PEORIA RIVERFRONT DEVELOPMENT (ECOSYSTEM RESTORATION) STUDY, ILLINOIS

FEASIBILITY REPORT

WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

PUBLIC REVIEW DRAFT

MAIN REPORT

MAY 2002

US Army Corps of Engineers ®
Rock Island District

CEMVR-PM-M

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Executive Summary

The Peoria Riverfront Development (Ecosystem Restoration) Project area includes Lower Peoria Lake and the Farm Creek Watershed. The area lies within Peoria and Tazewell Counties, Illinois, and includes Illinois River Miles 162-167. The Peoria Riverfront Development Project is 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. 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. 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 and the Farm Creek Watershed as part of the Peoria Riverfront Development Project.

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 and reduction of sediment delivery and deposition, 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. Measures 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.

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

The following restoration measures for Farm Creek were considered in detail to achieve the project goals and objectives:

1. No Federal action.

2. Wetland Restoration.
   a. 4-Acre Wetland Impoundment – Construction of an earthen dam creating a wetland pond with a surface area of approximately 4 acres
   b. 4-Acre and 3-Acre Wetland Impoundments – Construction of earthen dams creating wetland ponds with a surface area of approximately 4 acres and 3 acres

3. Wetland Plantings.
   a. Planting 2 rows of vegetation within and around pond perimeter(s)
   b. Planting 6 rows of vegetation within and around pond perimeter(s)

4. Prairie Plantings.
   a. Prairie plantings on 20 acres adjacent to the pond perimeter
   b. Prairie plantings on 35 acres

RECOMMENDATION

It is recommended that the Secretary of the Army for Civil Works approve the proposed project to include constructing in Peoria Lake of the mid-sized upper island and two lower islands with a flowing side channel and at Farm Creek a 4-acre and a 3-acre wetland impoundment, 6 rows of wetland plantings, and 35 acres of prairie plantings.

The current estimated first cost of the Recommended Plan is $15,926,192. 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 $10,352,024 and the non-Federal contribution is estimated at $5,574,167. 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 $15,160 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 authorized restoration of the Illinois River Basin, states:

> The Secretary shall develop, as expeditiously as practicable, a proposed comprehensive plan for the purpose of restoring, preserving, and protecting the Illinois River basin…The Comprehensive Plan shall provide for the development of new technologies and innovative approaches to: (1) enhance the Illinois River as a vital transportation corridor; (2) improve water quality within the entire Illinois River basin; (3) restore, enhance, and preserve habitat for plants and wildlife; (4) increase economic opportunity for agriculture and business communities…The comprehensive plan shall include such features as are necessary to provide for: (1) the development and implementation of a program for sediment removal technology, sediment characterization, sediment transport, and beneficial uses for sediment; (2) the development and implementation of a program for the planning, conservation, evaluation and rehabilitation, and stabilization and enhancement of land and water resources in the basin; (3) the development and implementation of a long-term resource monitoring program; (4) the development and implementation of a computerized inventory and analysis program…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 HR 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 benefits. 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.

It should be noted that in the Plan Formulation Section, options are discussed separately for in-lake restoration and upland watershed measures. This division of alternatives is consistent with the language of the authority, the functioning of the system, and the use of separate habitat evaluation procedures. This separation is maintained through the rest of the report to differentiate distinct but interrelated elements of the ecosystem. Finally, this organization is a better mechanism for addressing ecosystem goals.

This report has 10 appendices, as follows:

- A General
- B Hazardous, Toxic, and Radioactive Waste Phase I Environmental Site 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 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 next eight appendices are organized to separately address Peoria Lake and Farm Creek, the two main project areas. These 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. 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 1A). The decision was made because of 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 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 has been 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.

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, watershed planning activities were limited to nonexistent 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) 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 public involvement.

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 Illinois River formerly contained the flows of the much larger Mississippi River, but redirection of the Mississippi 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 taking place 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. The oldest complete survey of the river system was done in 1903. This 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*. Since 1903, the volume of Peoria Lake below elevation 440 feet 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…the mean flow (Illinois River discharge at Marseilles) since 1939 is 3448 cfs less than in the prior period. 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 which 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. These tributaries, which only represent 3% of the Illinois River drainage at Peoria, are estimated to deliver 40% or more of the sediment being deposited in the lake. 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 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.

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.

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. 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 implanted 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 separately with the existing resource conditions for Peoria Lake and Farm Creek. 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 separately for the alternatives in Peoria Lake and Farm Creek. 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 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 hydraulic/hydrologic conditions and high levels of barge traffic since the 1970's. 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

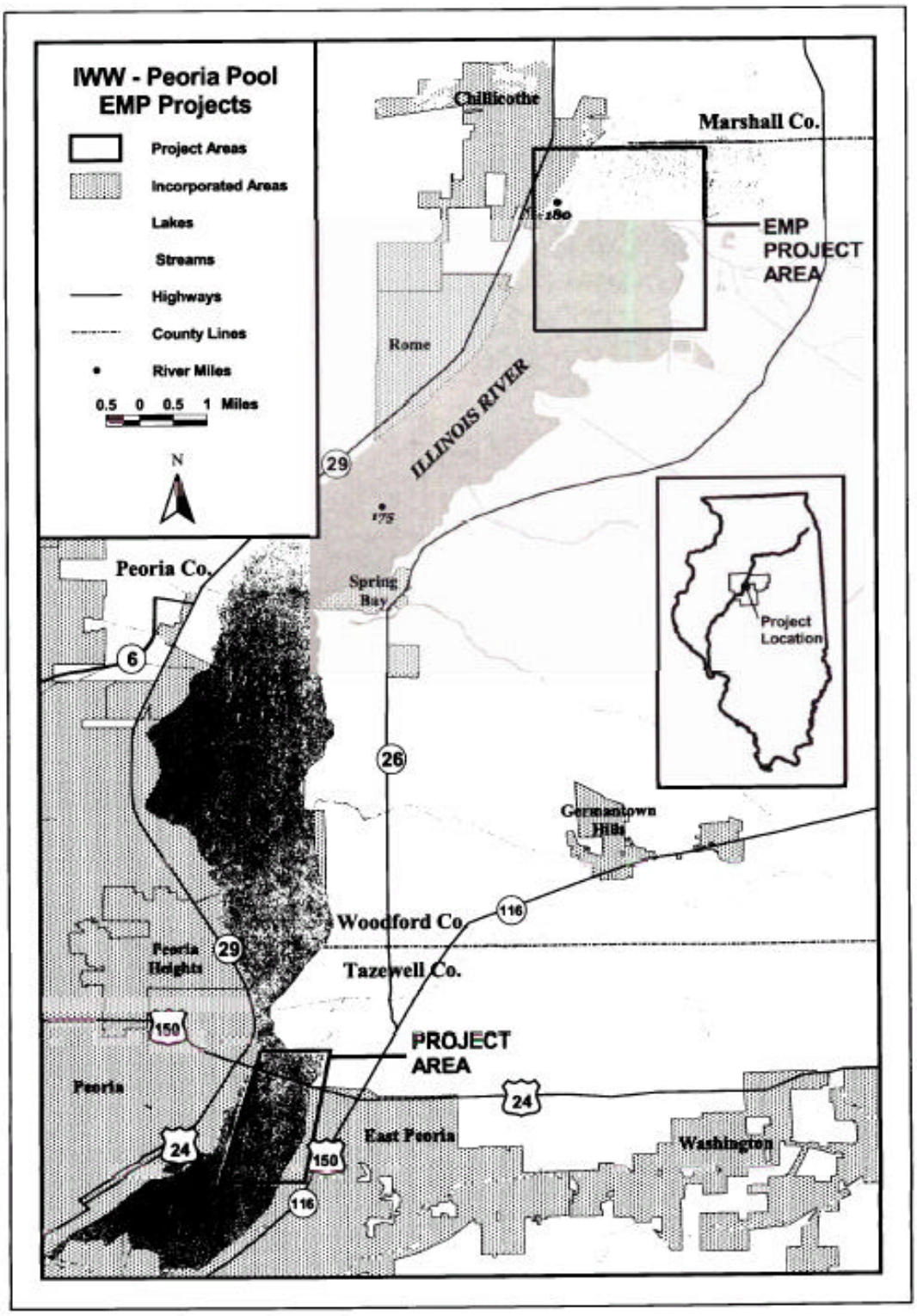


FIGURE 2-1. Peoria Pool EMP Projects

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. With continued loss of storage area to urbanization, flood flow peaks will increase.

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 LaSalle, 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 high flows, approximately 40% of the time, is lowered so that there is essentially 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. And, 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 MSL 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. The ISWS found that during drought years 25% of the sediment delivered to Peoria Lake was contributed by local tributaries. In an average year, 50% of the sediment delivered to Peoria Lake came from the local tributaries.

Wet year sediment transport load from the local tributaries to the lake would probably exceed 50%.

TABLE 2-1. Peoria Lake Sedimentation Rates

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 of transportation channelization. In this region, many roadways and railroad grades occupy the same or parallel corridors as streams. The results are nearly always a straightened stream channel that cannot migrate into the hardened structure and is forced into more sensitive (in terms of sediment delivery) bluff areas. The erosion results in almost instant sediment transport by the stream.

Agricultural practices that dominate the land use are another cause. The Farm Creek Watershed has 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 watershed 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.

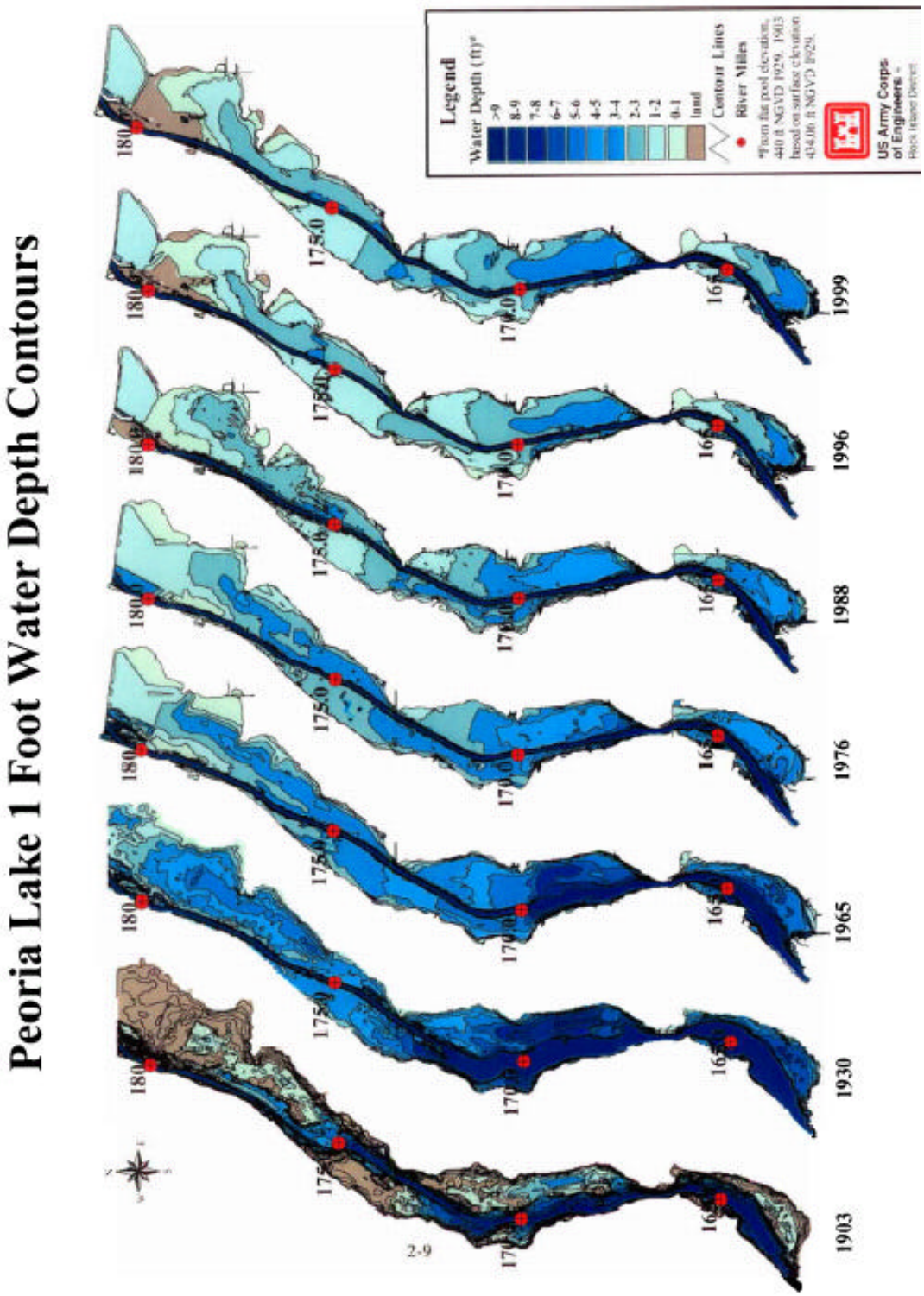
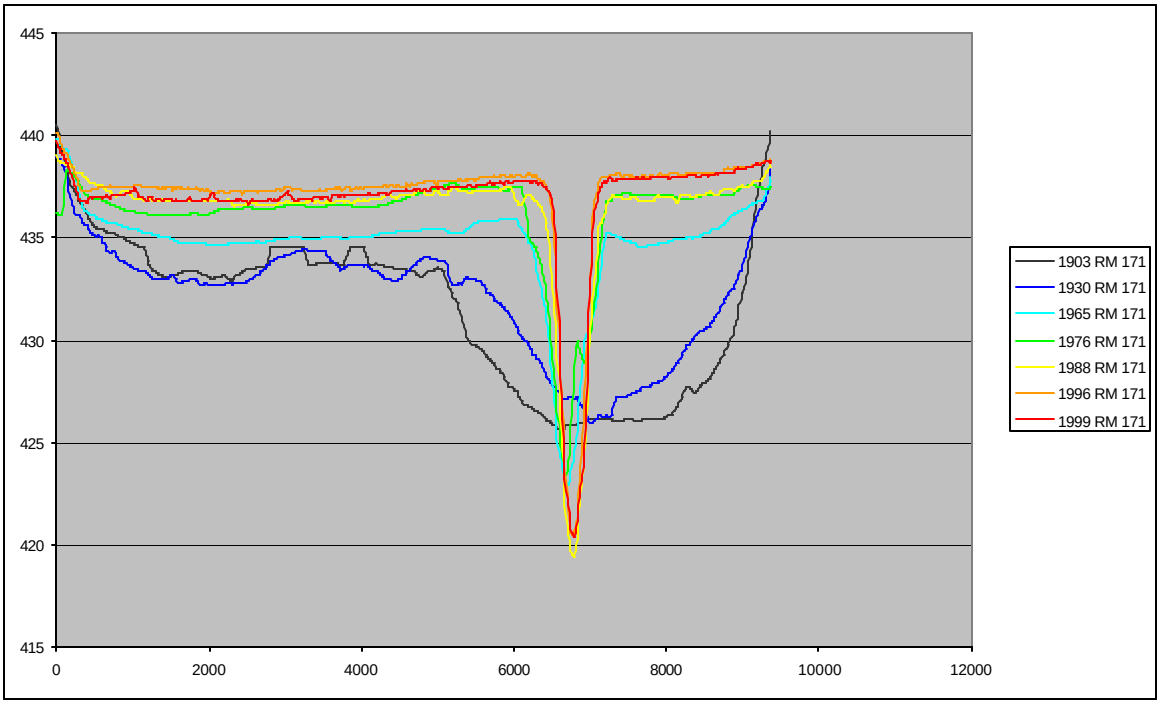


FIGURE 2-2. Peoria Lake 1-Foot Water Depth Contours



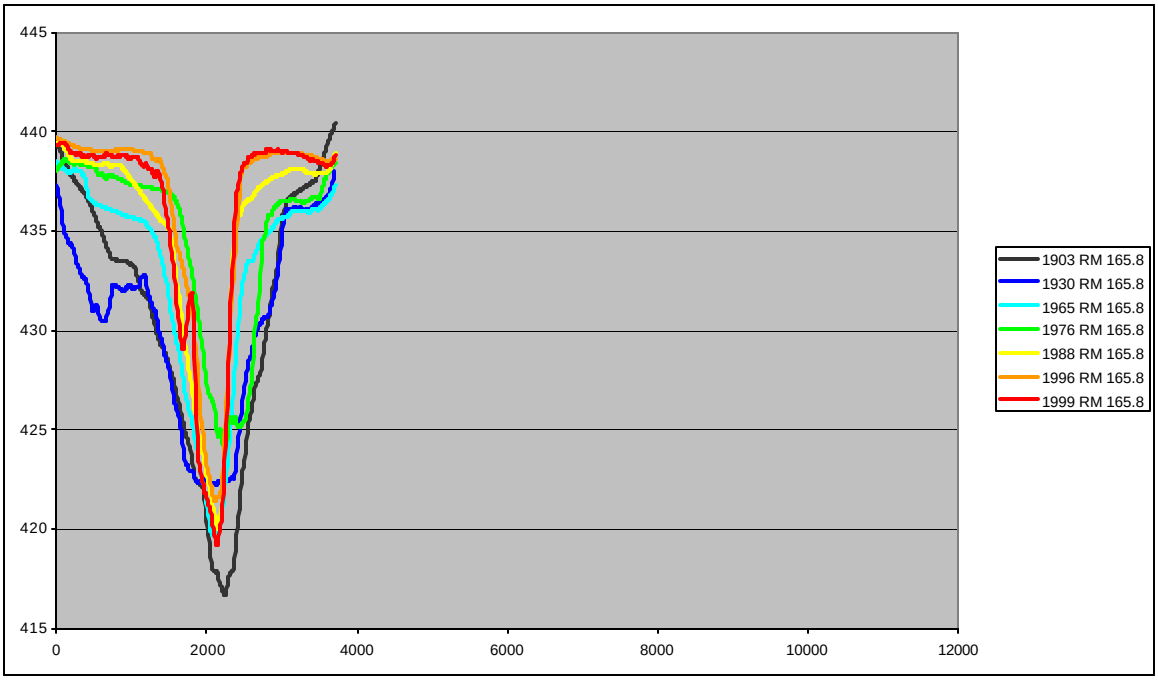


FIGURE 2-3. Typical Cross Sections of Upper and Lower Peoria Lakes

Sediment Quality. 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.

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 PAH group varied between laboratories, but in most cases were below screening values and levels of concern.

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 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 (report of the LTRM).

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 (report of the LTRM).

However, while chemical and industrial pollution is being brought under control, sedimentation is still a major issue on the Illinois Waterway, and it has destroyed much of the formerly high quality fish and wildlife value of Peoria Lake. 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 jointly managed with the Woodford State Fish and Wildlife Area and is a picturesque area along the east side of the Illinois River near Peoria. Among its features 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 one 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 meeting the goal of enhancing wetland 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 Blue 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.

INVENTORY RESOURCE CONDITIONS

Existing Conditions

Sediment Delivery

Peoria Lake has 452 square miles of direct tributary drainage, with the majority of the area contained by 10 watersheds (see Table 2-4 and Figure 2-4). This represents only

3% of the Illinois River's 14,165 square miles of drainage area at Peoria Lake. These tributaries are the source of approximately 40% to 50% of the sediment deposited within Peoria Lake (Bhowmik et al. 1993). In determining the contribution of the local tributary, the ISWS conducted sediment transport monitoring to Peoria Lake for 2 years, finding that in drought years 25% of the sediment delivered to Peoria Lake was contributed by local tributaries. In an average year, 50% of the sediment delivered to Peoria Lake came from the local tributaries, whereas in a wet year the sediment load from the local tributaries to the lakes would probably exceed 50%. While the greater percentage of sediment comes from the upstream portion of the Illinois River Basin, the small area and high contributions from the local tributaries make them obvious candidates for restoration efforts.

Deltas formed where tributaries enter Peoria Lake and have grown quite large over the years. The ISWS estimated growth of five deltas using plan form survey information from 1902-1904 and 1999. Estimates of net sediment accumulation for the deltas were: 2,683 acre-feet (Partridge Creek), 1,495 acre-feet (Blue Creek), 1,428 acre-feet (Richland Creek), 1,252 acre-feet (Farm Creek), and 338 acre-feet (Dickison Run) (Bhowmik et al. 2001).

TABLE 2-4. Tributary Streams of Peoria Lake with Respective Drainage Areas

Stream	***Drainage Area (square miles)***
Crow Creek	130.0
Dry and Richland Creek	47.0
Partridge Creek	28.0
Blue Creek	10.5
Funk's Run	5.4
Tenmile Creek	17.6
Senachwine Creek	85.0
Dickison Run	7.9
Farm Creek	60.0
Blalock Creek	2.8
Unnamed Tributaries	57.8
Total drainage area	452.0

Reprinted from Bhowmik, N.G., et al., ISWS, 2001.

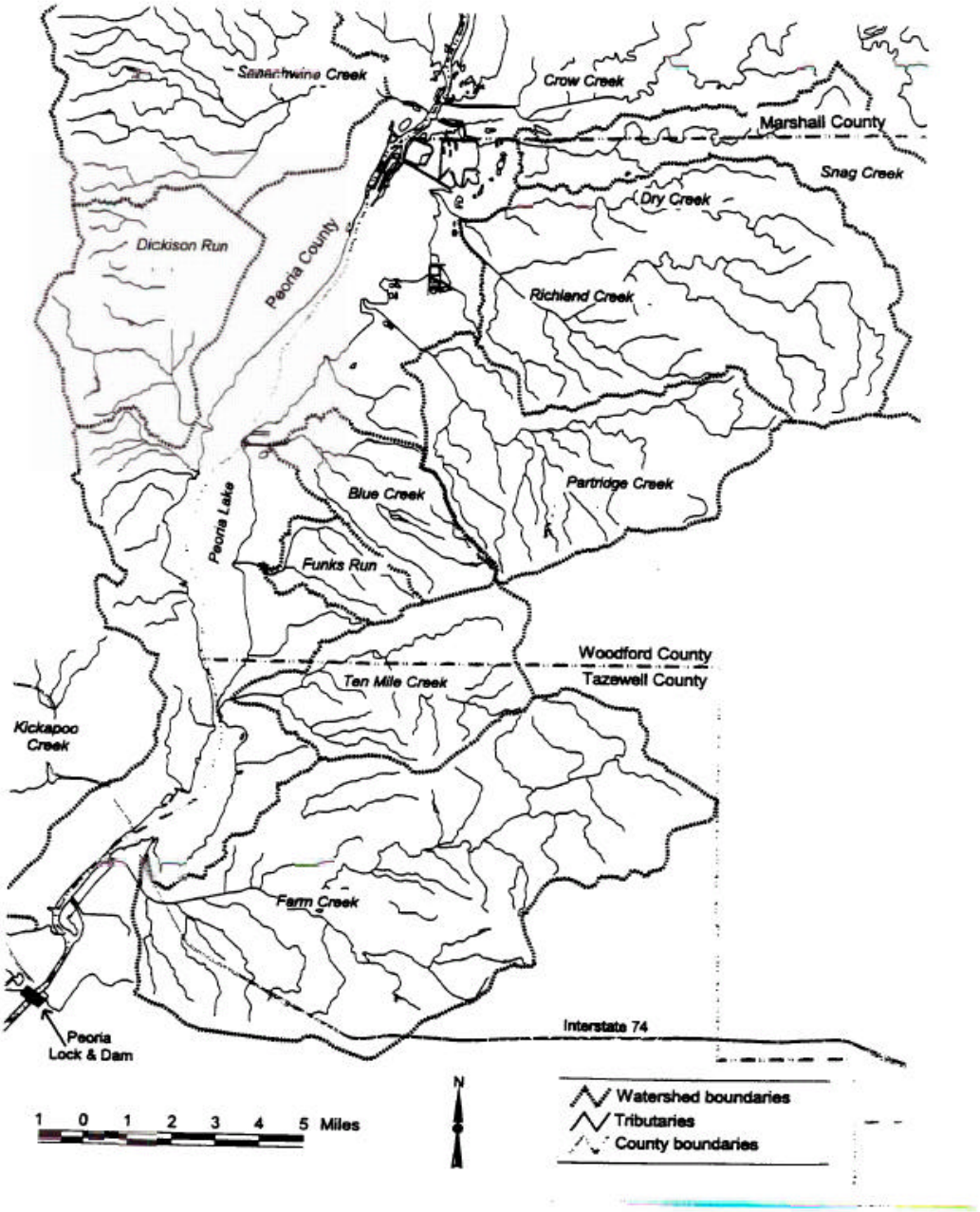


FIGURE 2-4. Peoria Tributaries (Reprinted from Bhowmik, N.G., et al., ISWS, 2001)

Causes of high tributary sediment loads are varied. Some degree of channelization has occurred; most acute is Farm Creek, which includes agricultural channelization as well as flood control. In this region, many roadways and railroad grades occupy the same or parallel corridors as streams. The results are nearly always a straightened stream channel that cannot migrate into the hardened structure and is forced into more sensitive (in terms of sediment delivery) bluff areas. The erosion results in almost instant sediment transport by the stream. In some watersheds, Farm Creek being one, 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. 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.

Farm Creek

Farm Creek is in the Illinois River watershed in central Illinois and drains into Lower Peoria Lake. Its watershed is entirely within Tazewell County. The drainage area is 60.95 square miles, or 39,007 acres. The source is about 2 miles north of the City of Washington, Illinois. It flows in a westerly direction to its confluence with the Illinois River at East Peoria. Farm Creek is about 19 miles long and follows a somewhat sinuous course. From source to mouth, streambed elevation drops approximately 372 feet. The valley is flat and narrow, with very steep side slopes as far upstream as Washington, where it merges with the rolling upland. In the upper reaches, the valley width is only a few hundred feet; its maximum width near mile 4.0 (from its mouth) is about one-half mile. Wooded hills rise about 200 feet on either side of the valley. Principle tributaries to Farm Creek include Fondulac, Little Farm, School, Cole, Kerfoot, Dempsey, and Ackerman Creeks.

The streams found below the bluff line have been extensively modified to control flash flooding. Farm, Cole, Kerfoot, and Fondulac Creeks have all had channel modifications, including construction of levees, concrete lining of the channels, and straightening of the creeks. Two flood control reservoirs are currently found within the watershed. Farmdale Dam and reservoir is found on Farm Creek between the cities of East Peoria and Washington. Fondulac Dam and reservoir is located on Fondulac Creek in the northwestern portion of the watershed.

About 43% of the watershed lies within incorporated municipalities of the Village of Morton, City of Washington, City of East Peoria, and the Village of Creve Coeur. The 2000 population for this area was 54,125, which was a decline of about 1.6% from the 1990 count. After experiencing a small decline, the Tazewell County population has been growing over the past decade and is projected to have modest growth through the year 2020.

In January of 1998, the Illinois EPA funded a local watershed planning effort in the Farm Creek Watershed. The purpose of the effort was to develop a watershed

implementation plan. These efforts were completed in October of 2001 with the Illinois EPA's acceptance of the Watershed Implementation Plan. This process overlapped the feasibility study, and a high degree of coordination occurred among the Corps of Engineers, the sponsor, and the watershed planning committee. Major recommendations of the plan relevant to this study include:

1. *Problem Statement:* Flooding from increased and uncontrolled urban, agricultural, and construction runoff is causing damage to property, risk to life, and streambank instability.

Goal: A reduction of flooding, as soon as possible, by means of detention facilities and conservation buffers.

Objective #1: Identify appropriate areas for stormwater detention and conservation buffers throughout the watershed.

Objective #2: Work with Morton, Washington, East Peoria, Creve Coeur, and Tazewell County to develop consistent and logical stormwater control ordinances throughout the watershed.

Objective #3: Construct appropriate facilities on the Gregory, Tarvin, and Blumenshine tracts that reduce flood damages, increase plant and wildlife habitats, reduce sediment delivery to nearby streams, and improve discharged water quality from the sites.

2. *Problem Statement:* Sediment entering Farm Creek and its tributaries is decreasing water quality and reducing habitat areas within the watershed. Lower Peoria Lake, as the receiving water body, is also experiencing declining habitat areas and water quality due to sedimentation. Finally, as a result of sedimentation, Lower Peoria Lake is experiencing reduced recreational opportunities and increased public expenditures to maintain the Illinois River as an economic asset.

Goal: Reduce sediment deposition to the Lower Peoria Lake from Farm Creek Watershed.

Objective #1: Begin a process of integrating the Farm Creek Management Plan into the Peoria Lakes Feasibility and the Illinois River Basin Restoration Studies.

3. *Problem Statement:* Water quality in the Farm Creek Watershed is impaired due to slight nutrient and moderate siltation problems. Municipal point sources, urban stormwater runoff, hydrologic and habitat modification in the watershed, and stream flow regulation cause these problems.

Goal: Improve water quality in the watershed by reducing sediment being delivered to streams and water bodies.

Objective #1: Reduce the sediment delivered to waterways from streambank and streambed erosion through grade control, bioengineering, and reduced stormwater velocities/volumes.

4. *Problem Statement:* Wildlife habitats within the Farm Creek watershed have decreased due to the drainage of wetlands and removal of stream corridor vegetation by erosion and urbanization.

Goal: Protect, enhance, and add to the areas and types of habitat necessary to increase native wildlife populations throughout the watershed.

Hydrology and Hydraulics

The climate of Farm Creek basin above Washington is typical of the American Midwest (see Appendix D-5). It has cold, dry winters and hot, wet summers. The transition season of spring tends to be very wet, while the fall season tends to be dry. Using Peoria as representative of the basin, average temperature for the year is 50.7 degrees Fahrenheit, with a peak maximum temperature of 113 degrees on July 15, 1931, and a minimum temperature of -27 degrees on January 5, 1884. The average yearly precipitation is 36.25 inches, including an average yearly snowfall of 26.2 inches per year.

Environmental Resources

Farm Creek is a meandering stream located on a central Illinois plain. Historically, the upper watershed of the stream passed through a landscape dominated by richly diverse tall grass prairies and prairie wetland complexes, with forest communities adjacent to the stream in some areas or broad savannas dominating the landscape in others. As it flowed west, thick upland hardwood forests dominated the high bluffs overlooking the Illinois River, gradually giving way to the bottomland hardwood forest and wetland landscapes of the Illinois River floodplain. Through time, the conversion of most of this diverse landscape to urban development and agriculture has eliminated much of the natural community or replaced it with more urban tolerant species and/or invader species introduced by the European expansion westward.

Today, the upper reaches of Farm Creek east of the City of Washington meander through agricultural farm fields. The stream in this reach, on average, is approximately 3 to 4 feet wide and maintains a depth of approximately 1 to 2 feet for most of the year. The stream near the project site has a thin riparian corridor (10 to 15 feet) of herbaceous vegetation of water-tolerant grass species, as well as some scattered forbs, and 40 to 50 trees can be found along a small tributary/fencerow flowing into the creek.

The creek corridor provides sanctuary, food, water, and travel lanes for many creatures. Field mice, voles, ground squirrels, skunk, rabbit, gopher, and fox are common to areas like this. Many common bird species (i.e., sparrow, eastern meadowlark, dove, pheasant, and grouse) can also be found here, as well as predators

like the red-tailed hawk. Fencerows along field borders also provide similar habitat for many of these creatures.

The site being considered for this project is approximately 109 acres and is mostly cultivated row crop farm field. There are no known state or federally listed threatened or endangered species located in this mainly agricultural area.

Wetlands

"Wetland" is a broad term that encompasses many different ecosystems that may include, but not be limited to, prairie, marshes, bogs, and swamps (USEPA 1996). They are often transitional zones between more traditional open water and dry land. They serve as a unique resource and habitat for fish and wildlife species. Wetlands do not have to be wet year round. The commonly accepted definition of wetland is an area that is inundated or saturated by surface or ground water at a frequency and duration to support, and under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions (taken from the EPA Regulations listed at 40 CFR 230.3(t)).

The U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers have joint responsibility in regulating wetlands. The wetlands information about the Farm Creek Watershed comes from the National Wetlands Inventory initiated by the U.S. Fish and Wildlife Service.

The Farm Creek Watershed has several wetlands of various types and sizes. Three hundred and fifty (350) wetlands of 29 different types are present in the watershed. A total of 880.95 acres is classified as wetlands, accounting for 2.2% of the total watershed acreage, and 305.16 acres is the result of excavation or impoundment. Operators currently farm 10.30 acres, with the rest forming natural wetlands. Table 2-5 lists the National Wetlands Inventory Code and description, with the number of said types present in the watershed and the average acres of the type listed. The existing condition of these wetlands is unknown.

Historic Properties

The tributary watershed restoration project has been recently farmed for row crops and includes landforms known to have a potential for containing significant historic properties. The Rock Island District proposed a Phase I intensive archaeological survey in the areas of potential effect to search for shallow and deeply buried historic properties. The District sent letters dated November 7, 2000, and October 5, 2001, concerning the absence of documented historic properties and the District's determination for a proposed Phase I archaeological investigation of the area of potential effect within the watershed restoration. The IHPA concurred by letter dated December 4, 2000 (IHPA Log No. 0011090020K-P, Appendix A-1) with the District's opinion to conduct a Phase I archaeological survey for the areas of potential effect located in the upland areas of the project (IHPA Log No. 0011090020K-P, Appendix A-1), consisting of the tributary watershed restoration project area.

TABLE 2-5. Wetlands Types of the Farm Creek Watershed

Code	Wetland Type	Number	Average Acres
PEM/FO1A	Palustrine-Emergent-Forested Broad Leaved Deciduous-Temporarily Flooded	1	1.3000
PEMA	Palustrine-Emergent-Temporarily Flooded	17	1.7453
PEMAF	Palustrine-Emergent-Temporarily Flooded-Semipermanently Flooded	24	0.4067
PEMAX	Palustrine-Emergent-Temporarily Flooded-Excavated	1	0.5600
PEMC	Palustrine-Emergent-Seasonally Flooded	8	1.6275
PEMCD	Palustrine-Emergent-Seasonally Flooded-Partially Drained & Ditched	2	7.3000
PEMCF	Palustrine-Emergent-Seasonally Flooded-Farmed	1	0.5400
PEMCH	Palustrine-Emergent-Seasonally Flooded-Diked & Impounded	7	4.1729
PEMCX	Palustrine-Emergent-Seasonally Flooded-Excavated	2	0.7500
PEMFX	Palustrine-Emergent-Semipermanently Flooded-Excavated	3	0.4833
PFO1A	Palustrine-Forested Broad Leaved Deciduous-Temporarily Flooded	93	4.7317
PFO1AH	Palustrine-Forested Broad Leaved Deciduous-Temporarily Flooded-Diked & Impounded	6	4.3533
PFO1C	Palustrine-Forested Broad Leaved Deciduous-Seasonally Flooded	4	0.6300
PFO1CH	Palustrine-Forested Broad Leaved Deciduous-Seasonally Flooded-Diked & Impounded	3	14.3567
PSS1/EMA	Palustrine-Scrub Shrub Broad Leaved Deciduous-Emergent-Temporarily Flooded	2	8.5700
PSS1/EMC	Palustrine-Scrub Shrub Broad Leaved Deciduous-Emergent-Seasonally Flooded	1	0.8300
PSS1/EMCH	Palustrine-Scrub Shrub Broad Leaved Deciduous-Emergent-Seasonally Flooded-Diked & Impounded	2	10.2300
PSS1A	Palustrine-Scrub Shrub Broad Leaved Deciduous-Temporarily Flooded	6	1.9283
PSS1C	Palustrine-Scrub Shrub Broad Leaved Deciduous-Seasonally Flooded	3	0.7200
PUB/ABGH	Palustrine-Unconsolidated Bottom-Aquatic Bed-Intermittently Exposed-Dike & Impounded	1	0.4700
PUBG	Palustrine-Unconsolidated Bottom-Intermittently Exposed	5	0.8140
PUBGH	Palustrine-Unconsolidated Bottom-Intermittently Exposed-Diked & Impounded	105	1.2638
PUBGX	Palustrine-Unconsolidated Bottom-Intermittently Exposed	22	0.9914
PUBKH	Palustrine-Unconsolidated Bottom-Artificially Flooded-Diked & Impounded	1	0.8600
PUBKX	Palustrine-Unconsolidated Bottom-Artificially Flooded-Excavated	4	1.6400
PUSAX	Palustrine-Unconsolidated Shore-Temporarily Flooded-Excavated	1	3.1900
PUSKH	Palustrine-Unconsolidated Shore-Artificially Flooded-Diked & Impounded	1	7.6300
R2UBHX	Riverine-Lower Perennial-Unconsolidated Bottom-Permanently Flooded-Excavated	3	3.1900
R2USA	Riverine-Lower Perennial-Unconsolidated Shore-temporarily Flooded	16	1.5981

Future Without-Project Conditions

The likely future without-project condition is anticipated to remain very similar to the present situation or degrade further. The tributary streams, which originate on relatively flat upland areas, flow through erodible loess bluffs, leading down to Peoria Lake. Further, future urbanization and continued cropping of these lands are likely to continue to maintain high volumes of sediment delivery and degradation of riparian habitat. It is anticipated that in areas where the bluffs and uplands are being developed, the rate of sediment delivery could increase rapidly.

Native wetlands will continue to remain as a small portion of the watershed land area and will likely degrade as high sedimentation fills these areas or makes them unsuitable for beneficial aquatic plants. As no native prairie exists within the watershed, with the exception of a few roadside plantings by the Department of Transportation, the expected future condition will continue to be little to no habitat of this type.

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, the largest bottomland lake in the valley, reflects changes similar to other lakes. Of the 60 backwater lakes along the Illinois River, the Illinois State Water Survey estimates that average volumetric loss of all lakes since 1903 is 70%, with several approaching 100% loss. This loss of aquatic habitat due to sedimentation is viewed as the greatest threat to the Illinois River. This conclusion was reached as a result of the statewide planning process that culminated in the Integrated Management Plan. Since 1903, the volume of Peoria Lake below elevation 440 feet MSL has decreased by approximately 61%. Elevation 440 is considered “flat pool” for the Peoria Lake. The elevation is a function of the height of Peoria Lock and Dam. Areas outside of the navigation channel have experienced more rapid sedimentation. In many areas, deeper, off-channel habitats have decreased from 8 feet to 1-2 feet. The lake formerly provided a great variety of high quality habitat types and great depth diversity, including large areas of deep and shallow water habitat and numerous islands. 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. Today, the lake is best characterized as a 9-foot navigation channel running through a relatively uniform shallow lake.

Peoria Lake is subject to high rates of sediment delivery from its 10 direct tributaries. These tributaries, which only represent 3% of the Illinois River drainage at Peoria, are estimated to deliver 40% or more of the sediment being deposited in the lake. 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 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 like 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 2-6 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. Further, impaired water quality due to sedimentation has resulted in Farm Creek being placed on the EPA 303(d) list of impaired waters. Reduced sediment delivery to Farm Creek from its tributaries will improve water quality in the stream, upstream of Farmdale Dam.

- **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.

- **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.

TABLE 2-6. Potential Measures to Address Study Goals and Objectives

Goals	Objectives	Measures
Create aquatic habitat	Restore depth diversity	Areas with water depth of >8 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

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 project life, it is not feasible to over dredge to allow for a 50-year project life. To over dredge sufficiently for a 50-year project life would require excavation of lake bottom parent material. Finally, to have a 50-year project life 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 which 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, 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, that restoration alternatives would focus on Peoria Lake.

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. 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 comparable costs between adjacent upland placement and island creation and greater habitat benefits of island construction, 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 (4-5 feet), some level of over dredging is necessary (10-11 feet) to maintain the project through the 25-year project life. The amount is the

anticipated annual sedimentation rate (1.5 inches per year) plus the desired depth for habitat.

- **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 2-5 through 2-8 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 following a Value Engineering Study that recommended several adjustments 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 148 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 project life 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 sponsor will be responsible for operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) costs during that period. At the end of 25 years, the project is estimated to begin having diminished benefits as sedimentation begins to reduce depths below 6 feet.

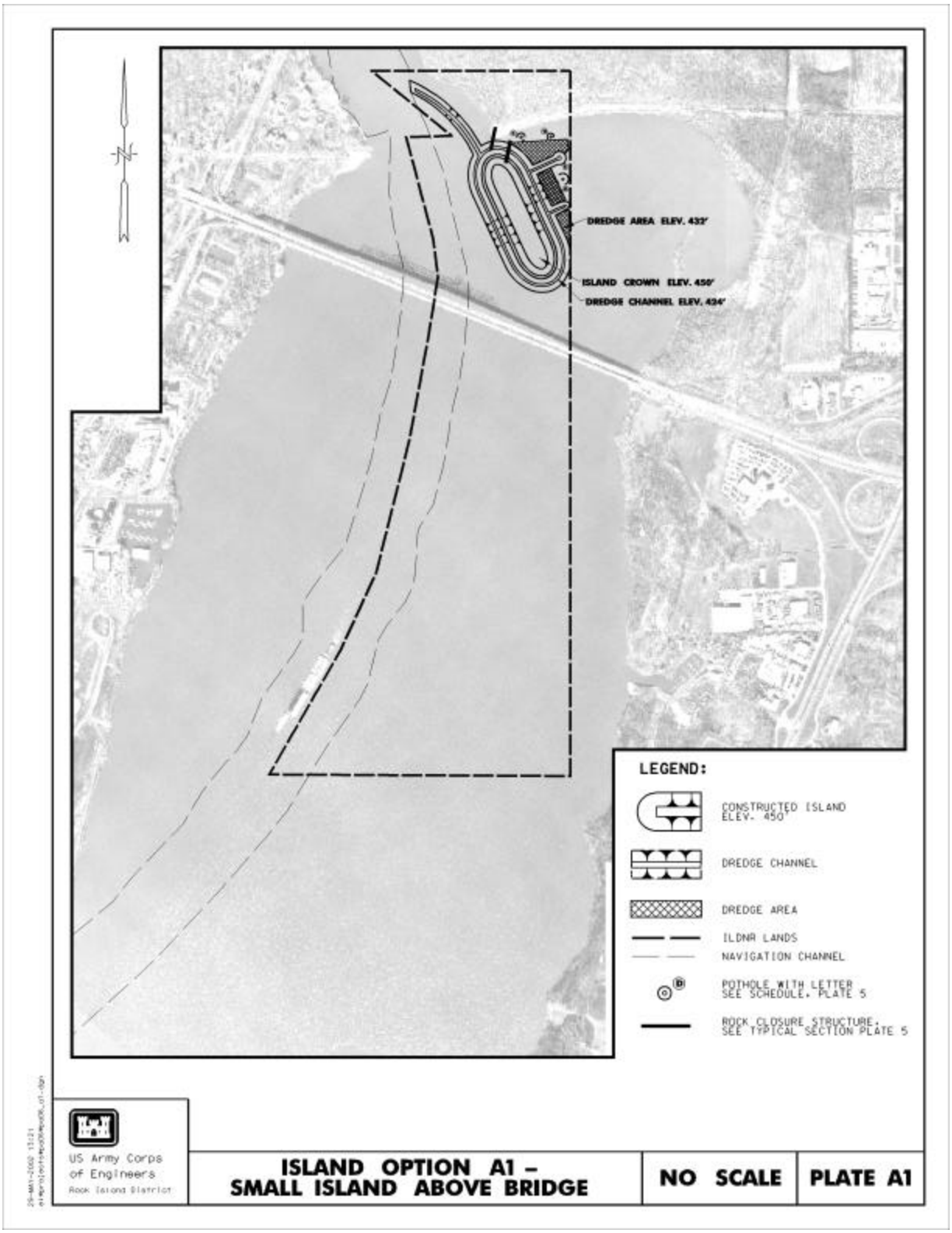


FIGURE 2-5. Alternative A1 - Dredging to create aquatic habitat and a small island

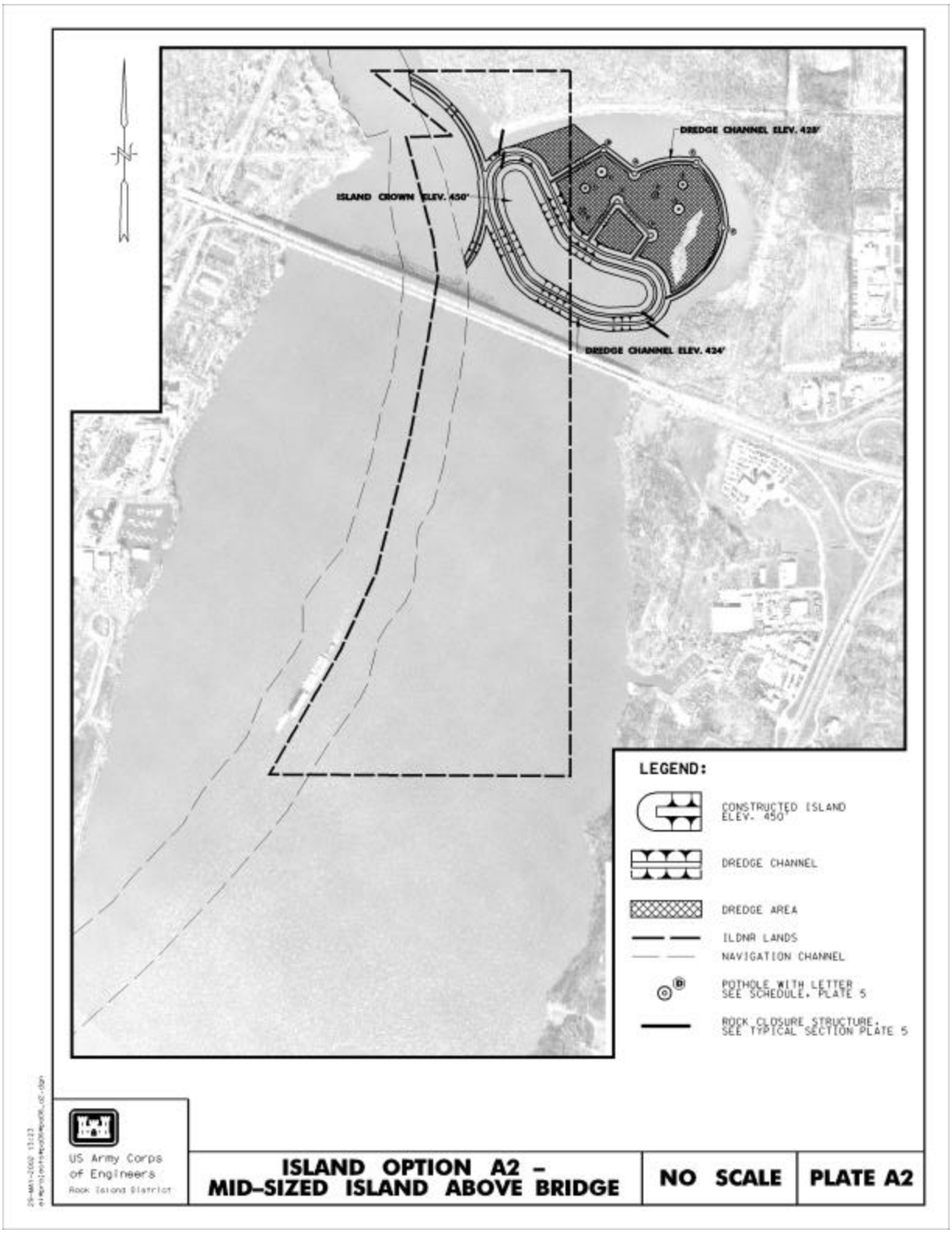


FIGURE 2-6. Alternative A2 - Dredging to create aquatic habitat and a mid-sized island

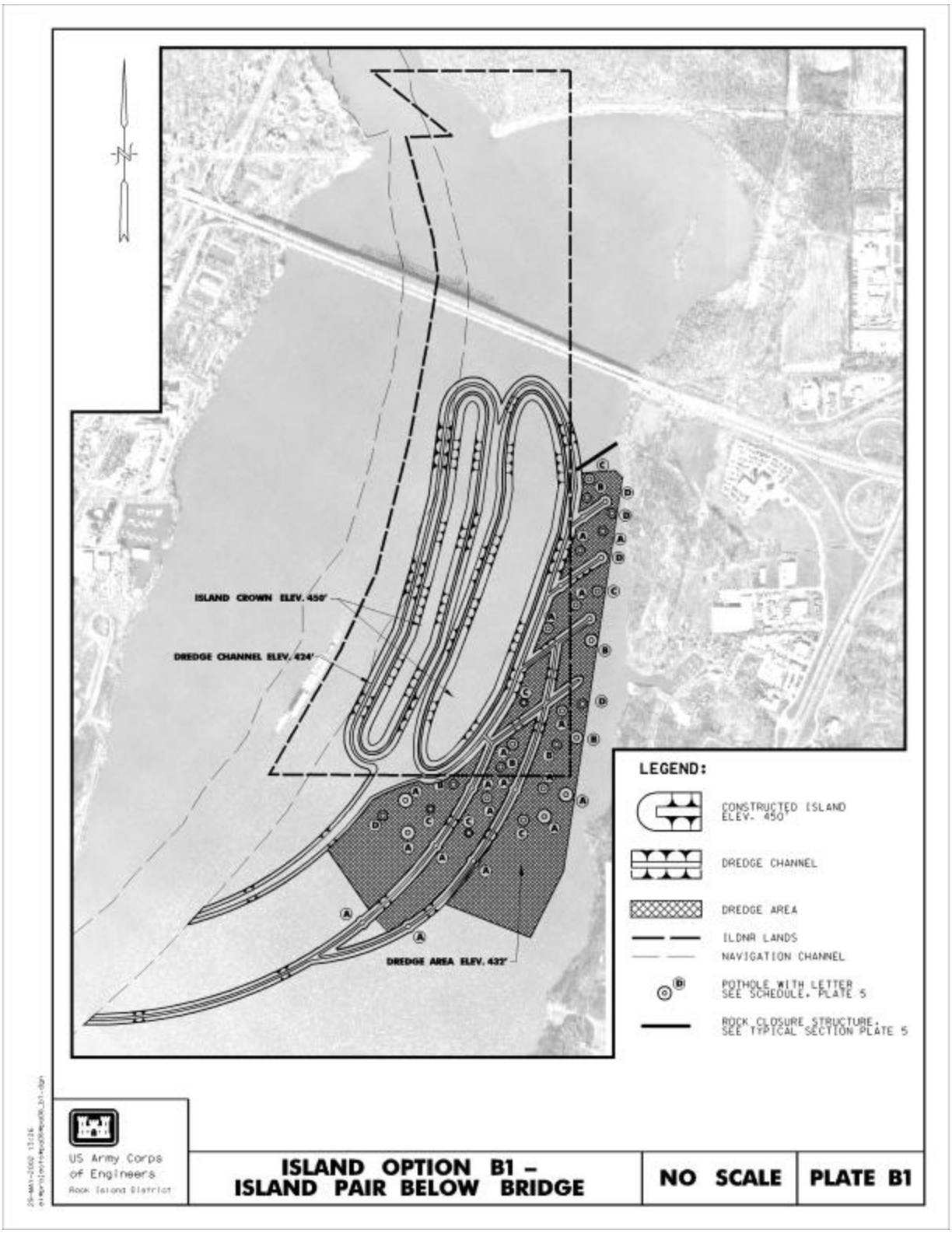


FIGURE 2-7. Alternative B1 - Dredging to create aquatic habitat and two islands with a flowing side channel

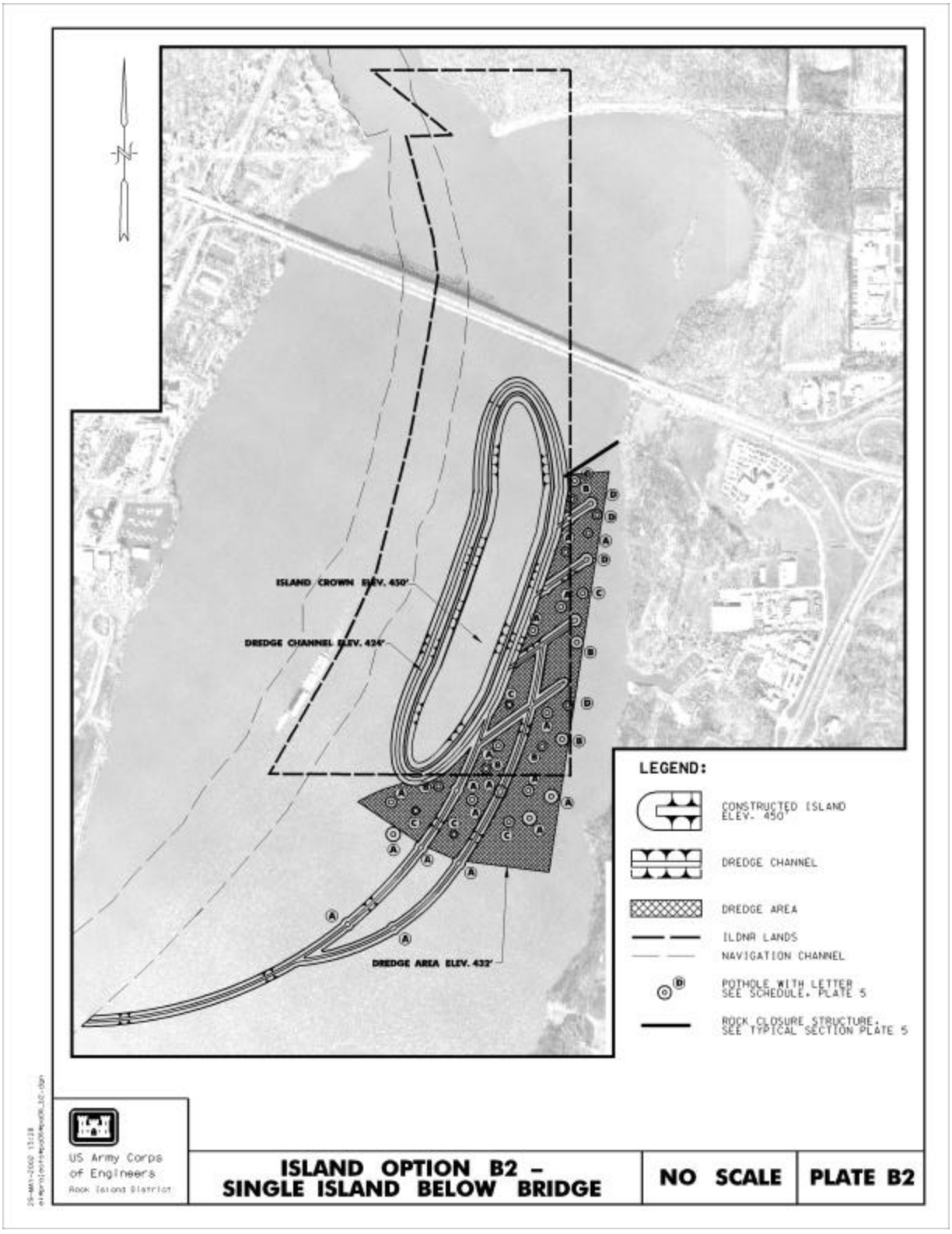


FIGURE 2-8. Alternative B2 - Dredging to create aquatic habitat and a large island

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 6-3/8% annual interest rate to the construction costs over the 25-year life of the project. 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-1 of this report.

The outputs, costs, and average cost per AAHU are presented in Table 2-7 on page 2-43 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 sedgedominant 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). Also, 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.

Also, 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 over-wintering 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 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 project life. 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 2-7 summarizes the outputs and costs associated with each proposed measure.

TABLE 2-7. Environmental Output and Costs of Each Measure

Proposed Measures	Symbol	Output*	First Cost Const.**	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	$170,300
Mid-Sized Island (21-acre island, 55 acres increased depth diversity)	A2	134.8	$3,750,000	$303,900
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	$806,800
Large Island (46-acre island, 99 acres increased depth diversity)	B2	341.1	$6,252,000	$506,700

* Outputs are calculated as Average Annual Habitat Units (AAHUs).
** Represents initial construction costs for dredging islands only, but does not include rock structures, etc.
*** Annualized cost is initial construction cost based on a 25-year project life, 6-3/8% 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 2-8 summarizes the outputs and costs associated with the nine alternative plans.

TABLE 2-8. Peoria Lake Alternative Evaluation

No.	Peoria Lake Alternatives	Symbol	Output (AAHUs) *	First Cost Const. **	Annualized Cost ***	Annualized Cost/AAHU
1	No Action	A0+B0	0.0	$0	$0	$0
2	Small Upper Island – No Lower Island	A1+B0	40	$2,102,000	$170,300	$4,260
3	Mid-Sized Upper Island – No Lower Island	A2+B0	135	$3,750,000	$303,900	$2,250
4	No Upper Island – Large Lower Island	A0+B2	341	$6,252,000	$506,700	$1,485
5	Small Upper Island – Large Lower Island	A1+B2	381	$8,354,000	$676,700	$1,775
6	Mid-Sized Upper Island – Large Lower Island	A2+B2	476	$10,003,000	$810,600	$1,705
7	No Upper Island – Two Lower Islands with Side Channel	A0+B1	665	$9,957,000	$806,800	$1,215
8	Small Upper Island – Two Lower Islands with Side Channel	A1+B1	705	$12,059,000	$976,900	$1,385
9	Mid-Sized Upper Island – Two Lower Islands with Side Channel	A2+B1	800	$13,707,000	$1,110,700	$1,390

* Outputs are calculated as Average Annual Habitat Units (AAHUs).
** Represents initial construction costs for dredging and islands only, but does not include rock structures, etc.
*** Annualized cost is initial construction cost based on a 25-year project life, 6-3/8% 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, $1,215 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, $2,250 per AAHU. Alternative 9 (Mid-Sized Upper Island - Two Lower Islands), the most extensive plan, has an annual cost of $1,390 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 $1,215 per AAHU (Table 2-9). Alternative 9 provides an additional 135 AAHUs at an incremental cost of $2,250 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 2-9. 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	806,000	665	$1,215	$806,800	665	$1,215
9	Mid-Sized Upper Island – Two Lower Islands with Side Channel	A2+B1	1,110,700	800	$1,390	$303,900	135	$2,250

* Annualized cost is initial construction cost based on a 25-year project life, 6-3/8% 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.

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 Micro Model (see Appendix D-2) used for this study compared 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 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

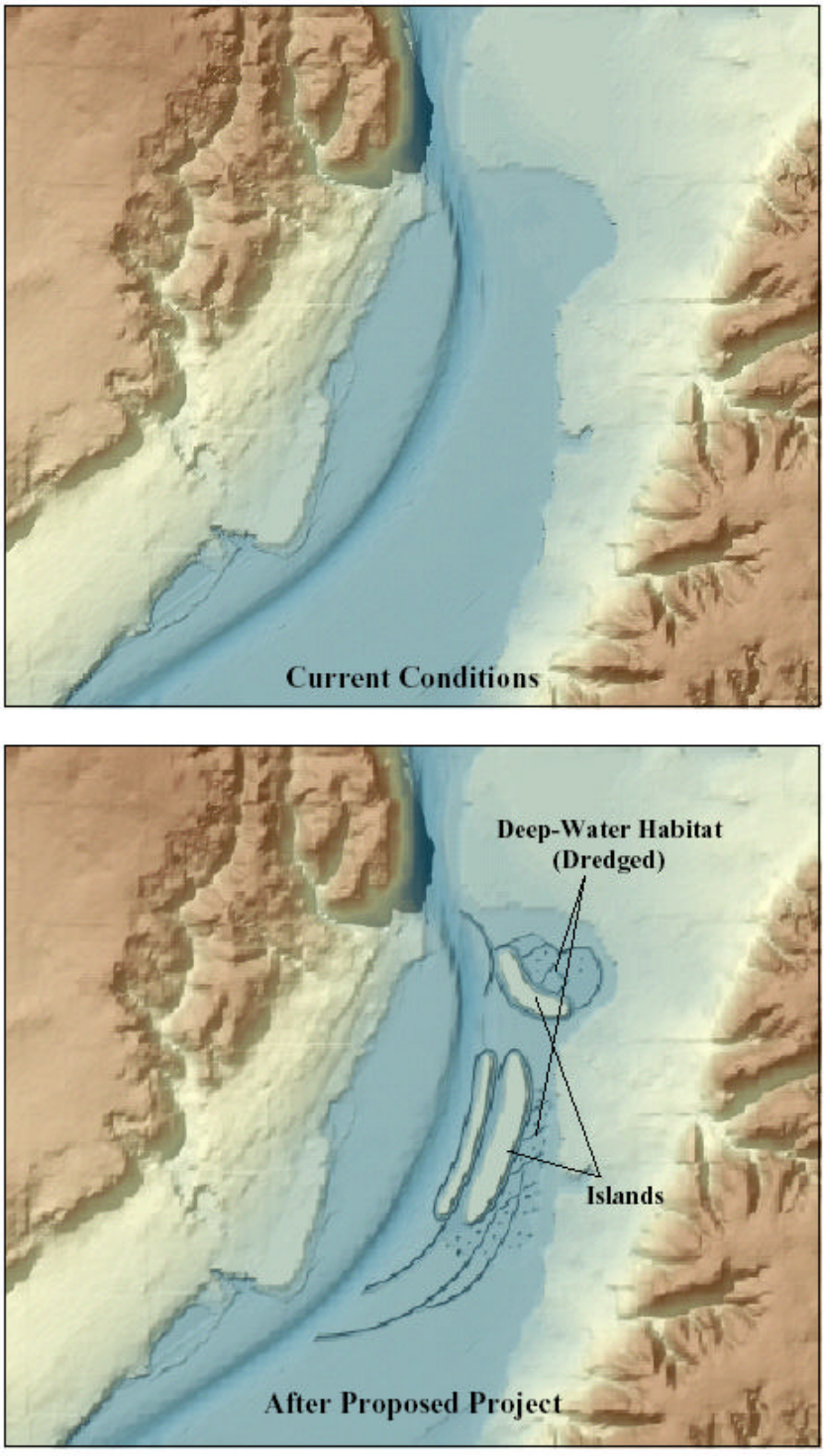
The interagency team recommends Alternative 9 (Mid-Sized Upper Island - Two Lower Islands with Side Channel) in consideration of the cost effectiveness/incremental cost analysis, significance of the habitat, comments received during public reviews, etc. (Figure 2-9). Appendix G-1 contains additional 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 $15,181,192. These costs are higher that those shown in the preceding tables, since once this option was selected additional design 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 2-9.

Lower Peoria Lake
Present and with Proposed Project



IDENTIFY MEASURES AND FORMULATE ALTERNATIVE PLANS FOR FARM CREEK

A number of sites within the Farm Creek Watershed were considered for detailed investigations (Ackerman Creek, Farmdale Reservoir, and City of Washington). These sites had existing interest in restoration, willing landowners, ease of obtaining land ownership, etc. After some investigation, a headcut on Ackerman Creek, which is located at a sewer crossing, was recommended to be pursued as a Section 14 (Emergency Streambank/Bankline Protection) project. Potential restoration at Farmdale Reservoir involved discussion with the ILDNR of possibly outgranting the site management, transferring ownership and operation, and alternatives possibly requiring restudy of the original project. It was decided, based on the scope of these alternatives, that further study, if desired, could be pursued as a separate study by the ILDNR. As a result of these decisions, efforts of this study were focused on restoration of sites upstream of the City of Washington.

The Farm Creek Watershed has a drainage area of 60.95 square miles (39,007 acres). Farm Creek flows through the City of Washington and has a drainage area of 26.5 miles at Farmdale Reservoir. Due to concerns over flooding, the City of Washington has purchased three tracts of land along Farm Creek just east of the city for potential wetland restoration and stormwater storage. The sites evaluated for potential restoration included a 19-acre site and a 67-acre site along Farm Creek, and a 109-acre site where two unnamed tributaries approach Farm Creek. The general locations of these sites are presented on plate 15. Based on initial evaluations, the 19-acre site was eliminated due to its small size and limited slope. The 67-acre site was investigated for potential wetland creation through the construction of a weir or dam. After reviewing initial proposals, the City of Washington determined that they did not want to seek wetland creation at this time and instead would keep the site available for other future development. After screening the other two sites, study efforts focused on the 109-acre site.

FORMULATION CRITERIA

Prior to developing specific alternatives, the study team developed the following formulation criteria:

- Ability to create aquatic habitat (maximize area with 1- to 2-foot depth for wetland benefits)
- Address sediment contribution/instability
- Proximity/relationship to any project in Peoria Lake
- No/limited impact on flooding along tributary
- Willing landowners/potential for partnerships

POTENTIAL PROJECT MEASURES FOR FARM CREEK

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

- Wetland Impoundments: Consideration was given to constructing wetland detention ponds. The site is suitable for either 1 or 2 wetland ponds. The measures would be designed to maximize the water surface area with a depth of 18 inches. In addition, Pool 1 was designed to contain a 50-year rainfall within elevation 748 feet MSL.

- Wetland Plantings: In combination with watershed wetland impoundments, planting shoreline and terrestrial vegetation would help to increase habitat values in the initial years. Planting of native species after project construction would decrease the time required and increase the likelihood for these or similar desirable species to establish through natural succession while reducing the number of undesirable invasive species. A variety of species for wetland plantings can be used, including sedges, prairie cord grass, black willow and button bush viburnum, dogwood, and bull rush.

- Prairie Plantings: This site is currently in row crop agriculture; converting some or all of the site to prairie would provide habitat value to many wetland and grassland species. The selected prairie seed mixture is a combination of grasses and forbs resembling a native Illinois ecotype.

DESCRIPTION OF ALTERNATIVES

The following measures met the goals and objectives of this project. These measures were combined to make various alternative plans composed of combinations of the measures. As part of the formulation process, it was determined that no wetland or prairie plantings would be undertaken in the absence of some wetland restoration work. Figures 2-10 and 2-11 show the plan form view of both proposed wetland impoundments.

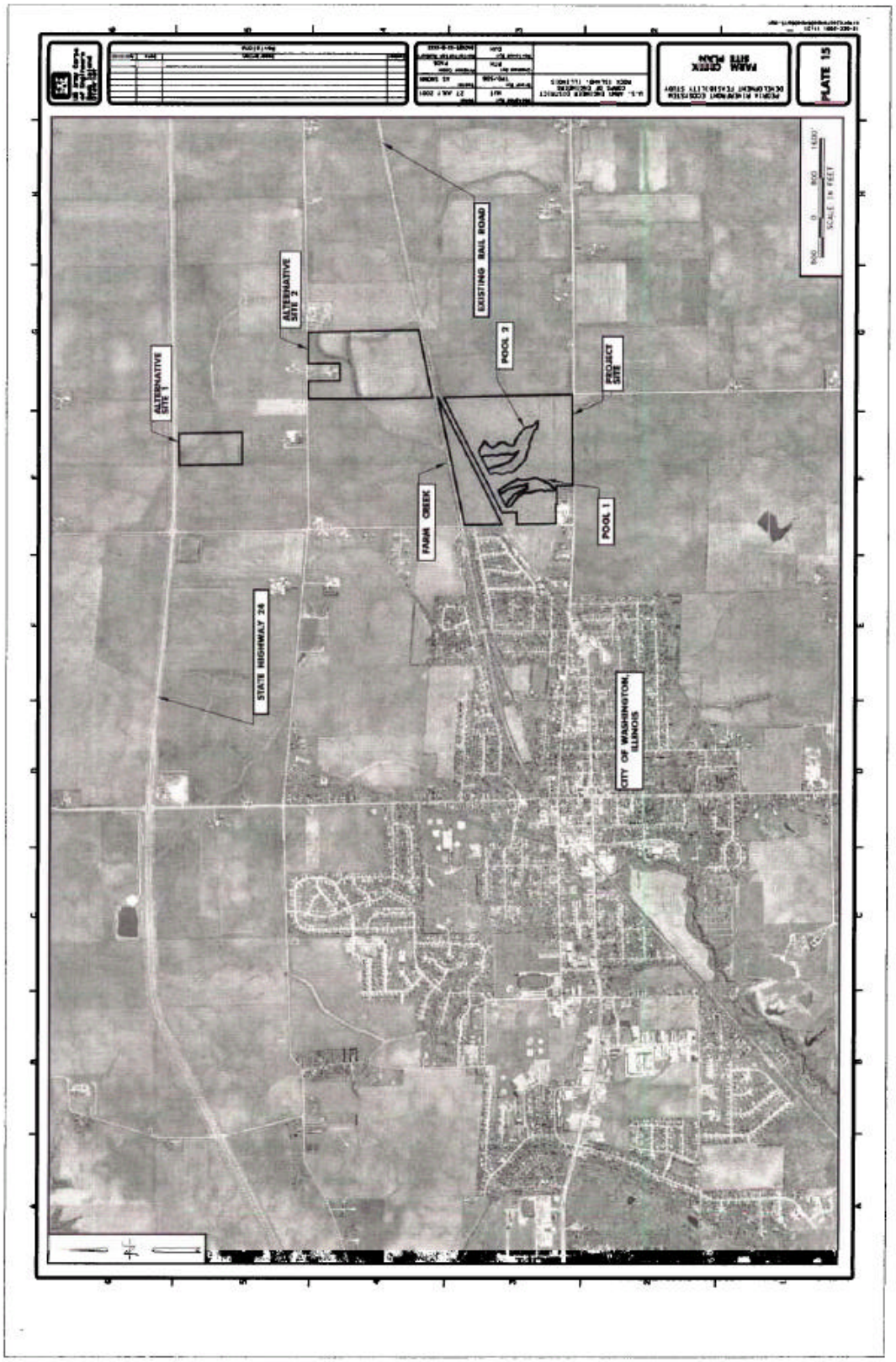


FIGURE 2-10. Farm Creek Site Plan

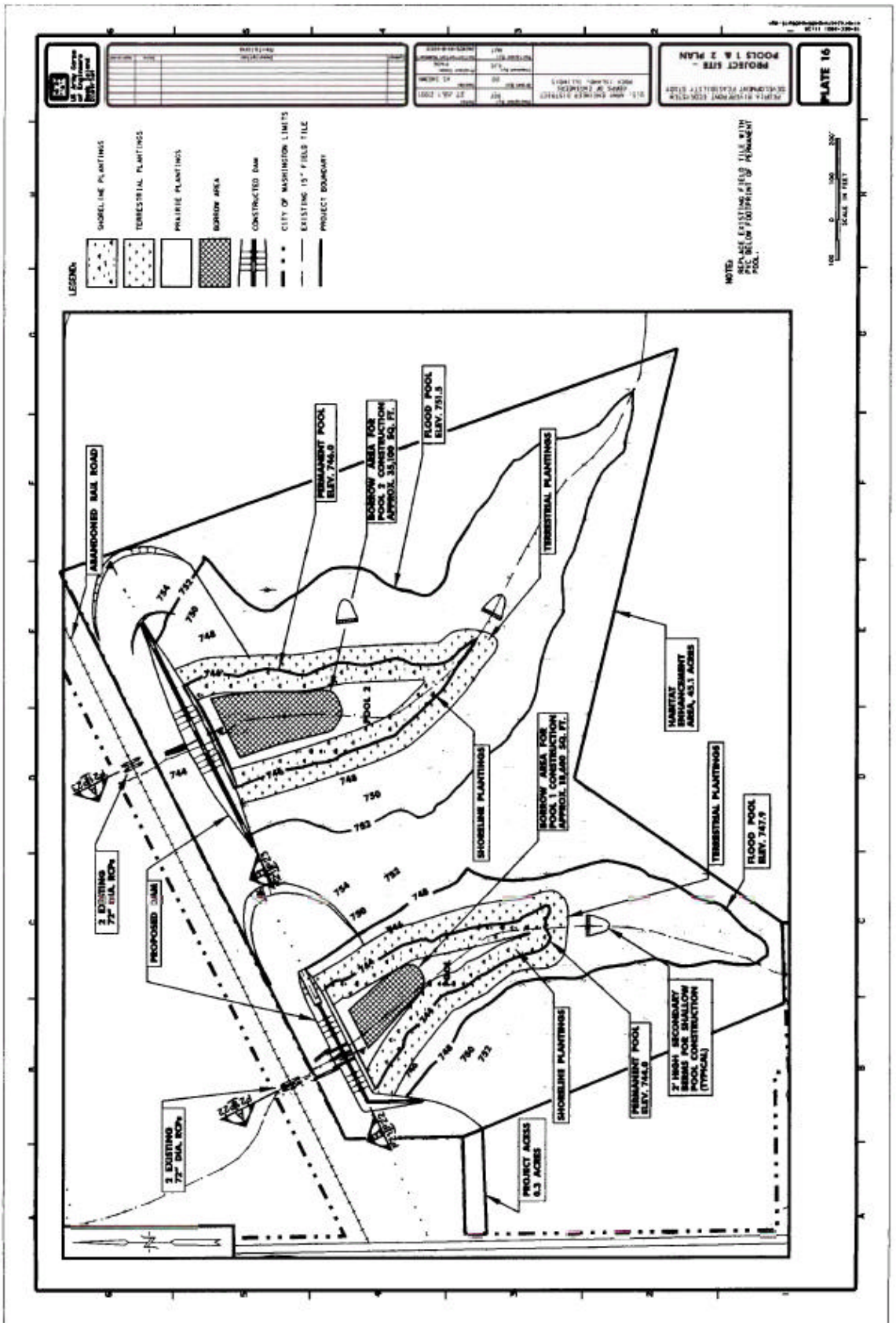


FIGURE 2-11. Project Site – Pools 1 and 2 Plan

1. No Action.

2. Wetland Impoundments:
    a. 4-Acre Wetland Impoundments – Construct earthen dam at elevation 754 feet MSL creating a wetland pond with a surface area of approximately 4 acres at elevation 746 feet MSL.
    b. 4-Acre and 3-Acre Wetland Impoundments – Construct earthen dam at elevation 754 feet MSL creating a wetland pond with a surface area of approximately 4 acres at elevation 746 feet MSL, construction of earthen dam at elevation 750 feet MSL creating a wetland pond with a surface area of approximately 3 acres at elevation 744 feet MSL.

3. Wetland Plantings:
    a. Planting 2 rows of vegetation within and around pond perimeter(s).
    b. Planting 6 rows of vegetation within and around pond perimeter(s).

4. Prairie Plantings:
    a. Prairie plantings on 20 acres adjacent to wetland perimeter.
    b. Prairie plantings on 35 acres.

During initial development of prairie planting alternatives, 35- and 100-acre measures were developed. These measures were subject to incremental and cost effectiveness analysis detailed below. However, after completion of the analysis, further consultation with the City of Washington indicated that they were no longer interested in prairie plantings on all 100 acres of the project site. Further, as a result of ITR comments, a review of the real estate cost estimates revealed that real estate costs were not included in the first construction costs used in the incremental cost/cost effectiveness analysis. This analysis was redone and detailed below. However, it indicated that the 35-acre prairie measure combined with either of the wetland impoundments individually would result in greater real estate credits to the sponsor than construction costs. Therefore, a 20-acre prairie planting measure was inserted into the single wetland impoundment options. This is more appropriate in the physical and real estate costs scale of the single impoundments.

EVALUATE AND COMPARE PLANS FOR FARM CREEK

This section describes the alternatives and process needed to determine the potential cost, habitat benefits, incremental cost/cost effectiveness, significance, hydrologic/sustainability, and public acceptability. Due to uncertainties regarding the long-term sustainability of the projects in a naturally aggrading river reach, a 25-year project life was used for the analysis of habitat benefits.

INCREMENTAL COST/COST EFFECTIVENESS ANALYSIS PROCESS

The same process described for the Peoria Lake alternatives was utilized for the watershed component. Further information on the analysis can be found in Appendix G of this report.

For tributary wetland impoundments, the outputs, costs, and average cost per AAHU are presented in Table 2-10 on page 2-56. The incremental analysis for tributary wetland impoundments evaluated Alternatives E0 to E6, F0 to F2, and various combinations.

HABITAT EVALUATION

A habitat analysis was conducted to evaluate potential benefits of habitat improvement features for the Farm Creek site portion of the Peoria Riverfront Development (Ecosystem Restoration) Study. Biologists from the Rock Island District of the U.S. Army Corps of Engineers (Corps) used a modified form of the Habitat Evaluation Procedure (HEP) program called EXHEP (EXpert Habitat Evaluation Procedures). For a more detailed explanation of the HEP evaluation process and its general application, refer to Appendix G-1 of this document.

The U.S. Army Engineer Research and Development Center, Environmental Laboratory (EL), developed the EXHEP software. It is a field evaluation procedure designed to estimate habitat quality and account for changes due to land management practices. The EXHEP program takes a rather specific approach and evaluates target species that are selected to be representative of habitat quality. This software integrates the formal scientific literature supporting the application of each HSI (Habitat Suitability Index) model, with the final reports generated by the EXHEP software. EXHEP also evaluated a broad range of target years for each species within a specified habitat type. By doing this, it is able to show habitat benefit gains and losses throughout the life of a project.

EXHEP is a species-driven evaluation process that involves mathematical associations between environmental cover types and the individual variables that compose each of those cover types. During the evaluation process, each variable of a cover type was calculated on a 0.1 to 1.0 index. This evaluation was done using suitability graphs created by the U.S. Fish and Wildlife Service (USFWS) for the Habitat Suitability Index Models Series. This series was researched and created by the USFWS to provide habitat information useful for impact assessment and habitat management. The variable suitability outcomes were then inserted into a Habitat Suitability Equation (also taken from the USFWS Habitat Suitability Series). The Habitat Suitability Equation is an evaluation that combines all Life Requisites of the specified wildlife and designates it a suitability index number. This final suitability number was then used to calculate final with- and without-project Average Annual Habitat Units (AAHUs). For a more detailed description of this habitat analysis, refer to Appendix G-2 of this report.

Several habitat types represented by species-driven HSI models were evaluated in this document. Although a particular species is used, each species represents required habitat for many 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 development of specific habitat types proposed by the project.

The use of this information is required to derive quantitative relationships between key environmental variables and habitat suitability within the immediate study area (i.e., within the Farm Creek Watershed). This provides the foundation for the HEP application of six species-based Habitat Suitability Index (HSI) models.

The marsh wren (*Cistothorus palustri*) is an abundant breeding bird species of freshwater and saltwater marshes and requires emergent vegetation with shallow standing water. The mink (*Mustela vison*) is a predatory, semi-aquatic mammal that is generally associated with streams, riverbanks, and freshwater marshes. The wood duck (*Aix sponsa*) is a waterfowl found around wetland areas with open water and nests in tree cavities or nest boxes. The chorus frog (*Pseudacris triseriata*) prefers grassy areas from dry to marsh to agricultural; also suburbs where pollution and pesticides are not a problem; as well as woodlands and river wetlands. The eastern meadowlark (*Sturnella magna*) is an omnivorous ground feeding bird that nests in open fields. The field sparrow (*Spizella pusilla*) prefers old fields with scattered woody vegetation.

Certain assumptions were made regarding the project site. The proposed site is currently farmed field and therefore has a high likelihood of residual pesticides and herbicides. Some maintenance of the project area would be required. If the City had not purchased the land, it would continue to be farmed and habitat value would be maintained at its current level.

To assess change over the period of analysis, target years have been defined. At each target year, change in habitat variables may be noticed. Noticeable changes can be characterized by a change in habitat benefit output. Imbedded in each cover type evaluation, change has been added to the model. For project planning and impact analysis, project life was established at 30 years. To facilitate comparison, target years were established at 0 (existing conditions), 1 year after, 5 years after, 10 years after, and 30 years after project construction.

The quantitative component of the EXHEP analysis is the measure of the acres of habitat that are available for the selected species. From the qualitative and quantitative determinations, the standard unit of measure, the Habitat Unit (HU), was calculated using the formula (HSI x Acres = HUs). Changes in the quality and/or quantity of HUs occur as a habitat matures naturally or is influenced by development. These changes influence the cumulative HUs derived over the life of the project. HSIs and AAHUs for each evaluation species were calculated to reflect expected habitat conditions over the life of the project. Then, cumulative HUs were annualized and averaged. This determined what is known as Average Annual Habitat Units (AAHUs). AAHUs were used as an output measurement to compare all the features and project as a whole.

The options considered were one or two ponds constructed with various shoreline and prairie plantings schemes proposed and evaluated. The proposed selected alternative would create 2 ponds—one of 4 acres and another of 3 acres. The perimeter of each pond would be planted with 6 rows of vegetation—3 rows of aquatic vegetation and 3 rows of terrestrial vegetation. An additional 35 acres of the farm field would be planted with native prairie plants to develop a total project area of roughly 45 acres.

The project would provide wetland features that include open water, seasonally wet areas, emergent vegetation, scrub/shrub woody vegetation, and open meadow/prairie. The evaluation showed AAHU values for the selected species to be: Chorus Frog 1.4, Eastern Meadowlark 37.5, Field Sparrow 49.1, Marsh Wren 0.6, Mink 2.3, and Wood Duck 0.9. The overall outputs for the models selected show that the project area would provide a total of approximately 92 AAHUs.

For a more detailed description of the habitat analysis, refer to Appendix G-2 of this report.

COST ESTIMATES FOR HABITAT IMPROVEMENT MEASURES

In order to conduct the cost effectiveness and incremental cost analysis of the various alternatives, rough cost estimates were developed. These cost estimates were only done for the first cost of construction. It was originally thought that additional factors such as operation and maintenance and real estate costs would be very comparable for the various alternatives and, as a result, were not necessary to include for the evaluation in the initial analysis. This assumption was incorrect and resulted in a reanalysis that included real estate costs in the first construction cost portion of the analysis. Table 2-10 summarizes the outputs and costs associated with each proposed alternative.

TABLE 2-10. Farm Creek Environmental Output and Costs of Each Measure

Potential Measure	Symbol	Output AAHUs*	Cost**	Annualized Cost***
Watershed Wetland Restoration	**E**			
No Action	E0	0	$0	$0
4-Acre Wetland Pond (no shoreline or terrestrial plantings)	E1	1	$295,000	$23,900
4-Acre Wetland Pond (1 row each shoreline and terrestrial plantings)	E2	3	$306,000	$24,800
4-Acre Wetland Pond (3 rows each shoreline and terrestrial plantings)	E3	5	$328,000	$26,600
4-Acre and 3-Acre Wetland Ponds (no shoreline or terrestrial plantings)	E4	2	$528,000	$42,800
4-Acre and 3-Acre Wetland Ponds (1 row each shoreline and terrestrial plantings)	E5	6	$549,000	$44,500
4-Acre and 3-Acre Wetland Ponds (3 rows each shoreline and terrestrial plantings)	E6	10	$623,000	$50,500
Prairie Plantings	**F**			
No Action Prairie	F0	0	$0	$0
20 Acres Prairie Plantings	F1	32	$29,000	$2,400
35 Acres Prairie Plantings	F2	56	$51,000	$4,100

* Outputs are calculated as Average Annual Habitat Units (AAHUs).
** Represents initial construction costs only.
*** Annualized cost is initial construction cost based on a 25-year project life, 6-3/8% interest rate.

SUMMARY OF ALTERNATIVE PLANS

In total, there are 13 possible alternative plans, developed from all the possible combinations of wetland and planting alternatives. Originally, 19 alternative plans were analyzed. However, when the City of Washington reconsidered plans placing 100 acres into prairies, these alternative plans were eliminated from consideration. The number of alternatives was reduced by the fact that wetland and prairie plantings are not stand-alone features, but would only be accomplished as riparian improvements associated with a wetland impoundments option. The number was also constrained by the fact that on initial development it was realized that the 3-acre wetland pond was more costly and would produce fewer or comparable habitat benefits than the 4-acre wetland pond and as such only needed to be considered as an increment of restoration beyond the 4-acre wetland pond. Table 2-11 summarizes the outputs and costs associated with all combinations of the proposed alternatives.

TABLE 2-11. Farm Creek Alternative Evaluation

No.	Alternatives	Symbol	Output (AAHUs)*	First Cost Const. **	Annualized Cost ***	Annualized Cost/AAHUs
1	No Action	E0+F0				
2	4-Acre Wetland Pond + no prairie plantings	E1+F0	1	$295,000	$23,900	$23,900
3	4-Acre and 3-Acre Wetland Ponds + no prairie plantings	E4+F0	2	$528,000	$42,800	$21,400
4	4-Acre Wetland Pond (1 row each shoreline and terrestrial plantings) + no prairie plantings	E2+F0	3	$306,000	$24,800	$8,265
5	4-Acre Wetland Pond (3 rows each shoreline and terrestrial plantings) + no prairie plantings	E3+F0	5	$328,000	$26,600	$5,315
6	4-Acre and 3-Acre Wetland Ponds (1 row each shoreline and terrestrial plantings) + no prairie plantings	E5+F0	6	$549,000	$44,500	$7,415
7	4-Acre and 3-Acre Wetland Ponds (3 rows each shoreline and terrestrial plantings) + no prairie plantings	E6+F0	10	$623,000	$50,500	$5,050
8	4-Acre Wetland Pond + 20 acres prairie plantings	E1+F1	33	$324,000	$26,300	$795
9	4-Acre Wetland Pond (1 row each shoreline and terrestrial plantings) + 20 acres prairie plantings	E2+F1	35	$335,000	$27,100	$775
10	4-Acre Wetland Pond (3 rows each shoreline and terrestrial plantings) + 20 acres prairie plantings	E3+F1	37	$357,000	$28,900	$780
11	4-Acre and 3-Acre Wetland Ponds + 35 acres prairie plantings	E4+F2	58	$579,000	$46,900	$810
12	4-Acre and 3-Acre Wetland Ponds (1 row each shoreline and terrestrial plantings) + 35 acres prairie plantings	E5+F2	62	$600,000	$48,600	$785
13	4-Acre and 3-Acre Wetland Ponds (3 rows each shoreline and terrestrial plantings) + 35 acres prairie plantings	E6+F2	66	$674,000	54,600	$830

* Outputs are calculated as Average Annual Habitat Units (AAHUs).

** Represents initial construction costs and real estate costs.
*** Annualized cost is initial construction cost based on a 25-year project life, 6-3/8% 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.

Three plans were considered best buy plans—Alternatives F9, F12, and F13. In addition, Alternatives F7, F8, and F10 were considered to be cost effective The best buy plans provide the greatest increase in benefits for the least increase in costs. In a general sense, this conveys the fact that for the aquatic areas, the 4-acre wetland creates habitat at a lower incremental cost than the 3-acre wetland. Increasing wetland plantings provides additional habitat benefits, but at a higher incremental cost. For the prairie planting areas, the larger the area planted the better, since the cost is relatively low compared to the increase in benefits. Incremental costs are detailed below in Table 2-12.

The study team, in coordination with the local sponsor(s), selected Alternative 13 as the Recommended Plan. First, it provides the greatest habitat benefits of the best buy plans. Second, it satisfies the local sponsor's desire to minimize impacts to flooding. Third, the additional increments of wetland plantings will further filter out sediments before they reach Farm Creek. Fourth, sediment delivery to an impaired stream will be reduced, thereby improving water quality. Fifth, the achievement of the above goals is consistent with the locally developed watershed plan and is supported by a variety of stakeholders outside the City of Washington and ILDNR. Sixth, and finally, the Recommended Plan is consistent with the goals and objectives of this study effort.

TABLE 2-12. Incremental Cost Analysis of Alternate Best Buy Plans for Farm Creek

No.	Alternatives	Symbol	Output AAHUs*	Annual Cost **	Avg. Annual Cost/AAHU	Inc. Cost **	Inc. Output*	Inc. $/ AAHU
1	No Action	F0	0	0.0	0	0	0	0
9	4-Acre Wetland Pond (1row each shoreline and terrestrial plantings) + 20 acres prairie plantings	F8	35	$27,100	$775	$27,100	35	$775
12	4-Acre and 3-acre Wetland Ponds (1 rows each shoreline and terrestrial plantings) + 35 acres prairie plantings	F11	62	$48,600	$785	$21,500	27	$796
13	4-Acre and 3-Acre Wetland Ponds (3 rows each shoreline and terrestrial plantings) + 35 acres prairie plantings	F12	66	$54,600	$830	$6,000	4	$1,500

* Outputs are calculated as Average Annual Habitat Units (AAHUs).
** Annualized cost is initial construction cost based on a 25-year project life, 6-3/8% interest rate.

OTHER FACTORS

In addition to the incremental cost/cost effectiveness analysis results, the study team also considered additional factors in selecting an environmental plan. These factors include significance, hydrology and hydraulics, public acceptability, HTRW, recreation, flood reduction, and real estate, as summarized below.

Significance

Statewide, Illinois has lost approximately 99% of the original tall grass prairie and over 85% of pre-settlement wetlands (Noss, LaRoe and Scott 1995). Based on the National Wetlands Inventory, wetlands currently comprise only 880 acres or 2.2% of the land area within the Farm Creek Watershed (Tri-County Regional Planning Commission 2000). As a landcover type, grasslands currently comprise 12% of the watershed, but little, if any, would be characterized as prairie. 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.

Hydrology and Hydraulics

Each alternative consists of one or two dams designed using the NRCS program SITES with the NRH-386 criteria. Since the dams are upstream of a main line railroad track and the City of Washington, the auxiliary, or emergency, spillway was designed to safely pass one-half the probable maximum flow. Other design considerations were to contain the 24-hour, 50-year storm event on city property and keep the 24-hour, 100-year storm within 1 foot vertical on the adjoining private property. The rainfall volumes used for design were 6.2 inches for the 24-hour, 50-year event and 7.0 inches for the 24-hour, 100-year event. Using these volumes, the permanent pool elevations were determined to be 744 feet MSL for Pool 1 and 746 feet MSL for Pool 2.

Public Acceptability

At the public workshops, 86% of those in attendance expressed support for tributary restoration. In general, these comments supported restoration to address erosion, reduce sediment delivery, increase wildlife habitat, restore wetlands, and increase biodiversity.

Sediment Reduction

The *Soil Erosion and Sediment Delivery Survey* completed by the NRCS estimated the types and quantities of erosion occurring in the watershed. In particular, the area above Washington, including the project site, was evaluated. While the purpose of the study was to determine how much sediment is reaching the Illinois River at Peoria Lake, the area above Washington is effectively characterized in terms of how much sediment enters Farm Creek and is available for transport. The report concluded that the vast majority of sediments entering Farm Creek from this part of the watershed never reach the Illinois River due to their detention in Farmdale Reservoir. However, the Recommended Plan will trap sediments from the project site and 951 acres of watershed above the site. In terms of sediment delivered to the Illinois River, this is an insignificant amount. However, in terms of sediment

not being delivered to Farm Creek, it is worth noting. Conservative calculations of erosion occurring in the drainage area upstream and including the project site are 2,948.1 tons on an average annual basis. This represent 13.2% of the erosion occurring upstream of the City of Washington. Of this, approximately 737.0 tons is delivered to Farm Creek and available for transport downstream. This is 7.1% of the total sediment available for transport upstream of the City of Washington. Again, these estimates are conservative and are based on the least erosive soil types being applied to the entire 951-acre drainage area and the lowest sediment delivery rates for this sediment.

Water quality is a serious problem in Farm Creek. The stream is currently on the EPA 303(d) list of impaired streams and scheduled for development of Total Maximum Daily Load (TMDL) requirements. The Recommended Plan has the potential to trap some of the stream sediment before it is delivered to Farm Creek and becomes an impairment to water quality.

Recreation

The project site is located on the eastern edge of the City of Washington. The Comprehensive Plan Land Use Map for the city identifies this area to remain in conservation for the 25-year planning horizon. The abandoned rail corridor that splits the parcel runs through an older section of the city. Portions of the corridor are in public ownership and targeted for development as cycling and walking trails. These trails would connect the project site to the pedestrian transportation system in the city.

Flood Reduction

The City contracted with a private engineering firm, Harding, ESE, to conduct a preliminary investigation of the flood control benefits associated with the proposed project. The investigators recalibrated a HEC-1 model previously developed for this portion of the watershed to include the proposed ecosystem restoration project as described in the Recommended Plan. The investigators note: "It is pointed out that these models were quickly prepared and have not been extensively reviewed and checked. The results should, therefore, be considered semi-qualitative. However, the models and results are believed to be adequate to indicate potential feasibility of each of the proposed impoundment projects for flood control."

Further, the investigation concluded that :

> The results indicate that the Site 3, Pool 1 project provides significant flood reduction potential with 10 to 35% reductions in peak discharges from that site. The percent and actual magnitudes of reduction are less for the 100-year flood than the 50-year event, which is not unexpected based the Corps of Engineers' design for a 50-year event.
>
> The results indicate that the Site 3, Pool 2 project provides very good flood reduction potential with 80% to 95% reductions in peak discharges from the site. The actual magnitude of the flow reductions are considerably larger than Pool 1 reductions and are approximately equal to the magnitude of the flow reduction that occurs in Farm Creek in the City of Washington.

Based on the flood elevation versus flow rate, or rating curve, from the Flood Insurance Study at Lawndale Avenue as discussed in the Detention Basin E Preliminary Design Study (QST Environmental 1998, the flood reduction is approximately 0.2 ft per 100 cfs reduction in peak flow for flows above 2,500 cfs and even larger for lower peak flows. Consequently, this information suggests that flood elevation reduction resulting from the Site 3 structures would be on the order of 1 ft, a significant amount.

Hazardous, Toxic, and Radioactive Waste (HTRW)

A Phase 1 Environmental Site Assessment (ESA) was conducted for the proposed project location near the City of Washington. The review discovered a potential HTRW issue with the western side of the proposed location. Accordingly, a Phase 2 ESA is being conducted to determine the type and extent of any contamination.

Real Estate

The City of Washington currently owns the proposed project site and is a willing landowner.

SELECT RECOMMENDED PLAN

The interagency study team, together with the City of Washington, selected Alternative 13. This alternative includes a 4-acre wetland impoundment and a 3-acre wetland impoundment, with 6 rows of wetland plantings and 35 acres of prairie plantings. This alternative was selected in consideration of the cost effectiveness/incremental cost analysis, comments received during public reviews, and significance of the habitat. Appendix G contains additional information on the results of the habitat analysis. The alternative was selected as the locally preferred plan by the sponsor, the City of Washington.

This alternative best meets the study objectives. It maximizes the creation of wetland and riparian habitat in the project area, given the constraints over land availability for project features. A potential reduction in flooding downstream of the project may be realized. This project is not anticipated to have a significant effect on sediment delivery to Peoria Lake due to its size relative to the watershed and location. However, it has the potential to reduce sediment delivery to Farm Creek, an impaired stream in terms of water quality. The implementation of additional similar projects throughout the watershed could ultimately result in reductions in overall sediment delivery to Peoria Lake.

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 66 AAHUs for a total first cost of approximately $745,000. These costs are higher that those shown in the preceding tables, since once this option was selected the implementation costs were included. These costs include planning, engineering, and design; construction management; real estate; and monitoring in addition to the construction costs. Section 3 contains more detailed discussions of the project features and estimated costs.

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. Typical Island Section

The material for the islands would be both mechanically and hydraulically dredged. The outer embankment would be mechanically 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 hydraulically dredged to an approximate elevation of 448 feet MSL.

The islands would be protected against wind, wave, and current erosion following the Corps of Engineers standard design for riprap. There would be an 18-inch-thick layer of 400-pound riprap underlain with a 6-inch layer of bedding stone protecting the island. 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 similar to Corps standard 400 pounds. Rock closing structures (for location, see plates 3 and 4) would be constructed of 400-pound riprap similar to Corps standard 400 pounds 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.

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.

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.

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.)	9000	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.)	1200	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.)	3200	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	225000	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	240000	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.)	9000	tons
Thickness	18	inches
Top Elevation	443	feet MSL
Approx. Length Protected	2,500	feet
Bedding Stone	3000	tons
Thickness	6	inches
Top Elevation	443	feet MSL
Approx. Length Protected	2500	feet
Fish Jetties		
Riprap (Corps 400 lbs.)	2200	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.)	3900	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.)	17000	tons
Thickness	18	inches
Top Elevation	443	feet MSL
Approx. Length Protected	4,700	feet
Bedding Stone	5500	tons
Thickness	18	inches
Top Elevation	443	feet MSL
Approx. Length Protected	4700	feet
Fish Jetties		
Riprap (Corps 400 lbs.)	2200	tons
Approximate Sp acing	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

The Corps of Engineers conducted micro modeling 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.

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.

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 (Corps 400 lbs.) 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 prevent erosion. Lastly, a geotextile fabric tube (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 year. The rock would be placed after the completion of island construction when required to prevent excessive erosion. It is anticipated that the island will erode some, but riprap will not be placed until the island slope has eroded to near an unstable angle. Riprapping at this point will save costs because less material will be required due to the slope difference and only those areas needing material will 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 similar to Corps 400 pounds.

Emergent Closing Structure

To minimize bedload transport into dredged areas, emergent rock closing structures would be constructed. The upper island (A2) would have closing structures 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 riprap similar to Corps 400 pounds. 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).

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. The advantages and disadvantages of the three construction methods are presented in Table 3-4. The mechanically excavated embankment method was selected because it would utilize the adjacent sediment as a borrow source rather than importing sand for embankment. This method would also use the greatest amount of sediments for island construction. 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 feet above water and were formed in 2 to 3 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. Firmer material was placed near the outside, with less firm material inside.

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. 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 will be constructed by a high solid dredging method. During the final design phase, the embankment interior construction method would be reviewed to ensure the feasibility. Since the contracting method will be best value or design build, contractors would 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 3-4. Construction Alternatives for Embankments Constructed in Water on Soft Foundations

Construction Alternative	Advantages	Disadvantages
Mechanical excavation using only adjacent soft sediments	• More cost-effective method • 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 • More use of adjacent sediments than other methods	• Potential erosion preventing vegetation establishment • Potential water quality impacts during construction
Hydraulic dredging using sand as a containment facility with subsequent soft sediment hydraulic dredging or inner island fill	• More conventional design and construction approach • Probably minor water quality issues	• More expensive method • Only a small amount of soft sediment could be pumped into the interior due to slope angle of sand • Island banks would require mechanical placement of soft sediments to promote vegetation and enhance habitat development
Hydraulic dredging using sand in a Geotube as a containment facility with subsequent soft sediment hydraulic dredging or inner island fill	• More conventional design and construction approach • Probably minor water quality issues	• More expensive method • Only a small amount of soft sediment could be pumped into the interior • Island banks would require mechanical placement of soft sediments to promote vegetation and enhance habitat development

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.

TABLE 3-5. Construction Alternatives to Fill Embankments

Construction Alternative	Advantages	Disadvantages
Conventional hydraulic excavation using nearby soft lake bottom sediments	• Maximize sediment removed • More cost-effective method • More conventional design and construction approach • Flexible placement location with pipe	• High water content • Sediment loses strength and cohesiveness • Longer cycling time to allow sediments to dry and consolidate • Potential water quality impacts during construction
Dry DREdge or similar high solids methods	• Flexible placement location with pipe • Probably minor water quality impact • Near in-situ moisture content	• Likely to be a more expensive method • Lower production rate • Sediment loses strength due to pumping

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 (Appendix E-1) 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 (Appendix E-1), the sedimentation rate was estimated to be 2.0 to 2.5 inches per year or 4 to 5 feet over the 25-year project life. 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, 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.

Borrow and Construction Materials

Lake bottom borrow locations would be precisely delineated prior to construction. 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 prevent embankment erosion.

Construction Contract

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 an alternative contracting method be employed, similar to best value or design-build because of multiple benefits. These contracting methods 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 from January 1 to June 1 to minimize potential hazards from weather-related events (flood, ice, etc.).

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

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 exceed for the exterior 6H:1V and interior 5H:1V. 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.

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, 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 this 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.

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 in the vicinity of the of 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 would total an estimated 9,000 cubic yards. To construct the test island, it is proposed that dragline crane or similar mechanical dredge would be used.

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 1B 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 anticipated that the testing would start in 2002 following this schedule:

- **1st lift.** Late summer/fall Year 1 – dredge and build 1st lift from EL 438 feet to EL 441 feet
- Monitor island
- **2nd lift**. Early winter 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.** Early summer Year 2 (150-180 days after 2nd lift) – dredge and build 3rd lift from EL 444 feet to EL 447 feet
- Monitor island
- **4th lift.** Late summer/fall 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, will be 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 will be included in the final submission of 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. Therefore, no permit will be required.

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 in this section 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 3-10

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	≥ 5.0	≥ 5.0	≥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 costs are substantially different from those presented in Section 2 of this report. 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
April 2002 Price Levels

Account	Feature	Current Working Estimate (CWE)	Fully Funded Estimate
1	Lands and Damages	$605,000	$605,000
2	Relocations	$0	$0
6	Fish and Wildlife Facilities	$11,724,546	$13,032,295
30	Planning, Engineering and Design	$1,524,191	$1,694,198
31	Construction Management	$1,172,455	$1,303,230
	Post-Construction Monitoring	$155,000	$155,000
	Total Project Costs	$15,181,192	$16,789,723
	Federal Costs (65%)	$9,867,775	$10,913,320
	State Cost (35%)	$5,313,417	$5,876,403

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	$21,743	20%
	Stage 1 Mechanical Dredging to Construct Island Embankment	172,000	CY	$4.10	$705,301	$151,572	20%
	Stage 2 Mob/demob	1	LS	$101,176	$101,176	$22,038	20%
	Stage 2 Dredging to Fill Embankment interior	116,000	CY	$4.05	$470,238	$102,425	20%
	Stage 3 Mob/demob	1	LS	$101,176	$101,176	$23,564	20%
	Stage 3 Mechanical Dredging to Construct Island Embankment	51,000	CY	$4.10	$209,130	$48,708	20%
	Stage 4 Mob/demob	1	LS	$101,176	$101,176	$23,244	20%
	Stage 4 Dredging to Fill Embankment interior	122,000	CY	$4.05	$494,561	$113,618	20%
	Stage 5 Rock Placement - Fish Structure Jetties	1,000	TON	$37.95	$37,949	$4,635	10%
	Stage 5 Rock Placement – Closing Structure	3,000	TON	$37.95	$113,846	$13,904	10%
	Stage 6 Erosion Protection - Bedding Stone	3,000	TON	$28.28	$84,825	$10,360	10%
	Stage 6 Erosion Protection – Riprap	9,000	TON	$37.95	$341,539	$41,713	10%
	SUBTOTAL - UPPER ISLAND				**$2,862,093**	**$577,524**	
06	**LOWER ISLANDS**						
	Stage 1 Mob/demob	1	LS	$101,176	$101,176	$21,743	20%
	Stage 1 Mechanical Dredging to Construct Island Embankment	501,000	CY	$4.10	$2,054,394	$441,498	20%
	Stage 2 Mob/demob	1	LS	$101,176	$101,176	$22,038	20%
	Stage 2 Dredging to Fill Embankment interior	236,000	CY	$4.05	$956,691	$208,382	20%
	Stage 3 Mob/demob	1	LS	$101,176	$101,176	$23,564	20%
	Stage 3 Mechanical Dredging to Construct Island Embankment	176,000	CY	$4.10	$721,703	$168,083	20%
	Stage 4 Mob/demob	1	LS	$101,176	$101,176	$23,244	20%
	Stage 4 Dredging to Fill Embankment interior	302,000	CY	$4.05	$1,224,240	$281,250	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	$18,539	10%
	Stage 5 Rock Placement - Closing Structure	4,000	TON	$37.95	$151,795	$18,539	10%
	Stage 6 Erosion Protection - Bedding Stone	9,000	TON	$28.28	$254,476	$31,080	10%
	Stage 6 Erosion Protection - Riprap	26,000	TON	$37.95	$986,667	$120,504	10%
	SUBTOTAL - LOWER ISLANDS				**$6,906,465**	**$1,378,464**	
	FISH AND WILDLIFE FACILITIES COST SUBTOTAL				$9,768,558	$1,955,988	
06	**FISH AND WILDLIFE FACILITIES COST TOTAL**				**$11,724,546**		
30	**PLANNING, ENGINEERING AND DESIGN**						
	Plans and Specifications				$1,289,700		
	Engineering During Construction				$234,491		
	SUBTOTAL				**$1,524,191**		
31	**CONSTRUCTION MANAGEMENT**						
	Contract Administration				$234,491		
	Shop Drawing Review				$117,245		
	Inspection and Quality Assurance				$820,718		
	SUBTOTAL				**$1,172,455**		
	TOTAL				**$14,421,192**		

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 [1]				0
			Subtotal	9,450
			Contingencies (20%)	1,890
		TOTAL		**$11,340**

[1] 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**
25-YEAR TOTAL	**155,000**

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

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.

FARM CREEK RESTORATION

PLAN COMPONENTS

General Description

The selected alternative for Farm Creek project near the City of Washington is described below:

> The City of Washington would dedicate approximately 45 acres to the project. One 4-acre and one 3-acre wetland impoundment (dam construction) with 6 rows of wetland plantings would be constructed, in addition to prairie plantings on the remaining 35 acres designated to the project.

Project Data Summary

Table 3-15 summarizes project data.

TABLE 3-15. Farm Creek Project Data Summary

Project Measure	Unit	Pool 1	Pool 2
Pond Construction			
Dam Top Elevation	Feet	749.9	753.5
Maximum Pool Elevation	Feet	748.7	751.9
Maximum Pool Area	Acre	10.6	15.0
Maximum Pool Volume	Acre-Feet	33.6	59.3
Emergency Spillway Elevation	Feet	747.9	751.5
Permanent Pool Elevation	Feet	744	746
Permanent Pool Area	Acre	2.8	4.2
Permanent Pool Volume	Acre-Feet	2.8	5.55
Embankment Volume	Cubic Yards	2750	5200
Dam Top Width	Feet	6	8
Dam Length	Feet	600	850
Dam Height	Feet	6.9	9.5
Dam Seeding Area	Acre	0.6	0.8
Spillway Seeding Area	Acre	0.4	0.55
Wood Duck Boxes	Each	6	9
Erosion Stone	Ton	300	400
Water Control Structure			
Culvert Upstream Elevation	Feet	744	746
Culvert Downstream Elevation	Feet	741	742.5
Culvert Dimensions	Inch	60 x 24	18 Dia.
Number of Culverts	Each	3	1
Culvert Length (Each)	Feet	94	119
Site Plantings			
Shoreline Plantings	Feet	1466	1721
Terrestrial Plantings	Feet	1466	1721
Prairie Plantings	Acre	17.5	17.5

Pond Construction

The compacted impervious dams were designed based on a 50-year rainfall. The dam top widths would be 6 feet for Pool 1 and 8 feet for Pool 2 with lengths of approximately 600 and 850 feet, respectively. The centerline of the dam tops would be offset from the toe of the abandoned railroad. The dam side slopes would be shaped to 3:1 horizontal on vertical. Vegetation would be planted on the dam top and side slopes. To provide for greater than a 50-year rainfall, an emergency spillway would be constructed at both pools out of compacted impervious material. The top elevations of the spillways are approximately 2 feet below the top of the dams, with minimum widths of 300 and 150 feet for Pools 1 and 2, respectively. The emergency spillways would be located at the east ends of the dams. For further information, refer to plates 16, 17, and 18.

Water Control Structure

Outlet structures are proposed for both pools as shown on plates 16, 17, and 18. The outlet structure for Pool 1 would consist of three 60-inch by 24-inch reinforced concrete box culverts, while the outlet structure for Pool 2 would consist of an 18-inch-diameter corrugated metal pipe. The outlet structures would be placed to maintain a permanent pool elevation of 744 feet MSL for Pool 1 and 746 feet MSL for Pool 2. A trash guard would be installed on the upstream end to prevent large debris from entering and constricting the structures with a rodent guard on the downstream end. The larger drainage associated with Pool 1 in combination with the limited land available for storage necessitated the larger outlet structure.

Site Plantings

Wetland and prairie plantings are proposed for the project site. The areas to be planted are presented on plate 16.

Wetland Plantings

Six rows of wetland plantings would be planted within the water and around the pond perimeter to introduce a component of aquatic vegetation to the project area. Three rows of bankline plantings would be planted on a 15-foot spacing within the water and distributed to allow for a natural appearance.

Three rows of terrestrial plantings would be planted around the pond perimeter to introduce a component of woody vegetation to the project area. The selected species would be planted on a 15-foot spacing and distributed to allow for a natural appearance. The planted trees would maintain this natural appearance throughout the establishment process, as only the vegetation directly surrounding the seedling would be controlled. The selected species would be alternated at each pond to avoid a solid line of any individual species.

The following is a more detailed wetland plant component and species list.

Plant Component

Trees: 30 trees per acre of pond. Use bare root stock unless otherwise stated. Plantings will be at least 2 feet above conservation pool and no closer than 15 feet from water's edge as coordinated with the ILDNR forester.

Male Black Willow: Plantings will be done using cuttings from a male black willow tree. Cuttings will be planted at the upper reach of the pond near amphibian ponds in a cluster. Remaining trees will be planted from bare root stock and planted in clusters grouped according to species. Approved tree species are:

- Swamp White Oak
- Burr Oak
- Walnut
- Shagbark Hickory
- Shellbark Hickory
- Pin Oak (Southern): Use seeds
- Hawthorns
- Wild Plum: Use seeds
- Sycamore

Shrubs: At least half of the shrub plants per site will be button bush.

- Button Bush: Plant at water's edge
- Remaining shrubs can be selected from the following list:

1. Indigo Bush: 15 feet from waters edge
2. High Bush Cranberry
3. Arrowwood
4. Virburnum Species
5. An approved Cornus Species
6. Wild Plum: Plant in clumps

In-Water Plants: Note the Prairie Cord Grass native to site is not an in-water plant.

- Up to 18" Depth: Plugs
    1. Slough Sedge
    2. Hummock Sedge
    3. Soft Stem Bull Rush
    4. Hard Stem Bull Rush

- Up to 6" Depth: Plugs
    1. Sweet Flag Calamus
    2. Arrowhead

3. Water Plantain

- Above Water to Edge: Seed
  1. Rice Cutgrass (15%)
  2. Switch Grass (no cultivars) (10%)
  3. Fowl Manna (15%)
  4. Prairie Cord Grass (30%)
  5. Blue Joint (30%)

Prairie Plantings

Approximately 35 acres of prairie plantings would be planted to provide a natural landscape to the project area. A combination of grasses and forbs resembling a Native Illinois Ecotype would be planted. This mixture would be applied at a rate of 6 pounds per acre with 5 pounds of grasses to 1 pound of forbs, with no more than 20% of any one species. Typical grasses include big bluestem, Indian grass, switchgrass, and little bluestem.

Revetment and Erosion Stone

Erosion stone would be placed around the upstream and downstream ends of the outlet structure. The erosion stone would be sized to sufficiently resist water velocity attack. Erosion protection for wave action is not necessary due to the small size of the ponds.

DESIGN AND CONSTRUCTION CONSIDERATIONS

Existing Site Elevations

Both ponds are located to the east of Washington, Illinois. The project site is currently an agricultural field with Farm Creek running along the northern border. The land surface elevation ranges from 742 feet MSL near the abandoned railroad embankment to 764 feet MSL near the southern border. Dam construction could be accomplished using traditional earth-moving equipment, ideally before or after spring rainfalls. Mobilization of construction equipment would likely be accomplished by truck. Project access would be just south of the abandoned railroad embankment along the west property line. For the access areas, improvements would be necessary at project completion.

Pond Construction

Borrow material for earthwork operations would be excavated just upstream of the proposed embankment areas as illustrated on plate 16. Soil investigations have determined that the borrow material consists of stiff brown lean clay in the upper 5 feet, underlain by stiff black medium clay from a depth of approximately 5 feet to 10 feet. This material is favorable for construction of the embankment areas. The limit for excavation is to not exceed a depth of 4 feet below the ground surface. For Pool 1, an area approximately 185 feet by 100 feet would be needed to provide nearly 2,750 cubic yards for construction of the dam. For Pool 2, an area almost twice the size of that for Pool 1 would be needed to provide roughly 5,200 cubic

yards for construction of the dam. These excavated areas would later serve as a control for the accumulation of sediment. Small, shallow depressions or "frog ponds" would also be constructed prior to the impounded wetlands for control of sedimentation. The deposited material at either of these areas would not be removed.

Construction Materials

Only common construction materials are required for this project. Revetment/erosion stone, granular surfacing, reinforced concrete box culverts, and corrugated metal pipe are available locally and can be trucked to the project site. Construction areas are easily accessible. Therefore, construction materials can be transported by conventional equipment.

Site Plantings

Wetland Plantings

The ideal spring planting date for bankline plantings includes a 2-month period between April 15th and June 15th to obtain as much growth as possible prior to winter and reduce winter mortality. It also would be possible to plant in the fall, ideally between August 15th and September 15th, but definitely not after 2 weeks prior to the early frost date. In-water plants will be separated into three categories. Plugs will be planted in water depths up to 18 inches. In depths ranging from 6-18 inches, the following species shall be considered: slough sedge, hummock sedge, hard stem bull rush, and soft stem bull rush. In depths ranging from 0-6 inches, the following species shall be considered: sweet flag calamus, water plantain, and arrowhead. A 7.5-foot band around the perimeter, above the water's edge shall be seeded using the following mix: 15% rice cutgrass, 15% fowl manna, 30% blue joint, 10% switch grass, and 30% prairie cord grass.

The survival of terrestrial plantings is affected by many factors, including weather, competing vegetation, and animal protection. In addition, the survival of newly planted trees is positively correlated with the size and health of the seedling that is planted. The species selected (black willow and button bush) are hardy, and it is anticipated that bare root stock could be used. However, if other species are selected or a higher rate of survivability is desired, planted trees should be at least 1/2-inch caliper and 4 feet in height. The contractor would have the option of planting container-grown or balled and burlapped trees. Container-grown trees would have a minimum container size of 5 gallons. Trees would be provided from within 300 miles of the project area. Trees would be planted either in the spring between March 1st and April 30th, or in the fall after the tree becomes dormant until December 1st. For both sites, the planting areas would be prepared by disking a minimum of two times (disked and cross disked) to a minimum depth of 4 inches.

Past failures for newly planted trees can be attributed to an over-abundance of competing vegetation. Abandoned crop fields and other disturbed sites often become dominated by annual weed species such as giant ragweed and cucumber vine, which can kill young seedlings by quickly overtopping and shading the planted trees within a short period of time. To help alleviate this problem, all planting areas would be sprayed

with a pre-emergent herbicide to a 6-foot-wide band around each tree immediately after placement. Additionally, a cover crop of red top grass and annual grains would be temporarily established at the planting areas to help control unwanted species. Repeated herbicide applications would be used, if necessary, to control any competing vegetation which threatens the survival of the planted trees. Follow-up spraying would be performed during the following growing season if the planted trees were threatened by competing vegetation. Following a 3-year establishment period, the surrounding ground in all planting areas may be allowed to assume a natural growth, if desired.

Planted trees are also vulnerable to damage by wildlife. Domestic animals, deer, mice, rabbits, squirrels, and beaver can destroy young seedlings. Protective measures include deer repellant and fencing. Despite good planting techniques, animal protection, and control of competing vegetation, some tree mortality within the first year after placement is inevitable. Unavoidable mortality due to natural causes would not be expected to exceed 10%.

Prairie Plantings

The scheduled planting date should allow for shallow disking of the planting area to eliminate weeds once the soil warms up in the spring. The ideal spring planting date includes a 2-month period from April 15th and June 15th to reduce the risk of encountering hot, dry weather, which would reduce seed germination and seedling survival. It also would be possible to plant in the fall, thus allowing the seeds to stratify naturally in the soil. If a fall planting date is desired, placement should be late enough so that the seeds germinate the following spring. The freezing temperatures of winter could kill the young seedlings if planted too early.

When planting is incorporated into an existing agricultural field, the soil must be free from herbicide carry-over that may be harmful to germinating prairie plants, especially the forbs. If the field has high, standing corn stubble, the stalks should be shredded so they will not interfere with the planting devices of the prairie seed drill. Typically, soybean stubble does not present a problem.

Once the corn stubble is removed, the next consideration is weed control. The vegetation should be allowed to grow to a height of about 6 inches and then sprayed with a non-selective herbicide, such as Roundup. A 2% solution should be sufficient to kill most herbaceous plants, including agricultural weeds. If weeds continue to be a problem after planting, they can be mowed at a height of 6 to 8 inches to reduce the competition with the developing prairie plants. If only parts of the field have concentrations of weeds, these areas should be mowed and the rest of the field left undisturbed.

The seed of prairie plants may be planted by a variety of methods, including specially made drills, rotary spreaders, or hydraulic mulchers. Even dispersal of the seed over the area is important. Any large-scale planting which does not drill the seed in to the ground would require the use of a harrow and roller to firmly place the seed. If the conditions are suitable, the seed should germinate within 2 or 3 weeks.

If a drill or rotary spreader is used to plant the prairie seed, the seed must be dry and the planting area must be relatively free of vegetation greater than 3 inches in length. If the seed is wet or full of debris, the spreader or drill will not operate properly. Drying and cleaning can be accomplished by placing the seed on a concrete floor and spreading out the seed to about a 2-inch-thick layer. The seed should be turned with a rake frequently to aid the drying process. Stems, sticks, and other debris can be removed at this time. If conditions are satisfactory, the seed should be dry within 1 or 2 days or less, depending on quantity and drying conditions.

Construction Sequence

Table 3-16 summarizes the probable construction sequence. However, this sequence is only a suggestion and would not be contractually required. It is anticipated that construction would be completed with 240 days of effort.

TABLE 3-16. Probable Construction Sequence

Sequence Number	Construction Work Item	Instructions	Purpose
1.	Site Preparation - Clearing/Disking	Accomplish first	Prepare agricultural field for site plantings
2.	Water Control Structures	Accomplish after site preparation is complete to allow drainage of project	Attain greater than 95% compaction
3.	Pond Construction	Accomplish after water control structures are complete and when soil is not frozen	Allow for correct placement of water control structure
4.	Erosion Stone	Accomplish after pond construction is complete and water control structures are installed	Provide protection for embankment and water control structures
5.	Site Plantings	Plant between March 1 and June 15 or August 15 and December 1 depending on planting type	Increase survival

Permits

A public notice is required by Section 404 of the Clean Water Act and Section 401 water quality certification will be obtained from the State of Illinois prior to project construction. Land disturbances, on greater than 5 acres, associated with this project require a National Pollutant Discharge Elimination System (NPDES) permit, or Section 402, for stormwater discharges. In addition, a construction permit will be required from the ILDNR.

Historic Properties

Under Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations, the Rock Island District has made a determination of ***No Historic Properties Affected***, as defined in 36 CFR Part 800.3(a)(1) for the tributary watershed restoration project. Therefore, the undertaking is in compliance with the NHPA and can proceed as proposed. Although the District documents no historic properties affected by the restoration Peoria Lake dredging/island creation and Farm Creek impoundments, if any undocumented historic properties are identified or encountered during the dredging or construction effort, the District will discontinue all activities and resume coordination with the Illinois Historic Preservation Agency to identify the significance of the historic property and determine potential effects under Section 106 of the NHPA of 1966 and 36 CFR Part 800.

OPERATION, MAINTENANCE, AND REHABILITATION CONSIDERATIONS

This section presents operation and maintenance instructions for the major project features. 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 shall be taken to ensure the availability of adequate labor and materials to meet contingencies.

Operation

This project has no general operational requirements. Specific operational requirements would be performed as determined by the Site Manager.

Maintenance

The proposed measures have been designed to ensure low annual maintenance requirements. The estimated annual maintenance costs are presented in Table 3-21. These quantities and costs may be revised during final design.

Dam Embankment

The Site Manager should provide at all times such maintenance as may be required to ensure serviceability of the dam in times of high flows. Appropriate measures should be taken to promote the growth of sod and control burrowing animals. This includes routine mowing or burning at least twice per year on the embankment and extending at least 10 feet horizontally from the toe, removal of wild growth, and repair of damage caused by erosion or other forces. Since the spillways are unlined, it will be important to maintain an established bed of sod that is mowed on a regular basis. A dam safety inspection report will be submitted annually to the ILDNR.

Water Control Structure

The water control structure should be inspected on a regular basis to determine whether seepage is occurring along the pipe through the embankment. The inlet and outlet of the water control structure should be examined for debris accumulation. In

either instance, steps will be taken to correct any adverse condition and other deficiencies.

Site Plantings

Wetland Plantings. The bankline plantings would be monitored for signs of disease or other stress. Some of these symptoms may occur naturally as the plants age, especially after the seeds have matured. Large insects causing damage to the bankline plantings would be removed. For serious insect infestation, a chemical agent may be applied after obtaining guidance on the proper chemical and application rate.

Dead wetland plants would be replaced as necessary to fill voids. Unwanted vegetation adjacent to the bankline plantings would be removed. Otherwise, this vegetation would shade and crowd the desirable wetland plants. Controlling the growth of trees or high shrubs would prevent excessive shading of the bankline plantings. Most wetland plants need at least 6 hours of sunshine each day. If desired, mature wetland vegetation may be trimmed after the plants have browned in the fall for visual aesthetics. However, only approximately two-thirds of the height of the plants would be cut.

Vegetation between the terrestrial plantings would be controlled for a minimum of two growing seasons by either mowing or herbicide application. Vegetation between the planted trees would not be allowed to exceed a height of 1 foot during this maintenance period.

Prairie Plantings. If dense weeds develop, the area would be mowed to a height of 8 to 12 inches with a rotary mower when the weeds reach a height of 2 to 3 feet. It is important to use a rotary mower because of its shredding action. The vegetation cut by sickle mowers could smother the seedlings of the prairie plants. Only those parts of the planting that have a weed problem would be mowed. The use of a selective herbicide for broadleaf plants can be applied when there are scattered, dense stands of particularly troublesome weeds. Care should be taken to avoid spraying desirable prairie plants.

Prescribed burning helps to eliminate the alien, cool season grasses and weeds. Therefore, a prescribed burn should be planned for February, March, or April of the year following the planting of the prairie seed. Burning in the spring allows the vegetation to remain throughout the winter, providing excellent cover for wildlife during this critical period. In the case of bluegrass and sweet clover, burns in early April are more beneficial than burns conducted in February and early March. Burns conducted at the time of buds open may also prove to be helpful in reducing invasion by rough-leaved dogwood or other shrubs.

PROJECT PERFORMANCE ASSESSMENT

This section summarizes the monitoring and data collection of the project. The primary project objectives were summarized elsewhere in this document. The performance assessment is intended

to gauge progress towards meeting these objectives. In particular, the project will be evaluated for physical changes (sedimentation, pond perimeter, depth, etc.) and vegetation.

Tables 3-17 and 3-18 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.

TABLE 3-17. Resource Monitoring and Data Collection Summary [1]						
Type Measurement	**Pre-Project Phase**	**Design Phase**	**Const Phase**	**Post-Const Phase**	**Sampling Agency**	**Remarks**
POINT MEASUREMENTS						
Borings					USACE	
Geotechnical [2]	1					
TRANSECT MEASUREMENTS						
Soundings					USACE	
Sedimentation [3]			1	5Y		
AREA MEASUREMENTS						
Survey						
Pond Perimeter [4]			1	5Y	USACE	
Wetland Vegetation [5]				5Y	ILDNR	
Wildlife Vegetation [6]			1	5Y	USACE	
Site [7]	1					

Legend
Y = Yearly
nY = n-Year interval
1,2,3, --- = number of times data are collected within designated project phase

[1] Monitoring and Data Collection Summary

[2] Geotechnical Borings (Pre-Project Phase)

Boring Number	Date
PL-01-7	05-31-01
PL-01-8	05-31-01
PL-01-9	05-31-01
PL-01-10	05-31-01

[3] Sedimentation Soundings (Construction and Post-Construction Phases) – Cross-sectional survey of pond depth, one section per pool running perpendicular from the dam along the natural swale.

[4] Pond Perimeter Survey (Construction and Post-Construction Phases) – Areal survey of pond perimeter at project completion to reflect as-built conditions and thereafter to monitor performance.

[5] Wetland Vegetation Survey (Post-Construction Phase) – Informal survey of wetland vegetation around pond perimeter to estimate acreage and identify plants.

[6] Wildlife Vegetation Survey (Construction and Post-Construction Phases) – Areal survey of prairie plantings at project completion to reflect as-built conditions and thereafter to monitor performance.

[7] Site Survey (Pre-Project Phase) – Conducted spring of 2001 to locate project boundaries, field tiles, railroad embankment, and culverts; determine existing elevations at proposed dam embankment centerlines; and profile creek/tributaries.

TABLE 3-18. Post-Construction Evaluation Plan

Goal	Objective	Enhancement Feature	Unit	Year 0 Without Project	Year 0 With Project	Year X With Project	Year 25 Target With Project	Feature Measurement	Annual Field Observations by Sponsor
Enhance Wetland Habitat	Provide food, shelter, and breeding habitat for wildlife	Pond creation	Acre					Perimeter survey	Describe any embankment erosion/seepage
		Pool 1		0	3	--	3		
		Pool 2		0	4	--	4		
		Pond creation	Feet [1]					Sedimentation transects	Describe any debris or sedimentation
		Pool 1		0	2	--	1.5		
		Pool 2		0	2	--	1.5		
	Increase overall vegetation diversity and availability	Wetland plantings	Acre					Vegetation survey	Estimate area of established wetland vegetation
		Pool 1		0	1	--	1		
		Pool 2		0	1.2	--	1.2		
		Prairie plantings	Acre	0	35	--	35	Site survey	Estimate effective acreage and wildlife use

[1] Average water depth along transect

PROJECT COST ESTIMATE

Detailed cost estimates of project design and construction costs are presented in Tables 3-19 and 3-20. MCASES construction estimates are found in Appendix F. A detailed estimate of annual operation, maintenance, and rehabilitation costs is presented in Table 3-21. Table 3-22 contains the estimated monitoring costs as described in Appendix I. Quantities may vary during final design.

TABLE 3-19. Estimated Project Costs
(October 2001 Price Levels)

Account	Description	Cost Estimate
01	Lands and Damages	$220,000
02	Relocations	$ 0
06	Fish and Wildlife Facilities	$377,000
30	Planning, Engineering and Design	$ 75,000
30	Engineering During Construction	$ 10,000
31	Construction Management	$ 38,000
	Post-Construction Monitoring	$ 25,000
	TOTAL PROJECT COSTS	**$745,000**
	Federal Costs (65%)	$484,000
	State Cost (35%)	$261,000

TABLE 3-20. Estimated Construction Costs
(October 2001 Price Levels)

Item	Quantity	Unit	Unit Price	Amount
Stripping	1.35	AC	$53,199.04	$71,818.70
Cutoff Trench	2,651	CY	$2.70	$7,158.60
Dam Embankment	7,954	CY	$3.31	$26,327.74
Outlet Pipe, 18" CMP	119	LF	$21.97	$2,614.43
Outlet Hood, 18"	1	EA	$144.79	$144.79
Box Culvert, 24" X 60" RCP	282	LF	$242.14	$68,283.48
Storm Pipe, 15" PVC	1,500	LF	$13.79	$20,685.00
Seeding (dam)	1.29	AC	$1,246.78	$1,608.35
Seeding (spillway)	0.86	AC	$1,246.78	$1,072.23
Wetland Plantings (6 rows total)				
Bankline Plantings (3 rows)	9,561	LF	$1.91	$18,261.51
Terrestrial Plantings (3 rows)	9,561	LF	$2.64	$25,241.04
Prairie Plantings	35	AC	$1,040.42	$36,414.70
Wood Duck Box	15	EA	$110.76	$1,661.40
Erosion Protection Stone	700	TN	$29.38	$20,566.00
Subtotal Construction				*$302,000.00*
Contingencies				$75,000.00
Engineering During Construction				$10,000.00
Supervision and Administration				$38,000.00
TOTAL CONSTRUCTION COSTS				**$425,000.00**

TABLE 3-21. Estimated Annual Operation and Maintenance Costs
(October 2001 Price Levels)

Item	Quantity	Unit	Unit Price	Amount
Operation				--
Maintenance				
Dam Inspection	8	HR	$ 40.00	$ 320
Erosion Protection Stone	10	TN	$ 30.00	$ 300
Biannual Mowing	16	HR	$ 40.00	$ 640
Herbicide/Pesticide Application	16	HR	$ 40.00	$ 640
Controlled Burning	8	HR	$ 40.00	$ 320
Debris Removal	40	HR	$ 40.00	$1,600
Rehabilitation [1]				--
TOTAL ANNUAL O&M COSTS				**$3,820**

[1] 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 3-22. Estimated Post-Construction
Monitoring Costs Every 5 Years
(October 2001 Price Levels)

Item	Amount
Engineering Data [1]	$760
Natural Resources Data [1]	$240
Planning, Engineering, Design [2]	$4,000
TOTAL MONITORING COSTS	**$5,000**

[1] Reference Appendix I, Tables I-2 and I-3.
[2] Includes cost of performance evaluation report.

PLAN ACCOMPLISHMENTS

The proposed project consists of multiple pond construction, water control structures, and site plantings, including wetland and prairie. This project would enhance wetland habitat by providing food, shelter, and breeding habitat for wildlife, in addition to increasing overall vegetation diversity and availability.

The constructed ponds would provide open water areas for wildlife feeding, nesting, and rearing habitat. These ponds would also support a thriving population of invertebrates, which, in turn, would provide a food source for a variety of other species. Site plantings would provide food resources for multiple resident species and increase overall habitat diversity. Additional benefits of the ponds

may be a significant reduction in peak flood flows from this portion of the watershed. This will have a positive effect in terms of flood damage reduction farther downstream in the City of Washington.

The proposed enhancement features will reduce the impacts of sedimentation in the upper portion of the watershed on water quality. A 7% reduction in sediment entering Farm Creek upstream of the City of Washington is likely to occur. The features will also provide a desirable mix of open water, emergent vegetation, and littoral zone conditions, as well as increase habitat diversity by planting a variety of vegetation. Implementation of the proposed enhancement measures is projected to result in a gain of 66 AAHUs.

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 90 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 203 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, given the right conditions, redevelop.

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 actually 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 located 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 resulted in 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 either of the proposed projects 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.

FARM CREEK

ENVIRONMENTAL IMPACTS OF THE NO ACTION PLAN

The land at the proposed Farm Creek site is owned by the City of Washington, and if there is no Federal project, the potential for environmental enhancement would be greatly reduced or may not occur at all. There is a probability of continued row crop production in the farm fields.

ENVIRONMENTAL IMPACTS OF THE SELECTED PLAN

Natural Resources

Construction of the detention dams would result in the formation of wetland impoundments of varying size at the proposed site. These impoundments would contain 4-acre and 3-acre ponds, with 6 rows of wetland plantings and 35 acres of prairie plantings.

Planting wetland species plants around and within the pond perimeter would help to quick start vegetative growth around the pools. Planting the farm fields with native prairie plants would help to create a riparian buffer with additional diverse habitat that has been missing from the area for many years. The creation of suitable flora habitat would promote colonization of the site by a variety of faunal species and provide greater diversity and species richness to the entire area.

Endangered Species

There are currently no known state or federally listed threatened or endangered species at the site. Therefore, it is our biological assessment that construction of the detention dams and wetlands 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 review of 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. It is our opinion that conditions could develop which would benefit endangered species and open the way for them to colonize the project area.

Water Quality

Adequate erosion control measures would be utilized during and after project construction so there should be no adverse impacts to Farm Creek. While there are no wetlands located on the proposed project site, it is located in a water course of the US and will require a Section 404(b)(1) and Section 401 water quality certification will be obtained from the State of Illinois prior to project construction.

Air Quality

Limited air pollution effects would be produced from machinery exhaust during construction of the wetland impoundments. The project area is basically outside the city limits. The site is located within 400 feet of a residential area on the eastern boundary of the City of Washington. Impacts from exhaust are anticipated to be negligible and temporary.

Historic Properties

The Illinois Historic Preservation Agency (IHPA) concurred by letter dated December 4, 2001 (IHPA Log #0011090020k-P, Appendix A-1) with the District's proposed Phase I intensive archaeological survey on the tributary watershed restoration project. 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 (NHPA). The Phase I archaeological survey for the Farm Creek restoration locations is documented in the final Archaeological Short Survey Report (ASSR), dated August 29, 2001 (McNerney and Anderson 2001).

The ASSR documents the discovery of historic property 11-T-410, located in Section 18, Township 26 North, and Range 2 West, within the tributary watershed restoration. Site 11-T-410 is potentially eligible to the National Register of Historic Places because of the presence of 19th century artifacts. The District and the ILDNR propose avoidance of Site 11-T-410 by changing the project boundaries of the Farm Creek Watershed restoration. Site 11-T-410 is no longer included within the area of potential effect for a determination ***No Historic Properties Affected*** as required by 36 CFR Part 800.3(a)(1) of the NHPA. The IHPA concurred with the findings of the draft report and the District's determination by letter dated October 30, 2001 (IHPA Log #0011090020k-P, Appendix A-1).

Two copies of the final ASSRs have been provided for the permanent files of the IHPA as evidence of Corps project compliance with the NHPA and its implementing regulations. Since archaeological site location is privileged information, written permission must be granted to any consulting party by the IHPA and provided to the Corps and the ILDNR as evidence of approval for receipt of copies of the Project ASSR.

Created Resources

The created resources of the area is the farm field, which would have two dams constructed to form impoundments and be planted to wetland species and native prairie vegetation. The monoculture of row crop would be changed to a more diverse ecosystem of native plantings and managed for increased habitat value. A reduction or total elimination of chemical applications used to maintain high production of crops would occur as more environmentally friendly management practices are utilized to promote the growth of the wetland and native prairie vegetation.

Farm Creek itself may also be considered to be a created resource because of the modifications brought about by farming activities in the area that have directly and indirectly affected its shape, hydrology, and flow.

Farm Displacement

No farm or farmsteads would be affected by the watershed restoration measures.

Noise Levels

The project area is basically outside the city limits. The site is located within 400 feet of a residential area on the eastern boundary of the City of Washington. Heavy construction equipment would generate a temporary increase in noise levels during project construction, which could be disturbing to nearby residents. No long-term noise impacts would result following project construction.

Property Values and Tax Revenues

It is expected that the proposed watershed restoration project would have an insignificant effect on property values and tax revenues.

Public Facilities and Resources

Public facilities and services would not be impacted by the Farm Creek alternatives.

Life, Health, and Safety

Overall, no significant impacts to life, health, or safety would result from the restoration efforts on Farm Creek.

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 Tazewell County.

Business and Industrial Development

Changes in business and industrial activity would be minimal. No business relocations would be required.

ENVIRONMENTAL IMPACTS OF NONPREFERRED ALTERNATIVES

The land at the proposed sites is owned by the City of Washington, and if there were no Federal involvement, the potential for environmental enhancement would be greatly reduced or may not occur at all. There is a high probability of continued row crop production in the farm fields, at least for the interim.

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. Also, while the farmland could be returned to crop production at some future date, the economic production of the field for the period of time that it is not utilized for row crops is 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 area.

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 tables break out these costs separately for the Peoria Lake and Farm Creek portions, and then show the combined total project cost.

Peoria Lake					
		Non-Federal		Federal	
Project Feature	First Cost	%	Cost	%	Cost
First Cost of Construction	$15,181,192	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%	

Farm Creek					
		Non-Federal		Federal	
Project Feature	First Cost	%	Cost	%	Cost
First Cost of Construction	$745,000	35%	$260,800	65%	$484,200
LERRD Credit		100%	$210,000	0%	
Cash			$ 50,800		$484,200
OMRR&R (average annual)	$3,820	100%		0%	

Total Peoria Lake and Farm Creek					
		Non-Federal		Federal	
Project Feature	First Cost	%	Cost	%	Cost
First Cost of Construction	$15,926,192	35%	$5,574,167	65%	$10,352,024
LERRD Credit		100%	$ 785,000	0%	
Cash			$4,789,167		$10,352,024
OMRR&R (average annual)	$15,160	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 $10,352,024. 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 $5,574,167 in cash with $785,000 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 project life at an average annual cost of $15,160.

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 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 (see Appendix A-3). In general, the items included in the Agreement have been outlined in the previous paragraphs.

FINANCIAL ANALYSIS

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.

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 $1,599,191.

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, the ILDNR, and City of Washington, Illinois, whereby the sponsors 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 and City of Washington, Illinois.

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 the spring of 2002 and for the Division Engineer's Public Notice of the completion of the feasibility report to be issued in July 2002. Execution of the PED agreement for the next phase of study is expected in May 2002, with the signing at the end of this calendar year, at the same time the Chief of Engineers' report is complete. The PED phase is scheduled to begin in July 2002 and will continue for approximately 3 years, until April 2004. 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. Project plans and specifications will be ready by January 2004. An advertisement in the Commerce Business Daily (CBD) will be prepared during February 2004 for the solicitation of bids for construction, and the process of receiving bids and awarding construction will be completed by April 2004. Construction will begin in June 2004 and 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 City of Washington, Illinois, and the Fon du Lac Park District, East Peoria, Illinois, own lands to be used for project implementation. Both have agreed to support the recommended plan through use of respective properties.

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 review of our initial proposal indicated that the proposed project was not likely to impact any federally listed species and requires no further action. Their letter, dated June 27, 2001, 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 June 27, 2001, 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-4.

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. Utilization of the preferred alternative would remove approximately 45 acres of farmland from production. A U.S. Department of Agriculture (USDA) Farmland Conversion Impact Rating (Form AD-1006) was submitted to the USDA for evaluation and was completed using the Farmland Protection Policy Act (FPPA) site assessment criteria. The land is classified as prime farmland. The completed Form AD-1006 can be found in Appendix A-1.

The City of Washington recently purchased three tracts of land to use as potential flood reduction projects for Farm Creek. They became aware of this project and asked the Corps of Engineers to evaluate the lands for potential consideration into the project. Site 1 was eliminated as being too small. Sites 2 and 3 were further evaluated, with Site 3 being the only practicable alternative reasonable to meet the project goals. The AD-1006 addressed an area larger than the 45 acres currently being considered for the project. This decrease in the size of the site reduces impacts to prime farmland to the smallest reasonable increment and still makes the project viable. This project is therefore judged to be in full compliance.

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 OPEN HOUSE

The third public open house will be held at the study's conclusion. The study's mailing list has grown to over 800 names and an announcement will be mailed to each addressee on the list prior to the open house. A copy of the newsletter will be included in Appendix A-1. A news release also will be issued to media (television, radio, and newspaper) sources in the study area.

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 - two lower islands with a flowing side channel and at Farm Creek a 4-acre and a 3-acre wetland impoundment, 6 rows of wetland plantings, and 35 acres of prairie plantings.

The current estimated first cost of the recommended plan is $15,926,192 (April 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 $10,352,024 and the non-Federal contribution is estimated at $5,574,167. 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 $15,160 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, which includes Peoria Lake and Farm Creek Watershed, 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)

Alternatives for Farm Creek

1. No Federal Action

2. Wetland Impoundments:
    a. 4-Acre Wetland Impoundment – Construction of an earthen dam creating a wetland pond with a surface area of approximately 4 acres

b. 4-Acre and 3-Acre Wetland Impoundments – Construction of earthen dams creating wetland ponds with a surface area of approximately 4 acres and 3 acres

3. Wetland Plantings:
    a. Planting 2 row of vegetation within and around pond perimeter(s)
    b. Planting 6 rows of vegetation within and around pond perimeter(s)

4. Prairie Plantings:
    a. Prairie plantings on 20 acres adjacent to the pond perimeter
    b. Prairie plantings on 35 acres

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.
- Construction along Farm Creek of a 4-acre and a 3-acre wetland impoundment, 6 rows of wetland plantings, and 35 acres of prairie plantings

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 Sections 401 and 404 of the Clean Water Act.

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

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(Date)

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

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