each could be picked above or below the bridge. For example, both the small upper island and mid-sized upper island would occupy the same location and, as a result, only one could be selected. Table 2-6 summarizes the outputs and costs associated with the nine alternative plans.

TABLE 2-6. Peoria Lake Alternative Evaluation

No.	Peoria Lake Alternatives	Symbol	Output (AAHUs) *	First Cost Construction **	Annualized Cost ***	Annualized Cost/AAHU
1	No Action	A0+B0	0	$0	$0	$0
2	Small Upper Island – No Lower Island	A1+B0	40	$2,102,000	$162,500	$4,062
3	Mid-Sized Upper Island – No Lower Island	A2+B0	135	$3,750,000	$289,900	$2,147
4	No Upper Island – Large Lower Island	A0+B2	341	$6,252,000	$483,300	$1,417
5	Small Upper Island – Large Lower Island	A1+B2	381	$8,354,000	$645,800	$1,694
6	Mid-Sized Upper Island – Large Lower Island	A2+B2	476	$10,003,000	$773,200	$1,624
7	No Upper Island – Two Lower Islands with Side Channel	A0+B1	665	$9,957,000	$769,700	$1,157
8	Small Upper Island – Two Lower Islands with Side Channel	A1+B1	705	$12,059,000	$932,200	$1,322
9	Mid-Sized Upper Island – Two Lower Islands with Side Channel	A2+B1	800	$13,707,000	$1,059,600	$1,324

* Outputs are calculated as Average Annual Habitat Units (AAHUs).
** Represents initial construction costs for dredging and islands plus Real Estate, but does not include rock structures, etc.
*** Annualized cost is initial construction cost based on a 25-year period of analysis, 5-7/8% interest rate.

RESULTS OF INCREMENTAL COST/COST EFFECTIVENESS ANALYSIS

The results of the incremental analyses shown in this section were considered with other factors, including site topography, management objectives of the resource agencies, critical needs of the region, and ecosystem needs of the Illinois River System.

The results of the cost effectiveness analysis for island/dredging alternatives showed that Alternative 7 (No Upper Island - Two Lower Islands) exhibited the lowest cost per unit of all alternatives, $1,1157 per AAHU. Of the alternatives above the McClugage Bridge, the incremental analysis showed that Alternative 3 (Mid-Sized Upper Island) had the lowest cost per unit, $2,147 per AAHU. Alternative 9 (Mid-Sized Upper Island - Two Lower Islands), the most extensive plan, has an annual cost of $1,324 per AAHU. Cost effectiveness means no plan can provide the same benefits for less cost or more benefits for the same cost. Since Alternative 7 provides more benefits for the least cost, it makes Alternative 6 not cost effective.

Alternatives 7 and 9 were considered best buy plans. These plans provide the greatest increase in benefits for the least increase in costs. Alternative 7 provides 665 AAHUs at an incremental cost of $1,157 per AAHU (Table 2-7). Alternative 9 provides an additional 135 AAHUs at an incremental cost of $2,147 per AAHU. Both of these incremental costs were considered reasonable and the alternatives represented are consistent with agency goals. Further, Alternative 9 provides the opportunity to develop two distinct habitat types in Peoria Lake—the flowing side channel

concept in the lower portion of the lake and a more traditional backwater area east of the upper island. The study team viewed the combination of these two major habitat types along with the other habitat improvements of the project as a major factor in the selection of a recommended plan.

TABLE 2-7. Incremental Cost Analysis of Best Buy Alternative Plans for Peoria Lake

No.	Alternative Plans	Symbol	Annual Cost ($) *	Output AAHUs **	Average Cost/AAHU	Inc. Cost	Inc. Output	Inc. $/AAHU
1	No Action	A0+B0	0	0	0	0	0	0
7	No Upper Island – Two Lower Islands with Side Channel	A0+B1	769,700	665	$1,157	$769,700	665	$1,157
9	Mid-Sized Upper Island – Two Lower Islands with Side Channel	A2+B1	1,059,600	800	$1,324	$289,900	135	$2,147

* Annualized cost is initial construction cost based on a 25-year period of analysis, 5-7/8% interest rate.
** Outputs are calculated as Average Annual Habitat Units (AAHUs).

OTHER FACTORS

The study team also considered resource significance, hydrology and hydraulics, public acceptability, recreation, and real estate in selecting an environmental plan.

Resource Significance

The Illinois River has long been an important environmental and economic resource. Congress recognized the Illinois River, as part of the Upper Mississippi River System, as a unique, nationally significant ecosystem and a nationally significant commercial navigation system in Section 1103 of the Water Resources Development Act of 1986 (WRDA 86). The National Research Council considers large floodplain-river ecosystems to be the highest priority for aquatic restoration and identified the Illinois River as one of three in the United States with sufficient ecological integrity to recover. The Illinois Valley also has international significance as a part of the Mississippi Flyway, a major migration route for hundreds of thousands of waterfowl, shorebirds, and neotropical migrant birds.

The types of deepwater off-channel habitat included in Peoria Lake restoration alternatives are limited on the entire Illinois River. The Habitat Needs Assessment conducted as part of the Upper Mississippi River System - Environmental Management Program found that the most critical need along the Illinois River was the restoration of backwater lakes and side channels to increase depth diversity. This report called for the restoration of backwaters on the Illinois River so that 25% of the backwater lakes (19,000 acres) would have an average depth of at least 6 feet.

Hydrological/Sustainability

The Illinois State Water Survey conducted numerical modeling of the alternative. The results indicate that the proposed alternative would have insignificant impacts on the navigation channel and sedimentation rates on adjacent privately held lands.

The Corps of Engineers conducted a Micro Model study (see Appendix D-2) which was used for this study to compare alternatives to one another as well as to the base condition to predict sediment deposition trends. No predictions were made for the length of time that channels would maintain their depths. The sediment deposition analysis was more qualitative than quantitative. Comparing the two single island alternatives above the bridge, the mid-sized upper island experienced less sediment deposition than the small upper island. Comparing the large island versus the two islands with side channel alternatives below the bridge, both options experienced similar sediment deposition patterns.

Separate river stage numeric modeling efforts confirmed that the proposed alternatives would not impact flood heights (see Appendix D-4).

Public Acceptability

At the public workshops, members of the public expressed strong support for in-lake dredging and island construction. In general, these comments supported the larger island options above and below the bridge. In addition, the Peoria Lakes Basin Alliance, a local group focused on restoration of the lakes, has developed recommendations for the eventual restoration of much larger areas of the lakes. This group strongly supports the recommendations of the study.

Recreation

Peoria Lake has a long history of recreation use, including sailing, sport fishing, waterskiing, and other similar activities. The local sponsor may choose, at a future date, to add recreational features to the islands, such as trails, beaches and recreational boat docking facilities. Most, if not all, of these activities have ceased on the lake at low river stages because of the uniform shallow depth currently present. Any attempt to restore some depth diversity to the lakes will allow for a resumption of the activities listed above. With the exception of the No Action alternative, any implemented project elements will produce recreation benefits.

Hazardous, Toxic, and Radioactive Waste (HTRW)

A Phase 1 Environmental Site Assessment (ESA) was conducted for the proposed project location in Peoria Lake (see Appendix B). The review discovered no known potential HTRW issues at the proposed site.

Real Estate

Most of the land for the proposed alternatives is currently in public ownership (see Appendix H). The State of Illinois and the Fondulac Park District own most of the property. Both groups are interested in participating in restoration.

SELECT RECOMMENDED PLAN

The interagency team recommends Alternative 9 (Mid-Sized Upper Island - Two Lower Islands with Side Channel) in consideration of the cost effectiveness/incremental cost analysis, significance of the habitat, comments received during public reviews, etc. (Figures 2-8 and 2-9). Appendix G contains additional information on the results of the habitat analysis.

This alternative best meets the study objectives. It would result in the greatest restoration of depth diversity of any of the plans proposed, including dredging over approximately 200 acres with connecting channels and deeper holes. Overall, lake habitat diversity would increase through the addition of shoreline and terrestrial habitats associated with the three islands and aquatic structures. The dredged area behind the upper island would provide slackwater backwater habitat, while the area around the lower islands would provide flowing side channel habitat. The islands would provide resting, nesting, and feeding areas for waterfowl and shorebirds. In addition, the islands would reduce wind- and wake-generated waves in the study area, helping to improve water quality by lowering turbidity levels.

In cooperation with the USFWS and ILDNR, the Corps of Engineers has planned and designed a project that serves the needs of the resources and the resource managers, while being cost conscious. The preferred alternative has an overall output of 800 AAHUs for a total first cost of approximately $15,182,000. These costs are higher that those shown in the preceding tables, since once this option was selected additional efforts were undertaken to incorporate the cost for bank protection, fish jetties, and closing structures. These costs also include the implementation costs associated with planning, engineering, and design; construction management; real estate; and monitoring discussed in greater detail in Section 3.

FIGURE 2-8. Peoria Lake – Selected Plan

Lower Peoria Lake
Present and with Proposed Project

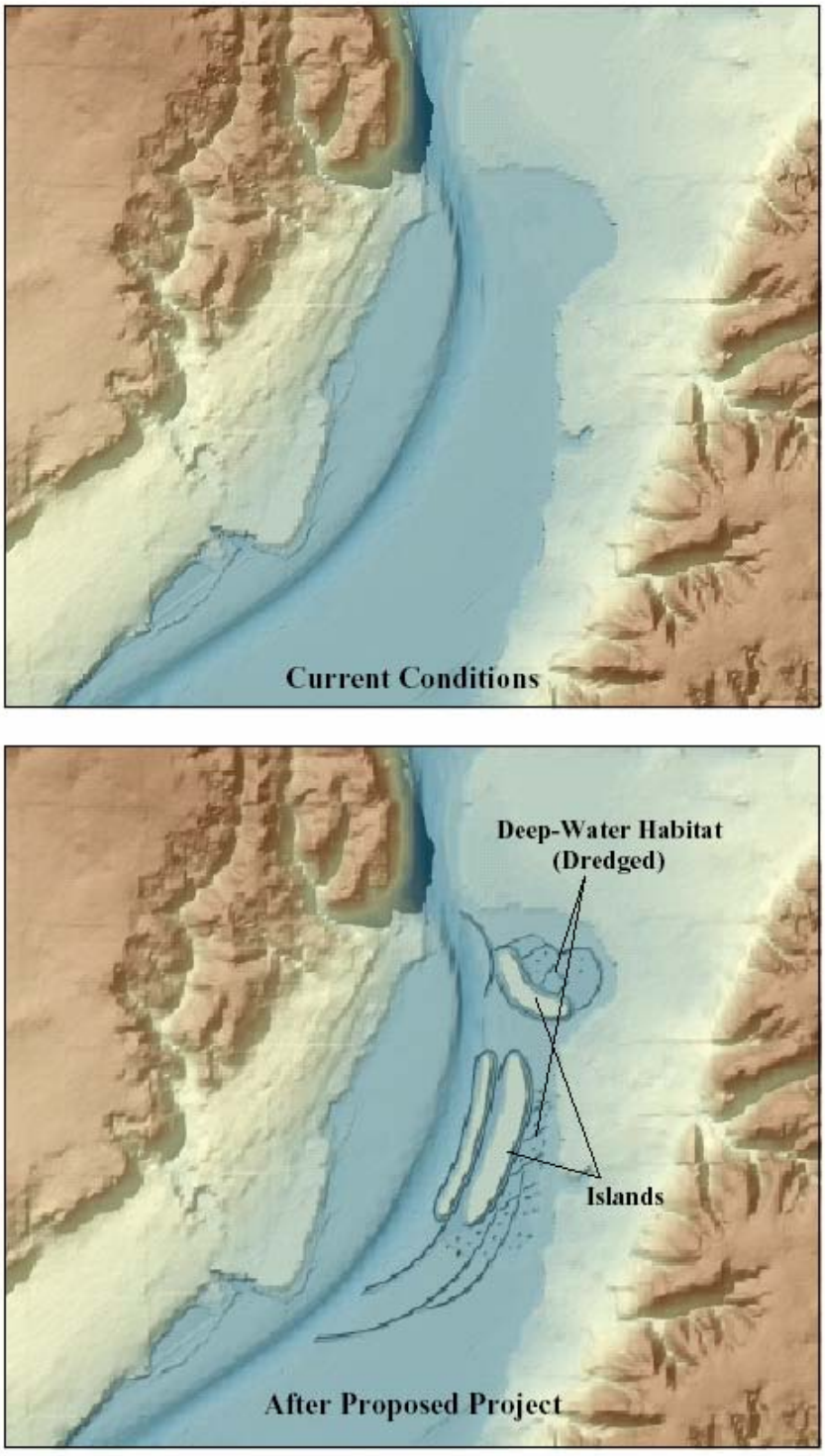


FIGURE 2-9.

Section 3

Description of Selected Plan

LOWER PEORIA LAKE ISLANDS

PLAN COMPONENTS

General Description

The selected aquatic restoration plan in Lower Peoria Lake is the off-channel dredging and middle-sized island creation above the McClugage Bridge (A2) and the off-channel dredging and construction of two islands below the McClugage Bridge (B1). Details of the alternative listed in the selected plan are shown on plates 2 through 4 and listed in Table 3-1. Each island would have a top elevation of 450 feet MSL, the side slopes from lake bottom to elevation 444 feet MSL would be no steeper than 6H:1V, at elevation 444 feet MSL there is a flat area 20 to 40 feet in width, and the side slope from elevation 444 feet MSL to 450 feet MSL would be no steeper than 5H:1V(Figure 3-1).

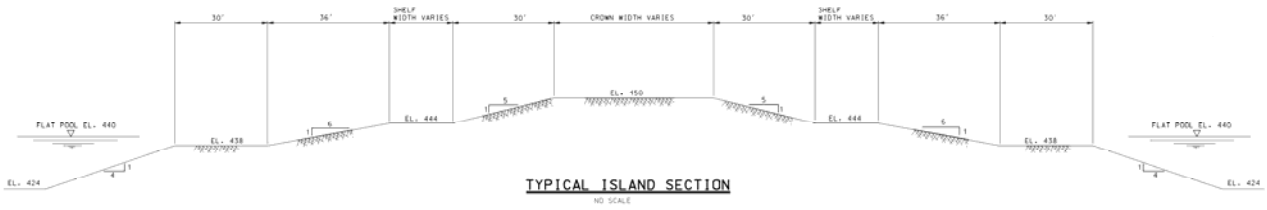


FIGURE 3-1. Typical Island Section

The outer embankment would be dredged lake bottom with side slopes no steeper than 6H:1V, top elevation of 450 feet MSL, and a 5-foot top width. Each island center would be constructed of dredged lake bottom material to an approximate elevation of 450 feet MSL.

The islands would be protected, as conditions prove necessary, against wind, wave, and current erosion with an 18-inch-thick layer of 400-pound riprap underlain with a 6-inch layer of bedding stone. Underwater fish habitat structures would be created around each island,

spaced every 250 feet (for design, see plate 5). The fish jetties would be 20 feet long, 2 feet tall, and constructed of 400-pound riprap. Rock closing structures (for location, see plates 3 and 4) would be constructed of 400-pound riprap to protect the deepwater from excessive sedimentation (for design, see plate 5).

Mid-Sized Island Above Bridge (A2)

This alternative would deepen a 53.4-acre protected backwater off the main channel (see plates 3, 6, and 8). The protected backwater bottom elevation would be 434 feet MSL with channels at elevation 430 feet MSL, and around the islands, there would be deep channels at elevation 424 feet MSL. The off-channel habitat is located east of the island to protect the area from wind and wave action. The island is approximately 2,210 feet long and 520 feet wide, creating 21 acres of terrestrial habitat. There would be one closing structure on the upstream end of the island.

Two Islands Below Bridge (B1)

This alternative would create 149.4 acres of off-channel deepwater aquatic habitat with varying depths (see plates 4, 6, and 8). 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.

TABLE 3-1. Island Summary Table

Alternative	Island Top Elev. (ft MSL)	Average Island Width (ft)	Island Length (ft)	Aquatic Habitat (acre)	Terrestrial Habitat (acre)
A2 - Upper Island	450	485	2210	54.9	21
B1 - East Island	450	475	3850	144	37
B1 - West Island	450	235	3650	*	17

* The aquatic habitat for B1 - West Island is included with B1 - East Island.

Project Data Summary

Tables 3-2 and 3-3 summarize the project data. Measurements are based on the best available data at the time. The quantities for dredging and island construction include displacement, consolidation, and desiccation.

TABLE 3-2. Island 1 - Project Summary

Measure	Measurement	Unit of Measure
Island 1 – Island Above McClugage Bridge		
Total:		
Length	2,210	feet
Width (avg.)	485	feet
Surface Area @ EL 438 feet MSL	22.5	acre
Surface Area @ EL 440 feet MSL	21.0	acre
Crown:		
Length	2,000	feet
Width (avg.)	275	feet
Elevation	450	feet MSL
Surface Area @ EL 450 feet MSL	11.5	acre
Area @ EL 444 feet MSL	4.0	acre
Avg. River Bottom Elevation	438	feet MSL
Island Side Slopes		
Side Slopes from EL 438 to EL 444 feet MSL	6:1	H:V
Side Slopes from EL 444 to EL 450 feet MSL	5:1	H:V
Erosion Protection -		
Riprap (Corps 400 lbs.)	9,000	tons
Thickness	18	inches
Top Elevation	443	feet MSL
Approx. Length Protected	2,500	feet
Bedding Stone	3,000	tons
Thickness	6	inches
Width	46	feet
Top Elevation	443	feet MSL
Approx. Length Protected	2,500	feet
Fish Jetties		
Riprap (Corps 400 lbs.)	1,200	tons
Approximate Spacing	250	feet
Height	2	feet
Length	20	feet
Top Width	0	feet
Slopes	2:1	H:V
Number	18	
Closing Structure		
Riprap (Corps 400 lbs.)	3,200	tons
Height	5	feet
Length	210	feet
Top Width	10	feet
Top Elevation	443	feet MSL
Slopes	3:1	H:V
Number	1	
Dredging for Deep Channels (used to construct embankment)		
Volume	225,000	cubic yards
Average Depth (below average river bottom)	12	feet
Bottom width	70	feet
Side Slopes	4:1	H:V
Approx. Surface Area @ EL 438 feet MSL	24.9	acres
Dredging Borrow for Fish Habitat/Channels (used to fill embankment)		
Volume	240,000	cubic yards
Average Depth (below average river bottom)	5	feet
Side Slopes	4:1	H:V
Approx. Surface Area @ EL 438 feet MSL	30.0	acres

TABLE 3-3. Islands 2 and 3 - Project Summary

Measure	Measurement	Unit of Measure
Island 2 - East Island below McClugage Bridge		
Total:		
Length	3,960	feet
Average Width	475	feet
Surface Area @ EL 438 feet MSL	39.0	acre
Surface Area @ EL 440 feet MSL	37.0	acre
Crown:		
Length	3,750	feet
Average Width	265	feet
Elevation	450	feet MSL
Surface Area @ EL 450 feet MSL	21.0	acre
Avg. River Bottom Elevation	438	feet MSL
Area @ EL 444 feet MSL	7.0	acre
Island Side Slopes		
Side Slopes from EL 438 to EL 444 feet MSL	6:1	H:V
Side Slopes from EL 444 to EL 450 feet MSL	5:1	H:V
Erosion Protection -		
Riprap (Corps 400 lbs.)	9,000	tons
Thickness	18	inches
Top Elevation	443	feet MSL
Approx. Length Protected	2,500	feet
Bedding Stone	3,000	tons
Thickness	6	inches
Top Elevation	443	feet MSL
Approx. Length Protected	2,500	feet
Fish Jetties		
Riprap (Corps 400 lbs.)	2,200	tons
Approximate Spacing	250	feet
Height	2	feet
Length	20	feet
Top Width	0	feet
Slopes	2:1	H:V
Number	34	
Closing Structure		
Riprap (Corps 400 lbs.)	3,900	tons
Height	5	feet
Length	500	feet
Top Width	10	feet
Top Elevation	443	feet MSL
Slopes	3:1	H:V
Number	1	
Dredging for Deep Channels (used to construct embankment)		
Volume	415,000	cubic yards
Average Depth (below average river bottom)	14	feet
Bottom width	70	feet
Side Slopes	4:1	H:V
Approx. Surface Area @ EL 438 feet MSL	33.5	acres
Dredging for Fish Habitat/Channels (used to fill embankment)		
Volume	400,000	cubic yards
Average Depth (below average river bottom)	5	feet
Side Slopes	4:1	H:V
Approx. Surface Area @ EL 438 feet MSL	65.0	acres

TABLE 3-3 (Continued)

Measure	Measurement	Unit of Measure
Island 3 - West Island below McClugage Bridge		
Total:		
Length	3,775	feet
Width	235	feet
Surface Area @ EL 438 feet MSL	19.0	acre
Surface Area @ EL 440 feet MSL	17.0	acre
Crown:		
Length	3,560	feet
Width	20	feet
Elevation	450	feet MSL
Surface Area @ EL 450 feet MSL	1.25	acre
Avg. River Bottom Elevation	438	feet MSL
Island Side Slopes		
Side Slopes from EL 438 to EL 444 feet MSL	6:1	H:V
Side Slopes from EL 444 to EL 450 feet MSL	5:1	H:V
Erosion Protection		
Riprap (Corps 400 lbs.)	17,000	tons
Thickness	18	inches
Top Elevation	443	feet MSL
Approx. Length Protected	4,700	feet
Bedding Stone	5,500	tons
Thickness	18	inches
Top Elevation	443	feet MSL
Approx. Length Protected	4,700	feet
Fish Jetties		
Riprap (Corps 400 lbs.)	2,200	tons
Approximate Spacing	250	feet
Height	2	feet
Length	20	feet
Top Width	0	feet
Slopes	2:1	H:V
Number	34	
Dredging for Channels (used to build embankment)		
Volume	140,000	cubic yards
Average Depth (below average river bottom)	14	feet
Bottom width	25	feet
Side Slopes	4:1	H:V
Approx. Surface Area @ EL 438 feet MSL	27.6	acres
Dredging for Channels/Fish Habitat (used to fill embankment)		
Volume	135,00	cubic yards
Average Depth (below average river bottom)	5	feet
Side Slopes	4:1	H:V
Approx. Surface Area @ EL 438 feet MSL	17.0	acres

Project Location

The projects were located in the upper portion of Lower Peoria Lake below a constriction formed by the Tenmile Creek delta. Construction in the wider portion of the river ensures that flood heights are not increased. In addition, as water velocities increase near the constructed islands, the sedimentation rate should decrease, resulting in a longer project life.

A2 - Upper Island project would be constructed on approximately 95 acres of lake bottom in the northeast corner of Lower Peoria Lake in Tazewell County, Township 26N, Range 4W.

The project would be on the east side of the navigation channel from river mile 165.6 to river mile 166.0.

B2 - Two Islands project would be constructed on approximately 287 acres of lake bottom in the middle of Lower Peoria Lake in Tazewell County, Township 26N, Range 4W. The project would be on the east side of the navigation channel from river mile 164.5 to river mile 165.5.

For more information on the real estate plan, refer to Appendix H.

Utility Relocations

The project involves no known utility relocations.

Deepwater and Island Configuration/Geometry

After geotechnical and hydraulic considerations were established, natural resources considerations were incorporated to ensure greatest habitat enhancement and sustainability. The present alignment is shown on plates 3 and 4. The off-channel deepwater habitat at elevation 432 feet MSL was located on the east side of the respective island to protect these areas from sedimentation and degradation. In Lower Peoria Lake, the dominant wind direction is from the southwest, so the islands would break the wind fetch and reduce sediment resuspension. The islands would also protect emergent plants from wind-generated waves. The islands would protect the off-channel area from waves generated from boat traffic in the navigation channel. Hydraulic modeling was used to evaluate island designs "streamlined" to minimize the potential for erosion.

Hydraulic Assessment

The Illinois State Water Survey, using the Surface Water Modeling System (SMS), conducted two-dimensional numerical hydraulic modeling for the proposed islands and flowing side channels. The presence of the island(s) and excavation of side channel(s) had insignificant impacts on the current flow and sediment transport patterns and magnitudes in the navigation channel. The modeling also concluded that the islands would not cause any significant change in sediment patterns on adjacent privately owned lands. See Appendix D-3 for more information.

The Corps of Engineers conducted a micro modeling study of Lower Peoria Lake. This is a small-scale physical model that assesses flow and sediment patterns and the impacts of alternatives upon those patterns. The model showed that sediment and flow patterns in the navigation channel should not be impacted by island construction. See Appendix D-2 for more information.

A UNET computer model analysis was conducted by the Corps of Engineers to determine the impacts of the various island/side channel combinations upon flood profiles. It was concluded that the island(s) would not raise water elevations during flood conditions. The model results indicate that the minimal effects on flood heights are within State guidelines for issuing a State Flood Plain permit. See Appendix D-4 for more information.

Bank Stabilization/Erosion Protection

Several alternatives for bank stabilization were evaluated. Bank protection is required subsequent to placement to minimize erosion from wind-driven waves, flood currents, and boat-generated waves. The standard alternative is to use 18 inches of 400-pound riprap over 6 inches of bedding stone. The second alternative consists of planting vegetation on the flattened slopes to prevent erosion. The vegetative alternative costs less than the standard alternative, but is not as effective. The vegetation planted for bank stabilization on the Peoria Lake EMP island never became established and subsequently died, leaving the island without erosion protection. Another alternative is to place a breakwater approximately 20 feet from the island. The breakwater could be constructed of rock or a geotextile fabric tube (geotube) could be filled with lake bottom sediments. The breakwater would dissipate the energy of the incoming waves and thereby reduce erosion. Lastly, a geotube could be filled with lake bottom sediments and placed along the island shoreline.

Riprap along the island is recommended because of the reliable protection provided. Riprap would only be placed in areas of expected erosion. Bank stabilization is recommended up to 443 feet MSL based on a hydrographic analysis and wave height calculation. Protection at 443 feet MSL would provide protection for approximately 80% of the hydrograph. The rock would be placed after the completion of island construction when required to prevent island failure/excessive erosion. It is anticipated that island erosion will occur, but riprap will not be placed until the island slope has eroded to near an unstable angle. Riprapping at this point would save costs because less material would be required due to the slope difference and only those areas needing material would be riprapped.

Fish Jetties

To increase the fisheries habitat diversity, rock would be placed underwater. The fish jetties would be spaced approximately 250 feet apart around all islands. The structures would be 2 feet tall (approximately to elevation 440 feet MSL) with side slopes no steeper than 2H:1V and be constructed of 400-pound riprap. Marking for navigation and boating will be further evaluated during development of plans and specifications.

Emergent Closing Structure

To minimize bedload transport into dredged areas, emergent rock closing structures would be constructed. The upper island (A2) would have closing structure at the upper end of the island. The east island below the bridge (B1) would have one closing structure on the east side of the island. The structures would have a top elevation of 443 feet MSL, 5 feet top width, and side slopes no steeper than 2H:1V. The structures would be constructed of 400-pound riprap. Each closing structure would have two offset portions. One section would be connected to the island and the other to the nearby lakeshore. The closing structure would continue up onto the lakeshore until elevation 443 feet MSL (see plates 3 and 4). The closing structures would not be marked for navigation since they are emergent structures.

Final Island Configuration

After the construction is complete, it is anticipated that the island would be naturally vegetated. The island in some areas could become perched wetlands, while in other areas would have positive slope to allow for drainage.

The Dry DREdge was jointly tested and developed by the U.S. Army Corps of Engineers - Engineering Research Development Center - Waterways Experiment Center and DRE was jointly developed and tested by DRE under the Corps of Engineers Construction Productivity Research Program (CPAR). The advantages and disadvantages of the two construction methods are presented in Table 3-5.

DESIGN AND CONSTRUCTION CONSIDERATIONS

Project Site

The Peoria Riverfront islands project is located on the Illinois Waterway Peoria Pool between river miles 164.5 and 166.0 in an area known as Lower Peoria Lake. Flat Pool elevation is 440 feet MSL. The river bottom elevation in the project area (not including the navigation channel) is approximately 438 feet MSL.

Dredging Depths

The dredging depths have been based on the biological requirements and a review of the historical sedimentation rates (see Appendix E-1). The dredging depth also considered the sponsor's need to minimize future maintenance to ensure minimum depths.

The sedimentation analysis showed that the sedimentation rate in Peoria Lake was highly variable. Since the 1930's, Upper and Lower Peoria Lakes have averaged 1.5 inches of sedimentation per year. During some periods, the lakes filled in at rates as high as 3 inches per year. Further, an analysis of two significantly deeper areas revealed that the average sedimentation rate since the 1930's has been 1.5 inches per year. However, from 1965 to 1976, one hole averaged 4.3 inches per year.

Based on the sedimentation analysis, the sedimentation rate was estimated to be 2.0 to 2.5 inches per year or 4 to 5 feet over the 25-year period of analysis. The sedimentation rate will vary due to many factors (weather, surrounding land use, flooding, etc.) over the period of analysis with higher rates in the earlier years. The minimum required depth for fisheries overwintering benefits is 6 feet. Therefore, the minimum construction depth for overwintering fisheries is assumed to be 10 feet.

Construction Equipment

Both land-based and floating plant equipment would be required for this project. Because of geotechnical considerations presented in Appendix C - Geotechnical Considerations, a minimum clamshell bucket size of 7 cubic yards would be required. The boom length of this clamshell must be approximately 180 feet. The estimated production rate of this equipment would be 6,000 cubic yards per day, based on a 20-hour operating day. Approximate water draft required for this equipment would be 7 feet.

Island Foundation

A review of the soil strength data indicated that the island could be constructed by the soil displacement method without the benefit of geotechnical fabrics. Soil displacement is a method of foundation or levee construction where volumes of material are simply dumped or

placed on soft soils until the weaker soil has been displaced to the depth where the soil beneath the fill becomes stable. Estimated displacement is 3 feet. Soil displacement is the least costly alternative if the volume of material displaced is not excessive and if the material could be placed to design heights. Using the soil displacement method, fill is gently placed on the site and spread progressively beginning from one end of the embankment. For more information, refer to Appendix C.

Construction Method - Embankment/Containment Facility

The island would be constructed in multiple stages. The first step would be to construct an embankment or containment facility. Three principal embankment construction methods were evaluated. A mechanical excavation alternative would consist of mechanically excavating adjacent soft sediments with gentle placement on adjacent sites using multiple passes to ensure stability. The second method considered was hydraulic dredging. This method would consist of hydraulically dredging adjacent or nearby sand borrow sources to form a confined material placement facility in Peoria Lake with subsequent soft sediment hydraulic dredging to fill the interior of the island. The third method of embankment construction that was considered was hydraulically filling Geotubes with adjacent or nearby sand borrow to form a confined material placement facility with subsequent soft sediment hydraulic dredging to fill the interior. The sand borrow would be taken from potential sources within the lake. However, the potential sand source is near the Farm Creek delta, approximately 3 miles away and the cost of hydraulic dredging sand is expected to be higher than mechanically dredging adjacent sediments. The advantages and disadvantages of the three construction methods are presented in Table 3-4.

The mechanically excavated embankment method was selected for several reasons. First and foremost, it will utilize the adjacent sediment as a borrow source rather than importing sand for embankment. This method will use the greatest amount of sediments for island construction and therefore have the greatest habitat benefits because a wider area would be dredged. Second, this method has recent application in that a similar island was constructed in Upper Peoria Lake as part of the Environmental Management Program (EMP) Peoria Lake Enhancement project. Side slopes of these islands were approximately 6:1. These islands were constructed with a 7-cubic-yard clamshell at a cost of $2.35 per cubic yard in 1994. The constructed islands were about 6-8 feet (up to elevation 446 feet MSL) above water and were formed in 3 to 4 passes. This method of excavation was successful due to the use of a large bucket with bucket loads placed gently, as opposed to high drops or sidecasting.

TABLE 3-4. Construction Alternatives for Embankments Constructed in Water on Soft Foundations

Construction Alternative	Advantages	Disadvantages
Mechanical excavation using only adjacent sediments	• More cost-effective method • More use of adjacent sediments than other methods • Excavated sediment material greatly promotes reestablishment of vegetation for habitat enhancement due to high nutrients • Material at/near in-situ moisture content • Material maintains cohesive strength because of minor disturbance • Probably minor water quality issues	• Limited reach of existing equipment • Requires erosion protection in vulnerable areas
Hydraulic dredging using sand as a containment facility with subsequent sediment hydraulic dredging for inner island fill	• Conventional design and construction approach • Probably minor water quality issues	• More expensive method because cost involved with pumping sand • Smaller quantity of adjacent sediments would be used than other methods • Sand embankments would support less vegetation than an embankment constructed of adjacent sediments • Requires erosion protection in vulnerable areas
Hydraulic dredging using sand in a Geotube as a containment facility with subsequent soft sediment hydraulic dredging or inner island fill	• Innovative approach • Probably minor water quality issues • Geotube will provide erosion protection	• More expensive method due to cost of Geotube and cost of dredging sand • Smaller amount of soft sediment would be used than mechanical methods • Vegetation will not grow well on Geotube • Extremely costly to build to design height

Construction Method - Embankment Interior

After the embankment is constructed, the interior area would be filled. To fill the interior, it is preferable that the material has the lowest water content possible to decrease the drying, consolidation, and desiccation time. Lower water content will increase cycling time and therefore decrease construction time and costs. Conventional hydraulic dredging is approximately 10% to 15% solids contents. Currently, several new dredging technologies are being developed/tested that promise lower water content than conventional hydraulic

dredging, like the Dry DREdge. This report assumes that the embankment interior would be constructed by a high solid dredging method which would deliver a material with greater than 45% solids content. During the final design phase, the embankment interior construction method will be reviewed to ensure the feasibility. Since the contracting method will be a negotiated type contract, contractors will be able to propose the use of an alternative dredging technology.

In this report, two methods to fill the embankment interior were evaluated. One option would use a conventional hydraulic dredge to fill the confined facility using nearby soft sediment. A second option would involve the use of an alternative dredging technology such as the Dre-Dredge, which is a combination of mechanical and hydraulic dredging. The material is excavated from the river bottom by a clamshell mounted on a rigid, extensible boom. The open clamshell is driven into the sediments at low speed to minimize the potential of sediment disturbance and resuspension. The clamshell is closed, thereby excavating the bottom sediment near its in-situ moisture content. The sediment is deposited in the hopper of a positive displacement pump, similar to a concrete pump, and is then pumped through a pipeline to the placement location. The sediment discharge has the consistency of toothpaste.

TABLE 3-5. Construction Alternatives to Fill Embankments

Construction Alternative	Advantages	Disadvantages
Conventional and high solids hydraulic excavation using nearby soft lake bottom sediments	• More cost-effective method • More conventional design and construction approach • Flexible placement location with pipe	• High water content will increase construction time to allow for sediment consolidation • Sediment loses strength and cohesiveness • Longer cycling time to allow sediments to dry and consolidate • Potential water quality impacts during construction • Unable to fill the embankment interior to top of embankment (containment) because of freeboard required
Dry DREdge or similar high solids methods	• Near in-situ moisture content will decrease construction time • Flexible placement location with pipe • Probably minor water quality impact • Fill the embankment interior to the top • Requires less containment area than hydraulic dredging	• Likely to be a more expensive method per cubic yard • Lower production rate than hydraulic dredging • Sediment loses strength and cohesiveness due to pumping • Unique piece of equipment

Borrow and Construction Materials

Lake bottom borrow locations would be precisely delineated prior to construction. The contractor would be able to vary the lift thickness based on material conditions. Near Island 1 (above the McClugage Bridge), shallow water would dictate that construction by floating plant begin in the navigation channel at the upstream end of the project. The dredge would begin by digging a channel to the proposed island location while sidecasting the material. Near Island 2 (west island below the bridge), the construction would start at the navigation channel. The top 3 feet of lake bottom has been determined to be unsuitable for embankment construction of each island. This material would be placed on either side of the embankment toe, on either side of the excavated channel, and along the lake shoreline. This material would provide an early breakwater and minimize embankment erosion.

Construction Contracting

The construction of the habitat restoration features is a complex and interconnected activity, and there are multiple potential methods to accomplish the dredging and island construction. At this time, many innovative high solids hydraulic dredging technologies are being developed and tested. To minimize the construction time, it is essential to minimize or eliminate the amount of water added to dredged material to fill the interior area created by the embankment. Therefore, to construct this project it is proposed that a negotiated contracting method be employed, similar to best value because of multiple benefits. A negotiated contracting method would allow a contractor to submit a proposal that would be evaluated on technical and cost merits. First and foremost, one contractor would be responsible for the entire project. Second, this contractor, based on the project scale, could utilize an innovative dredging technology.

Construction Sequence

Construction activities should not occur during unfavorable weather conditions due to flooding or ice flow. Typically, this occurs from January 1 to June 1; however, the contractor would be permitted to work during this period if weather is favorable.

The dredging and island construction would have multiple stages. The timing of each stage would be determined by field measurements to ensure that material has sufficient strength to proceed. The estimated schedule is found in Table 3-6. A construction sequence, based on soil strength data for the islands, is shown on plate 6. The time intervals shown are estimates of when the project could be completed. It is noted that soft soil construction is difficult and that the soil strength increases with time as it is allowed to consolidate. Time between passes must be field monitored with soil testing between passes to assure that minimum stability requirements are met. The contractor should not be allowed to throw the material from the clamshell, but must place the clamshell and then release the material to retain maximum strength from the borrow material. This strength is essential because placement of the succeeding layers for the island would be on previously placed borrow material. Further consideration would be given to time between passes as a contractual requirement. Operating distances from the barge (or borrow area) to the toe of the island should be strictly maintained to avoid stability failures.

TABLE 3-6. Proposed Construction Timeline

Stage	Activity	Anticipated Start Time *	Est. Length (months)
1	Construct Island Embankment – Lift 1 to EL 444 feet MSL	Summer 2005 – Year 1	18
2	Fill Embankment Interior to EL 444 feet MSL	Summer 2006 – Year 2	6
3	Construct Island Embankment – Lift 2 to EL 450 feet MSL	Summer 2008 – Year 4	18
4	Fill Embankment Interior to EL 450 feet MSL	Summer 2009 – Year 5	6
5	Rock Placement (Fish Jetties and Closing Structures)	Summer 2010 – Year 6	3
6	Erosion Protection	When required by project conditions	3

* This schedule assumes project authorization in 2003 and construction funding in FY 04.

Stage 1 - Construct Island Embankment – Lift 1 to EL 444 feet MSL

The contractor would construct an embankment 6 feet high and approximately 150 feet wide through the incremental placement of lake bottom material. The slope of the material would not be less than 6H:1V for the exterior and 5H:1V for the interior. The first lift would be placed until the material is out of the water. The second lift would be up to 6 feet above the bottom. A summary of this stage is as follows: (A) The contractor would start at the navigation channel at the north end of the project site and excavate (while sidecasting the material) a 1,200-foot channel to the upper island location; (B) then would begin the first pass on the upper island; (C) then would move downstream and begin the first pass on the west island; (D) then the first pass on the east island; and (E) the contractor would continue to cycle between the three sites until completed.

Stage 2 - Fill Embankment Interior to EL 444 feet MSL

The actual start of this stage would be determined by the consolidation and strength of the material placed during stage 1. The contractor would fill the embankment constructed in stage 1.

Stage 3 - Construct Island Embankment – Lift 2 to EL 450 feet MSL

The actual start of this stage would be determined by the consolidation and strength of the material placed during stages 1 and 2. The contractor would raise the existing embankment by mechanical dredging up to a 450 feet MSL elevation (approximately 12 feet above lake bottom) and approximately 5 feet wide through the incremental placement of lake bottom material. Each lift of material would be no more than 3 feet tall. The contractor would cycle between the three islands before starting a new lift. The embankment slope would not exceed 5H:1V.

Stage 4 - Fill Embankment Interior to EL 450 feet MSL

The actual start of this stage would be determined by the consolidation and strength of the material placed during stages 1, 2, and 3. The contractor would fill by the embankment constructed in stages 1 and 3 on top of the material placed in stage 2.

Stage 5 - Rock Placement for Fish Jetties and Closing Structures

The contractor would place the rock to construct the closing structures and fish jetties during this stage, as specified on plates 3 and 4.

Stage 6 - Rock Placement for Erosion Protection

The contractor would place rock to protect the islands from erosion in the locations on plates 3 and 4. Erosion protection may be required based on field conditions during any prior stage. If the erosion is severe in other locations, rock would be placed to prevent further erosion.

Value Engineering

A value engineering study was conducted and is included in Appendix J.

Water Quality Impacts

Water quality impacts associated with island construction activities may result from the mechanical placement of material to construct ring levees, which would form the perimeter of the islands, and from the filling of the interior of the islands by hydraulic dredging. In order to assess the water quality impacts of these actions, two numerical models were used—STFATE and EFQUAL. Both models are modules of the Automated Dredging and Disposal Alternatives Management System (ADDAMS).

Mechanical Placement

Material used to construct the ring levees would contain some percentage of fine-grained material. Associated with this fine-grained material would likely be contaminants. Since the placement of dredged material would be in open water, it is likely that contaminants would be released to the water column, requiring some limited mixing zone where water quality standards may be exceeded. The size of this mixing zone would depend on a number of factors, including the contaminant concentration in the dredged material, concentrations in the receiving water, the applicable water quality standards of the receiving water, and receiving flow rate and turbulence. STFATE is capable of estimating near-field contaminant dilution and dispersion processes.

Based on previous island construction performed in Peoria pool (Peoria Island EMP project), and for purposes of estimating the water quality impacts resulting from the proposed action, it is assumed that a large clamshell bucket dredge would be used to construct the levees. Often sediments dredged by clamshell remain in fairly large consolidated clumps and reach the bottom in this form. Whatever its form, the dredged material descends rapidly through the water column to the bottom and only a

small amount of the material remains suspended. The behavior of the material during placement is assumed to be separated into three phases: convective descent, during which the material cloud falls under the influence of gravity; dynamic collapse, occurring when the descending cloud impacts the bottom; and passive transport-dispersion, commencing when the material transport and spreading are determined more by ambient currents and turbulence than by the dynamics of the disposal operation.

Model Input

Estimation of ambient conditions includes current velocity and water depths over a computational grid. The dredged material is assumed to consist of a number of solid fractions, a fluid component, and conservative dissolved contaminants. Each solid fraction has a volumetric concentration, a specific gravity, a settling velocity, and a void ratio for bottom deposition, critical shear stress, and information on whether the fraction is cohesive and/or strippable. Table E-4-1 in Appendix E-4 lists the input parameters utilized for this model.

Model Output

The output starts by echoing the input data and then optionally presenting the time history of the descent and collapse phases. In recent history, the location and velocity of the cloud centroid, the conservative constituent concentration, and the total volume and concentration of each solid fraction are provided as functions of time since release of the material. Figure E-4-1 (Appendix E-4) shows the maximum concentration of zinc predicted to occur at any point downstream from the placement site. Figure E-4-2 (Appendix E-4) shows the discharge plume size and shape, as well as the concentration of zinc throughout the plume.

Hydraulic Placement

Because hydraulic dredging is the most efficient means of moving large quantities of material, it is likely that a form of dredging would be used to perform the majority of deepwater habitat formation. The quality of water discharged from confined disposal areas is also a concern that must be addressed. The predicted concentrations of the effluent can be used with appropriate water quality standards to determine the mixing zone required to meet respective water quality standards. EFQUAL is capable of computing predicted dissolved and total contaminant concentrations in the effluent from a confined disposal site, comparing predicted effluent concentrations with specified water quality standards, and computing required dilution of effluent to meet specified water quality standards considering contaminant concentrations in the receiving water.

Model Input

The main data requirements for EFQUAL are modified elutriate test conditions and result, background receiving water concentrations, and water quality standards for contaminants of concern. Table E-4-2 (Appendix E-4) lists the input parameters used for this model.

Conclusions

Results of the analysis suggested that two parameters that commonly occur in elevated concentrations in the sediment and water column of the Illinois Waterway will exceed water quality standards in a small area immediately downstream from the placement site during mechanical dredging. It is not likely that this action will have a substantial or long-term impact to the water quality of the river.

Test Island Construction

The Corps proposes to construct a test island or islands within the same vicinity of the recommended plan in order to test the material suitability and to better determine important design parameters. The goals and objectives of this test are:

- Minimum and maximum angle of repose
- Rate and extent of foundation consolidation
- Rate of erosion
- Time required between "lifts"
- Desiccation

The testing location would be near Illinois Waterway River Mile 165.3 on the left descending side of the channel in the vicinity of the Avery Daymark. The test island(s) would be covered by the recommended island during later construction. The test island would be approximately 250 feet in length, 150 feet wide, and 12 feet tall. The required material to construct the test island is an estimated 9,000 cubic yards. The test island might be divided into two sections to investigate the locational differences in the lake. In this case, each island would be 125 feet in length, 150 feet wide, and 12 feet tall. Both islands together would total an estimated 9,000 cubic yards. To construct the test island, it is proposed that a clamshell mechanical dredge would be used. However, this dredge would be smaller than the dredge proposed for the restoration project.

The required borrow location would be adjacent to the island and would be 250 feet in length, 75 feet wide, and 12 feet deep. It is anticipated that the top 3 feet of material, an estimated 4,000 cubic yards, would be unsuitable for use in the test and would be sidecast to both sides of the borrow location. See plate 2 for more information.

The proposed testing sequence would be based on the behavior of the dredged material, weather conditions, river water elevations, and available funding. The island would be extensively monitored between stages. It is desirable that the testing start in early 2003 at the latest following this schedule:

- **1st lift.** March Year 1 – dredge and build 1st lift from EL 438 feet to EL 441 feet
- Monitor island
- **2nd lift.** July Year 1 (60-90 days after 1st lift) – dredge and build 2nd lift from EL 441 feet to EL 444 feet
- Monitor island
- **3rd lift.** December Year 1 (150-180 days after 2nd lift) – dredge and build 3rd lift from EL 444 feet to EL 447 feet
- Monitor island
- **4th lift.** June Year 2 (60-90 days after 1st lift) – dredge and build 4th lift from EL 447 feet to EL 450 feet

- Monitor island

Any potential environmental impacts associated with the construction of a test island are covered by and would be similar to, those addressed for the larger islands in **Section 4, Environmental Impacts/Effects**, but on a much smaller scale. Since this document already addresses the area of potential impact, a separate environmental assessment will not be written and distributed for the test island as indicated in earlier correspondence. Therefore, any comments received during the public review period regarding the larger islands should also include comments for the test island.

Permits

A public notice, as required by Section 404 of the Clean Water Act, was made prior to submission of this report for final approval. A Section 401 water quality certificate from the State of Illinois and a Section 404(b)(1) Evaluation is included in this report. An additional permit from the ILDNR, Division of Water Resources for floodplain construction also will be completed prior to final submission of this report. A Peoria Lake Island Flood Height Impact Analysis was conducted as part of the Feasibility Study (Appendix D-4). The analysis concluded that construction of the proposed islands in Peoria Lake will not significantly impact flood levels.

OPERATION, MAINTENANCE, AND REHABILITATION CONSIDERATIONS

The Site Manager will take action to correct adverse conditions. To ensure feature serviceability, the Site Manager will schedule regular maintenance repair measures for accomplishment during the appropriate season. Appropriate advance measures will be taken to ensure the availability of adequate labor and materials to meet contingencies.

Operation

This project has no general operating requirements.

Maintenance

The project measures have been designed to require only minimal annual maintenance. Estimated annual maintenance costs are listed in Table 3-13.

PROJECT PERFORMANCE ASSESSMENT

The primary project objectives were summarized in Section 2 of this document. The performance assessment is intended to gauge progress towards meeting these objectives. In particular, the project will be evaluated for changes to the physical footprint (sedimentation rates, erosion, etc.), water quality, and biological response.

Tables 3-7 through 3-10 present an overall description of the project phases, the activities that are to take place during certain phases, agency responsibilities, and monitoring data collection summaries. The detailed monitoring description is in Appendix I.

TABLE 3-7. Monitoring and Performance Evaluation Matrix

Project Phase	Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Implementation Instructions
Pre-Project	Sedimentation Problem Analysis	Define system-wide problem. Evaluate planning assumptions.	Corps	Corps	Corps	--
	Pre-Project Monitoring	Identify and define problems at site. Establish need of proposed project features.	Sponsor	Sponsor	Sponsor	--
	Baseline Monitoring	Establish baseline for performance evaluation.	Corps	Sponsor through Cooperative Agreements, or Corps	Corps/ Sponsor	See Tables 3-8 and 3-9
Design	Data Collection for Design	Include quantification of project objectives, design of project and development of performance evaluation plan.	Corps	Corps	Corps	See Tables 3-8 and 3-9
Construction	Construction Monitoring	Assess construction impacts. Assure permit conditions are met.	Corps	Corps	Corps	See State Section 401 Stipulations
Post-Construction	Performance Evaluation Monitoring	Determine success of project as related to objectives.	Corps (quantitative) Sponsor (field observations)	Sponsor through O&M, or Corps	Corps/ Sponsor	See Table 3-9

TABLE 3-8. Summary of Physical and Chemical Monitoring

	Pre-Project	Design	Construction	Post-Construction*	Comments
Water Quality					
Field		1	Annual	Y, 3Y, 5Y	
Lab		1	Annual	Y, 3Y, 5Y	
Survey					
Sedimentation Ranges		1		Y, 3Y, 5Y	
Survey Ranges		1		Y, 3Y, 5Y	
Velocity		1		Y, 3Y, 5Y	
Discharge					
Sediment Quality		1	Annual	Y, 3Y, 5Y	
Geotechnical		1		Y, 3Y, 5Y	

* See Appendix I for details.

TABLE 3-9. Summary of Biological Monitoring

Parameter	Pre-Project	Design	Construction	Post-Construction*	Comments
Fish Surveys:					
Electrofishing	1	0	0	Y, 5Y	
Trap net	1	0	0	Y, 5Y	
Gill net	1	0	0	Y, 5Y	
Minnow seine	1	0	0	Y, 5Y	
Mussel survey	1	0	0	5Y	
Macroinvertebrate	1	0	0	Y, 5Y	
Vegetation	0	0	0	Y, 5Y	
Waterfowl	Y	0	0	Y	

* See Appendix I for details.

Y- yearly
#Y - every # years

TABLE 3-10. Post-Construction Evaluation Plan

Enhancement Potential									
Goal	**Objective**	**Enhancement Measure**	**Unit**	**Year 0 Without Alternative**	**Year 1 With Alternative**	**Year 25 Target With Alternative**	**Year 50 With Alternative**	**Feature Measurement**	**Annual Field Observations by Site Manager**
Restore and Protect Backwater Habitat	Create off-channel deepwater areas to provide year-round habitat for fisheries and associated species	Excavate channels in backwater areas	Winter water temperature (°F)	32	34	34	34		
Restore and Protect Aquatic Habitat			Water depth (acres > 8 ft)						
			Above bridge	0	53.4	53.4	53.4		
			Below bridge	0	149.9	149.9	149.9		
			Dissolved oxygen mg/L	3.0-5.0	$\geq$ 5.0	$\geq$ 5.0	$\geq$5.0	Perform water quality tests at stations listed above	
	Reduce sedimentation in backwaters	Construct flowing side channel between islands below bridge	Current velocity (ft/sec)	<1.0	>1.0	>1.0	>1.0		.
		Construct closing structure	Current velocity (cm/sec)	>1.0	0	0	0		

PROJECT COST ESTIMATE

Detailed cost estimates of project design and construction costs are presented in Tables 3-11 and 3-12. MCASES construction estimates are found in Appendix F. A detailed estimate of operation, maintenance, and rehabilitation costs is presented in Table 3-13. Table 3-14 shows the estimated annual monitoring costs as described in Appendix I. Quantities may vary during final design. The cost estimate below reflects the changes implemented as part of the Value Engineering Study.

TABLE 3-11. Lower Peoria Lake – Aquatic Restoration and Island Project Cost Summary December 2002 Price Levels

Account	Feature	Current Working Estimate (CWE)	Fully Funded Estimate (FFE)
1	Lands and Damages	$605,000	$605,000
2	Relocations	$0	$0
6	Fish and Wildlife Facilities	$11,510,000	$13,254,106
30	Planning, Engineering and Design	$1,738,000	$1,723,034
31	Construction Management	$1,174,000	$1,325,411
	Post-Construction Monitoring	$155,000	$155,000
	Total Project Costs	$15,182,000	$17,062,550
	Federal Costs (65%)	$9,867,775	$11,090,658
	State Cost (35%)	$5,313,417	$5,971,893

***** Lands and Damages include an estimated $575,000 in non-Federal Costs and $30,000 in Federal expenses.

TABLE 3-12. Lower Peoria Lake – Aquatic Restoration and Island Construction Cost Estimate

Acct Code	Item	Quantity	Unit	Unit Price	Amount	Contingency	Cont. %
06	**FISH AND WILDLIFE FACILITIES**						
06	**UPPER ISLAND**						
	Stage 1 Mob/demob	1	LS	$101,176	$101,176	$20,235	20%
	Stage 1 Mechanical Dredging to Construct Island Embankment	172,000	CY	$4.10	$705,301	$141,060	20%
	Stage 2 Mob/demob	1	LS	$101,176	$101,176	$20,235	20%
	Stage 2 Dredging to Fill Embankment interior	116,000	CY	$4.05	$470,238	$94,048	20%
	Stage 3 Mob/demob	1	LS	$101,176	$101,176	$20,235	20%
	Stage 3 Mechanical Dredging to Construct Island Embankment	51,000	CY	$4.10	$209,130	$41,826	20%
	Stage 4 Mob/demob	1	LS	$101,176	$101,176	$20,235	20%
	Stage 4 Dredging to Fill Embankment interior	122,000	CY	$4.05	$494,561	$98,912	20%
	Stage 5 Rock Placement - Fish Structure Jetties	1,000	TON	$37.95	$37,949	$3,795	10%
	Stage 5 Rock Placement – Closing Structure	3,000	TON	$37.95	$113,846	$11,385	10%
	Stage 6 Erosion Protection - Bedding Stone	3,000	TON	$28.28	$84,825	$8,483	10%
	Stage 6 Erosion Protection – Riprap	9,000	TON	$37.95	$341,539	$34,154	10%
	SUBTOTAL - UPPER ISLAND				**$2,862,093**	**$514,603**	
06	**LOWER ISLANDS**						
	Stage 1 Mob/demob	1	LS	$101,176	$101,176	$20,235	20%
	Stage 1 Mechanical Dredging to Construct Island Embankment	501,000	CY	$4.10	$2,054,394	$410,879	20%
	Stage 2 Mob/demob	1	LS	$101,176	$101,176	$20,235	20%
	Stage 2 Dredging to Fill Embankment interior	236,000	CY	$4.05	$956,691	$191,338	20%
	Stage 3 Mob/demob	1	LS	$101,176	$101,176	$20,235	20%
	Stage 3 Mechanical Dredging to Construct Island Embankment	176,000	CY	$4.10	$721,703	$144,341	20%
	Stage 4 Mob/demob	1	LS	$101,176	$101,176	$20,235	20%
	Stage 4 Dredging to Fill Embankment interior	302,000	CY	$4.05	$1,224,240	$244,848	20%

TABLE 3-12 (Continued)

Acct Code	Item	Quantity	Unit	Unit Price	Amount	Contingency	Cont. %
	Stage 5 Rock Placement - Fish Structure Jetties	4,000	TON	$37.95	$151,795	$15,180	10%
	Stage 5 Rock Placement - Closing Structure	4,000	TON	$37.95	$151,795	$15,180	10%
	Stage 6 Erosion Protection - Bedding Stone	9,000	TON	$28.28	$254,476	$25,448	10%
	Stage 6 Erosion Protection - Riprap	26,000	TON	$37.95	$986,667	$98,667	10%
	SUBTOTAL - LOWER ISLANDS				**$6,906,465**	**$1,226,820**	
	FISH AND WILDLIFE FACILITIES COST SUBTOTAL				$9,768,600	$1,741,400	
06	**FISH AND WILDLIFE FACILITIES COST TOTAL**				**$11,510,000**		
30	**PLANNING, ENGINEERING AND DESIGN**						
	Plans and Specifications				$1,496,300		
	Engineering During Construction				$241,700		
	SUBTOTAL				**$1,738,000**		
31	**CONSTRUCTION MANAGEMENT**						
	Contract Administration				$230,200		
	Shop Drawing Review				$115,100		
	Inspection and Quality Assurance				$828,700		
	SUBTOTAL				**$1,174,000**		
	TOTAL				**$14,422,000**		

TABLE 3-13. Estimated Annual Operation and Maintenance Costs, April 2002 Price Levels

	Quantity	Unit	Unit Price ($)	Total Cost ($)
Operation				0
Maintenance				
Island Inspection	20	Hr	30	600
Riprap	150	Ton	35	5,250
Erosion Control	80	Hr	30	2,400
Debris Removal	40	Hr	30	1,200
Rehabilitation *				0
			Subtotal	9,450
			Contingencies (20%)	1,890
		TOTAL		**$11,340**

* Rehabilitation cannot be accurately estimated. Rehabilitation is reconstructive work that significantly exceeds the annual operation and maintenance requirements identified above and which is needed as a result of major storms or flood events.

TABLE 3-14. Estimated Post-Construction Annual Monitoring Costs
April 2002 Price Levels

Item	Annual Cost ($)
Engineering Data [1]	2,000
Natural Resources Data [1]	2,000
Subtotal	4,000
Contingency (20%)	800
Subtotal	4,800
Planning, Engineering, Design [2]	1,400
ANNUAL TOTAL	**6,200**

[1] Reference Appendix I.
[2] Includes cost of evaluation report.

25-YEAR TOTAL	**155,000**

PLAN ACCOMPLISHMENTS

The dredging and construction of islands in Peoria Lake would provide positive habitat benefits in both the aquatic and terrestrial environment. Ancillary recreational and water quality benefits would likely be realized and the local population supports the project.

Section 4

Environmental Impacts/Effects

PEORIA LAKE

ENVIRONMENTAL IMPACTS OF THE NO ACTION PLAN

The no action plan would preclude Federal involvement in dredging and construction of islands in Lower Peoria Lake. The lake would most likely continue as a shallow, highly turbid body of water with little habitat.

ENVIRONMENTAL IMPACTS OF THE SELECTED PLAN

Natural Resources

In contrast to the industrial, commercial, and urban nature of the Peoria area, a considerable amount of natural resources is associated with Peoria Lake and surrounding environs. A large variety of wetland or water-tolerant forbs, grasses, sedges, and rushes are common to the Peoria Lake bankline and floodplain, particularly on the east and northeast sides. Lands along the lake and its tributaries contain stands of this vegetative mixture that includes wild millet (*Echinochloa muricata*), fowl manna grass (*Glyceria striata*), cord grass (*Spartina petinata*), straw-colored sedge (*Cyperus strigosus*), river bulrush (*Scirpus fluviatilis*), smartweed (*Polygonum spp.*), cattail (*Typha latifolia*), milkweed (*Asclepias spp.*), dock (*Rumex spp.*), and many other species beneficial to area wildlife.

There is also a significant woody component in some areas around the lake. The majority of the species are comprised of silver maple (*Acer sacharinum*), cottonwood (*Populus deltoides*), and green ash (*Fraxinus pennsylvanica*). Other species found in the area include black willow (*Salix nigra*), box elder (*Acer negundo*), American elm (*Ulmus americana*), button bush (*Cephalanthus occidentalis*), and wild grape (*Vitis spp*.).

Many of these herbaceous and woody plant species produce seeds that are carried into Peoria Lake, sink to the bottom, and are buried in the sediment on the lake bottom. Some species seeds survive and lie dormant in this condition for several years, forming a ready-made seed bank in the event that the water recedes or when lake bottom material is brought to the

surface for whatever reason. If and when the proper conditions are met, these seeds germinate and develop into mature plants or trees.

This ready bank of local seed, when brought to the surface during construction of the proposed islands, would provide some of the vegetation likely to grow on the islands. Other vegetation would be brought to the islands by area wildlife or by wind transporting seeds or plant material there. Additionally, seeds could arrive by floating on the water surface during high water events and be deposited on the islands to germinate after the water recedes. Because of this ready-made seed source and the success of volunteer vegetation growing on the previously constructed islands in the Upper Lake, the team concluded that a plan to vegetate the islands (other than planting some type of erosion control shortly after construction) was not necessary. There is also a strong possibility that decurrent false aster (*B. decurrens)* could potentially colonize portions of the newly created islands because there is a known stand of that species located near the lakeshore.

The dredging activities in the lake to build the proposed islands would produce approximately 75 acres of terrestrial habitat. Herbaceous vegetation would develop over the islands from the previously mentioned seed sources, and after some time the larger islands would develop a bottomland hardwood forest component. This would most likely consist of silver maple, green ash, and cottonwood. With the development of vegetation on the islands, it is anticipated that they would become an attractant for nesting, loafing, and feeding of many species of waterfowl, shorebirds, and neotropical migratory birds.

The proposed project would result in short-term decreases in water quality due to localized dredging and construction activities. Silt curtains and/or other appropriate technologies would be used to minimize the majority of adverse water quality impacts to downstream areas of the lake. After construction, the natural resource value of the aquatic environment of Lower Peoria Lake would soar dramatically from its existing condition. Dredging would create approximately 200 acres of improved aquatic habitat that would include deepwater habitat for fish overwintering and constructed backwater and side channel habitat. Interconnected channels and jetties would provide structure or "edge" habitat to increase diversity of the area.

While a number of factors have prevented emergent vegetation from developing at the previously constructed islands in the Upper Lake, historically pondweeds (*Potomogetom spp.)*, wild celery (*Valisnoria ammericana*), and coontail (*Certophylum demerson*) were part of this river reach's local flora and could possibly redevelop, given the right conditions.

Endangered Species

Section 2 under "Environmental Resources" addresses federally listed threatened or endangered species that might be found within the general vicinity of Peoria Lake. This is mainly because of the natural resources found in the general area around the lake. However, because the natural resources are so limited at the proposed project site located within the lake, there are no listed species to be found on the project site or any area that would be affected by the extraction of material to build the proposed islands. The work would be performed from barges located in the lake, and any activity requiring access of construction personnel or staff to or from the dredging and construction operation would be from area boat ramps or marinas. Staging areas, if required, would be existing ramp or launch

facilities. No additional shoreline of the lake would be impacted for this project, other than small areas for tying in the closing structure at elevation 443 feet MSL or lower.

Therefore, it is our biological assessment that dredging and construction of the islands would not adversely impact any state or federally listed threatened or endangered species, nor would it adversely impact any critical habitat for any of the listed species. If, after reviewing this document, the USFWS concurs with this assessment, they will respond by letter stating so and the requirements of the Endangered Species Act will have been met.

Water Quality

Water quality conditions throughout Peoria Lake are dominated by the shallow nature of the lake and the soft, unconsolidated sediments found throughout the lake. Siltation over the years has severely impaired several beneficial uses of the lake. The primary water quality problems at Peoria Lake are related to high concentrations of suspended solids. High turbidity is a result of agricultural non-point runoff and resuspension of sediments by the waves. High turbidity and suspended solids values have contributed to a lack of rooted aquatic vegetation throughout the lake.

The majority of water quality information available for the Illinois River is from samples collected from the channel, not backwater areas. In a 1988 publication, the Illinois Environmental Protection Agency rated the Illinois River (255 river miles) as "partially supporting aquatic life uses with minor impairment." This rating was primarily a result of elevated turbidity values and, to a lesser degree, high nutrient concentrations.

In order to predict the impact of proposed construction activities on water quality, sediment data gathered by the Illinois Geological Survey were evaluated. In addition, column-settling tests were performed on samples taken in the vicinity of the areas proposed for dredging. Results indicate that ammonia, nitrogen, zinc, and suspended solids would be the parameters of concern during construction. However, should the proper dredging and dredged material placement management techniques be utilized, impacts on water quality of Peoria Lake can be minimized. Any impacts seen would be temporary in nature. Additional discussion of testing and results is presented in Appendix E-3. Further discussion of modeling efforts to predict water quality during construction is presented in Appendix E-4.

Air Quality

Limited air pollution effects would be produced from machinery exhaust from the dredge itself. The immediate area surrounding the island construction sites is somewhat isolated so impacts should be negligible.

Historic Properties

The Illinois Historic Preservation Agency concurred by letters dated December 4, 2001, and October 30, 2001 (IHPA Log #0011090020k-P, Appendix A-1) with the District's opinion that the proposed dredging, island creation, and rock jetty and closing structures in the Lower Peoria Lake would not affect any submerged historic properties. No comments were received by consulting with societies, agencies, Native American Tribes, and other interested parties; therefore, there were no considerations promulgated under 36 CFR Part 800.5(c)(3) and 800.5(f)(3) of the National Historic Preservation Act.

Created Resources

The dredging and island construction would affect what are considered to be created resources. The Illinois Waterway, with its shoreline, islands, and backwaters, is a natural resource modified by humans to facilitate waterborne commerce on the Upper Mississippi River System. The river channel is essential to commercial navigation on the Illinois Waterway, and the construction of the island in the lake has been oriented so that no impacts to the navigation channel would occur.

The series of pools and the channel were created and are controlled by the operation of the locks and dams in conjunction with other components of the Upper Mississippi River 9-Foot Channel Navigation Project. Completion of this project would help to counteract the effects of sediment accretion in the Peoria Lake area.

Farm Displacement

No farm or farmsteads would be affected by the island alternatives.

Noise Levels

Heavy construction equipment would generate a temporary increase in noise levels during island construction. The surrounding area is primarily industrial in nature and contains no sensitive receptors (schools, hospitals, etc.). No long-term noise impacts would result following project construction.

Aesthetics

Impacts to the aesthetic resources of the area would be a matter of perspective. The proposed plan would construct the islands to be approximately 10 feet above the water surface. Views from across the lake and from the shore would change to some degree. Although this is not particularly high, some may feel that it would inhibit their view across the lake and would create negative visual impacts from the shoreline. Others may find an island that offers diverse vegetation and attracts a variety of wildlife quite appealing, and that blocking the view of an industrial area across the lake is a benefit.

Community and Regional Growth

The Peoria Pool (commonly referred to as Peoria Lake) is a 14,400-acre body of water used primarily for commercial navigation, recreational boating, fishing, hunting, and wildlife refuge. No significant impacts to community or regional growth would result from the proposed project; however, the proposed island alternatives could lead to a small increase in tourism for the Peoria Pool area.

Displacement of People

The proposed project would not result in any residential displacements.

Community Cohesion

The island alternatives could create minor, positive impacts for community cohesion as recreational islands provide entertainment and gathering sites. There also is the potential for the project and the islands to unify the cities surrounding the lake as they work together toward developing beneficial uses for the riverfront areas.

Regional, state, and local agencies have been involved in the coordination efforts for the proposed project and support the study efforts. Two public open houses provided opportunities for the public to learn about the proposed project and the study process and to provide feedback on the study goals and alternatives. Overall, public response indicated agreement with the study goals of creating habitat diversity and reducing sediment delivery. Island creation in Lower Peoria Lake was the favored method of achieving those goals.

Property Values and Tax Revenues

It is expected that the proposed island alternatives would have an insignificant effect on property values. Enhanced boating opportunities in Peoria Lake could be followed by a small increase in boat ownership and purchases; tax revenues would rise as a result of increased sales tax and boat license fee revenues, plus increased spending by recreationists using the lake.

Public Facilities and Resources

Peoria Lake has become a popular tourist and recreation destination, as evidenced by the many marinas, boat clubs, parks, picnic areas, and camping sites along the shoreline.

The proposed island alternatives would provide recreational islands in the Peoria Pool, enhancing recreational boating opportunities in the area and resulting in a more enjoyable leisure experience for users. The beaching areas provided by the islands, as well as the dredged areas for waterskiing, would help to fulfill a portion of the recreational needs of the general public within Peoria and Tazewell Counties and outlying areas.

The entrance to Spindler Marina is located approximately 1,000 feet east of the proposed island pair below McClugage Bridge. It is not anticipated that island construction would have a negative impact on this public facility. The marina owner expressed support of this project in that the dredging would be beneficial for keeping the inlet open to the marina and would also improve fishing and boating in the area.

Life, Health, and Safety

Sedimentation has caused a loss of water depth, resulting in reduced habitat value and diversity and reduction of lake area available to recreational boaters. The net result of this sedimentation pattern is the shrinking of the deep parts of the lake, which could eventually increase the potential for groundings of commercial and recreation craft. The proposed islands would be created from sediment dredged from the lakebed, thus removing sediment from the lake bottom and improving safety conditions for watercraft and operators. The islands could also serve as harbors of refuge in case of inclement weather or mechanical failures when a pleasure boater could not make it to the main shore.

Employment and Labor Force

Construction of the proposed project would temporarily increase short-term employment in the project area. There would be no permanent impacts to employment or labor force in Peoria or Tazewell Counties.

Business and Industrial Growth

Adverse changes in business and industrial activity would be minimal. No business relocations would be required. Access to the river would not be obstructed for any of the industrial properties located along the shoreline and would not interfere with business activity.

Enhancing recreational opportunities through island creation could result in the establishment of new businesses that would serve the recreationists. Local spending by recreational users of Peoria Lake would generate additional economic activity/output throughout the surrounding area.

ENVIRONMENTAL IMPACTS OF NONPREFERRED ALTERNATIVES

With the selection of the "No Action" alternative, there would essentially be no change in the condition of the lake.

The other alternatives considered were basically variations of the preferred alternative at differing sizes or number of islands. The analysis evaluation showed that many of the same habitat benefits would result with these other alternatives, except that the habitat benefits gained were directly proportional to the size of the area dredged and island created. Therefore, the larger the area dredged and island created, the greater the overall habitat benefits gained. The largest proposed project was selected to maximize project habitat benefits.

ANY IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD OCCUR IF THE PROPOSED ACTION WERE IMPLEMENTED

Fuel consumed, manpower expended, and the commitment of construction materials are considered to be irretrievable.

RELATIONSHIP OF THE PROJECT TO LAND-USE PLANS

The proposed project would not conflict with any known land-use plans for the Peoria Lake area.

CUMULATIVE IMPACTS

The District identified island creation and backwater aquatic habitat as the primary resources for improvement by this ecosystem restoration project. The habitat that this project represents was quantified by a query of land cover/use from 1989 landsat thematic mapper data using the United States Geological Survey's *Habitat Needs Assessment* (HNA) query tool. Systemic changes have been discussed in the *Ecological Status and Trends of the Upper Mississippi River System 1998* and the *Habitat Needs Assessment for the Upper Mississippi River System Technical Report*, dated October 2000. The HNA was conducted to: "describe historical and existing conditions, identify objectives for future habitat conditions, define habitat needs at system-wide, reach, and pool scales, address a variety of habitat requirements including physical, chemical, and biological parameters, address the unique habitat needs of distinct river reaches, pools, and the system, and be a collaborative, technically sound and consensus based effort."

Table 4-1 shows HNA land cover classes found in Peoria and La Grange Pools within the floodplain and covers approximately 75 miles of river in either direction of the proposed project. Of the 17 classes identified, only 7 were found to occur within the 2 pools, with the majority being agriculture (51%), open water (21%), and wet mesic forest (16%). The other 4 categories found are: grassland and developed (both around 4%), permanent flooded emergent perennial (3%), and sand/mud (>1%).

TABLE 4-1. HNA Land Cover Classes

HNA Land Cover Class (in acres)	**Peoria Pool**	**La Grange Pool**	**Total**
Open Water	40,070	34,660	74,730
Submersed Aquatic Vegetation	0	0	0
Floating-Leaved Aquatic Bed	0	0	0
Permanent Flooded Emergent Annual	0	0	0
Permanent Flooded Emergent Perennial	5,416	4,806	10,222
Seasonally Flooded Emergent Annual	0	0	0
Seasonally Flooded Emergent Perennial	0	0	0
Wet Medow	0	0	0
Grassland	7,292	8,294	15,586
Scrub/Shrub Wetland	0	0	0
Salix Community	0	0	0
Populus Community	0	0	0
Wet Mesic Forest	19,501	38,097	57,598
Mesic Bottomland Hardwood Forest	0	0	0
Agriculture	49,153	131,803	180,956
Developed	9,832	3,511	13,343
Sand/Mud	52	55	107
No Photo Coverage	0	1	1
Totals:	**131,316**	**221,227**	**352,543**

Past Actions

Environmental restoration projects on the Upper Mississippi River System (UMRS) have been undertaken through a variety of private local and regional clubs and organizations, State governmental agencies, the USFWS, and the Corps of Engineers in partnership with State agencies through the Environmental Management Program (EMP) and the Section 1135 and Section 206 programs. While Sections 1135 and 206 are relatively new authorizations under which the Corps performs environmental restoration, the majority of our restoration efforts have been done under the EMP. All EMP projects have taken place on the mainstem of the Mississippi or the Illinois Rivers. Under the EMP, 28 habitat projects have been completed and 12 are currently under construction. Only five EMP projects have been constructed on the Illinois branch of the UMRS and a sixth is in the planning stages. A seventh area (Alton Lake) is proposed as a "Future Opportunity." Twenty-four of the completed EMP projects affect approximately 28,000 acres of aquatic and floodplain habitat.

Section 1135 and 206 generally provide ecosystem restoration on a much smaller scale. Five restoration projects have been completed or are near completion under Section 1135. All were done on the Mississippi River and affected approximately 5,000 acres. No Section 206 projects have been constructed at this time.

Present Actions

Approximately 13 EMP projects are currently in various stages of planning and design. These additional projects under construction will increase the area affected by EMP to about 97,000 acres, which is approximately 11% of the total UMRS floodplain and aquatic habitat area, not counting agricultural and urban areas. About 20 Section 206 projects are currently in various stages of feasibility, but none are ready to go to construction at this time. The total area impacted by those 5 to 6 proposed Section 206 projects that are farthest along would be less than 1,000 acres. While a majority of the current Section 206 projects are located in Illinois, they are not located on the mainstem of the Illinois River.

If the proposed Peoria Riverfront Development (Ecosystem Restoration) Study is approved, plans and specifications would be developed over the next year and the project would then be ready to go to construction. The proposed project would construct 3 islands for a total of approximately 75 acres and create approximately 200 acres of 4- to 8-foot-deep aquatic habitat within lower Peoria Pool.

Reasonably Foreseeable Future Actions

With the authorization of the Illinois River Basin Restoration Feasibility Study, it is anticipated that more projects like the restoration project proposed for Peoria Lake would be developed and pursued. The overall goal of these restoration projects is to enhance the environment by rehabilitating declining habitat and/or also work to reduce the sediment input into the Illinois Waterway, thereby improving the ecosystem as a whole. The size and number of projects developed would depend on congressional funding and willing non-Federal cost-share sponsors.

Reasonably Foreseeable Future Actions in La Grange and Peoria Pools

These and other future restoration projects may increase island structures and backwater aquatic habitat within the La Grange and Peoria Pools. Investigations are ongoing to develop potential projects within the general watershed of the Peoria and La Grange Pools; however, there are no specific projects proposed or being considered at this time (other than those already specifically mentioned) that would take place within the Peoria and La Grange Pools.

Associated Actions in La Grange and Peoria Pools

Dredging of the navigation channel by the Corps would continue to take place with 18 Dredged Material Management Plans (DMMPs) active or proposed for the 77.4 miles of the La Grange Pool and 9 DMMPs active or proposed for the 73 miles of the Peoria Pool. Dredging also would take place for the island construction proposed in the upper portion of Lower Peoria Lake. Because of high sedimentation rates on the Illinois Waterway, there also would be a large amount of private dredging to remove sediments from harbors and barge docking areas.

Approximately 2% of these actions have related to ecosystem restoration, while a total of 47% percent related directly to dredging. Only 3% have been Federal dredging projects, (generally main channel dredging) and the other 44% were non-Federal dredging projects (mostly harbor maintenance). Table 4-2 displays the regulatory actions that have occurred in and adjacent to Peoria and La Grange Pools since 1960. These include Section 10 (construction of structures in navigable waters, not involving dredged or fill material) and Section 404 (construction projects that affect the waters of the United States) regulatory actions. The District evaluates the impact of these regulatory actions on a continuous and ongoing basis, actively soliciting responses to these actions from the public, State and other Federal agencies through the Clean Water Act permit process.

The District continues to identify practical methods for the quantitative assessment of the cumulative impacts of dredging through impact analysis studies of mussels, plants, sedimentation, invertebrates, and fish pursuant to Section 404 of the Clean Water Act. Findings from these studies will be used in the future consideration of cumulative impacts of dredged material placement on many types of habitat.

The proposed project has identified and taken into account cumulative impacts, considered alternative actions that could lessen such adverse impacts, and is, to the extent practicable, compatible with state, unit of local government, and private programs and policies to protect floodplain agricultural field habitat and bankline habitats. The proposed project would not cumulatively exceed any known biological or social thresholds.

TABLE 4-2. Regulatory Actions in and Adjacent to Peoria and La Grange Pools Since 1960

Regulatory Permits Issued Between 1960-Present	La Grange Pool 1960's	Peoria Pool 1960's	La Grange Pool 1970's	Peoria Pool 1970's	La Grange Pool 1980's	Peoria Pool 1980's	La Grange Pool 1990's	Peoria Pool 1990's	La Grange Pool 2000's	Peoria Pool 2000's	**TOTAL**
TOTAL*	**46**	**58**	**46**	**98**	**68**	**125**	**73**	**130**	**22**	**1**	**667**
Ecosystem Restoration	0	0	0	0	1	2	2	6	2	0	**13**
Dredging (Federal)	0	0	0	0	3	3	9	3	0	0	**18**
Dredging (Non-Federal)	30	20	30	63	25	45	32	52	0	0	**297**
Bank Stabilization (Federal)	0	0	0	0	4	2	0	1	4	0	**11**
Bank Stabilization (Non-Federal)	2	17	0	9	11	23	11	23	11	0	**107**
Structures (Control)	0	0	0	0	0	0	0	0	0	0	**0**
Structures (Docks)	0	3	2	2	1	12	3	13	3	0	**39**
Structures (Levee)	0	0	0	0	0	0	3	4	0	0	**7**
Structures (Boat Ramp)	1	5	7	6	5	8	4	5	1	1	**43**
Structures (Intake)	2	2	4	1	1	2	0	1	0	0	**13**
Utilities	0	0	0	0	0	0	1	3	0	0	**4**
Bridge Repair	0	0	0	1	2	3	0	0	0	0	**6**
Excavation Clearing	0	0	0	0	1	2	0	7	0	0	**10**
Fill	11	11	2	13	12	21	7	12	0	0	**89**
Other	0	0	1	3	2	2	1	0	1	0	**10**

* Prior to 1980, the District did not issue itself a permit for channel maintenance dredging. These numbers reflect individual dredging events.

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Section 5

Plan Implementation

This chapter presents the requirements for implementing the Recommended Plan, including Federal and non-Federal cost sharing, and the division of responsibilities between the Federal Government and the Non-Federal Sponsor, the Illinois Department of Natural Resources. It also lists the major milestones necessary for project approval, and a schedule of milestones associated with designing and constructing the Recommended Plan.

DIVISION OF PLAN RESPONSIBILITY

RECOMMENDED PLAN COST SHARING

Federal and non-Federal cost sharing for the Recommended Plan is in accordance with Section 210 of the Water Resources Development Act of 1996, which establishes the cost-sharing rules for projects authorized after October 12, 1996. Ecosystem restoration projects require that the non-Federal share of the first cost of the project or the separable element be 35%. Non-Federal Sponsors will provide 100% of any lands, easements, rights-of-way, relocations of utilities or other existing structures, and disposal areas (LERRD). The value of LERRD will be included in the non-Federal 35% share. Where the LERRD exceed the Non-Federal Sponsor's 35% share, the sponsor will be reimbursed for the value of the LERRD that exceeds the 35% non-Federal share. The Non-Federal Sponsor is also responsible for 100% of the costs for operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) of project features. The following table breaks out these costs.

Peoria Lake					
		Non-Federal		Federal	
Project Feature	First Cost	%	Cost	%	Cost
First Cost of Construction	$15,182,000	35%	$5,313,417	65%	$9,867,774
LERRD Credit		100%	$ 575,000	0%	
Cash			$4,738,417		$9,867,774
OMRR&R (average annual)	$11,340	100%		0%	

FEDERAL RESPONSIBILITIES

The Federal Government would provide 65% of the First Cost of implementing the Recommended Plan including Preconstruction Engineering and Design (PED), construction and construction management, which is estimated to total $9,867,774. In addition to its financial responsibility, the Federal Government would:

1. Design and prepare plans and specifications for construction of the Recommended Plan; and

2. Administer and manage contracts for construction and supervision of the project after authorization, funding, and execution of a Project Cooperation Agreement with the ILDNR.

NON-FEDERAL RESPONSIBILITIES

The ILDNR would be responsible for providing 35% of the First Cost of implementing the Recommended Plan. The 35% share of the project cost includes the ILDNR's responsibility for providing all lands, easements, rights-of-way, relocations and disposal areas (LERRD). The estimated costs are $5,313,417 in cash with $575,000 in LERRD credit.

The ILDNR would also be responsible for operations, maintenance, repairs, replacements, and rehabilitation (OMRR&R) of project features. This includes future monitoring of sediment deposition within the project area, and maintenance dredging of the in-lake restoration feature if required. The operations and maintenance costs are anticipated to be minimal over the 25-year period of analysis at an average annual cost of $11,340.

The ILDNR also would be required to provide certain local cooperation items based on Federal law and policies. The items of local cooperation are:

1. Provide 35% of the separable project costs allocated to environmental restoration as further specified below:

   (a) Enter into an agreement that provides, prior to execution of a Project Cooperation Agreement for the project, 25% of design costs;

   (b) Provide, during the first year of construction, any additional funds needed to cover the non-Federal share of design costs;

   (c) Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations determined by the Government to be necessary for the construction, operation, and maintenance of the project;

   (d) Provide or pay to the Government the cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the project; and

(e) Provide, during construction, any additional costs as necessary to make its total contribution equal to 35% of the separable project costs allocated to environmental restoration.

2. For so long as the project remains authorized, operate, maintain, repair, replace, and rehabilitate the completed project, or functional portion of the project, at no cost to the Government, in accordance with applicable Federal and State laws and any specific directions prescribed by the Government.

3. Give the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the local sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

4. Assume responsibility for operating, maintaining, replacing, repairing, and rehabilitating (OMRR&R) the project or completed functional portions of the project, including mitigation features without cost to the Government, in a manner compatible with the project authorized purpose and in accordance with applicable Federal and State laws and specific directions prescribed by the Government in the OMRR&R manual and any subsequent amendments thereto. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the Non-Federal Sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

5. Hold and save the Government free from all damages arising for the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the Government or the Government's contractors.

6. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs.

7. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project; except that the Non-Federal Sponsor shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government.

8. Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Government determines necessary for the construction, operation, or maintenance of the project.

To the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA.

9. Prevent future encroachments on project lands, easements, and rights-of-way that might interfere with the proper functioning of the project.

10. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction, operation, and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act. Comply with all applicable Federal and State laws and regulations, including Section 601 of the Civil Rights Act of 1964, Public Law 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled, "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

11. Provide 35% of that portion of total cultural resource preservation mitigation and data recovery costs attributable to environmental restoration that are in excess of 1% of the total amount authorized to be appropriated for environmental restoration.

12. Not use Federal funds to meet the Non-Federal Sponsor share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized.

INSTITUTIONAL REQUIREMENTS

SPONSORSHIP AGREEMENT

Prior to the start of construction, the ILDNR will be required to enter into a Project Cooperation Agreement (PCA) with the Federal Government and satisfy state laws and all applicable regulations. In general, the items included in the Agreement have been outlined in the previous paragraphs.

FINANCIAL ANALYSIS AND CAPABILITY

Financial information on the Non-Federal Sponsor's ability to fund their share of the plan is required to establish implementation of the project as required by the *Principles and Guidelines*. The information includes a preliminary financing plan outlining the costs, schedule of expenditures, and a statement of financial capability by the Non-Federal Sponsor, including funds. The ILDNR has expressed their financial capability in their letter of intent.

Illinois
Department of
Natural Resources

http://dnr.state.il.us

One Natural Resources Way • Springfield, Illinois 62702-1271 George H. Ryan, Governor • Brent Manning, Director

October 31, 2002

Colonel William J. Bayles
U.S. Army Engineer District
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

RE: STATEMENT OF FINANCIAL CAPABILITY, Section 216 Environmental Restoration Project, Peoria Riverfront Development, Illinois River

Dear Colonel Bayles:

The State of Illinois, Department of Natural Resources (DNR) has the legal authority to enter into the Project Cooperation Agreement and to fulfill all financial obligations for completion of the project. The DNR understands that the current cost estimate for the entire project is $15,181,192. Of this, the DNR share is $5,313,417($4,738,417 cash and $575,000 for rights-of-way and relocation costs).

It is the DNR intention to finance its share of project costs through State budget appropriations. As with the federal annual appropriations, the State of Illinois commitment to funding each year of the planned project construction cost is dependent upon the DNR receiving an annual appropriation from the Illinois General Assembly to do so. Enclosed also is a copy of State (DNR) budget documents, indicating scheduled specific funding planned by year for this project.

The Illinois DNR has reviewed the *draft* Project Cooperation Agreement (PCA) and has found its provisions acceptable. The DNR strongly desires to proceed with this habitat restoration project. If further information is needed, please do not hesitate to contact our office.

Sincerely,

Brent Manning
Director

Enclosures

Cc: Kirby Cottrell
Debbie Bruce
Scott Stuewe
Jim Mick

Peoria Riverfront Development
Section 216 Environmental Restoration Project
Schedule of Project Costs - Peoria Lake Component
Current Working Estimate (April 2002 Price Level)

CWE (April 2002)

Year	TOTAL Project	Federal Costs	Sponsor Cash	Sponsor LEERD
2002	$193,500	$193,500	$0	
2003	$850,100	$850,100	$0	
2004	$1,967,500	$1,291,900	$120,600	$ 575,000
2005	$4,888,000	$3,030,600	$1,857,400	
2006	$204,900	$127,000	$77,900	
2007	$554,200	$343,600	$210,600	
2008	$3,615,200	$2,241,400	$1,373,800	
2009	$2,587,100	$1,604,000	$983,100	
2010	$165,800	$102,800	$63,000	
TOTAL	$15,026,300	$9,784,900	$4,686,400	$ 575,000
		65.03%	34.968%	

Notes:

1 Fiscal year refers to U.S. Government Fiscal year 1 October thru 30 September.

2 LERRD refers to lands, easements, relocations, rights-of-way, and damages.

3. An additional $155,000 in Post-Construction Monitoring is not reflected in this table but is part of the total project cost.

4. Numbers were round to the nearest $100.

LOCAL COOPERATION

Subsequent to public review of the draft report, the ILDNR will be requested to provide a letter of intent indicating their support for the Recommended Plan and its willingness and intent to execute the PCA including providing the non-Federal required assurances.

PROJECT MANAGEMENT PLAN

A Project Management Plan (PMP) for implementation of the Recommended Plan will be prepared for the final report. The PMP will describe activities, responsibilities, schedules and costs required for the PED phase and construction of the project. The PED phase will last for an estimated 3 years at a total cost of $1,738,000.

PROCEDURES FOR PROJECT IMPLEMENTATION

Future actions necessary for project approval and implementation are summarized as follows:

1. The Corps of Engineers Mississippi Valley Division Commander will review the final report and then issue a public notice announcing completion of the final report. This is referred to as the Division Engineer's Notice, or DE's Notice.

2. The report will then be submitted to Headquarters, U.S. Army Corps of Engineers (HQUSACE), and the Office of the Assistant Secretary of the Army for Civil Works (ASA (CW)) for concurrent Washington level review.

3. The 30-day state and agency review and coordination of the Environmental Assessment will be ongoing concurrently during the HQUSACE review.

4. Concurrent Washington level review by HQUSACE and ASA(CW) will conclude with a HQUSACE staff assessment, the 30-day state and agency review, review input by the ASA(CW), HQUSACE final assessment, a field visit and meeting, if necessary, and the documentation of report review prepared by HQUSACE.

5. The Washington level decision-making process will follow the decision-making sequence of HQUSACE and ASA(CW), once the documentation of report review has been completed. There will be a briefing, if necessary, for the Designated Senior Representatives of Decision-Makers to resolve any outstanding issues. The Chief of Engineers will provide his recommendations on the report to the ASA(CW), who will provide the report and proposed recommendations to the Office of Management and Budget (OMB) to obtain their views and comments on whether the proposed recommendations are consistent with Administrative policies. Prior to the transmittal of the report to the Congress, the Non-Federal Sponsor, the State of Illinois, interested Federal agencies, and other parties will be advised of any significant modifications made to the recommendations and will be afforded an opportunity to comment further.

6. The report will then be transmitted to Congress for project authorization with the Chief of Engineers report, ASA(CW) report, state and agency comments, and Office of Management and Budget comments.

7. Congress will be required to authorize the project for implementation, generally as part of a Water Resources Development Act.

8. Funds could be provided, when appropriated in the budget, for Preconstruction Engineering and Design (PED) upon issuance of the Division Engineer's public notice, announcing the completion of the final report and pending project funding authorization. A Design Cooperation Agreement will need to be developed and executed between the Federal Government and the ILDNR, whereby the sponsor will provide 25% of the cost of PED studies.

9. The Corps of Engineers will complete final design and plans and specifications for project construction.

10. Subsequent to appropriation of construction funds by Congress, formal assurances of local cooperation in the form of a Project Cooperation Agreement (PCA) will be required from the ILDNR.

11. The ILDNR will be required to provide all real estate requirements for project implementation.

12. Bids for construction will be advertised and contracts awarded.

13. Upon completion of construction, the project will be turned over to the ILDNR, who will be responsible for OMRR&R in accordance with guidelines provided by the Corps of Engineers.

PROJECT IMPLEMENTATION SCHEDULE

The schedule for the feasibility study is for the final report to be forwarded to CEMVD in January 2003 and for the Division Engineer's Public Notice of the completion of the feasibility report to be issued in February/March 2003. Execution of the PED agreement for the next phase of study is expected in March 2003. The PED phase is scheduled to begin in March/April 2003 and will continue for approximately 3 years, until 2006. The PED phase includes refinements to the design of the recommended plan, detailed bathymetric and topographic surveys, habitat and species surveys, bioassay surveys, and chemical, grain size, and density tests of the material to be dredged. Completion will be dependent on annual funding and the timing of construction authorization. Once initiated, construction will last about 6 years.

VIEWS OF NON-FEDERAL SPONSOR(S) AND ANY OTHER AGENCIES WITH IMPLEMENTATION RESPONSIBILITIES

The State of Illinois, through the Department of Natural Resources, acting as the local sponsor, supports the recommended plan. Further, the Fon du Lac Park District, East Peoria, Illinois, owns lands to be used for project implementation. The Park District has agreed to support the recommended plan through use of property.

COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

A. Endangered Species Act of 1973, as amended. The project would not adversely impact any threatened or endangered species or their critical habitats. The U.S. Fish and Wildlife Service (USFWS) was coordinated with concerning federally endangered species, as required by the Endangered Species Act of 1973, as amended. Their letter, dated July 25, 2002, responds to both the ESA and the Fish and Wildlife Coordination Act and can be found in Appendix A-1.

B. National Historic Preservation Act of 1966, as amended. Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) establishes a program for the preservation of additional historic properties throughout the Nation, and for other purposes, approved October 15, 1966 (Public Law 89-665; 80 Stat. 915; 16 U.S.C. 470) as amended. The NHPA and its implementing regulations 36 CFR Part 800: "Protection of Historic Properties," establishes the primary policy, authority for preservation activities, and compliance procedures. The NHPA ensures early consideration of historic properties preservation in Federal undertakings and the integration of these values into each agency's mission and declares Federal policy to protect historic sites and values in cooperation with other nations, states, and local governments.

Allowing for tribal and interested/consulting party review and comment contributes to fulfilling obligations as set forth in the National Historic Preservation Act (PL 89-665), as amended; the National Environmental Policy Act of 1969 (PL 91-190); Executive Order (EO) 11593 for the "Protection and Enhancement of the Cultural Environment" (Federal Register, May 13, 1971); the Archaeological and Historical Preservation Act of 1974 (PL 93-291); the ACHP "Regulations for the Protection of Historic and Cultural Properties" (36 CFR Part 800); and the applicable National Park Service and Corps regulations.

Responses were received from the IHPA by letters dated December 4, 2000, and October 30, 2001 (IHPA Log #0011090020k-P), which concurred with the Corps' opinions and a determination of ***No Historic Properties Affected***, as defined in 36 CFR Part 800.3(a)(1) for the project as proposed. Compliance with the NHPA has been met.

C. Federal Water Project Recreation Act. Opportunities for recreational development were considered during the planning of this project. While the project is not specifically intended for recreational purposes, it is recognized that recreational opportunities would be an ancillary benefit of the project.

D. Fish and Wildlife Coordination Act. Project plans have been coordinated with the USFWS, the U.S. EPA, and the ILDNR. The USFWS and ILDNR have also been involved concerning formulation of alternatives for the project and their opinions considered in its development regarding endangered species, critical habitats, and other sensitive areas of concern. The USFWS coordination letter, dated July 15, 2002, provides comments under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.); and the Endangered Species Act of 1973, as amended. All coordination responses can be found in Appendix A-1.

E. Wild and Scenic Rivers Act of 1968, as amended. This portion of the Illinois Waterway is not listed as a component of the National Wild and Scenic River System.

F. Executive Order 11988 (Flood Plain Management). Executive Order 11988 directs Federal agencies to: (1) avoid development in the floodplain unless it is the only practical

alternative; (2) reduce the hazards and risks associated with floods; (3) minimize the impact of floods on human safety, health, and welfare; and (4) restore and preserve the natural and beneficial values of the floodplain. After an extensive alternatives evaluation, the placement of dredged material to construct islands in Peoria Lake is deemed to be the only practicable alternative for this project. As such, the proposed action is in accordance with Executive Order 11988 and is judged to be in full compliance.

G. Executive Order 11990 (Protection of Wetlands). The proposed alternatives for this project propose construction activities that would directly promote the development of wetlands. Since the results of the construction activities promote the development of wetland habitat, the project is deemed to be in full compliance.

H. Clean Water Act (Sections 401 and 404), as amended. A Section 404(b)(1) Evaluation for the selected plan can be found in Appendix A-3.

I. Clean Air Act, as amended. No aspect of the proposed project has been identified that would result in violations to air quality standards.

J. Farmland Protection Policy Act of 1981. No farmland is impacted by the recommended plan.

K. National Environmental Policy Act of 1970, as amended. The completion and public coordination of this EA fulfills NEPA compliance.

L. National Economic Development (NED) Plan. The NED Plan is the plan that best satisfies the Federal planning objectives of increasing the Nation's output of goods and services and produces the most improvement to the national economy. Dollars and non-monetary outputs (average annual habitat units) were used to quantify all possible plans and alternatives for this project. The proposed plan is therefore considered the best to fulfill the NED objective.

Section 6

Summary of Coordination, Public Views, and Comments

COORDINATION

Throughout a feasibility study, the Corps of Engineers strives to inform, educate, and involve the many groups who may have an interest in the study. This coordination is paramount to assuring that all interested parties have the opportunity to be part of the study process.

One process used for coordination is the public involvement process. Public involvement is the exchange of information with various segments of the public. It attempts to reduce unnecessary conflict and achieve consensus. The goal of public involvement and coordination is to open and maintain channels of communication with the public in order to give full consideration to public views and information in the planning process (Engineering Regulation 1105-2-100, Appendix B - Public Involvement, Collaboration and Coordination).

An effective public involvement program must identify and respond to as many affected publics as possible throughout the study and consider their input in the study's decision-making process. Content analysis is the method employed to identify public opinion, study concerns, and potential controversy. It ensures that the public involvement plan is responsive to the level of interest and concern expressed by the public, and it assesses the effectiveness of the public involvement techniques.

The main forum for receiving feedback during the Illinois River, Peoria Riverfront at Peoria, Illinois, Environmental Restoration Feasibility Study was through the study's newsletters and open houses. As discussed below, newsletters provided points of contact for the publics' questions/comments. The open house attendees were offered comment sheets to express their concerns and provide comments. Following each open house, a content analysis report was prepared to document the proceedings and public comments, and to analyze the information that was submitted. The reports described the dominant tones and themes of the feedback generated by the public participation program. A copy of each report was distributed to all study team members for use in the plan formulation process.

During the study, the Corps of Engineers coordinated not only with its cost-sharing partner, the ILDNR, but also with numerous groups including elected congressional representatives; Federal,

State, county, and city agencies; environmental groups/organizations; farm bureaus; businesses; media; and the unaffiliated general public.

PUBLIC VIEWS AND COMMENTS - JUNE 2000 OPEN HOUSE

In May 2000, a study newsletter was mailed to a distribution list of nearly 700 addresses notifying them of the study's initiation and an upcoming cost-sharing signing ceremony and public open house. The newsletter also provided information about the study area, study background, coordination efforts, and Corps of Engineers and ILDNR points of contact for comments/questions. A copy of the newsletter is included in Appendix A-1, Correspondence. A news release also was issued to media (television, radio, and newspaper) sources in the study area.

The cost-sharing signing ceremony and open house were held in Peoria, Illinois, on June 5, 2000. The ceremony, sponsored by Congressman Ray LaHood (IL-18), formally signified the partnership formed by the Rock Island District of the U.S. Army Corps of Engineers and the Illinois Department of Natural Resources to execute this study. The purpose of the open house was to meet with the public to discuss on a one-to-one basis information on the range of alternatives for restoring the environment in the Illinois River along the Peoria Riverfront, and to gather comments on the alternatives and problems in the area.

Approximately 70 members of the public attended the open house, viewed the displays, and met with study members (represented by Corps of Engineers, ILDNR, Illinois Department of Natural Resources Watershed Management, Illinois Department of Agriculture, Illinois State Water Survey, Cooperative Extension Service, and Natural Resources Conservation Service). A comment sheet was offered to the public for feedback, and approximately 27% (19) were returned.

Overall, comments were very favorable regarding the open house format, displays, and the goals of the study. A strong majority of attendees agreed:

- That the open house provided an opportunity to gain information and a better understanding of the study, that the materials and displays were informative, and that they had a chance to talk to a study team member and offer comments about the study.
- That the goal of the study should be to create and maximize habitat diversity, reduce sediment delivery from tributaries, and provide ancillary recreation benefits.
- That island creation and/or sediment removal through dredging are appropriate methods of reaching the above-stated goals.

Other responses revealed that, overall, the public considers the general placement of the island and dredged areas acceptable, that tributary restoration is viewed as the most important means of addressing sediment delivery to Peoria Lake, and that water quality is also an important issue.

The comments received at the open house were provided to the study team members for consideration and use in the analysis of the array of potential alternatives.

PUBLIC VIEWS AND COMMENTS - NOVEMBER 2000 OPEN HOUSE

In November 2000, a second newsletter was mailed to over 700 addresses. (Note that the mailing list grew to include new names added from the June 2000 open house attendees.) The newsletter provided the study background, purpose, and a study update; summarized the June 2000 open house; announced a November 29, 2000, open house; stated that another open house would be held before the study's conclusion; and listed points of contact for comments/questions. (The open house was held in conjunction with an Illinois River Ecosystem Restoration Study cost-sharing signing ceremony and open house; however, the summary of comments provided below pertains to the Peoria Riverfront Development Study only.) A copy of the newsletter is included in Appendix A-1. A news release also was issued to media (television, radio, and newspaper) sources in the study area.

The November 2000 open house was held in Peoria, Illinois. The purpose of the open house was to provide information on the study status and on the alternatives being considered for restoring the environment within the Illinois River watershed along the Peoria Riverfront and to gather comments on the alternatives. Corps of Engineers, Illinois Department of Natural Resources, and Illinois State Water Survey representatives were present at the open house to discuss the study with the public on a one-to-one basis and to receive the public's comments.

A total of 72 people attended the open house. Of those, 42% (39) returned comment sheets. The following paragraphs summarize questions asked and responding comments.

For the alternative that includes dredging to create islands, the "large island above the bridge (renamed mid-sized island above the bridge)" alternative was selected as the most acceptable by over half of those responding. About one-third of the respondents supported the "large island pair below bridge alternative (subsequently screened due to high cost and lack of sponsor interest)," and the remaining island alternatives of "small island above bridge," "single island below bridge (renamed large island below the bridge)," and "island pair below bridge" were supported fairly equally.

Additional comments received pertaining to this alternative included the need to determine a purpose for any island creation, a suggestion to move the silt in the river into a large island, and the concern for islands for wildlife and habitat restoration. Although most respondents agreed with the dredging to create islands alternative, a comment was made that this alternative is not the long-term answer to the river's problems.

The stream restoration alternatives on Farm Creek were supported by 86% of those in attendance. Additional comments about this alternative included concerns about erosion, sediment reduction, the importance of wildlife habitat, wetland restoration, and increased biodiversity.

The comments received at the open house were provided to the study team members for consideration and use in the analysis of the array of potential alternatives.

PUBLIC VIEWS AND COMMENTS – SUMMER 2002 PUBLIC MEETING

The third public meeting was held at the study's conclusion. The May newsletter announced the public meeting schedule and was mailed to each of the 800+ names on the study's mailing list prior to the meeting. A copy of the newsletter is included in Appendix A-1. A news release also was issued to media (television, radio, and newspaper) sources in the study area.

The June 2002 public meeting was held in Peoria, Illinois. The purpose of the meeting was to address the public during the public review phase and to explain the alternatives that the study team had selected to enhance the Peoria Lake and Farm Creek environment. The meeting also served as a forum for gathering comments on the recommended plans. Two sessions of the meeting were held with an open house session for the first one-half hour, followed by the public meeting portion. Representatives from the Illinois Department of Natural Resources and the Corps of Engineers met with the public on a one-to-one basis during the open house portion to discuss the displays and to receive public comments. The public meeting sessions began with a formal presentation explaining the selected alternatives, followed by a question and answer and comment/statement period.

A total of 77 people attended. Meeting attendees were asked to fill out a comment sheet after each session. A total of 35 comment sheets were returned. Four statements were entered for the record at the meeting and one statement was sent through the mail. Tributary restoration and sediment delivery remain major concerns expressed by the public both at this set of meetings and at the June 2000 open houses. Another recurring comment reiterates that the public wants to get the project moving as soon as possible.

The majority of responses (74%) regarding Peoria Lake agree that the plan would enhance aquatic habitats and restore depth diversity; however, less than half of the responders (49%) agree that the plan would address sediment delivery and deposits, and an equal number either disagreed (29%) or were neutral (20%) about whether this problem would be successfully addressed by the recommended plan. Additional comments regarding the Peoria plan reflect the concern that scouring and erosion of the islands will create other problems, that the Plan is a temporary fix and does not address the real problems causing river sedimentation.

For Farm Creek, 66% agreed that the recommended plan would maximize habitat creation, and 60% agreed that the plan would reduce sediment delivery and improve water quality. The larger number of responders that were either neutral or disagreed with the plan could indicate that many of them were not convinced that the recommended plan would meet the needs for restoring Farm Creek. This is also reiterated in the additional comments received citing that the project, as stated, only prevents flooding, not sediment reduction.

The majority of questions asked during both question and answer sessions were directed at how the project would affect riverfront property owners, boating, water supply, water quality, flood heights, bankline erosion, and downstream area. Statements entered into the record by the Peoria Area Chamber of Commerce, Heartland Water Resources Council, Nature Conservancy, Peoria Lakes Basin Alliance, and Peoria Audubon Society all support the recommended plans for this study.

The information received at the public meeting was distributed to the study team members.

SUMMARY

Various publics were identified as target audiences for public involvement and coordination, including elected congressional representatives; Federal, State, county, and city agencies; environmental groups/organizations; farm bureaus; businesses; media; and the unaffiliated general public. These publics made up the 800+ addresses on our mailing list that was used to inform, educate, and involve the public.

The goals of the coordination process were to inform, educate, and involve the public and solicit feedback through open communication and to include in the plan formulation process all publics interested in and affected by the study recommendation(s).

The newsletters and public open houses provided the public with opportunities to become informed and educated about the study and involved in the study by providing feedback to the study team. The feedback was gathered into content analysis reports and used by the study team to shape the plan formulation process and to develop the recommended plan. The study plans that are included in this report have been influenced by the public involvement process.

Recommendation

I have weighed the outputs to be obtained from the full implementation of this ecosystem restoration project against its estimated cost and have considered the various alternatives proposed, impacts identified, and overall scope. In my judgment, this project, as proposed, justifies expenditure of Federal funds. I recommend that the Secretary of the Army for Civil Works approve the proposed project to include constructing in Peoria Lake the mid-sized upper island of 21 acres and two lower islands of 17 and 37 acres, respectively, with a flowing side channel. The total area to be dredged for construction of the project would be approximately 200 acres.

The current estimated first cost of the recommended plan is $15,182,000 (December 2002 price levels). This total estimated project cost includes construction of the project features; planning, engineering, and design; construction management; real estate; and monitoring. Implementation would be cost shared 65% by the Federal Government and 35% by the Illinois Department of Natural Resources (ILDNR), the Non-Federal Sponsor. The Federal contribution is estimated at $9,867,774 and the non-Federal contribution is estimated at $5,313,417. It is the ILDNR's responsibility to provide the real estate and conduct operation and maintenance. The operation and maintenance of these features is estimated to cost $11,340 annually.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of the national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding.

William J. Bayles
Colonel, U.S. Army
District Engineer

Finding of No Significant Impact

I have reviewed the information provided by this Feasibility Study with integrated Environmental Assessment, along with data obtained from Federal and State agencies having jurisdiction by law or special expertise, and from the interested public. I find that the proposed Peoria Riverfront Development (Ecosystem Restoration) Project would not significantly affect the quality of the human environment. Therefore, it is my determination that an Environmental Impact Statement is not required. This determination may be reevaluated if warranted by further developments.

An array of features and alternatives was considered for the Peoria Riverfront Development (Ecosystem Restoration) Project. Alternatives considered were:

Alternatives for Peoria Lake:

1. No Federal Action
2. Dredging to create aquatic habitat and a small island (9-acre island and 17 acres increased depth diversity) – Upstream of the McClugage Bridge (U.S. Highways 24 and 150)
3. Dredging to create aquatic habitat and a mid-sized island (21-acre island and 55 acres increased depth diversity) – Upstream of the McClugage Bridge (U.S. Highways 24 and 150)
4. Dredging to create aquatic habitat and two islands with a flowing side channel (17- and 37-acre islands and 144 acres increased depth diversity) – Downstream of the McClugage Bridge (U.S. Highways 24 and 150)
5. Dredging to create aquatic habitat and a large island (46-acre island and 99 acres increased depth diversity) – Downstream of the McClugage Bridge (U.S. Highways 24 and 150)

The preferred alternative consists of:

- Dredging in Peoria Lake with construction of the mid-sized island above and two islands with a flowing side channel below the McClugage Bridge (U.S. Highways 24 and 150). We also anticipate construction of one or two test islands within the same area prior to construction of the two larger islands below the bridge.

Factors considered in making a determination that an Environmental Impact Statement was not required were as follows:

- The project is anticipated to improve the value of Peoria Lake for migratory and resident birds, fish, and wildlife species.

- Aside from temporary disturbance during construction periods, no long-term adverse effects to natural resources or historic properties are anticipated. No State or Federal endangered or threatened species would be affected by the proposed action.

- The project is in compliance with Section 404 of the Clean Water Act. Section 401 certification from the State of Illinois will be received prior to project construction.

- No significant economic impacts are expected to occur in the project area.

_____
(Date)

William J. Bayles
Colonel, U.S. Army
District Engineer

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