



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
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**PEKIN LAKE STATE FISH AND WILDLIFE AREA
SOUTHERN UNIT**

**CRITICAL RESTORATION PROJECT
ILLINOIS RIVER BASIN RESTORATION STUDY, ILLINOIS**

FEASIBILITY REPORT

Public Review Draft September 2004

Executive Summary

The Pekin Lake State Fish & Wildlife Area (SFWA) - Southern Unit Critical Restoration Project area is part of the Pekin Lake SFWA. The SFWA is located along the Illinois River immediately downstream of Peoria Lock and Dam and adjacent to and west of the communities of Pekin, North Pekin, and Marquette Heights. The area is generally bounded by the Illinois River (Rock Island District uses the term Illinois Waterway in some reports/documents, but that this report will use Illinois River) to the west, the communities mentioned above to the east, Peoria Lock and Dam/Interstate 474 to the north, and Illinois Highway Route 9 to the south. The SFWA is divided into two units, North and South. Perpendicular to the general layout of the SFWA is a rubble causeway supporting Central Illinois Light Company (CILCO) high voltage transmission lines. The corridor is 400 feet wide and owned by CILCO. This investigation deals exclusively with the Southern Unit of the Pekin Lake SFWA.

Specific authority to conduct the Pekin Lake SFWA – Southern Unit Critical Restoration Project is contained in Section 519 of the Water Resources Development Act of 2000.

The principal goals of the project are Restoration of aquatic habitat through the introduction of depth diversity and over-wintering habitats. Currently, this reach of the Illinois River lacks any deep-water overwintering habitat for fish outside of the 9-foot navigation channel. Opportunities were explored to address these conditions. Goals to achieve ecosystem restoration include: (1) improve aquatic habitat; (2) improve wetland habitat; (3) improve terrestrial habitat.

MEASURES FOR PEKIN LAKE – SOUTHERN UNIT SFWA

The following alternative plans for Pekin Lake SFWA – Southern Unit were evaluated over a 50-year period of analysis to achieve project goals and objectives:

- S0. No Action
- S1. 6.6 Acres of Dredging with 7.2 Acres of Onsite Placement Mast Trees
- S2. 26.8 Acres of Dredging with 28.0 Acres of Onsite Placement for Mast Trees

S3. 26.7 Acres of Dredging with 34.9 Acres of Onsite Placement for Wetland Restoration

S4. 45.7 Acres of Dredging with 47.9 Acres of Onsite Placement for Mast Trees and Wetland Restoration

S5. 45.7 Acres of Dredging with 42.8 Acres of Onsite Placement for Mast Trees and Wetland Restoration

S6. 40.6 Acres of Dredging with 43.9 Acres of Onsite Placement for Mast Trees and Wetland Restoration.

RECOMMENDATION

The recommended plan for this project is S5. It is recommended that the Secretary of the Army for Civil Works approve the proposed project to include constructing in Pekin Lake SFWA – Southern Unit, 45.7 Acres of Dredging with Onsite Placement for Mast Trees and Wetland Restoration.

This alternative involves dredging deep channels into Soldwedel Lake and Lake of the Woods from the Illinois River with additional dredging of fingers, shelves, and deep holes in Lake of the Woods and Soldwedel Lake (See Plate 5). Dredged material would be sidecast adjacent to the channels with additional placement of 13,000 CY of material at **Site E** and 320,720 CY of material at **Site B**. Material would also be placed to create islands **C1** (1,500 CY), **C2** (2,500 CY), **C3** (39,000 CY), **C4** (2,500 CY) and **C5** (1,500 CY).

The current estimated first cost of the recommended plan is \$7,571,270. 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 (IDNR), the Non-Federal Sponsor. The Federal contribution is estimated at \$4,921,944 and the non-Federal contribution is estimated at \$2,649,944. The IDNR would provide all Lands, Easements, Rights-of-Way, Relocation, and Dredged or Excavated Disposal Areas (LERRD). The IDNR would also be responsible for the operation and maintenance of the project. The operation and maintenance of these features is estimated to cost \$7,115 annually.

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F Cost Engineering
G Environmental Assessment
 EA-A Section 404(b)(1) Analysis
 EA-B Pertinent Correspondence
 EA-C Programmatic Agreement
H Real Estate Plan
I Value Engineering Study
J Distribution List
K Plates

Introduction

1.1 AUTHORITY

The Rock Island, St. Louis, Chicago, and Detroit Districts and the Illinois DNR (non-Federal sponsor) are currently working together on two similar and complementary studies to investigate the Federal and State interest in ecosystem restoration within the Illinois River Basin. A Reconnaissance Study identifying a Federal interest in restoration was completed in February of 1999. Study efforts were then initiated in the basin through the Illinois River Ecosystem Restoration Feasibility Study conducted under Section 216 of the 1970 Flood Control Act. Congress provided additional authority for Illinois River Basin Restoration in Section 519 of WRDA 2000.

Prior to initiating Federal involvement in addressing water resources problems, the Corps of Engineers (Corps) must have authority to investigate the problem. Authority was granted in Sections (b) & (c) of Section 519 of the Water Resources Development Act 2000 to complete a comprehensive plan and identify, evaluate, and implement critical restoration projects in the Illinois River Basin. The authority states:

SEC. 519 (WRDA 2000). ILLINOIS RIVER BASIN RESTORATION.

(a) ILLINOIS RIVER BASIN DEFINED- In this section, the term 'Illinois River basin' means the Illinois River, Illinois, its backwaters, its side channels, and all tributaries, including their watersheds, draining into the Illinois River.

(b) COMPREHENSIVE PLAN-

(1) DEVELOPMENT- The Secretary shall develop, as expeditiously as practicable, a proposed comprehensive plan for the purpose of restoring, preserving, and protecting the Illinois River basin.

(2) TECHNOLOGIES AND INNOVATIVE APPROACHES- The comprehensive plan shall provide for the development of new technologies and innovative approaches--

(A) to enhance the Illinois River as a vital transportation corridor;

(B) to improve water quality within the entire Illinois River basin;

(C) to restore, enhance, and preserve habitat for plants and wildlife; and

(D) to increase economic opportunity for agriculture and business communities.

(3) SPECIFIC COMPONENTS- The comprehensive plan shall include such features as are necessary to provide for--

(A) the development and implementation of a program for sediment removal technology, sediment characterization, sediment transport, and beneficial uses of sediment;

(B) the development and implementation of a program for the planning, conservation, evaluation, and construction of measures for fish and wildlife habitat conservation and rehabilitation, and stabilization and enhancement of land and water resources in the basin;

- (C) the development and implementation of a long-term resource monitoring program;
and
(D) the development and implementation of a computerized inventory and analysis system.

(4) *CONSULTATION*- The comprehensive plan shall be developed by the Secretary in consultation with appropriate Federal agencies, the State of Illinois, and the Illinois River Coordinating Council.

(5) *REPORT TO CONGRESS*- Not later than 2 years after the date of enactment of this Act, the Secretary shall transmit to Congress a report containing the comprehensive plan.

(6) *ADDITIONAL STUDIES AND ANALYSES*- After transmission of a report under paragraph (5), the Secretary shall continue to conduct such studies and analyses related to the comprehensive plan as are necessary, consistent with this subsection.

(c) *CRITICAL RESTORATION PROJECTS*-

(1) *IN GENERAL*- 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.

(2) *AUTHORIZATION OF APPROPRIATIONS*- There is authorized to be appropriated to carry out projects under this subsection \$100,000,000 for fiscal years 2001 through 2004.

(3) *FEDERAL SHARE*- The Federal share of the cost of carrying out any project under this subsection shall not exceed \$5,000,000.

(d) *GENERAL PROVISIONS*-

(1) *WATER QUALITY*- In carrying out projects and activities under this section, the Secretary shall take into account the protection of water quality by considering applicable State water quality standards.

(2) *PUBLIC PARTICIPATION*- In developing the comprehensive plan under subsection (b) and carrying out projects under subsection (c), the Secretary shall implement procedures to facilitate public participation, including providing advance notice of meetings, providing adequate opportunity for public input and comment, maintaining appropriate records, and making a record of the proceedings of meetings available for public inspection.

(e) *COORDINATION*- The Secretary shall integrate and coordinate projects and activities carried out under this section with ongoing Federal and State programs, projects, and activities, including the following:

(1) *Upper Mississippi River System-Environmental Management Program authorized under Section 1103 of the Water Resources Development Act of 1986 (33 U.S.C. 652).*

(2) *Upper Mississippi River Illinois Waterway System Study.*

(3) *Kankakee River Basin General Investigation.*

(4) *Peoria Riverfront Development General Investigation.*

(5) *Illinois River Ecosystem Restoration General Investigation.*

(6) *Conservation Reserve Program (and other farm programs of the Department of Agriculture).*

(7) *Conservation Reserve Enhancement Program (State) and Conservation 2000 Ecosystem Program of the Illinois Department of Natural Resources.*

(8) *Conservation 2000 Conservation Practices Program and the Livestock Management Facilities Act administered by the Illinois Department of Agriculture.*

(9) *National Buffer Initiative of the Natural Resources Conservation Service.*

(10) *Nonpoint source grant program administered by the Illinois Environmental Protection Agency.*

(f) *JUSTIFICATION-*

(1) *IN GENERAL- Notwithstanding Section 209 of the Flood Control Act of 1970 (42 U.S.C. 1962-2) or any other provision of law, in carrying out activities to restore, preserve, and protect the Illinois River basin under this section, the Secretary may determine that the activities--*

(A) are justified by the environmental benefits derived by the Illinois River basin; and

(B) shall not need further economic justification if the Secretary determines that the activities are cost-effective.

(2) *APPLICABILITY- Paragraph (1) shall not apply to any separable element intended to produce benefits that are predominantly unrelated to the restoration, preservation, and protection of the Illinois River basin.*

(g) *COST SHARING-*

(1) *IN GENERAL- The non-Federal share of the cost of projects and activities carried out under this section shall be 35 percent.*

(2) *OPERATION, MAINTENANCE, REHABILITATION, AND REPLACEMENT- The operation, maintenance, rehabilitation, and replacement of projects carried out under this section shall be a non-Federal responsibility.*

(3) *IN-KIND SERVICES- The Secretary may credit the value of in-kind services provided by the non-Federal interest for a project or activity carried out under this section toward not more than 80 percent of the non-Federal share of the cost of the project or activity. In-kind services shall include all State funds expended on programs and projects that accomplish the goals of this section, as determined by the Secretary. The programs and projects may include the Illinois River Conservation Reserve Program, the Illinois Conservation 2000 Program, the Open Lands Trust Fund, and other appropriate programs carried out in the Illinois River basin.*

(4) *CREDIT-*

(A) *VALUE OF LANDS- If the Secretary determines that lands or interests in land acquired by a non-Federal interest, regardless of the date of acquisition, are integral to a project or activity carried out under this section, the Secretary may credit the value of the lands or interests in land toward the non-Federal share of the cost of the project or activity. Such value shall be determined by the Secretary.*

(B) *WORK- If the Secretary determines that any work completed by a non-Federal interest, regardless of the date of completion, is integral to a project or activity carried out under this section, the Secretary may credit the value of the work toward the non-Federal share of the cost of the project or activity. Such value shall be determined by the Secretary.*

Therefore, this feasibility study is being conducted as a critical restoration project under the authority of Section 519 with supplemental authority from the Illinois River Ecosystem Restoration Study, which is being carried out under the Corps' General Investigations (GI) Program. That study was initiated pursuant to the provision of funds in the Energy and Water Development Appropriations Act, 1998. The study was authorized by Section 216 of the 1970 Flood Control Act and 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

1.2 STUDY PURPOSE AND SCOPE

The study assesses the water and related land resource problems and opportunities present in the Pekin Lake State Fish and Wildlife Area (SFWA) – Southern Unit. The development of appropriate ecosystem restoration measures involves a comprehensive examination of the problems contributing to the system degradation and development of alternative solutions. This study further evaluates the Federal and State interest in such ecosystem restoration measures in the Pekin Lake SFWA– Southern Unit. Finally, this study assesses the significance of all potential environmental impacts of the recommended plan.

Due to the broad scope, multiple objectives and time frame of Section 519 authority, this report serves as an interim response to the overall authority. Further, the specific language addressing critical restoration projects is partially satisfied by this study.

The study followed the Corps' six-step planning process. This process included the identification of problems and opportunities; inventory and forecast of resource conditions; formulation, evaluation, and comparison of alternatives; and the selection of a recommended plan. Specific investigations included a review of past studies; compilation, development and analysis of bathymetric surveys of Pekin Lake SFWA to estimate historical sedimentation rates over time; numerical and hydraulic models to assess alternatives; preparation and use of Habitat Evaluation Procedures (HEP) models; and cost effectiveness and incremental analyses. The Corps and the Illinois Department of Natural Resources (IDNR) jointly conducted the study, with both organizations conducting some of the study tasks individually while jointly working on the overall study effort. The purpose of this study report serves as the basis for the construction of the Pekin Lake SFWA – Southern Unit Critical Restoration Project.

1.3 ORGANIZATION OF THE FEASIBILITY REPORT

The study presented in this Feasibility Report has separately bound supporting appendices, including an Environmental Assessment (EA). The purpose of the main report is to concisely summarize the multidisciplinary efforts of the Corps and the IDNR

that lead to the final study recommendations. This process involves the public as well as the City of Pekin, Illinois.

This report is organized into six sections. These sections include:

- (1) Introduction: which highlights the study authority, study area, purpose and scope of study efforts, and the background of the project;
- (2) Plan Formulation: which covers a descriptions of the study process, an assessment of problems, opportunities and constraints, and summaries of the formulation and evaluation of alternatives for Pekin Lake (SFWA) Southern Unit;
- (3) Description of the Selected Plan: that details various components and considerations;
- (4) Plan Implementation: which includes institutional requirements, division of plan responsibility, views of the non-Federal sponsor and other agencies with implementation responsibilities;
- (5) A Summary of Coordination, Public Views, and Comments
- (6) Study Recommendations.

There are 11 appendices:

- General
- Hazardous, Toxic, and Radioactive Waste Phase I & IIA Environmental Site Assessment
- Geotechnical Considerations
- Hydrology and Hydraulics
- Sedimentation Rate Analysis
- Cost Engineering
- Environmental Assessment
- Real Estate Plan
- Value Engineering Study
- Distribution List
- Plates

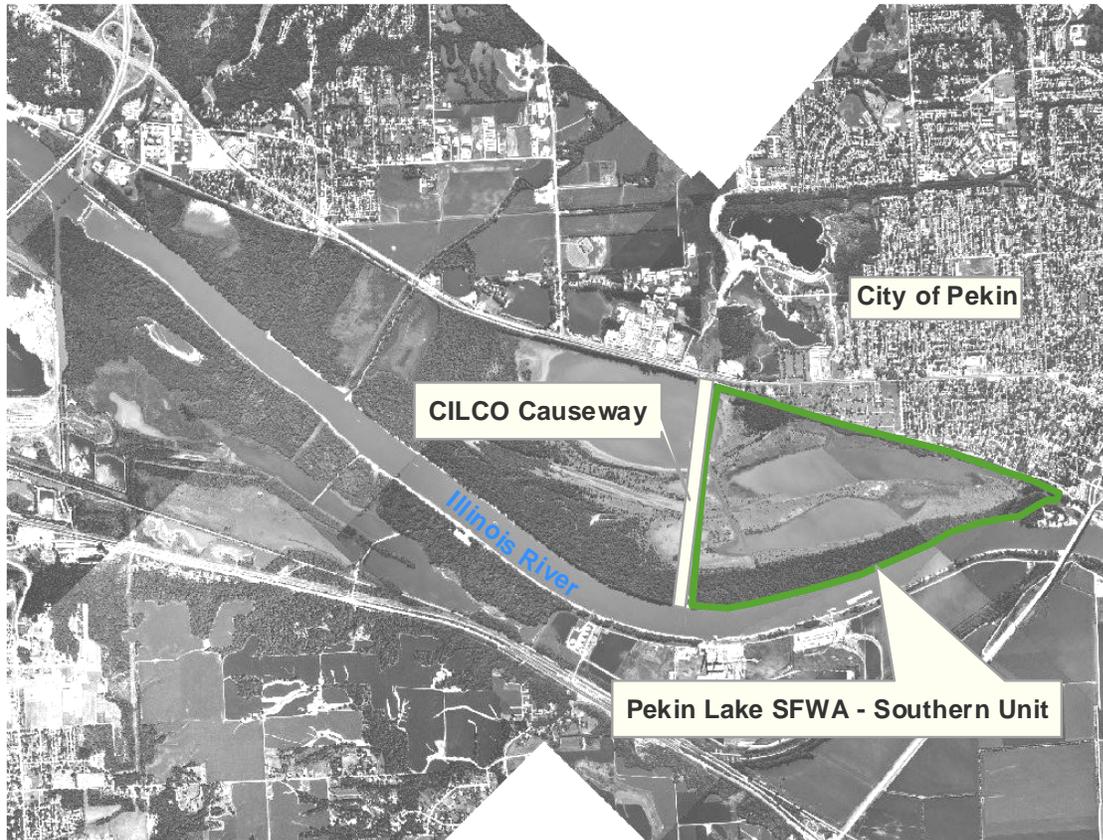
1.4 STUDY AREA

The area of consideration for this critical restoration project is the Southern Unit of the Pekin Lake SFWA. This area is located along the Illinois River immediately downstream of Peoria Lock and Dam and adjacent to and west of the communities of Pekin, North Pekin, and Marquette Heights, Illinois (See Figure 1-1). The area is generally bounded by the Illinois River to the west, the communities mentioned above to the east, Peoria Lock and Dam/Interstate 474 to the north, and Illinois Highway Route 9 to the south.

Several manmade features divide the area. First, in the northern portion of the site is Lick Creek, which crosses perpendicular to the site and is incised to such a degree, that it provides virtually no hydraulic benefit to the site. This creek drains residential and

commercial areas of Pekin, Illinois through the Pekin Lake SFWA to the Illinois River. Further south of Lick Creek is a rubble causeway supporting Central Illinois Light Company (CILCO) high voltage transmission lines. This causeway is also perpendicular to the north south orientation of the Pekin Lake SFWA and divides the Northern Unit from the Southern Unit. The corridor is 400 feet in width and owned by CILCO.

Figure 1-1 Pekin Lake State Fish & Wildlife Area



The fact that the IDNR manages the entire site in a separate manner with distinct ecosystem goals for the Northern and Southern Units, make clear the need for separate feasibility level documents pertaining to each unit. Further, the habitat needs of the site are distinctly different from north to south and therefore reinforce this view. Therefore, this report addresses the Southern Unit only.

1.5 ELIGIBILITY CRITERIA

The project eligibility for inclusion as a critical restoration project is based on whether the restoration project addresses the ecosystem restoration vision and goals identified in the Initial Assessment for Illinois River Basin Restoration. The ecosystem restoration goals are as follows:

- Restore and maintain ecological integrity, including habitats, communities, and populations of native species, and the processes that sustain them,
- Reduce sediment delivery to the Illinois River from upland areas and tributary channels with the aim of eliminating excessive sediment load,
- Restore aquatic habitat diversity of side channels and backwaters, including Peoria Lake, to provide adequate volume and depth for sustaining native fish and wildlife communities,
- Improve floodplain, riparian, and aquatic habitats and functions,
- Restore and maintain longitudinal connectivity on the Illinois River and its tributaries, where appropriate, to restore or maintain healthy populations of native species,
- Restore Illinois River and tributary hydrologic regimes to reduce the incidence of water level conditions that degrade aquatic and riparian habitat, and
- Improve water and sediment quality in the Illinois River and its watershed.

The Pekin Lake SFWA - Southern Unit Ecosystem Restoration Project is consistent with the ecosystem restoration goals of selectively removing sediment in backwater and side channel areas, restoration of floodplain function, increasing connectivity of aquatic habitats, and improving water.

The authorizing legislation (Section 519 of the Water Resources Development Act, Paragraph (c)(1), identified the following minimum eligibility criteria for the Critical Restoration Projects: “If ...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.” Consistency with these criteria are reviewed in Section 2.5 – Evaluate and Compare Alternative Plans

1.6 SELECTION PROCESS

In the fall of 2000, the IDNR prioritized Illinois River Basin watersheds. The process identified high quality watersheds that are threatened with degradation, where there is high potential for restoration, and public ownership or willing landowners. The following six watersheds/areas were selected for the initial site specific projects: Blackberry Creek, Waubonsie Creek, Iroquois River, Kankakee River near Aroma Park, Pekin Lake, and McKee Creek.

The study team reviewed available literature, met with local agencies and partnerships, and visited the areas to further define problems and opportunities and initiate feasibility level evaluations for restoration activities in the watershed that met the ecosystem restoration goals described above. Eligibility requirements and the project selection process will be further developed as part of the Illinois River Ecosystem Study and Illinois River Basin Restoration and will be described in the Illinois River Comprehensive Plan.

1.7 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 WRDA 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 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 initiated in 2000. 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 are 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 number of evaluations to develop detailed project plans for specific sites were begun under this authority. The IDNR and the Corps have initiated assessments for seven site-specific projects in the basin. The seven site-specific investigations are Iroquois River, McKee Creek, Kankakee River - Mainstem, Pekin Lake – Northern Unit and Southern Unit, Waubonsie Creek, and Blackberry Creek. These projects were transferred to the Section 519 authority of WRDA 2000 in 2002 as critical restoration projects. Section 519 is the primary authority under which the site-specific projects are being undertaken.

The types of deepwater off-channel habitat included in the Pekin Lake SFWA restoration alternatives are limited on the entire Illinois River. The *Habitat Needs Assessment* completed as part of the Upper Mississippi River System – Environmental Management Program in 2000 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.

Concurrent to the development and initiation of the Ecosystem Study, the IDNR initiated development of a *Pekin Lake Draft Preliminary Restoration Plan*. This document established site goals and management objectives to be obtained through restoration at the site. The management objective for the site is:

- To maintain and enhance the existing natural heritage and wildlife resource integrity of the site with emphasis on waterfowl management, protecting the heron rookery and other sensitive avian species, and maintaining the site's value as a fish nursery to the LaGrange Pool of the Illinois River.

The document also relates the site's long history of use and natural resources. This information provided the Corps and sponsor with clear justification, consistent with critical restoration authorizing language and eligibility criteria defined above, to select the site for further investigation.

1.8 CONSIDERED DISCUSSION OF STUDIES, REPORTS, AND EXISTING WATER PROJECTS

1.8.1 Prior Studies and Reports. In conducting this analysis, a number of documents were consulted, which included:

- (1) ***Section 519 Initial Assessment.*** In February 2002, an Initial Assessment was completed. Section 519 of WRDA 2000 authorizes both completion of a Comprehensive Plan for the basin and the identification, evaluation, and selection of Critical Restoration Projects. The purposes of this Initial Assessment are to:
 - (1) Identify watershed needs and present a framework to develop and implement a Comprehensive Plan, including long-term resource monitoring and
 - (2) Identify procedures and responsibilities for the identification and evaluation of Critical Restoration Projects.
- (2) ***Pekin Lake State Fish and Wildlife Area – Management Plan,*** 2001, Illinois Department of Natural Resources. The site management plan summarizes the site history, significant resources, and makes recommendations for future management of the site.
- (3) ***Soldwedel and Worley Lakes: Topographic Features and Preliminary Sediment Characteristics,*** February 2001, James A. Slowikoski and Nani Bhowmik, Illinois State Water Survey. This letter report provides a brief overview of topographic features and sediment characterizations for the Soldwedel and Worley Lakes.

- (4) ***Ground-Water Conditions in the Vicinity of Soldwedel and Worley Lakes***, February 2001, Stephen Burch, Illinois State Water Survey. This letter report summarizes ground water conditions near Pekin, Illinois, and addresses connectivity of the lakes with the river.
- (5) ***Vegetative Sampling***, 2001, Upper Midwest Environmental Science Center, http://www.umesc.usgs.gov/data_library/data_library.html, Upper Mississippi River Environmental Management Program - Long Term Resource Monitoring Program (LTRMP). Staff at the Illinois River Biological Station (IRBS) have monitored submersed aquatic vegetation at Pekin Lake yearly from 1998 through 2001 using standardized protocols through the LTRMP.
- (6) ***Dredged Material Management Plan for Dredged Material Placement***: Illinois River Navigation Project, Site Plan for the Lick Creek/Peoria Lock Lower Dredge Cuts, River Miles 154.0-157.7, August 1996, U.S. Army Corps of Engineers, Rock Island District. This document records the process used to develop a Dredged Material Management Plan (DMMP) by evaluating the potential alternative placement locations for dredged materials in this reach.
- (7) ***Pekin Lake Conservation Area - Water Flow Balance Proposal***, June 1986, Illinois Association of Duck & Goose Hunters. The proposal calls for an 18-inch or 24-inch water supply line from the upstream side of Peoria Lock and Dam and a discharge structure with drop logs.

1.8.2 Existing Water Projects at Pekin Lake SFWA.

Significant actions include:

- **Existing Corps of Engineers Activities in the Vicinity of the Pekin Lake SFWA.**

Peoria Lock and Dam is located at River Mile (RM) 157.7 near the city of Peoria, Illinois. This facility, constructed in 1938, has a lock with a usable chamber 110 feet wide and 600 feet long with a flat pool lift of 11 feet. The dam is constructed of wicket gates that can be lowered during higher flows, allowing tows to transit the area without locking through the chamber. Open river conditions, wickets lowered, typically occur 38% of the year. At other times, the dam is operated to maintain a pool elevation of 440 feet National Geodetic Vertical Datum 1929 (NGVD) upstream of the lock and dam. River levels downstream are influenced by flows at the Peoria Lock and Dam, the Mackinaw River which comes into the Illinois River at RM 147.7 and the La Grange Lock and Dam at RM 80.2. The La Grange Lock and Dam has a similar design and operation to the Peoria Lock and Dam and its influence on river water levels progresses farther upstream as river flows decrease.

Shoaling in the navigation channel regularly occurs from RM 154.0-157.7. Since 1940, the dredge cuts have required dredging a combined 21 times, generating 1,229,127 cubic yards to provide a safe and unobstructed navigation channel.

- **Existing Federal Activities at Pekin Lake SFWA.** The Upper Mississippi River Environmental Management Program (EMP) - Long Term Resource Monitoring Program (LTRMP) monitors fish and vegetation at Pekin Lake SFWA. There are no other Federal activities at the site.
- **Partnerships and Ongoing Water Resource Projects and Programs.** The IDNR owns and manages Pekin Lake SFWA as a State of Illinois Fish and Wildlife Area.

The City of Pekin, Illinois sought and received a \$150,000 state grant to conduct restoration at Pekin Lake SFWA. This grant has not been utilized and represents a potential non-Federal funding source for restoration in the area.

Plan Formulation

2.1 DESCRIPTION OF THE STUDY PROCESS

Development of the Pekin Lake SFWA – Southern Unit Feasibility Study followed the Corps’ 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 characterizes and assesses conditions in Pekin Lake SFWA - Southern Unit as it currently exists 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 lake and its uses are anticipated to be like over the 50-year planning period without any restoration implemented as a result of this study. The with-project condition is what the lake and its uses are anticipated to be 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 will be considered.

4. Evaluate Alternative Plans: The evaluation of each alternative consists of measuring or estimating the environmental benefits (Habitat Units), costs, technical considerations, and social effects of each plan, and determining the difference between the without and with-project conditions. A key measure for 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 cost.

6. Select Recommended Plan: A Recommended Plan is selected based on the comparison of the alternatives and other relevant information. If a viable plan 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 following sections are outlined in accordance with report content guidance in ER 1105-2-100 and therefore do not follow exactly the planning steps as they occurred. Further, the planning process is iterative. As such, as additional information was learned in subsequent steps, it was necessary to revisit and repeat portions of the previous step(s).

2.2 ASSESSMENT OF PROBLEMS AND RESOURCE CONDITIONS

The Northern Unit of the Pekin Lake SFWA is defined as the area directly north (upstream) of and including the CILCO causeway and south of Lick Creek. This Unit is bounded on the west by the Illinois River and to the east by an active railroad corridor. The Southern Unit of Pekin Lake SFWA is defined as the area directly south (downstream) of but not including the CILCO causeway and north of Coopers Island.

2.2.1 Existing Conditions. The Pekin Lake SFWA Area is located adjacent to the City of Pekin, Illinois and consists of six former and current bodies of water separated by moist soil plant communities and bottomland timber. Sediment deposited over the years has filled the former lake basins, making most of these water areas dry or too shallow to sustain fish life during normal dry season/low water period pool levels in the Illinois River. Please see Appendix E for a more detailed analysis of historic and existing surface areas. The lakes and their approximate sizes are:

Southern Unit

Soldwedel Lake, 105 acres (old Pekin Lake)
Lake of the Woods, 108 acres

Northern Unit

Worley Lake, 258 acres
Slim Lake, 57 acres
Round Lake, 16 acres
Little Round Pond, 4 acres

These lake basin areas, with the exception of Round Lake and Little Round Pond, are all connected by channels, or culverts through man-made levees and causeways. The connecting channel to the Illinois River is located at the south end of Soldwedel Lake, near the Illinois Route 9 road bridge. The only water control structure at the site is a nonfunctioning, east-west levee (IDNR levee) that was constructed many years ago to retain water in Worley Lake, Upper Lake of the Woods, Round Pond, and Slim Lake for the purpose of waterfowl hunting. A causeway was constructed in 1965 approximately 600 feet north of the levee to provide access and footings for a Central Illinois Light Company (CILCO) electric transmission towers and overhead lines. There are several culverts through the causeway, and the causeway does not function efficiently to retain water.



Figure 2-1. CILCO causeway looking West.

For many years, a low-level dam (Boley Ice Company) was maintained at the south end of Pekin Lake SFWA to retain water for ice cutting operations. Ice was cut from the lake and sold commercially. In 1938, the Peoria Lock and Dam were completed, replacing the dam at Copperas Creek. This resulted in a lower pool elevation in the Illinois River adjacent to Pekin Lake SFWA, thereby lowering water levels in Pekin Lake SFWA.

The Forest Park Foundation purchased the Pekin Lake SFWA property and sold it to the state in 1966. The land was purchased for open space, as a wildlife sanctuary, and to preserve the heron rookery. The state has since purchased other small tracts. Biological studies of the area have been conducted since 1962, including annual monitoring of the heron rookery.

Current management of Pekin Lake SFWA is passive. The dam at the south end of Pekin Lake SFWA has long since deteriorated and the center IDNR levee is no longer

complete. During periods of high water, boats can enter Pekin Lake SFWA at the south end from the Illinois River. Other uses include bank fishing, hiking, picnicking, waterfowl hunting, archery deer hunting, and wildlife observation.



Figure 2-2. Pekin Lake Fish & Wildlife Area Looking Downstream. Soldwedel and Lake of the Woods are in the distance.

2.2.1.1 Hydraulics. The hydrologic conditions in the Pekin Lake SFWA project area are essentially determined by the Illinois River water level. River water enters the lakes through a connection at the southern end of the site when river water surface elevations exceed the high-point channel bottom elevation of 431 feet. It also enters the lakes via overland flood flow when it exceeds approximately 440 feet. Lick Creek once fed the lakes in this area, but at some point since 1904, the creek was channelized to flow directly into the Illinois River, and very little area now contributes runoff directly to the lakes within the Pekin Lake SFWA. Geotechnical investigations have confirmed that the lake bottom is composed of at least 10 feet of clay material. Regional groundwater discharges into the Illinois River and the project area. The other source of water to the site is direct precipitation.

Sediment-bearing upland runoff is not a concern, and any groundwater or precipitation contributions would have little sediment. When water levels in the Illinois River are lower than approximately 440 feet, river inflows occur only through the constricted entrance at the south end of the site; river water would tend to back up through this constriction, reducing flow velocities and drawing water from the edge of the river instead of the high sediment-load flows in the main channel. When the river exceeds the

bank-full level of approximately 440 feet, flood flows enter the site, contributing both sediment and water, and the effects of the constricted outlet no longer protect the site from sediment loading. It should be noted that the high-flow periods during which the river would have the most connection to the site are also the times of high sediment concentration, so despite the fact that the site is better off than some backwater lakes, it still receives a significant sediment load from the river.

Because the site is located between the Peoria Lock and Dam and the Kingston Mines gage on the Illinois River, it is possible to construct a hypothetical gage record of the water levels at the site outlet. Figure 2-3 shows the median annual hydrograph for 62 years of Illinois River water level records. Also shown are the 90% and 10% exceedance water levels, which correspond to the 10-year low- and high-water levels, respectively. This figure shows that the site is generally flooded from late March through late May, but that there is at least a 10% chance that it will be flooded on any day of the year except from late July until the autumn. The average annual high water level is 446.8 feet NGVD, and the 90% and 10% exceedances are 442.7 and 452.1 feet NGVD, so the site can be expected to flood even during the 10-year low-flow year. The corresponding low-water levels are 430.5, 429.8, and 431.2 feet NGVD, so the site draws down nearly every year until the surface water connection to the river goes dry.

Although this water regime currently maintains the site, historic water levels may have been higher due to control of the Illinois River and changes on the site. The construction of Copperas Creek dam elevated river water levels at the site from the time it was constructed in the late 1870's until it was removed in 1936. The current dams at La Grange and Peoria maintain lower water levels in this area because the site is in the extreme upstream end of the La Grange pool and the effects of the dam are generally small relative to the effects of the Copperas Creek dam, which was only 16 miles downstream. The dam constructed across the outlet to benefit ice production in Pekin Lake SFWA, in combination with flows from an undiverted Lick Creek and higher river water levels, probably maintained higher water levels on the site at the turn of the 20th century. The dam across the outlet is nonexistent, and the water regime is no longer affected by Lick Creek flows.

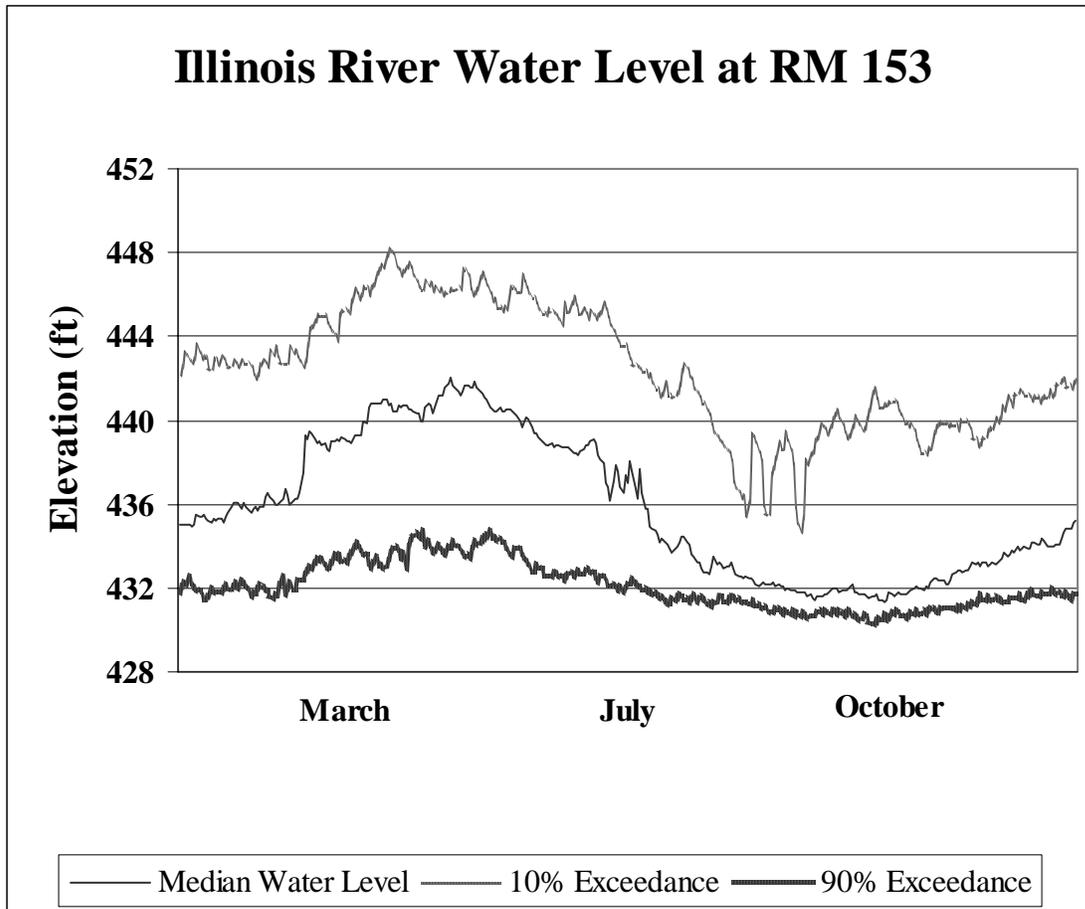


Figure 2-3. Median annual hydrograph for Illinois River Mile 153.

2.2.1.2 Environmental Resources

For much of the 20th century, water quality was in decline on the Illinois River. 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 River. 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 River (report of the LTRM).

While chemical and industrial pollution is being brought under control, sedimentation is still a major issue on the Illinois River, and it has destroyed much of the formerly high quality fish and wildlife. 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.

2.2.1.3 Fishery Resources. Pekin Lake SFWA currently provides spawning and nursery habitat for Illinois River fishes. High river stages during spring provide fish access to off channel spawning sites. As spring floods subside, the fish produced in Pekin Lake SFWA are drained back into the LaGrange Pool of the Illinois River. This recruitment of fish is a critical fishery function of the site and is essential to the aquatic health and vitality of the Illinois River. Any proposed water management structures at Pekin Lake SFWA should be designed in such a way that the fishery nursery function can be maintained.

The staff at the Illinois River Biological Station (IRBS) has been collecting fish data from the Pekin Lake SFWA since 1995. Boat access to Pekin Lake SFWA is limited throughout much of the year due to low water levels. However, 5,470 fish including 32 taxa have been collected using mainly fyke, minnow fyke, and electrofishing gears since 1995. The top five most abundant species collected over the period of record were gizzard shad (*Dorosoma cepedianum*), white bass (*Morone chrysops*), common carp (*Cyprinus carpio*), emerald shiner (*Notropis atherinoides*), and black bullhead (*Ameiurus melas*). In addition to fish, one common snapping turtle (*Chelydra serpentina*) and one red-eared slider (*Chrysemys scripta*) were also collected at Soldwedel Lake (Personal Com. Mark Pegg, INHS and LTRMP website). These results are consistent with other backwater lake complexes along the Illinois River that are impaired by shallow depths and lack of aquatic structure.

2.2.1.4 Forest Resources. Floodplain forests within the Pekin Lake SFWA occupy approximately 633 acres and consist of tree species typical of a seasonally

flooded river bottom. Cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), black willow (*Salix nigra*), and boxelder (*Acer negundo*) constitute the most prevalent tree species at Pekin Lake SFWA. The area between Lake of the Woods and Soldwedel Lake is virtually devoid of quality forest habitats. IDNR field staff indicates that the forest resources present at this location were destroyed as a result a flood in 1993. The hydrologic regime of the Illinois River has probably been the single largest factor in determining the forest condition at Pekin Lake SFWA, though historic logging, fire suppression, and disruption of other disturbance regimes have influenced forest structure. Mast producing tree species were once an integral part of the forestry resources present in the Illinois River floodplain. However, increases in river levels have virtually eliminated mast producing trees from the floodplain landscape.

The three soil types present are Jules silt loam, Lawson silt loam, and Landes fine sandy loam. These soils are listed in the *Soil Survey* as being frequently flooded, except Jules, which is listed as occasionally flooded. There is some likelihood that other bottomland hardwood species such as hackberry (*Celtis occidentalis*), pecan (*Carya illinoensis*), pin oak (*Quercus palustris*), shingle oak (*Quercus imbricaria*), bur oak (*Quercus macrocarpa*), and black walnut (*Juglans nigra*) may have occurred in this area (especially in the higher and drier sites) in the past but may have been eliminated by cutting and changes in hydrology.

2.2.1.5 Waterfowl. In years of low river levels throughout the summer, the area provides very important pasture for Canada geese. This area also provides important brood habitat for mallards, wood duck, and Canada geese.

The area was opened to public waterfowl hunting in 1979. Currently, 12 blinds are allocated by an annual draw and hunted in compliance with statewide regulations. The blinds are located on Lower and Upper Lake of the Woods and on Slim Lake. The remaining areas of Pekin Lake SFWA (south of Lick Creek), including Lower Lake of the Woods, Soldwedel Lake, and Worley Lake, are managed as a refuge with no entry between 7 days prior to the opening of the regular waterfowl season through the close of the waterfowl season (including the late goose season).

Waterfowl usage of the site is recorded in periodic aerial inventory data collected by the Illinois State Water Survey. Inventories include information on numbers of individuals of various species of ducks and geese as well as some information on bald eagles and double-crested cormorants. Most flights were on a weekly basis when the weather permitted: fall (September-December): weekly 1949-1956, 1964-1966, 1971-2000 and spring (February-April): 1956, 1958, 1960, 1961, 1974, 1976-1985, 1987, 1990-2001. The sit has seen a general decline, consistent with other backwater lake areas along the Illinois River.

2.2.1.6 Shorebirds. During low-water periods, large numbers of shorebirds feed in shallow water and exposed mud flats at Pekin Lake SFWA during their spring and especially fall migrations. Different species migrate at different times, but overall the spring migration is from mid-March through June, and the fall migration is from early

July through early November.

All shorebirds consume invertebrates, but different shorebird species prefer different foraging water depth and vegetation height and density conditions. A range of habitats is needed to support a diverse species assemblage. Variations in elevation at Pekin Lake SFWA allow a variety of foraging conditions at the same time. Due to high shorebird use and high quality habitats, the area has been designated by the American Bird Conservancy as a Nationally Important Bird Area because of the number of breeding black-crowned night herons.

2.2.1.7 Wading Birds. Large numbers of wading birds (herons, egrets, and night herons) nest and feed in the Pekin Lake SFWA area. This is consistently one of the largest rookeries on the Illinois River and has been active since at least 1935, except from 1973-1985 when logging caused rookery abandonment.

Wading birds forage in Pekin Lake SFWA throughout much of the year, except during floods or when the lake is frozen. These birds feed primarily on fish, but also on frogs, insects, crayfish, and small vertebrates. Great blue herons and great egrets require water depths between a few inches and 2 to 3 feet deep for foraging. Black-crowned night herons are smaller and forage in water less than 6 inches deep. High water not only eliminates foraging areas, but also results in dispersal of fish over a larger body of water, which compromises the quality of foraging habitat.

Each wading bird species has somewhat different timing, but in general, they arrive in February and March, lay eggs from March to June, and the nestlings develop and fledge between June and August. The most critical time to provide adequate water depths for these birds is during nesting and fledging.

2.2.1.8 Aquatic Vegetation. Staff at the IRBS began monitoring submerged aquatic vegetation within La Grange Pool of the Illinois River in 1991. The Pekin Lake SFWA area was not included in this sampling until 1998 when a stratified random sampling design was implemented. Sampling within Pekin Lake SFWA has taken place yearly from 1998 through 2001. No submerged aquatic vegetation has been found within the Pekin Lake SFWA and surrounding area. Water depths taken during sampling varied depending on river stage from exposed mudflats to almost 13 feet. Substrate was dominated by silt and clay. Lack of submersed aquatic vegetation is probably due to a combination of biotic and abiotic factors, including water level fluctuation, increased sedimentation, and poor water quality, as well as uprooting and herbivory by fishes and waterfowl (Personal Com. Mark Pegg, INHS, and LTRMP website).

2.2.1.9 Moist Soil Plant Communities. The term and concept of “moist-soil” plant production, introduced by Illinois Natural History Survey scientist Frank Bellrose in the 1940s, referred to plant species that grew on exposed mud flats after surface water retreated in spring or summer. Under historic conditions, the natural flood pulse and other natural disturbance regimes of the Illinois River influenced much of the ecological function and structure of the floodplain. These moist soil plant areas were part of a larger

structure of backwater and wetland complexes on the Illinois River that were composed of open water of varying depths, bottomland hardwood forest and wetlands of varying types. Seeds produced by these moist soil plants often attract and concentrate waterfowl and other wetland wildlife species. The decomposing vegetative parts of moist-soil plants also provide substrata for invertebrates, which are critical food for many wetland wildlife species. The Pekin Lake SFWA was characteristic of this floodplain archetype.

Moist soil plant communities have been severely degraded in the Upper Mississippi River and the Illinois River in particular. This fact has been recognized through research conducted as part of the Upper Mississippi River Environmental Management Program (EMP) Habitat Needs Assessment. Further, the recognition of this loss of moist soil plant communities along the Illinois River has resulted in three of the five completed EMP Habitat Rehabilitation and Enhancement Projects (HREP) in Illinois being constructed to improve structure and function of moist soil plant communities. These projects have been supported and/or sponsored by the State of Illinois and the United States Fish and Wildlife Service.

The moist soil plant communities present in Soldwedel and Lake of the Woods are limited to the fringes of the two lakes under normal pool elevations. Water levels fluctuate sufficiently to limit the entire lake bottoms ability to produce moist soil plants.

2.2.1.10 Endangered Species. Two federally threatened species are known to be located in the Pekin Lake SFWA. While Tazewell County is listed as “wintering” habitat for the threatened bald eagle (*Haliaeetus leucocephalus*), there was an eagle nest along the river near the downstream end of the wildlife area. However, that nest has blown down and no further activity has been observed by IDNR field staff. Please see Appendix G for further information. The decurrent false aster (*Boltonia decurrens*) is a federally threatened floodplain species found within the upper end of the Pekin Lake SFWA. Two specimens of this plant were also found along the CILCO levee during a survey by the IDNR in 2000. The State endangered black-crowned night heron (*Nycticorax nycticorax*) can also be found nesting within the historic heron rookery northwest of Worley Lake.

2.2.1.11 Invasive and Exotic Species. The main problems present are cockleburs and willow invasion in some of the water areas such as Slim Lake. Reed canary grass is not much of a problem yet, but should be monitored closely. Purple loosestrife had not been found on the site as of the summer of 2000. However, it is found along the river just northwest of Pekin Lake SFWA, so it is only a matter of time before it occurs. The area should be monitored closely for purple loosestrife. All of the above species would require monitoring and control measures, which would include drawdowns, flooding, disking, spraying, mowing, and herbicide.

2.2.1.12 Public Use. The site currently provides numerous recreational opportunities, including fishing, waterfowl hunting, bow hunting, picnicking, canoeing, small pleasure boating, hiking, and wildlife observation. Site use estimates included over 550 hunting trips during the 1999-2000 season, but this number may significantly understate actual usage since the site is not staffed and sign-ins are voluntary.

2.2.1.13 Historic Properties. Initial investigations into cultural resource potential did not reveal any known historic sites and generally indicates low potential. Please see Appendix G 1 Environmental Assessment, Section V. D. and Section XIII B for further information.

2.2.2 Future Without-Project Conditions. Sedimentation has historically reduced, and is likely to continue to reduce, the depth of backwater lakes and side channels, deteriorating the natural aquatic resources. Even if relative equilibrium is being established in terms of sediment deposition, it remains very unlikely that the existing degraded habitats would see measurable improvements in the near future. With respect to the expected future environmental condition of Pekin Lake SFWA, ongoing sedimentation would likely result in continued limitations or potential further decline in populations of fish and wildlife.

At Pekin Lake SFWA, the net result of changes in river management and historic sedimentation has been the shrinking of the historic Soldwedel Lake volume from an estimated 323 acre-feet in 1903 to 200 acre-feet in recent years (ISWS 2001). With respect to the expected future environmental condition of Pekin Lake SFWA - Southern Unit, ongoing water level fluctuations and sedimentation would likely result in continued limitations or potential further decline in populations of fish and wildlife.

In preparation for the Habitat Analysis, a baseline without-project condition was developed for the project area. This serves as the base conditions from which to measure benefits of various project alternatives. They are also useful in putting a number against anticipated future without project conditions.

In the Southern Unit of Pekin Lake SFWA, the management goals are to increase overwintering habitat for fish. Currently, no overwintering habitat exists on the site and is limited in the Illinois River. Over the 50-year life of the project, if nothing is done, we will see significant losses (approximately 43%) of the remaining shallow water in the Southern Unit. The moist soil/emergent cover will also decline, giving way to additional scrub-shrub willow invasion and marginal quality forested areas. Further, reestablishment of mast producing trees along this reach of the Illinois River floodplain would provide unique habitat for wildlife that is currently lacking.

Table 2-1 Southern Unit Without Project Conditions

Southern Unit Baseline Habitat Conditions		Without Project Acres by Target Year				
Cover Types	Description	0	1	5	20	50
<i>Deep</i>	Deep water = or > 4ft in depth	0.0	0.0	0.0	0.0	0.0
<i>Shallow</i>	Shallow open water	26.2	25.8	24.3	19.2	10.8
<i>Moist/Emergent</i>	Combination of moist soil, mud flat, and emergent cover types	174.6	172.4	163.6	134.3	84.2
<i>Scrub-Shrub</i>	Scrub-Shrub Areas that are invading the Moist Emergent areas, predominately willows	89.4	90.7	95.6	109.9	120.5
<i>Forested</i>	Forested areas, Including Forested Wetland and Bottomland Hardwood	99.9	101.2	106.7	126.8	174.5
		390.0	390.0	390.0	390.0	390.0

2.2.3 Problems and Opportunities. The principal problem at Pekin Lake SFWA – Southern Unit is the lack of depth diversity caused by sedimentation and lower water levels have resulted in reduced habitat value and diversity. Also, once plentiful stands of mast producing trees have been eliminated due to water level fluctuations and higher than historic water levels. Backwater lakes and side channels along the Illinois River formerly provided a great variety of high quality habitat types with greater depth diversity and topographic diversity. These areas formerly provided large areas of deep and shallow water habitats and numerous sloughs and forested and non-forested wetland habitats. Pekin Lake SFWA - Southern Unit provides an excellent opportunity for restoration of many of these habitat types.

Opportunities listed below were used as the foundation for the development of alternatives to address the principal problems at Pekin Lake SFWA – Southern Unit:

- Preserve and maintain the existing natural heritage and wildlife resource integrity

of the site with emphasis on waterfowl management, protect the heron rookery and other sensitive avian species, and maintain the site's value as a fish nursery to the La Grange & Peoria Pools of the Illinois River.

- Restore habitat and species lost from much of the Illinois River Valley, including, aquatic plants, mast trees, invertebrates, and off channel overwintering habitat for fish.
- Maintain or improve the site’s connectivity with the river.

2.2.4 Goals and Objectives

In consultation with the non-Federal sponsor and interested parties from the City of Pekin, Illinois, Goals and Objectives were developed during the summer of 2001 and finalized at a meeting on December 6, 2001. They are the following:

Table 2-2 Project Goals & Objectives

Project Goals, Objectives, and Potential Restoration Features

Goal	Objective	Feature (proposed)
<i>Improve aquatic habitat</i>	Provide overwintering fish habitat	Dredge connection with main channel
		Dredge areas of >6ft depth
	Improve spawning and nursery habitat	Dredge areas of ~4ft depth over firm substrate Add structure – rock/woody debris
<i>Enhance wetlands</i>	Improve migratory waterfowl and shorebird habitat	Establish a waterbird management area (perched wetland)
<i>Improve terrestrial habitat</i>	Improve forest diversity and introduce mast trees	Use dredged material to create areas of higher elevation.
		Forest management and tree planting

2.3 PLANNING CONSTRAINTS

The principal focus of this study is to identify opportunities for restoring degraded ecosystem structures and functions, taking into account the sites hydrology, plant, fish, and wildlife communities. Several constraints must be taken into account in developing alternatives to achieve the above focus.

- **Constraint #1** - Dredged material placement in the floodplain cannot significantly increase flood heights.
- **Constraint #2** - Any proposals that involve the use of stormwater culverts under the railroad and Illinois Rt. 29 will require coordination and Railroad and Illinois Department of Transportation (IDOT) agreement.

- **Constraint #3** - Permanent wetland fills should be avoided, minimized, and compensated to comply with existing laws and regulations.
- **Constraint #4** - 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. In addition, the Sponsor desires more natural and sustainable alternatives that avoid high operation and maintenance costs.

2.4 IDENTIFY MEASURES AND FORMULATE ALTERNATIVE PLANS

Before alternative plans were formulated, the first step taken was to identify general locations and categories of potential improvements that would satisfy the goals and objectives established previously. A Regional Team consisting of IDNR site managers, regional biologists, City of Pekin, Illinois representatives, and Corps personnel met monthly to formulate these alternatives. The process began with several discussions concerning the management goals and objectives in practice by the State of Illinois. This yielded an array of *general measures* from which *specific measures* were developed. The formulation of these specific measures involved an assessment of the measures as to whether they met the goals and objectives of the study and how likely they were to produce measurable habitat benefits. Obviously, this is a subjective process requiring further trade off analysis and habitat evaluation procedures of alternative plans; however, the depth of professional experience and first-hand management knowledge by many members of the team was invaluable in defining specific measures.

Finally, several specific measures were screened for a variety of reasons. They are not included as specific measures but are described in the screening section below, along with necessary justification for their elimination from consideration. Upon finalization of specific measures, alternatives were developed through combination of specific measures. This development of *alternative plans* is described below.

2.4.1 General Measures and Criteria. As each potential category of measures was developed, a corresponding list of criteria related to each potential measure was developed. The IDNR maintains a regional field office in Pekin and as a result, local field staff expertise played a key role in development of the criteria. Further, IDNR has developed a management plan for the site that was used to guide criteria development and assist with development of specific measures. Below are listed the potential categories of actions, and corresponding criteria, to provide improved aquatic habitat, water level management, and improved terrestrial habitat.

2.4.1.1 Dredging and sediment removal to create aquatic habitat. The Initial Assessment, discussed the potential for dredging to improve aquatic habitat diversity and function. The sedimentation that has occurred has eliminated the conditions necessary for aquatic plant communities. Further, the lack of depth diversity and aquatic structure in the Southern Unit has severely limited deep-water areas for fisheries. This

category of measures would involve dredging portions of Soldwedel Lake and Lake of the Woods to a depth consistent with healthy aquatic ecosystem function at this location. Variations include channel connections between the lakes and the Illinois River, large and small area dredging, finger-like channels off main dredged areas, deep “potholes,” and deep and shallow dredging.

Criteria include:

- Provide adequate deep-water connection with the main channel of the Illinois River.
- Provide overwintering fish habitat – areas 6-8 feet in depth. Assuming 90% exceedance of EL. 432.0 NGVD water surface elevation during winter months. Deep dredging is 6 feet + 2 feet of sedimentation over a 50-year period of analysis = 8 feet. $432.0 - 8.0 = \text{EL. } 424$. At the beginning of the period of analysis, there would be a 10% chance in any given year that fish would have less than 8 feet of water during the winter and almost no chance that they would have less than 6' of water. Holes are assumed to be 4 feet deeper than channels and fingers (EL. 420.0).
- Provide spawning, nursery habitat for fish areas with 4 feet of depth. Shallow dredging is assumed to be 4 feet more shallow than deep dredging, or EL. 428.0.
- Project measures should be sustainable through the period of analysis and minimize any increase in additional sedimentation.
- Provide foraging areas for great blue heron and egret that are up to 2 feet deep.
- Avoid dredging any areas with elevations 433 or greater to minimize losses to the limited moist soil plant communities already present.

2.4.1.2 Dredged material placement. Any discussion of dredging backwater areas necessitates development of dredged material placement options. This category would include several onsite placement alternatives, one adjacent placement site proposed by the City of Pekin, Illinois, and several off-site placement alternatives. Onsite alternatives can include use of material for terrestrial habitat creation. The adjacent site option includes placement in an abandoned gravel pit. Off-site placement may include transport to Chicago for use as cover for formerly used industrial sites or transport to other wildlife areas such as Banner Marsh or Rice Lake.

Criteria include:

- Minimize impacts to existing moist soil plant communities (i.e. areas approximately 433.0 to 437.0 elevation)
- If placement is in the Pekin Lake SFWA - Southern Unit, shoreline areas are preferable to increase habitat diversity.
- Use material, if feasible, to increase elevations allowing for improved forest diversity and reintroduction of mast trees (minimum elevation of 444).
- Consider options than utilize geotubes to contain dredged materials.

2.4.1.3 Access channels. Currently, the main connection between the Illinois River to Pekin Lake SFWA is at the south end of Pekin Lake SFWA. These measures would allow for fish access during low water periods. The channel allows for fish and boat access to the Lake during periods of high water. The primary purpose of

investigation into this category of options is to allow dredge equipment to enter into Soldwedel and Lake of the Woods. Ancillary benefits would be for boat access.

Criteria include:

- Provide access to the Illinois River for fish during low-water periods.
- Provide for the shortest distance of access (cost) and adequate access for dredge equipment.
- Prevent displacement of Pekin Boat Club facilities.

2.4.1.4 Recreation. Currently the site is open to the public and recreation is passively managed. The opportunity exists to enhance recreational opportunities at the site without diminishing ecosystem benefits. This category includes additional public access points and parking, public boat access, piers, and walking trails.

Criteria include:

- Section 103 (c)(4), WRDA 1986 (P.L. 99-662) defines federal involvement in recreation features as being limited to 10% of the overall project costs and the features cannot diminish restoration efforts. The cost share is 50/50.

2.4.1.5 Aquatic Structures. The goal of improving aquatic habitat through non-dredging alternatives is necessary to provide for a full and complete range of alternatives. This category includes rock structures (reefs, jetties, etc.) and woody debris.

2.4.1.6 Lower end water control structures. Water level management in the Southern Unit for the Restoration of moist soil plants was identified as part of the larger water level management and improved habitat goals. This category includes installation of a control structure (stop logs) at the southern end of Soldwedel Lake similar in function to the historic Boley Ice Company dam. This structure would allow for the creation and management of a pool in the lower unit.

Criteria include:

- Reduce water level fluctuations in summer moist soil plant growing season.
- Ability to remove gate(s) for lowering of water levels during the majority of the year to maintain connectivity.
- Allow for fish and boat passage.

2.4.2 Specific Measures. Reflecting the criteria outlined above and the constraints present at the project site, specific measures were developed within the broad categories of potential measures. These measures are intended to satisfy the objectives and reach the goals of the project study.

2.4.2.1 Dredging and Sediment Removal Measures.

D1 *6.6 Acres of Dredging: Connecting Channels (Base Option)* – 50’ wide channel from the river into Soldwedel Lake, and 50’ wide channel from Soldwedel Lake into Lake of the Woods to EL. 424.0 +/- This option is included in all other dredging measures.

D2 *26.7 Acres of Dredging:* – Dredge finger channels to EL. 424.0+/- and holes to EL. 420.0+/- in Soldwedel Lake. Dredge shelved areas ranging from EL. 420.0+/- to 428.0+/- in Lake of the Woods.

D3 45.7 Acres of Dredging: – This measure includes D2 plus dredging shelved areas ranging from EL. 420.0+/- to 428.0+/- in Soldwedel Lake and Lake of the Woods.

D4 40.6 Acres of Dredging: – This measure includes D3 with approximately 5.0 fewer acres of dredging adjacent to the northern ends of Soldwedel and Lake of the Woods.

2.4.2.2 Dredged Material Placement.

P1 Sidecast Material Along Dredged Channels – Mechanically place material along the dredged channel for the dredging *Base Option*. This would place approximately 13,000 CY (cubic yards) of material on approximately 2 acres at **Site E** to an elevation of roughly 443 NGVD and approximately 72,245 CY of material on approximately 5 acres along the outer edges of **Site B** to an elevation of roughly 444 NGVD.

P3 East Side of Soldwedel Lake – Placement would occur adjacent to and parallel to the railroad embankment to serve as a buffer between the railroad, residential areas and the lake. There is potential for this area to be used for continued road access, parking, and boat ramps. Finally, placement at this location would increase shoreline length, diversity of transition habitat, and areas for mast tree production.

P4 West Side of Lake of the Woods – Place material along the west side of Lake of the Woods or on the natural bankline to the west of Lake of the Woods. The material would be placed high enough to allow for the production of mast trees.

P5 Between CILCO Causeway and IDNR Levee – Fill in an area between the two features to an elevation high enough to support mast tree production or stockpile material adjacent to one of the levee alignments

P6 City of Pekin, Illinois Quarry Site – Hydraulically pump material under railroad and IL Rt. 29 to an abandoned quarry site on the east side of Rt. 29

P7 Between Soldwedel and Lake of the Woods – Fill in an area between the two features to an elevation high enough to support mast tree production and or wetland species.

P8 Removal Offsite – Ship material by barge or rail to Chicago Superfund sites, Banner Marsh or Rice Lake.

P9 Create Islands in Lower Lakes (Soldwedel & Lake of the Woods) – Mechanically or hydraulically dredge material and create islands to the side of finger channels and/or holes.

2.4.2.3 Access Channel To Pekin Lake SFWA - Southern Unit. Originally, three potential access points could be explored. However, after preliminary site visits it was realized that one option was preferred that required no additional lands outside of IDNR ownership and it provided the most direct route at the lowest cost. Therefore, all dredge options include access from the Illinois River at this location. This access route is shown on Plates 1-6.

2.4.2.4 Recreation. As the full range of measures and costs were developed, it was realized that recreation features would add costs in excess of the per project limit. Therefore, the sponsor decided not to pursue recreational features as part of this project in favor of more habitat restoration. However, these features may be added by the City of Pekin of IDNR subsequent to the project being completed.

R1 Public Access & Parking – If dredge placement site P3 is included in the recommended plan, public access and parking facilities could be located here. The IDNR currently maintains an access road, limited parking, and a small picnic area at this location. This measure would include improvements and expansion of existing facilities.

R2 Public Boat Ramp – This measure would include construction of a public boat access ramp on the east bankline of Soldwedel Lake.

R3 Fishing Pier – This measure would include construction of a public fishing pier on the east bankline of Soldwedel Lake.

R4 Trails - If dredge placement on the East bankline were included in the recommended plan, portions of walking trails would be located here. This measure includes walking trails along the east bankline of Soldwedel Lake and possibly along any of the cross levee measures.

2.4.2.5 Aquatic Structures. Originally, it was thought that aquatic structures could be added to enhance edge habitat diversity. However, after input from site managers, review of existing conditions, formulation of dredge and sediment removal measures and inclusion of dredge material placement measure P9, it was concluded that additional aquatic structures would be redundant and add to total project cost. Therefore, they were no longer considered as part of the study.

2.4.2.6 Lower end Water Control Structures. This category of potential measures was eliminated due to unsuitability with more fully defined management objectives by the study team and the non-Federal sponsor. In particular, the desire to restore deep-water habitats in the Southern Unit. The maximum line of protection for such a management unit would be approximately EL. 438. On average, the site is flooded in late fall to an elevation of approximately EL. 436. At this elevation, areas of Soldwedel and Lake of the Woods are inundated and available for waterfowl use currently at depths ranging from 3-4 feet. The other issue with management of the Southern Unit for waterfowl is the availability of food. Limited areas of moist soil plants are found on the fringes of the two lakes. These areas would not be impacted by other measures under consideration. However, the moist soil plant communities are limited and subject to frequent late spring and early summer rises in water elevations that kill emerging plants. In order to improve the success of these moist soil areas, it would be necessary to keep the rising water levels out of the site from late May through mid August, further limiting fish access to the lakes. This would be unlikely due to the areas of low elevation (EL. 438) along the Illinois River bankline being overtopped by the frequent summer water level rises that occur. A larger structure than EL. 438 would require efforts to fill in existing low elevations along the bankline with considerable impact to existing forest resources. Finally, installation of a water control structure in combination with dredging would limit the ability of the sponsor to maintain dredged areas beyond the 50-year period of analysis by blocking larger dredging equipment from the site. Therefore, this category of measures was no longer considered as part of the study.

Table 2-3 Preliminary Specific Measures

Category	Specific Measure	Symbol	Study Goal
<i>Dredging and Sediment Removal Measures</i>	6.6 Acres of Dredging	D1	Improve Aquatic Habitat
	26.7 Acres of Dredging	D2	
	45.7 Acres of Dredging	D3	
	40.6 Acres of Dredging	D4	
<i>Dredged Material Placement</i>			Improve Aquatic Habitat
	East Side of Soldwedel Lake	P3	Enhance Wetlands
	West Side of Lake of the Woods	P4	
	Between CILCO Causeway and IDNR Levee	P5	Improve Terrestrial Habitat
	City of Pekin, Illinois Quarry Site	P6	
	Between Soldwedel and Lake of the Woods	P7	
	Removal Offsite	P8	
	Create Islands in Lower Lakes	P9	

2.4.3 Initial Screening of Specific Measures. Some screening of measures is typical even prior to alternative plan development. Reasons for elimination of specific measures include excessive construction costs before real estate appraisals are made, inconsistency with goals or objectives, and inability to acquire LERRD areas. Further, continued clarification of goals and objectives concurrent with development of measures and lessons learned through previous cooperative study efforts with the IDNR, would improve study efficiency. Table 2-4 details which alternatives were eliminated from further consideration and why.

Table 2-4 Specific Measures Screened from Further Consideration

Category	Specific Measure	Symbol	Justification for Elimination from Further Consideration
<i>Dredge Material Placement</i>	East Side of Soldwedel Lake	P3	HTRW sampling conducted as part of the Phase I site assessment (Appendix B) showed elevated concentrations of Lead, Cadmium and PAH's in the soil. The sponsor chose not to pursue remediation at this time therefore the proposed material placement area was dropped from further consideration. A Phase IIA investigation was conducted to ensure that contaminants had not migrated into the proposed dredging areas.
	Between CILCO Causeway and IDNR Levee	P5	Placement of material at this location would negatively impact vegetation that site managers felt was critical to the site's health. Therefore, it is inconsistent with the study goal of improving terrestrial habitats.
	City of Pekin Quarry Site	P6	HTRW sampling conducted as part of the Phase I site assessment (Appendix B) showed elevated concentrations of lead within the water present in the quarry. Further, the State of Illinois declared the submerged area of the quarry a wetland requiring mitigation. For these reasons the site was removed from further consideration as part of this project. The City of Pekin however, intends to use the balance of the property not affected by HTRW..
	Removal Offsite	P8	A barge transport option was investigated and cost estimates ranged from \$5,337,500 to \$9,912,500 depending on who initially fills the barges. The Federal per project limit of this authority is \$5 million.

At the request of the non-Federal sponsor, Specific Measure P8 – Removal Offsite, was further investigated for cost of dredging, transport and offloading at the Banner Marsh site. Rock Island District Cost Engineering estimated a per Cubic Yard Cost of \$21 (Personal communication with Mike Cox OD-T). The \$21/CY is broken down as follows:

\$ 10/CY - Mechanical Dredging and transport first 4 miles

\$ 1.40/CY additional - Transport 4-8 miles

\$ 1.70/CY additional - Transport greater than 8 miles

\$7.80/CY additional - Pump out dredged material from barge to placement site

2.4.4 Selection and Combination of Measures into Alternative Plans. Alternative Plans were developed that combined the best measures to provide a broad range of alternatives. Based on discussions with the sponsor and a study team review of goals and objectives, these alternatives are supported and suitable for evaluation and comparison analysis.

2.4.5 Description of Alternative Plans for Southern Unit. The goals for the Southern Unit are to improve aquatic and terrestrial habitats through restoration that provides overwintering fish habitat, spawning and nursery areas for fish, improved water quality, and improved forest diversity through mast producing trees. Dredging and sediment removal measures were matched with the range of placement measures. The range of dredge placement options were merged into two general features; West side of Lake of the Woods and between Soldwedel Lake and Lake of the Woods. All alternatives utilize some type of small islands for placement. These were included because 1) they provide scarce habitat opportunities not found on the current landscape of backwaters in the Illinois, and 2) the different construction techniques would be evaluated for future use in Critical Restoration Projects. The alternatives below represent a full range of alternatives that provide for opportunities to reintroduce mast trees and enhance wetland functions with dredged material.

The alternatives are:

S0 No Action Alternative. Over the 50-year life of the project, if nothing were done, we would see significant losses (approximately 43%) of the remaining shallow water area in the Southern Unit. Willows are suited over other more desirable tree species in many of these areas because of low elevations and frequent flooding. As a result, moist soil/emergent cover would also decline, giving way to additional scrub-shrub and willow invasion producing marginal quality forested areas. This is not a consequence desired by the IDNR for the Pekin Lake SFWA

S1 6.6 Acres of Dredging with Onsite Placement (Appendix K - Plate 1). This alternative involves dredging deep channels into Soldwedel Lake and Lake of the Woods from the Illinois River (*Base Option D1*). Dredged material would be sidecast adjacent to the channels with placement of 13,000 CY of material at **Site E**, 39,715 CY of material at **Site B** and 19,500 CY of material to create island **C3**.

S2 26.8 Acres of Dredging with Placement for Mast Tree Production (Appendix K - Plate 2). This alternative involves dredging of the *Base Option* with additional dredging of fingers, shelves, and deep holes (dredging option **D2**). Dredged material would be sidecast adjacent to the channels with additional placement of 13,000 CY of material at **Site E**, 106,015 CY of material at **Site B** and 197,500 CY of material at **Site A**. Material would also be placed to create islands **C1**

(1,500 CY), **C2** (2,500 CY), **C3** (39,000 CY), **C4** (2,500 CY) and **C5** (1,500 CY) (placement options **P4**, **P7** and **P9**).

S3 26.7 Acres of Dredging with Placement for Wetland Restoration (Appendix K - Plate 3). This alternative involves dredging of the *Base Option* with additional dredging of fingers, shelves, and deep holes (dredging option **D2**). Dredged material would be sidecast adjacent to the channels with additional placement of 13,000 CY of material at **Site E** and 200,515 CY of material at **Site B**. Material would also be placed to create islands **C1** (1,500 CY), **C2** (2,500 CY), **C3** (39,000 CY), **C4** (3,000 CY) and **C5** (1,000 CY) (placement options **P7** and **P9**).

S4 45.7 Acres of Dredging with Placement for Mast Tree Production and Wetland Restoration (Appendix K - Plate 4). This alternative involves dredging of the *Base Option* with additional dredging of fingers, shelves, and deep holes in Lake of the Woods and Soldwedel Lake (dredging option **D3**). Dredged material would be sidecast adjacent to the channels with additional placement of 13,000 CY of material at **Site E**, 276,026 CY of material at **Site B** and 218,000 CY of material at **Site A**. Material would also be placed to create islands **C1** (1,500 CY), **C2** (2,500 CY), **C3** (39,000 CY), **C4** (2,500 CY) and **C5** (1,500 CY) (Options **P4**, **P7** and **P9**).

S5 45.7 Acres of Dredging with Placement for Mast Trees and Wetland Restoration (Appendix K - Plate 5). This alternative involves dredging of the *Base Option* with additional dredging of fingers, shelves, and deep holes in Lake of the Woods and Soldwedel Lake (dredging option **D3**). Dredged material would be sidecast adjacent to the channels with additional placement of 13,000 CY of material at **Site E** and 320,720 CY of material at **Site B**. Material would also be placed to create islands **C1** (1,500 CY), **C2** (2,500 CY), **C3** (39,000 CY), **C4** (2,500 CY) and **C5** (1,500 CY) (placement options **P7** and **P9**).

S6 40.6 Acres of Dredging with Placement for Mast Tree Production and Wetland Restoration (Appendix K - Plate 6). This alternative involves dredging of the *Base Option* with additional dredging of fingers, shelves, and deep holes in Lake of the Woods and Soldwedel Lake (dredging option **D4**). Dredged material would be sidecast adjacent to the channels with additional placement of 13,000 CY of material at **Site E**, 256,115 CY of material at **Site B** and 191,000 CY of material at **Site A**. Material would also be placed to create islands **C1** (1,500 CY), **C2** (2,800 CY), **C3** (39,000 CY), **C4** (2,500 CY) and **C5** (1,500 CY) (Options **P4**, **P7** and **P9**).

Alternatives S2 & S3 have similar dredging configurations but distinctly different placement configurations. Alternative S2 places the majority of the dredged material for purposes of introducing mast trees. Alternative S3 places material such that it enhances wetland functions. Similarly Alternatives S4 & S5 reflect the same approach but with

larger quantities of material. Finally, Alternative S6 strives to balance placement between the West side of Lake of the Woods and between Soldwedel Lake and Lake of the Woods.

2.5 EVALUATE AND COMPARE ALTERNATIVE PLANS

This section describes the alternative plans and the process used to determine the potential costs, habitat benefits, incremental cost/cost effectiveness, and other factors leading to a recommended plan.

2.5.1 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 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 alternative; (2) determine a cost estimate for each alternative; (3) combine the alternatives to evaluate the best overall project alternative based on habitat benefits and cost. While cost and environmental outputs are necessary factors, other factors such as the ability to construct, schedule, likelihood to achieve projected results, unmeasurable environmental benefits, ancillary benefits etc., are very important in deciding on the preferred alternative.

Environmental outputs were calculated as Average Annual Habitat Units (AAHUs). The annualized costs were calculated by applying a 5-7/8% annual interest rate to the construction costs over the 50-year life of the project. The incremental analysis for each alternative was accomplished using the Corps Institute for Water Resources methodology described in Robinson *et al.* Further information on the analysis can be found in Appendix A of this report.

2.5.2 Habitat Evaluation Procedures. A habitat analysis was conducted to evaluate potential benefits of habitat improvement features for the Southern Unit of the Pekin Lake SFWA. Biologists from the Rock Island District of the 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 A-2 of this document.

The U.S. Army (Engineer Research and Development Center), Environmental Laboratory, 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 HSI 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 AAHUs.

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 Southern Unit of the Pekin Lake SFWA. This provides the foundation for the HEP application of six species-based HSI models.

2.5.3 Habitat Evaluation

Several species were chosen to evaluate the Southern Unit habitat. They are:

The blue gill (*Lepomis macrochirus*) is abundant along low velocity shoreline areas where submerged vegetation or logs and brush provide cover in the summer. They are opportunistic feeders that prefer low to moderate turbidity. They require deeper, very low or no velocity water for overwintering.

The great blue heron (*Ardea herodias*) is the largest and most widely distributed of the herons and occurs in a variety of habitats from freshwater lakes and rivers to brackish marshes and coastal wetlands. Fish are their preferred diet, but they will eat a large variety of other small aquatic and terrestrial creatures (e.g. frogs, newts, snakes, rodents, insects, snails, etc.).

The marsh wren (*Cistothorus palustris*) is an abundant breeding bird species of freshwater and saltwater marshes and requires emergent vegetation with shallow standing water.

The wood duck (*Aix sponsa*) is a waterfowl found around wetland areas with open water and nests in tree cavities or nest boxes.

The muskrat (*Ondatra zibethicus*) is a valuable semi-aquatic fur-bearing mammal found throughout most of North America. It is primarily an herbivore and requires a permanent supply of still or low velocity water. It also serves as a food source for many predators and is an important component of the marsh ecosystem.

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. Embedded in each cover type evaluation, change has been added to the model. For project planning and impact analysis, period of analysis was established at 50 years. To facilitate comparison, target years were established at 0 (existing conditions), 1 year after, 5 years after, 20 years after, and 50 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 ($HSI \times Acres = HUs$). 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. AAHUs were used as an output measurement to compare all the features and project as a whole.

The options considered were various dredging configurations with various placement options. The proposed alternatives would create large areas of deep-water habitat while providing dredged material placement areas onsite for mast tree production and wetland restoration. Further, several small islands would be created to evaluate the performance of these structures in physical and biological respects.

The project would provide deep-water features that include open water, seasonally wet areas, and emergent vegetation. In addition, onsite dredged material placement areas would be used for the production of mast producing trees. Table 2-5 shows the relative changes in HU outputs by each alternative plan for each of the species utilized in the HEP analysis. For a more detailed description of the habitat analysis, refer to Appendix A of this report.

Table 2-5 Habitat Units by Plan for the Southern Unit

Habitat Response to Alternative Plans

	<i>Plans</i>						
	<i>S0</i>	<i>S1</i>	<i>S2</i>	<i>S3</i>	<i>S4</i>	<i>S5</i>	<i>S6</i>
<i>Bluegill</i>	0	2	8.2	8.2	14.2	14	12.5
<i>Great Blue Heron</i>	0	-2.1	0.6	1.6	3.4	1.4	1.2
<i>Marsh Wren</i>	0	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1
<i>Muskrat</i>	0	-1	-0.4	-0.2	-0.2	-0.2	-0.3
<i>Wood Duck</i>	0	0.2	-0.2	0.2	-0.3	-0.1	-0.3
Total	0	-1.1	8	9.7	17	15	13

2.5.4 Cost Estimates for Habitat Improvement Measures.

Rough cost estimates were developed to conduct the cost effectiveness and incremental cost analysis of the various alternative plans. Items included in the first cost construction estimated are mobilization, dredging, placement, demobilization, 25% contingency, Engineering and Design During Construction (EDC), Supervision & Administration (S&A), and As-Built drawing costs. Table 2-6 summarizes the costs associated with each alternative plan.

Table 2-6 Southern Unit Alternative Plan Costs

Alternative Plans	Name & Symbol	First Cost Construction	Annualized First Cost
<i>S0</i>	No Action Alternative	\$ 0.0	\$ 0.0
<i>S1</i>	S1 6.6 Acres of Dredging with Onsite Placement	\$2,337,060	\$140,570
<i>S2</i>	26.8 Acres of Dredging with Placement for Mast Tree Production	\$5,499,017	\$330,757
<i>S3</i>	26.7 Acres of Dredging with Placement for Wetland Restoration	\$5,391,282	\$324,277
<i>S4</i>	45.7 Acres of Dredging with Placement for Mast Tree Production and Wetland Restoration	\$8,242,483	\$495,772
<i>S5</i>	45.7 Acres of Dredging with Placement for Mast Trees and Wetland Restoration	\$7,571,270	\$455,400
<i>S6</i>	40.6 Acres of Dredging with Placement for Mast Tree Production and Wetland Restoration	\$7,661,321	\$460,816

*February 2004 Price Level

2.5.5 Results of the Incremental Cost/Cost Effectiveness Analysis

For the Southern Unit, two incremental cost/cost effectiveness analyses were run. The first, looked at only the bluegill target species in the HEP analysis. Overwintering habitat is the primary management goal of the Southern Unit and the bluegill model represents this. The second is the traditional analysis-comparing alternative plans across a range of habitat types and species. The results of the two analyses are shown on Table 2-7.

The target species analyses showed that alternative plans S1, S3, S4, and S5 are cost effective. Aside from the No Action alternative, S5 exhibited the lowest cost per Unit of all alternatives, \$32,528 per AAHU. Alternative plan S1 exhibited the highest cost per Unit at \$70,285 per AAHU. The overall analyses showed that alternative plans S3, S4, and S5 were cost effective.

Table 2-7 Southern Unit Alternative Plan Evaluation

Alt. Plans	AAHU Output (Bluegill)	AAHU Output (Combined)	First Cost Const.	Annzed. Cost	Annzed. Cost/AAHU (Bluegill)	Annzed. Cost/AAHU (Overall)
S0	0	0			\$0.0	\$ 0.0
S1	2	-1.1	\$2,337,060	\$140,570	\$70,285	\$154,627
S2	8.2	8	\$5,499,017	\$330,757	\$40,336	\$41,344
S3	8.2	9.7	\$5,391,282	\$324,277	\$39,545	\$33,430
S4	14.2	17	\$8,242,483	\$495,772	\$34,913	\$29,163
S5	14	15	\$7,571,270	\$455,400	\$32,528	\$30,360
S6	12.5	13	\$7,661,321	\$460,816	\$36,865	\$35,447

Overall, alternative plans S0 and S4 were considered best buy plans. However, alternative plan S4 exceeds the Federal per project limit of \$5 million specified under the Section 519 authority. Plans that exceed authority project limits should not arbitrarily be eliminated from consideration if that alternative is the best option. However, Plan S4 was not supported by the sponsor and other cost effective plans provide similar benefits for less cost. Therefore, alternatives S0, S3, and S5 were carried forward into an incremental cost analysis. These plans provide the greatest increase in benefits for the least increase in costs. Alternative plan S3 provides 9.7 AAHUs at an annualized incremental cost of \$33,430 per AAHU (Table 2-8). Alternative plan S5 provides additional AAHUs, over and above , at an annualized incremental cost of \$24,740.

Table 2-8 Incremental Cost Analysis of Best Buy Alternative Plans for Southern Unit

Alt. Plans	AAHU Output **	Annualized Cost *	Annualized Cost/AAHU	Inc. Cost	Inc. Output	Inc. \$/AAHU
S0	0	\$0	\$0	\$0	0	\$0
S3	9.7	\$324,277	\$33,430	\$324,277	9.7	\$33,430
S5	15	\$455,400	\$30,360	\$131,123	5.3	\$24,740

Annualized cost is initial construction cost based on a 50-year period of analysis, 5-5/8% interest rate.
 ** Outputs are calculated as Average Annual Habitat Units (AAHUs).

2.5.6 Other Factors

2.5.6.1 Significance. The Illinois River has long been an important environmental and economic resource. Congress recognized the Illinois River, 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). The State of Illinois has recognized the importance of the Illinois River through enactment of the Illinois River Watershed Restoration Act; 20 ILCS 3967. This public act has been instrumental in development of the *Integrated Management Plan for the Illinois River*. This document has guided the restoration efforts underway between the Corps and IDNR. The National Research Council (Council) considers large floodplain-river ecosystems to be the highest priority for aquatic restoration. The Council has 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 birds.

The entire Upper Mississippi River System has undergone dramatic changes in the extent, composition, and structure of its floodplain forests over the last two centuries. The report *Ecological Status and Trends of the upper Mississippi River System*, found that what was once a diverse forest are composed of mixed silver maple, willow, cottonwood, oak-hickory, swamp cypress, shrub, and plantation communities is now nearly 80% mixed silver maple. The decline of mast producing oak-hickory stands was due to the cultivation and or use as fuel and building material of the mast producing oak- hickory areas. The oak-hickory component of the floodplain forest across the basin is around 10%. The opportunity exists at Pekin Lake SFWA - Southern Unit for the bankline dredged material placement measures to be constructed at such a height to provide suitable habitat for mast producing trees such as pin oak, bur oak, swamp white oak, shagbark hickory, shellbark hickory, bitternut hickory, pecan and hackberry.

The types of deepwater off-channel habitat included in the Pekin Lake SFWA - Southern Unit restoration alternatives are limited on the entire Illinois River. Further, the unstable hydrologic regime at Pekin Lake SFWA - Southern Unit limits the productivity of existing moist soil and emergent habitats there. 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. Further, the report called for the restoration of hydrologic variability needed to restore and maintain existing backwater habitat. The recommended plan would provide for the greatest amount of depth diversity.

2.5.6.2 Systemic Diversity¹. While the habitat evaluation methodology for the project, utilized one fish species (blue gill), to evaluate effects of restored depth and structure, many riverine fish species of the Upper Mississippi River System (UMRS) and the Illinois River in particular will benefit from the restored habitat. The UMRS supports an extraordinary number of fish species. Historically, 150 species have been found in the UMRS. The presence of so many fish species results from the physical complexity of the system, including the Illinois River, that provides a wide range of aquatic habitats such as channels and backwater lakes for fish. For example, basses, crappies, and sunfish that thrive in the UMRS, require lake like backwaters of sufficient depth and structure such as that to be restored at Pekin Lake – Southern Unit.

On the Illinois River in particular, largemouth bass, bluegill, and crappie are centrarchids that inhabit side channels and backwaters, and are important sport fish species. Carp and black bullhead are common and abundant in backwater habitats. Channel catfish, and gizzard shad are fish that commonly inhabit main channel and channel boarder habitats. All seven species utilize backwater areas as spawning habitat. Finally, spatial distribution of backwater habitats along the Illinois River is critical to healthy ecosystem function. Currently, no backwater lake areas, with suitable depth, exist within 20 miles of the Pekin Lake – Southern Unit site.

2.5.6.3 Hydrological/Sustainability. The alternatives that have been evaluated would not produce significant impacts to flood heights are expected (Appendix D).

2.5.6.4 Public Acceptability. The City of Pekin, Illinois has expressed strong interest and support for the recommendations made by this study. Alternative Plan S5 is supported by the City of Pekin, Illinois and the IDNR and is the locally preferred plan. The current cost estimate exceeds the Federal per project limit. The City of Pekin, Illinois is willing to provide the additional funding. In addition, at a public open house 50 citizens expressed strong support for the recommended plan (S5). Finally, Ducks Unlimited supports the plan and has agreed to provide financial support to the project.

2.5.6.5 Recreation. The opportunity exists, through dredging and dredged material placement, to create multiple recreational opportunities available to a range of users as a function of habitat improvements, rather than as stand-alone measures. First, the use of the Southern Unit for boating, fishing, and waterfowl hunting activities has been well documented. This usefulness has declined in recent years due to the site filling with sediment. Second, bankline placement for mast producing trees would allow for expanded bankline fishing opportunities not currently present at the site.

¹ U.S. Geological Survey. 1999. Ecological status and trends of the Upper Mississippi River System 1998: A report of the Long Term Resource Monitoring Program. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin, April 1999. LTRMP 99-T001. 236 pp.

2.5.6.6 Hazardous, Toxic, and Radioactive Waste (HTRW). Phase I and Phase IIA HTRW Environmental Site Assessments (ESAs) were performed for the Pekin Lake Section 519 Project. The project area covered by these assessments consisted of approximately 498 acres of wetland backwaters of the Illinois River and approximately 32 acres of a former quarry and timberland. The CILCO Causeway divides the project area into two portions known as the Pekin Lake-Northern Unit and Pekin Lake-Southern Unit.

After screening the entire project area, the Phase I ESA did identify recognized environmental conditions east of the Northern and Southern Unit project areas that included the following:

- “The presence of rubble dumped on the banks of the eastern portion of Pekin Lake. Although the materials that were observed appeared to have been dumped in recent history, it is unknown if other materials have been buried or covered in that area. Due to the uncontrolled nature of these materials, it is possible that regulated contaminants have been dumped in the area.
- The presence of three cemetery sites adjacent to the east and south of the CILCO Causeway (west and southern portions of the quarry site). Historic cemetery sites have the potential for regulated contaminants to leach to soil and groundwater. These constituents have the potential to impact surface waters in the quarry.”²

A Phase IIA ESA was performed based on the recognized environmental conditions and concern of contaminant migration. This assessment included sampling efforts at the rubble piles, the quarry site, the CILCO Causeway, within the lakebed areas of both the Northern and Southern Units of the Pekin Lake project, and in the left descending bank of the railroad embankment that lies along the east boundary of the Northern Unit but north of the rubble piles. Details of the sampling are provided in the Phase IIA report.

“The Phase IIA ESA evaluation determined that the areas of proposed dredging and excavation contain residual levels of PAH constituents; however, the concentrations are below Tier 1 Soil Remediation Objectives (SRO) developed and published by the Illinois Environmental Protection Agency (IEPA). Constituents were detected in the embankment fills on the eastern boundary of Soldwedel and Worley Lakes at elevated concentrations; however, the potential for these constituents to migrate into the surface waters is low. Based on the data collected for the subject property, it appears that residual contaminants may be associated with embankment fills or rubble fills placed on or adjacent to the property.” While not likely to contribute to surface waters, the study team and sponsor concluded

² Phase IA and IB Environmental Site Assessment, Pekin Lake Section 519 Target Properties T25N, R5W of Tazewell County, Illinois, Missman, Stanley & Associates, P.C, Bettendorf, Iowa, September 27, 2002.

that elimination of the eastern dredged material placement areas from further project consideration.

In summary, the Pekin Lake SFWA - Southern Unit Project's surface samples of lakebed material resulted in lead, cadmium, and PAH levels that were below the State of Illinois Tiered Approach to Corrective Action Objectives (TACO). Consequently, these results show that it is unlikely that these areas pose a significant threat beyond background to cause adverse effects to human health or the environment and it is not recommended to do any further HTRW assessment. See Appendix B for the Phase I executive summary or contact the Rock Island District, ATTN: CEMVR-ED-DN, for further information regarding the Phase I and Phase IIA ESA Pekin Lake reports.

2.5.6.7 Real Estate. All of the land for the proposed alternative is currently in public ownership by the sponsor. Approximately 468 acres of land will be required for and utilized for this project. The project is claiming benefits for approximately 390 acres. See Appendix H for further information. Total

2.5.6.8 Mast Tree Production. The *EMP-Habitat Needs Assessment* indicates a decline in mast producing trees in the floodplain that has been pronounced over the last century. The opportunity exists to reestablish mast-producing trees through placement of dredged material at appropriate heights in the Southern Unit.

2.5.6.9 Acceptability, Completeness, Effectiveness, and Efficiency. The Recommended Plan meets the four evaluation criteria of the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. The four criteria are acceptability, completeness, effectiveness, and efficiency.

- **Acceptability.** The plan is acceptable to Federal, state, tribal, local entities, and the public. It is compatible with existing laws, regulations, and policies.
- **Completeness.** The plan is complete. Realization of the plan does not depend on implementation of actions outside the plan.
- **Effectiveness.** The plan is effective. It addresses all the project objectives. It improves the moist soil plant communities within the project area. The diversity and quality of wetland habitat is increased through water level management, removal of willows and shallows sediments.
- **Efficiency.** The plan is efficient. It is a cost-effective solution to the stated problems and objectives. No other plan produces the same level of output more cost effectively. The plan is cost effective and provides the greatest increase in benefits for the least increase in costs.

2.6 SELECTION OF A RECOMMENDED PLAN

The interagency team recommends Alternative Plan S5. The following considerations were made in selecting this plan: First, the selected plan would provide for a suitable large and elevated area for mast producing trees, a need identified previously in the *Habitat Needs Assessment*. Second, the small islands to be constructed have not been attempted in a backwater complex with the characteristics of Pekin Lake SFWA - Southern Unit. Post construction monitoring of these islands would produce valuable data about habitat response and physical characteristics that can be used to design future critical restoration project elements. Finally, the placement of dredged material would be done in such a ways so as to improve critical floodplain habitats currently limited along the Illinois River.

Table 2-9 Southern Unit With-Project Conditions

Southern Unit Baseline Habitat Conditions		With Project Acres by Target Year				
<u>Cover Types</u>	<u>Description</u>	0	1	5	20	50
<i>Deep</i>	Deep water = or > 4ft in depth	0.0	23.9	22.5	17.7	10.0
<i>Shallow</i>	Shallow open water	26.2	19.5	19.8	20.3	19.2
<i>Moist/Emergent</i>	Combination of moist soil, mud flat, and emergent cover types	174.6	151.5	143.6	117.6	75.3
<i>Scrub-Shrub</i>	Scrub-Shrub Areas that are invading the Moist Emergent areas, predominately willows	89.4	83.5	87.6	99.3	107.3
<i>Forested</i>	Forested areas, Including Forested Wetland and Bottomland Hardwood	99.9	96.5	101.5	135.1	178.3
		390.0	390.0	390.0	390.0	390.0

This alternative best meets the study objectives. It would result in restoration of depth diversity within Lake of the Woods and Soldwedel Lake. Further, placement of dredged material would be accomplished in a manner that is innovative and feasible, and that addresses defined needs in the Illinois River Valley. Overall, lake habitat diversity would increase through the addition of aquatic, shoreline and terrestrial habitats associated with the dredging, islands, and bankline placement.

In cooperation with the USFWS, City of Pekin, Illinois, and IDNR, the Corps has planned and would design a project that serves the needs of the resources and the resource managers. The preferred alternative plan has an overall output of 15 AAHUs for a total cost of approximately \$7,571,270.

Description of Selected Plan

3.1 DESIGN AND CONSTRUCTION CONSIDERATIONS**3.1.1 Description of Selected Alternatives**

The recommended plan consists of dredging of channels and areas of varying-depth open water, with on-site placement in the form of islands and areas of relatively higher ground. Channels would be eight feet in depth, using elevation 432.0 +/- as the reference "low winter water" elevation. This eight feet of depth would allow for a recommended six feet of depth required for adequate fish overwintering habitat, including ice cover, plus an additional two feet of depth to account for sedimentation during the life of the project. The channels would continue from the Illinois River into Soldwedel Lake and Lake of the Woods. Adjacent to the channel, additional dredging to four-foot, eight-foot, and twelve-foot depths would be accomplished to add depth diversity to the site. Areas of shallower dredging at the edges of channels and deeper areas are designed to guard against sedimentation due to wind fetch at relatively abrupt changes in depth near the water's surface.

Mechanically dredged material would be placed into two islands designed to be perched wetland areas, two islands designed to be nesting habitat, and one larger island designed to be high enough to support mast tree growth. The two nesting islands would be a maximum of one-quarter acre. The larger island would have approximately one acre above elevation 444.0, which is the elevation at which mast trees are estimated to survive reliably.

Hydraulically dredged material would be placed into the area between Soldwedel Lake and Lake of the Woods. After placement of dredged material, this area would be at an elevation well above elevation 444.0, and would support mast tree growth for greater environmental diversity and benefits.

3.1.2 Planning, Engineering & Design – Quality Control & Quality Assurance

The Pekin Lake product development team is responsible for producing a high quality product to meet the needs of the environment. Technical adequacy and quality shall be obtained through periodic internal reviews. Technical review of the project documents (computations, drawings, etc.) would be accomplished throughout the design and contract documentation period and before further technical review is done. Internal reviews would be documented through certification of a product development team checklist.

A Value Engineering team has already assessed the Pekin Lake project, Comments focused on mechanical versus hydraulic dredging, and placement of a sediment structure at the entrance to the complex from the Illinois River. Cost engineering

reviewed the dredging proposals and the report as written shows the most cost effective dredging strategy at the feasibility level. More refined estimates will be developed during plans and specifications. The VE concern that maintenance of the entrance channel will be difficult due to high sedimentation rates. The data presented in the sediment rate survey indicated relatively low sedimentation rates and the entrance to the complex is currently the only deep water area off the main channel.

An internal product review would take place at the 75% design completion stage. The Project Engineer would respond in writing to review comments submitted by members of the review team. The purpose of the review is to accomplish an efficient, broad review of the project by senior engineers in all applicable disciplines. Junior engineers may also be in attendance to gain experience and insight into the design and contract document preparation process. Members of the 75% review team would include, but may not be limited to:

- Chief of & Assistant Chief of Design Branch
- Project Engineer
- Geologists
- Civil Engineers
- Structural Engineers
- Hydraulic Engineers
- Electrical Engineers
- Specifications Writers

Independent Technical Review (ITR): The ITR team for the Pekin Lake Southern Unit Ecosystem Restoration project would consist of personnel from Rock Island District. Team members would be selected based on individual expertise and technical background in order to provide a comprehensive technical review. ITR team members would not have been directly involved with the development of the project. The review would be ongoing throughout product development using a team concept, not a cumulative review process performed only at the end of product completion. However, a scheduled review would be done at the 95% design completion stage, after completion of the 75% review. To ensure a complete design that is suitable for bidding and constructing the activities depicted in the product, the ITR members should concentrate their focus on the technical, construction, and environmental product issues, ensuring that the product design package is based on sound engineering practices and construction techniques, applicable codes, and the latest environmental regulations.

Biddability, Constructability, Operability and Environmental Review (BCOE): CEMVR Memo 1180-1-2 establishes a system and assigns responsibilities and implementation procedures to assure that BCOE reviews and considerations are integrated into construction procurement documents. After 75% review and 95% ITR comments are incorporated into the product, the Project Engineer would coordinate a BCOE review with CD and OD personnel at the project site.

Reviewers would be advised in writing of actions taken on their specific comments. The reviewers would approve these responses, and changes would be incorporated into contract documents prior to advertisement.

3.1.3 Design Strategy & Assumptions

In the Southern Unit, softer clays and lower elevations would preclude conventional earthmoving equipment from being used. Dredging, then, appears to be the most effective method of deepening the area intended for deep-water fish overwintering habitat.

A depth of eight feet was chosen for the main channel depth considering that a depth of six feet would be required for adequate fish habitat during freezing conditions in the lower lakes, and an additional two feet was added to account for a conservatively estimated sediment deposition rate over the lifetime of the project. With eight feet of initial dredging, the project is still estimated to be viable at the end of its 50-year lifespan. Other depths and dredging configurations would be included to add depth diversity to the project, such as areas of four-foot, eight-foot, and 12-foot deep dredging. Also, at the edges of the dredged areas, an additional two feet of material would be removed to reduce the effect of wavewash erosion on sediment suspension and erosion to the bottom of the deeper areas.

The product development team researched the possibility of using mechanical dredging methods and hydraulic dredging methods for on-site placement. A large barge-mounted crane and bucket would be required to mechanically dredge the primary channel and place all the material safely to the side of the channel. Most barge-mounted excavators would not be able to reach the distance required, but there have been other projects that used crane-and-hopper/bucket configurations which have been successful. This method of dredging could effectively be used to sidecast material to build containment berms for the future containment of hydraulically dredged material.

Hydraulically dredged material would experience a “bulking factor,” decreasing the effective capacity of the site by 50% to 75% until consolidation of the material was allowed. Hydraulically dredged materials, especially clays, take much longer to consolidate than “dry-dredged” or mechanically dredged material. Depending upon the actual consolidation rate, mast tree plantings may have to wait until the construction season after the last hydraulic dredging event. It is estimated that at least 240, and preferably 360 days, may be required for adequate consolidation of dredged material during the first stage of the project, such that conventional equipment might be mobilized and used to push containment berms higher in preparation for Stage II hydraulic dredging.

High-solids, or “dry” dredging may be possible to fill the geotubes for the two “perched wetland” islands. Contractor proposals may have an impact on the method of placement for this part of the project.

In the present configurations, there are no utilities or sewer outfall locations that would have an impact upon the project.

Based on observations of existing conditions, specifically that of the old IDNR levee on site, which was evidently constructed from adjacent borrow, no riprap protection would be used for island or bankline placement of dredged material. At many locations, slopes on the old IDNR levee are standing at approximately 1V:4H slopes, and the levee is fairly well vegetated, and even overgrown in places. Conditions were estimated to be similar at planned bankline and island locations as for the old IDNR levee. There is very little flow (current) in these lake areas, even during high water periods, since the bankline is vegetated and adds such a significant amount of roughness to the flow that most conveyance is confined to the Illinois River's main channel. Wind or wavewash erosion was estimated to have little effect, since during low water, there is normally a distance of 750 or less over open water in the direction of the prevailing winds, and the lakes are protected on all sides by mature tree growth. During high water, wind or wavewash has little effect because at those elevations, slopes are vegetated solidly enough to withstand the waves resulting from an increased wind fetch over the open water, and the depth of the lake bottom is well below the surface so bottom sediments would not be stirred.

Existing trees are surviving on site at approximately elevation 439.5 or higher. However, these are typical bottomland forest silver maples and cottonwood trees, not mast trees. It is estimated that mast trees would be planted to an elevation as low as 444.0' (estimated to be inundated at least once out of every two years), and those trees would be monitored and their survival rate at varying water level conditions documented for future reference. Root Production Method™ (RPM™) trees would be a preferred alternative that would offer a higher probability of survival within the first several years of the initial plantings. However, based on hydrologic data, there is no guarantee that inundation of the site would not kill fresh plantings.

3.1.4 Final Design Considerations & Field Data

Use of a combination of mechanical sidecast dredging and hydraulic dredging, as well as some conventional equipment to move consolidated materials, is the preferred method of construction. The contractor shall field verify all elevations, dimensions, and quantities prior to commencement of work.

3.1.5 Contractor Submittals

Equipment used
Method of dredging
Proposed schedule
Compaction testing method
Rate of dredging

3.1.6 Hydrology & Hydraulics

The hydrologic conditions in the Pekin Lake project area are largely determined by the Illinois River water level. The current dams at La Grange and Peoria maintain lower water levels in this area than had been experienced prior to 1936 because the pool of La Grange dam is maintained 6 feet lower (429 feet NGVD) than was the pool of the Copperas Creek dam which had previously influenced the site water level. Existing long-term daily water level records indicate that the site is generally flooded from late March through late May, but that there is at least a 10% chance that it would be flooded on any day of the year except from late July until November. Also, the site can be expected to flood at least once even during the 10-year low-flow year but it draws down nearly every year so that the surface water outlet to the river goes dry. Water levels in Pekin Lake exceed 432 feet NGVD approximately 90 percent of the time during December and February, when freezing conditions necessitating deepwater refuge generally occur, so excavation to 424 feet NGVD would provide adequate overwintering depth at least 90 percent of the time throughout the period of analysis. Because the proposed restoration project would place dredge material in the floodplain a hydraulic impact assessment was completed to determine whether the material placement would significantly raise the water surface elevations. Considering a maximum potential impact scenario where all potential restoration activities are conducted on the Pekin Lake site, the proposed project would not cause an unpermitted increase in water surface elevations. Also, at no point would the average channel velocity increase above 2.2 ft/s, indicating that bed erosion would not be instigated by the material placement. A detailed Hydrological and Hydraulic analysis of the Pekin Lake area and project considerations can be found in Appendix D.

3.1.7 Geotechnical

The material to be dredged from the Pekin Lake Southern Unit is a generally firm clay throughout the proposed dredging depth. Mechanical dredging would yield an estimated 1:1 ratio of bank volume to placed volume, and hydraulic dredging would cause bulking of the material such that 1 bank cubic yard would take up approximately 1.4 to 1.5 cubic yards when first placed, before consolidation over a long period of time. Geotechnical analysis of the material supports the estimation that the abovementioned dredging and placement methods can be reasonably employed. A detailed Geotechnical analysis of the Pekin Lake SFWA - Southern Unit area and project considerations can be found in Appendix C.

3.1.8 Foundations

There would not be any hardened structures associated with the Pekin Lake Southern Unit project. Temporary installations of drop structures to allow detention of hydraulic dredging water on site so that particulates can fall out would be necessary, but these can be installed in any of various conditions.

3.1.9 Borrow Sites/Suitability/Water Table

Some dredging, especially the first channel from the Illinois River into Soldwedel Lake, would probably have to be done during a period of relatively high water. However, exceptionally high flows on the Illinois River during flood conditions may prohibit equipment from being transported to the site. Otherwise, there should be few problems performing the dredging work.

3.2 NATURAL RESOURCES

Restrictions / Considerations: Survival of the bottomland forest within the project area should be maintained to the extent possible. Therefore, minimal impacts to the forestry component should be observed when placing and moving dredged pipe for the transport of the dredged material. Also, any removal of peeling or loose-barked trees of 11 inches or greater in diameter at breast height would **only** take place between September 1 and April 30 to avoid potential adverse impacts to Indiana Bats.

Activities within the lower lakes must be done in a manner that does not adversely impact the existing eagle nest. The critical nesting period for the bald eagle is from March 15 to May 15, with moderate nesting activity into June 15. Activity within a zone of 330 feet of the nest is prohibited at all times. From 330 feet (100m) to 660 feet (200m), activity is prohibited from February 15 through September 30 with minor justified activity at other times. At a distance of 1,320 feet (400m) from the nest, activity is prohibited from February 15 through September 30 with no restrictions on activity at other times. Outside of the 1,320-foot (400m) zone, there are no restrictions on activities in the vicinity if they are justified.

Equipment brought into the area from other project sites should be clean and free of debris, to prevent the introduction of invasive, non-native species from other areas.

A complete list of these considerations is in the Environmental Assessment.

3.3 CONSTRUCTION

3.3.1 Site Access & Staging

All site access for supplies and equipment would be from the Illinois River. No overland routes to the site would be provided. This would further ensure that the environment restoration aspects of the project are protected. During construction, a

separate agreement with the City of Pekin and/or the State of Illinois may be reached whereby workers may park on the public road adjacent to the railroad tracks and use boats to get to the dredging area, but this would not be provided as a part of this project.

Floating equipment can access the lower lakes from the Illinois River, river mile 153.2, just upstream from the sunken barge upstream of Cooper's Islands.

3.3.2 Site Elevations

Existing lower lake bottom elevations are generally between 431.5' and 433'. The Southern end is connected to the Illinois River, so the water surface profile for the Southern Unit is estimated to match the Illinois River profile at river mile 153.2 (see Hydraulics and Hydrology Appendix). There is an existing, however deteriorated, IDNR levee on site whose top elevation is between approximately 437' and 438'.

The natural bankline between the Pekin Lake SFWA - Southern Unit site and the Illinois River varies, but is generally above elevation 444'. High ground at the site is generally delineated by the railroad tracks above elevation 458.5'.

3.3.3 Construction Equipment Considerations

Initial dredging operations would require the use of mechanical dredging at least until an access channel into the lakes can be established. It is estimated that mechanical dredging would be the most feasible means of constructing berms for the containment of further hydraulic dredging. Conventional equipment may be feasible to push up higher berms for additional containment, but river levels and the rate of dredged material consolidation would dictate when this might be possible. Access to the site would be primarily from the river, as mentioned above, so equipment used would need waterborne transport capability.

3.3.4 Debris Removal & Disposal

There should not be a need to removal debris from the site. The contractor shall be required to remove trash from the site, but woody debris can be incorporated into the project unless the contractor removes it at his own responsibility.

3.3.5 Monitoring During Construction

There have been no concerns regarding water quality in the Pekin Lake SFWA area. Dissolved oxygen is estimated to be sufficient for sustaining aquatic habitat. A more detailed analysis can be found in Appendix G-A. During dredging operations, water quality would have to comply with IEPA Section 401 standards. Return water from dredged material placement is estimated to have enough detention time to meet water quality standards.

3.3.6 Construction Sequence

Construction would likely happen in three phases. Phase I would consist of mechanically dredging a channel from the Illinois River into the lower lakes, construction islands and containment berms by sidecasting materials. During that same construction season, a limited amount of hydraulic dredging may be performed. Phase II would require containment berms to be pushed up and constructed to finished heights, and additional hydraulic dredging to complete the project. Phase III would require the dredged materials and islands to consolidate, and would consist of mast tree plantings on those higher areas.

3.3.7 Permits

Clean Water Act Section 401 / 404

A public notice is required by Section 404 of the Clean Water Act, and Illinois State Section 401 water quality certification would be obtained prior to project construction as part of the Environmental Assessment (see Appendix G).

Clean Water Act Section 402

Land disturbances of greater than 5 acres associated with this project require a National Pollutant Discharge Elimination System (NPDES) permit, or Section 402, for stormwater discharges. The construction contractor would be responsible for this permit.

State of Illinois Floodplain

A Hydrologic Engineering Centers River Analysis System (HEC-RAS) model was run using the most intrusive alternative for on-site dredged material placement, and it showed a negligible change in 100-year flood height, conveyance, and storage (see Hydraulics Appendix). A floodplain permit would be applied for prior to construction.

3.4 OPERATIONS, MAINTENANCE, AND REHABILITATION

3.4.1 Project Data Summary

The period of analysis is estimated to be at least 50 years. Operation and maintenance costs, to be assumed at 100% sponsor cost upon completion of construction, can be found in Table 3-1.

3.4.2 Operation

The Southern Unit would require no operating measures. However, periodic monitoring would be required to record the performance of any test measures, and to document the success of several measures of the project. Access to the site could be either via the causeway, from the South via a public at-grade railroad crossing and gravel access road to the East bankline, or by boat from the Illinois River.

3.4.3 Maintenance

There would be no maintenance required for dredged material placement sites.

TABLE 3-1 Estimated Annual Maintenance Costs
June 2004 Price Levels

Item	Quantity	Unit	Unit Price	Total Cost
Inspect Tree Plantings	12	HR	\$ 55.00	\$ 660
Inspect Islands	8	HR	\$ 55.00	\$ 440
Rehabilitation ¹				\$ -
			Subtotal	\$ 1,100.00
			Contingencies (25%)	\$ 275.00
			TOTAL	\$ 1,375.00

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, flood events, or other catastrophes.

3.4.4 Monitoring

There are several aspects of the project that would require follow-up monitoring and documentation:

- 1) Mast tree plantings: the survivability, growth rate, and time at which new plantings start mast production should be tracked and documented.
- 2) Vegetative growth and ecosystem worth of the islands: This should be closely monitored. Documentation of progress and its relationship with river levels would give important information regarding the viability of similar projects in the future.
- 3) Sedimentation rate: hydrographic surveys should be done periodically to give actual sedimentation rates and estimate the viability of the project throughout its design life.

TABLE 3-2 Estimated Annual Post-Construction Annual Monitoring Costs
June 2004 Price Levels

Item	Annual Cost
Engineering Data ¹	\$ 2,200
Natural Resources Data ¹	\$ 2,000
Subtotal	\$ 4,200
Contingency (20%)	\$ 840
Subtotal	\$ 5,040
Planning, Engineering, & Design ²	\$ 700
TOTAL	\$ 5,740

¹ Reference paragraph 3.7

² Includes cost of evaluation report.

3.5 COST ESTIMATE AND FUNDING SCHEDULES

3.5.1 Cost Estimates

TABLE 3-3 Pekin Lake SFWA Southern Unit Cost Summary
March 2004 Price Levels

Acct Code ¹	Item	Quantity	Unit	Unit Price	Amount	Contingency	Cont. %	Total Cost w/ Cont, CWE ²	Escalation	FFE ²
01	LANDS AND DAMAGES									
	Federal Lands	1	LS	\$25,000	\$25,000	\$0	0	\$25,000	\$0	\$25,000
	Non-Federal Lands	1	LS	\$1,139,000	\$1,139,000	\$0	0	\$1,139,000	\$0	\$1,139,000
	TOTAL LANDS AND DAMAGES COST							\$1,164,000		\$1,164,000
12	DREDGING									
	STAGE I									
	Disposal Area	1	LS	\$10,131	\$10,131	\$2,533	25	\$12,664	\$481	\$13,145
	Mob & Demob Sites C1, C5, B, & E-Mech Dredging Side Casted	141515	CY	\$7.75	\$1,096,855	\$274,214	25	\$1,371,069	\$52,101	\$1,423,170
	Site C3-Mech Dredging w/ Barging	19500	CY	\$12.67	\$247,145	\$61,786	25	\$308,931	\$11,739	\$320,671
	Dry Dredge w/ Geotubes Site C2 Hydraulic Dredging	3600	CY	\$21.72	\$78,173	\$19,543	25	\$97,716	\$3,713	\$101,429
	Site C4 Hydraulic Dredging	1000	CY	\$9.45	\$9,445	\$2,361	25	\$11,806	\$449	\$12,255
	Site B Hydraulic Dredging	1000	CY	\$9.45	\$9,445	\$2,361	25	\$11,806	\$449	\$12,255
	Site B Hydraulic Dredging	213500	CY	\$7.85	\$1,676,311	\$419,078	25	\$2,095,389	\$79,625	\$2,175,014
	Sub Total							\$4,041,930		\$4,195,525
	STAGE II									
	Disposal Area	1	LS	\$30,979	\$30,979	\$7,745	25	\$38,724	\$2,323	\$41,047
	Mob & Demob Site B Hydraulic Dredging	54500	CY	\$7.68	\$418,433	\$104,608	25	\$523,041	\$30,380	\$553,422
	Sub Total							\$585,920		\$620,074
	TOTAL DREDGING COST							\$4,627,850		\$4,815,599
	CONSTRUCTION TOTAL COST							\$4,627,850		\$4,815,599
30	PLANNING, ENGINEERING, & DESIGN (PED)									
	STAGE I									
	P&S				\$447,730	\$0	0	\$447,730	\$11,820	\$459,550
	EDC				\$242,516	\$0	0	\$242,516	\$9,216	\$251,731
	DPR				\$300,000	\$0	0	\$300,000	\$0	\$300,000
	Sub Total							\$990,246		\$1,011,281
	STAGE II									
	P&S				\$58,592	\$0	0	\$58,592	\$2,871	\$61,463
	EDC				\$35,155	\$0	0	\$35,155	\$2,109	\$37,265
	Sub Total							\$93,747		\$98,728
	TOTAL PED COST							\$1,083,993		\$1,110,009

31	CONSTRUCTION MANAGEMENT						
	STAGE I SUB TOTAL	\$404,193	\$0	0	\$404,193	\$15,359	\$419,552
	STAGE II SUB TOTAL	\$58,592	\$0	0	\$58,592	\$3,516	\$62,108
	TOTAL CONSTRUCTION MANAGEMENT COST				\$462,785		\$481,660
	TOTAL PROJECT COST				\$7,338,628		\$7,571,268

NOTES:

1. PROJECT FEATURES ARE COST SHARED AND THE LANDS AND DAMAGES AND RELOCATIONS COSTS ARE SPLIT AS 35% NONFEDERAL AND 65% FEDERAL.
2. CURRENT WORKING ESTIMATE PRICE LEVEL IS BASED ON MARCH 2004 PRICES. CONSTRUCTION SCHEDULED FOR STAGE I IS SCHEDULED TO BEGIN IN FY06 AND STAGE II IS SCHEDULED TO BEGIN IN FY07. FULLY FUNDED ESTIMATE (FFE) FOR STAGE I IS BASED ON MIDPOINT OF CONSTRUCTION OF 1ST QTR 2006, AND STAGE II IS BASED ON A MIDPOINT OF CONSTRUCTION OF 1ST QTR 2007.

3.5.2 Funding Schedules

Southern Unit Stage I could be done in one construction season / fiscal year. Stage II would have to lag Stage I by at least 240 days, and could likely be done during one additional construction season / fiscal year. Stage III (tree plantings) could be done during the year following the last of the dredging operations.

3.6 SCHEDULE FOR DESIGN AND CONSTRUCTION

3.6.1 Design & Planning Phase

Division Approval of Feasibility Report	October 2004
Plans and Specifications Complete	February 2005

3.6.2 Construction Phase

Assistant Secretary of the Army Approval	February 2005
Project Cooperation Agreement Executed	September 2005
Acquisition of LERRDs Complete	March 2006
Notice to Proceed	May 2006
Construction Physically Complete	June 2007

Plans and Specifications would be developed between October 2004 and February 2005. Construction of Stage I could commence during the 2006 construction season. Stage II could be constructed during the 2007 construction season.

3.7 PLAN ACCOMPLISHMENTS

The selected alternative would benefit the Illinois River basin in the project area by providing off-channel deep water fish overwintering habitat not found elsewhere along this reach. Other ancillary benefits of the project would be to improve wading bird and

waterfowl habitat, provide depth diversity in the lower lakes, and provide elevation diversity capable of supporting mast-producing trees.

TABLE 3-5. Pekin Lake SFWA Southern Unit – Project Summary

Feature	Measurement	UOM
Main Channel	424	feet MSL
Bottom Width	50	feet
Depth	8	feet
Length	11,700	feet
Area	662,000	square feet
	15.2	acres
Volume Dredged (main channel)	158,000	cubic yards
Dredging 4' Deep (shallow)	428	feet MSL
Area	1,430,000	square feet
	32.7	acres
Volume Dredged (4' deep)	133,000	cubic yards
Dredging 8' Deep (normal)	424	feet MSL
Area	340,000	square feet
	7.9	acres
Volume Dredged (8' deep)	102,000	cubic yards
Dredging 12' Deep (deep)	420	feet MSL
Area	90,000	square feet
	2.1	acres
Volume Dredged (12' deep)	41,000	cubic yards
Placement at Site "C" – Islands		
Nesting Islands - C1 and C5		
Area (ea.)	10,890	square feet
Volume of Dredged Material Placement (ea.)	1,468	cubic yards
Volume of Dredged Material Placement (total nesting)	2,936	cubic yards
Perched Wetland Islands - C2 and C4		
Area (ea.)	10,890	square feet
Volume of Dredged Material Placement (ea.)	2,420	cubic yards
Volume of Dredged Material Placement (total wetland)	4,840	cubic yards
Mast Tree Island C3		
Area	65,340	square feet
Volume of Dredged Material Placement	58,890	cubic yards
Mast Trees	66	each
total dredged volume	434,000	cubic yards
total placed volume*	542,000	cubic yards
* this amount accounts for an initial <i>hydraulic</i> dredging bulking factor of approximately 1.4		

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.

4.1 DIVISION OF PLAN RESPONSIBILITY

4.1.1 Recommended Plan Cost Sharing

Federal and non-Federal cost sharing for the Recommended Plan is in accordance with Section 519 of the Water Resources Development Act of 2000. 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 would provide 100% of any lands, easements, rights-of-way, relocations of utilities or other existing structures, and disposal areas (LERRDs). The value of LERRDs would be included in the non-Federal 35% share. Where the LERRDs exceed the non-Federal sponsor's 35% share, the sponsor would be reimbursed for the value of the LERRDs that exceed 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.

Pekin Lake SFWA– Southern Unit					
Project Feature	Cost	Non-Federal		Federal	
		%	Cost	%	Cost
First Cost of Construction	\$7,571,270	35%	\$2,649,944	65%	\$4,921,944
LERRD Credit	\$1,139,000	100%	\$1,139,000	0%	\$0
Cash			\$1,510,944		\$4,921,944
OMRR&R (average annual)	\$7,115	100%	\$7,115	0%	

4.1.2 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 \$4,921,944. 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 IDNR.

4.1.3 Non-Federal Responsibilities

The IDNR would be responsible for providing 35% of the First Cost of implementing the Recommended Plan. The 35% share of the project cost includes the IDNR's responsibility for providing all LERRDs. The estimated costs are \$1,510,944 in cash with \$1,139,000 in LERRD credit.

The IDNR also would be responsible for OMRR&R of project features. The operation and maintenance costs are anticipated to be minimal over the 50-year period of analysis at an average annual cost of \$7,115.

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

- a. Provide a minimum of 35 percent of total project costs as further specified below:
 1. Provide, during the first year of construction, any additional funds needed to cover the non-federal share of design costs;
 2. 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 Federal Government to be necessary for the construction, operation, and maintenance of the project;
 3. Provide or pay to the Federal 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

4. Provide, during construction, any additional costs necessary to make its total contribution equal to 35 percent of total project costs;
- b. Provide the non-Federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project, in accordance with the cost sharing provisions of the agreement;
 - c. Do not use Federal funds to meet the non-Federal Sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized;
 - d. Operate, maintain, repair, replace and rehabilitate the project, or functional portion of the project, including mitigation, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;
 - e. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Non-Federal Sponsor, now or hereafter, owns or controls for access to the project for the purpose of inspecting, operating, maintaining, repairing, replacing, rehabilitating, or completing the project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall relieve the Non-Federal Sponsor of responsibility to meet the Non-Federal Sponsor's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance;
 - f. Hold and save the United States free from all damages arising from 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 United States or its contractors;
 - g. 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), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the initial construction, periodic nourishment, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the Non-Federal Sponsor with prior specific written direction, in which case the Non-Federal Sponsor shall perform such investigations in accordance with such written direction;

- h. Assume, as between the Federal Government and the non-Federal Sponsor, 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 Federal Government determines to be necessary for the initial construction, periodic nourishment, operation, or maintenance of the project;
- i. Agree that, as between the Federal Government and the Non-Federal Sponsor, the Non-Federal Sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, and repair the project in a manner that will not cause liability to arise under CERCLA;
- j. Prevent obstructions of or encroachments on the project (including prescribing and enforcing regulations to prevent such obstruction or encroachments) which might reduce the level of protection it affords, hinder operation and maintenance, or interfere with its proper function, such as any new developments on project lands or the addition of facilities which would degrade the benefits of the project;
- k. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total costs of construction of the Project, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;
- l. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5), and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213), 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;
- m. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), 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", and all applicable Federal labor standards and requirements, including but not limited to 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.*), the

Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 *et seq.*) and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c *et seq.*); and,

n. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, necessary for the initial construction, periodic nourishment, operation, and maintenance of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

4.2 INSTITUTIONAL REQUIREMENTS

4.2.1 Sponsorship Agreement

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

4.2.2 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.

4.2.3 Local Cooperation

Subsequent to public review of the draft report, the IDNR will be requested to provide an 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.

4.2.4 Project Management Plan

A Project Management Plan (PMP) for implementation of the Recommended Plan will be prepared. The PMP will describe activities, responsibilities, schedules, and costs required for the Plans and Specifications phase and construction of the project. The Plans and Specifications phase will last for an estimated 6 months at a total cost of \$540,526.

4.2.5 Procedures for Project Implementation

Future actions necessary for project approval, budgeting, and implementation are summarized below. MVD will provide overall management and budgeting for the

program. Report and other submission to higher authority will be processed through MVD with coordination with Lakes and Rivers Divisions (LRD) as needed, with the exception of PCA's which will be processed and negotiated by the district and MSC where the project is located.

1. As project reports near completion, an In Progress Review (IPR) will be scheduled with Mississippi Valley Division (MVD) (or Lakes and Rivers Division as applicable) and Headquarters U.S. Army Corps of Engineers (HQUSACE) to discuss report findings. An information package similar to that provided for and Alternative Formulation Briefing will be prepared for the meeting.
2. The final report will be provided to Mississippi Valley Division (and LRD as applicable) to conduct a policy and procedural review. For initial project reports submitted, MVD (and LRD as applicable) will conduct this review prior to review by HQUSACE.
3. Upon completion of the policy and procedural review and endorsement by MVD (MVD will provide endorsement regardless of Major Subordinate Command (MSC) through coordination with LRD), the report will then be submitted to Headquarters, U.S. Army Corps of Engineers for review and submission to the Office of the Assistance Secretary of the Army for Civil Works (ASA(CW)) for approval.
4. Plans and Specification can be initiated upon issuance of the Division endorsement to HQUSACE, or as further noted in this paragraph. When concurrent review with HQUSACE is in place, MVD can provide instruction for initiation of Plans and Specifications when it is satisfied that policy and procedural requirements are met prior to full completion of the review process.
5. Subsequent to report approval by ASA(CW) and Construction General funding being provided by the Congress, a PCA must be negotiated and executed with the non-Federal sponsor (Illinois Department of Natural Resources). The PCA describes the project, the items of local cooperation, and the responsibilities of the Government and the non-Federal sponsor in the cost sharing, financing and execution of the project.
6. The Corps can submit a budget request for Construction General funds for any project approved by ASA(CW) by 1 August of the program year, with changes possible until 1 August. Therefore, there are no construction funds in the Fiscal Year (FY) 04 budget for this program, and additional funds in FY 04 will be dependent upon Congressional add. In the case of FY 05, construction funds can be budgeted for project approved by 1 August 2003, assuming the program gets a legislative extension beyond FY 04.
7. The Corps will complete final design, plans, and specification for the project construction.

8. The IDNR will be required to provide all lands, easements, rights-of-way, relocations and disposal areas necessary for project construction and OMRR&R.
9. Bids for construction will be advertised and contracts awarded upon approval of the report by ASA(CW), appropriation of CG funding, and execution of the PCA and certification of Right-of-Way availability.
10. Upon completion of construction, the project will be turned over to the IDNR, who will be responsible for OMRR&R in accordance with guidelines in the PCA and the OMRR&R manual as furnished by the Corps.

4.2.6 Project Implementation Schedule

The schedule for the feasibility study is for the final report to be forwarded to CEMVD in September 2004 and for the Division Engineer's recommendation to be issued in October 2004. Initiation of Plans & Specifications in October 2004. The PED phase will continue for approximately 5 months, until February 2005. 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. Acquisition of LERRDs by the sponsor is anticipated to take 6 months and be completed in March 2006. An advertisement in the Federal Business Opportunities (FedBusOps) will be prepared during April 2006 for the solicitation of bids for construction, and the process of receiving bids and awarding construction will be completed by June 2006. Construction will begin in 2006 and be completed by June 2007.

4.2.7 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.

4.2.8 Compliance with Environmental Requirements

An environmental assessment with a Clean Water Act Section 404(b)(1) Evaluation was completed for this project and was submitted for 30-day public review. That document can be found in Appendix G.

Summary of Coordination, Public Views, and Comments

5.1 COORDINATION

Throughout a feasibility study, the Corps 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 Pekin Lake SFWA – Southern Unit Critical Restoration Project was through the study's open houses. The open house attendees were offered comment sheets to express their concerns and provide comments. During the study, the Corps coordinated not only with its cost-sharing partner, the IDNR, but also with numerous groups including elected congressional representatives; Federal, State, county, and city agencies; environmental groups/organizations; businesses; media; and the unaffiliated general public.

5.1.1 PUBLIC VIEWS AND COMMENTS – AUGUST 2002 OPEN HOUSE

In July 2002, a press release was issued providing the study background, purpose, and a study update; announced an August 6, 2002, open house; stated that another open house would be held before the study's conclusion; and listed points of contact for comments/questions.

The August 6, 2002 open house was held in Pekin, 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 Pekin riverfront and to gather comments on the alternatives. Corps, 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 55 people attended the open house. Of those, 27% (15) returned comment sheets.

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 restore aquatic, wetland, and terrestrial habitats and provide ancillary recreation benefits.

The majority of questions asked during the question and answer sessions were directed at how the project would affect boating, fishing, hunting, water quality, and flood heights. Ducks Unlimited provided formal written comment on the project that raised the issue of installing a water control structure in the Southern Unit to manage water levels for waterfowl during the October to November timeframe. This proposal was evaluated and found not feasible (See Section 2.4.2.6).

5.1.2 PUBLIC VIEWS AND COMMENTS – AUGUST 2004 OPEN HOUSE

In September 2004, a final public meeting will be held in conjunction with the public review of the feasibility report and Environmental Assessment. Public input provided at this meeting and throughout the public review process of the documents will be included in the final report.

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.

The goals of the coordination process are 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 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, analyzed 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 Pekin Lake SFWA Southern Unit .

The current estimated first cost of the recommended plan is \$7,571,270. 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 (IDNR), the Non-Federal Sponsor. The Federal contribution is estimated at \$4,921,944 and the non-Federal contribution is estimated at \$2,649,944. It is the IDNR's responsibility to provide the real estate and conduct operation and maintenance. The operation and maintenance of these features is estimated to cost \$7,115 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.

Duane P. Gapinski
Colonel, U.S. Army
District Engineer