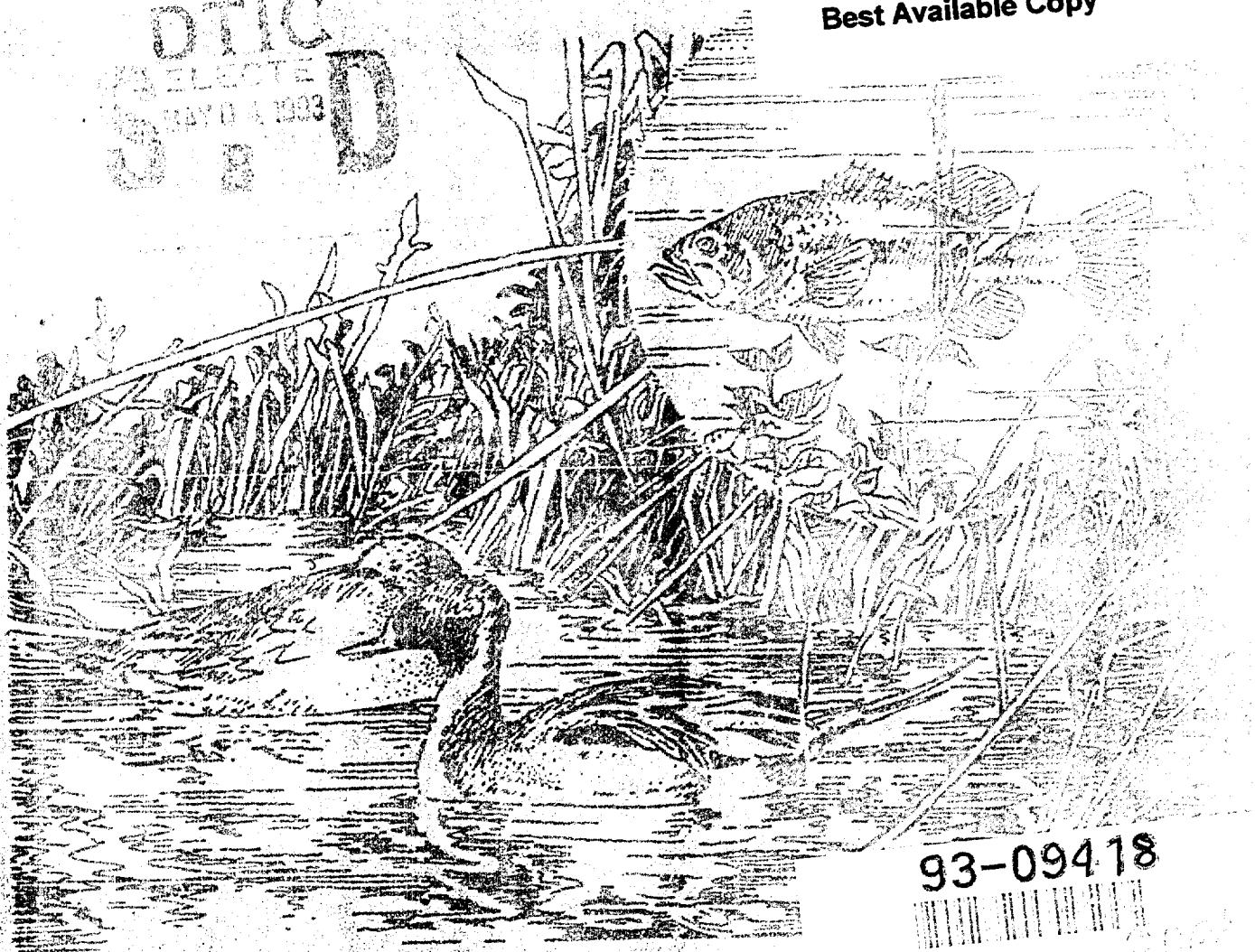
UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT (R-7F)
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT
LAKE CHAUTAUQUA
REHABILITATION AND ENHANCEMENT



JUNE 1991

US Army Corps
of Engineers
Rock Island District

LA GRANGE POOL
ILLINOIS WATERWAY
MASON COUNTY, ILLINOIS

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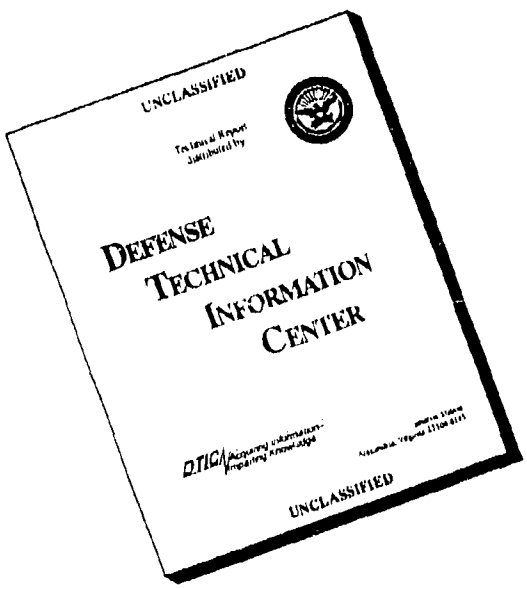

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DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING—P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

June 28, 1991

REPLY TO ATTENTION OF

Planning Division

SEE REPORT DISTRIBUTION LIST III

The accompanying 45 revised pages and 1 revised plate (enclosure 1) reflect changes made to the public review Definite Project Report for the Lake Chautauqua, Illinois, Habitat Rehabilitation and Enhancement Project (R-7PR), dated March 1991. Your incorporation of these pages and plate with the previously provided public review document(s) will represent distribution of the final report for this project. An instruction sheet is provided to assist you in this process. Appropriate copies of the final Technical Appendices volume are provided as enclosure 2.

The Lake Chautauqua habitat project was proposed by the U.S. Fish & Wildlife Service and has been developed in cooperation with the Rock Island District of the U.S. Army Corps of Engineers, the Illinois Department of Conservation, and other appropriate Federal and State agencies.

The project goals are to enhance waterfowl and fishery habitat. To achieve these goals, it was determined that the following project objectives should be met:

a. Increase availability of emergent and submergent vegetation; and,

b. Create flowing side channel and deep water slough habitat.

These objectives will be accomplished by improving Upper and Lower Lake water control capabilities and by excavating selected reaches of Liverpool Ditch.

The recommended project includes:

a. Constructing a 41,000-GPM pump station to service both the Upper and Lower Lake;

b. Providing 10-year flood event protection for the Upper Lake by upgrading the existing cross dike and Upper Lake perimeter levee and modifying the existing radial gate structure;

c. Installing an Upper Lake gravity outlet structure;

d. Installing a stop log structure at the lower end of the Lower Lake;

e. Dredging approximately 7,500 feet of drainage channels in the Lower Lake;

f. Excavating approximately 8,400 feet of Liverpool Ditch to 10 feet below current surface elevation and an additional 300-foot section to 16 feet below current surface elevation;

g. Installing an entrance closure structure with boater access notch at the upper end of Liverpool Ditch; and,

h. Constructing a boat ramp to provide Upper Lake management access.

Questions regarding the report distribution process or the project in general should be directed to Mr. Jerry Skalak, Rock Island District Habitat Program Manager. You may reach him by telephoning 309/788-6361, Ext. 6605, or by writing to the following address:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division (J. Skalak)
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Sincerely,

John R. Brown
Colonel, U.S. Army
District Engineer

Enclosures

PAGE AND PLATE CHANGES
TO
DEFINITE PROJECT REPORT (R-7PR)
LAKE CHAUTAUQUA REHABILITATION AND ENHANCEMENT
MARCH 1991

Delete Pages	Substitute Pages
Cover	Cover
Title Page	Title Page
Executive Summary	Executive Summary
i thru iv	i thru iv
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Appendix C, pages 1 and 2	Appendix C, pages 1 and 2
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Delete Plate	**Substitute Plate**
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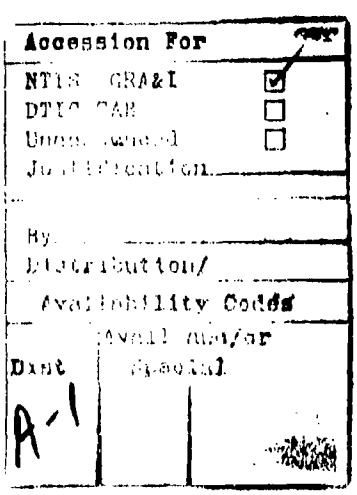

REVISED JUNE 1991

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
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REPLY TO
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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-7F)

LAKE CHAUTAUQUA REHABILITATION AND ENHANCEMENT
LA GRANGE POOL, ILLINOIS WATERWAY, RIVER MILES 124-128
MASON COUNTY, ILLINOIS

JUNE 1991

EXECUTIVE SUMMARY

Lake Chautauqua is a 3,250-acre floodplain lake and wetland complex located in Mason County, Illinois, within the LaGrange pool of the Illinois Waterway between river miles 124 and 128 (see plate 1). The lake is formed by a 9-mile perimeter levee and is divided into an upper and lower lake by a cross dike. The area is presently managed by the U.S. Fish and Wildlife Service (USFWS) for migratory waterfowl as part of the Chautauqua National Wildlife Refuge.

Following the organization of the Chautauqua Drainage and Levee District in 1916, the area was drained and leveed for farming. However, recurrent flooding lead to the abandonment of the area in 1926. In 1936, the purchase of the Chautauqua Drainage and Levee District by the Department of Interior (USFWS) was approved, and Lake Chautauqua became a part of the National Wildlife Refuge System. The levee was retained for refuge water level control purposes. In 1969, a cross dike was constructed to divide the lake into upper and lower management units.

The lakes have since deteriorated due to frequent flooding and sedimentation. Suspended sediments carried in by floodwaters impede submergent and emergent plant growth by decreasing light penetration and creating a soft, flocculent lake bottom. Since 1978, there has been a documented, long-term decline in both the annual fall peak number of ducks in the refuge and the total fall use days.

The goals for this project are the enhancement of waterfowl and fishery habitats. In order to accomplish these goals, the following design objectives were identified: (1) increase submergent and emergent vegetation (2) create flowing side channel and deepwater slough habitat; and (3) reduce sedimentation. Five alternatives were considered to meet the stated objectives: (A) no Federal action (B) improve water control, (C) construct barrier islands, (D) excavate flowing side channel, and (E) raise levee elevations.

Evaluation of the project alternatives was accomplished through the application of habitat value assessment methodologies. Aquatic models developed by the Waterways Experiment Station (WES) were used to evaluate existing aquatic and benthic resources and to quantify potential project outputs. The Wildlife Habitat Appraisal Guide, a habitat assessment methodology designed by the Missouri Department of Conservation in cooperation with the U.S. Soil Conservation Service, was used in the analysis of wetland and terrestrial habitats. The alternatives were evaluated on an individual and combined feature basis. As a result of the analysis, the construction of water control structures and side channel excavation (alternatives B and D) were recommended (see plate 2).

The proposed construction includes: raising approximately 3.8 miles of existing levee and cross dike to a 10-year level of protection; modifying

an existing radial gate structure; providing a pump station with 41,000 gpm capacity; providing gated gravity outlets for the upper and lower lakes; providing drainage channels to the pump station and gravity outlets; providing a boat ramp for upper lake management purposes; excavating a selected reach of side channel; and constructing a side channel entrance closure structure.

Development of the selected plan features will provide about 3,250 acres of manageable aquatic and wetland habitat and approximately 8,400 feet of flowing side channel. Migratory waterfowl habitat value will be enhanced by increasing the seasonal availability of reliable water, food resources, and resting, loafing, and nesting opportunities. Fisheries benefits will be accrued through the creation of off-channel, flowing water habitat and deepwater slough habitat.

It is proposed that selected quantitative physical, chemical, and natural resource parameter measurements, as specified in the project report, be collected following completion of construction to evaluate project performance with respect to the stated objectives. The Corps of Engineers would have responsibility for this data collection. Additional field observations would be gathered by the USFWS and submitted to the Corps of Engineers as part of the annual project monitoring plan.

Average annual operation and maintenance of the project, estimated to cost $29,800, will be satisfied through agreement between the U.S. Fish and Wildlife Service and the non-Federal project sponsor, the Illinois Department of Conservation (IDOC).

The U.S. Army Corps of Engineers will be responsible for the Federal share of any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the Definite Project Report and that is needed as a result of specific storm or flood events. Rehabilitation of the project is considered reconstructive work which cannot be accurately estimated at this time.

The District Engineer has reviewed the project outputs and determined that implementation of the identified plan is justified and in the Federal interest. The project area is managed as a National Wildlife Refuge within the meaning of Section 906(e) of the 1986 Water Resources Development Act. Therefore, approval of the construction of Lake Chautauqua Habitat Rehabilitation and Enhancement project is recommended by the Rock Island District Engineer at 100-percent Federal expense estimated at $4,113,000.

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
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LAKE CHAUTAUQUA REHABILITATION AND ENHANCEMENT
LA GRANGE POOL, ILLINOIS WATERWAY, RIVER MILES 124-128
MASON COUNTY, ILLINOIS

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LAKE CHAUTAUQUA REHABILITATION AND ENHANCEMENT
LA GRANGE POOL, ILLINOIS WATERWAY, RIVER MIL 124-128
MASON COUNTY, ILLINOIS

1. INTRODUCTION

a. **Purpose.** The purpose of this report is to present a detailed proposal for the rehabilitation and enhancement of Lake Chautauqua. This report provides planning, engineering, and sufficient construction details to allow final design and construction to proceed upon approval of this document.

b. **Resource Problems and Opportunities.** Sediment and turbidity have been the principle problems associated with Lake Chautauqua. The accreting lake bed has resulted in decreasing water depths within the lake. With the limited depth, wind and fish-related turbulence results in resuspension of bed sediments and increased turbidities. These turbidities have seriously decreased water quality for migrating waterfowl benefits.

Sedimentation has been the major problem with Liverpool Ditch which runs along the riverside of the lower Lake Chautauqua levee and is one of the few side channel habitats in the Illinois Waterway. However, as a result of clogging and sedimentation, this habitat has been severely degraded. During low flows approaching flat pool elevations, Liverpool Ditch no longer acts as a side channel.

Deficiencies of existing refuge levees and water control structures have hindered the ability to manipulate water levels in upper and lower Lake Chautauqua for moist soil plant production. Several hundred acres of refuge are providing minimal to no benefit because of these deficiencies.

c. **Scope.** The project scope includes the Lake Chautauqua area and the adjacent Liverpool Ditch. Lake Chautauqua is a 4,200-acre lake/wetland complex within the floodplain of the Illinois River near Havana, Illinois, as shown on plate 1. Lake Chautauqua is formed by a 9-mile perimeter levee and is essentially divided into an upper lake and a lower lake by a cross dike. The lake varies between .5 to 1.5 miles in width and is over 6 miles long. The U.S. Fish and Wildlife Service (USFWS) presently operates the lake for migratory waterfowl as part of the Chautauqua National Wildlife Refuge.

Liverpool Ditch is a 3-mile-long side channel created when the area was used as borrow for construction of the levee. The configuration of the original ditch is not known because cross-sectional information is

unavailable for the time period. However, based on data collected at a later date, the ditch is estimated to have been between 12 to 15 feet deep and approximately 100 feet wide at the top when it was excavated. At or near flat pool, the current ditch section ranges from dry to a few inches deep and anywhere from a few feet to 30 feet wide. These estimated ditch sections are based on a flat pool elevation of 429.4 feet National Geodetic Vertical Datum (NGVD). The ditch is located within the Chautauqua National Wildlife Refuge.

The study focused on providing project features that would allow: (1) operation of the upper lake as a stable level lake during most years; (2) the independent operation of the lower lake as a moist soil management unit; and (3) rehabilitation of scarce side channel habitat in Liverpool Ditch. The ability to completely draw down the upper lake periodically was considered essential to allow consolidation and desiccation of the bed sediments, thereby improving water quality and encouraging the growth of submergent vegetation.

Field surveys, aerial photogrammetry, and hydrographic soundings were done to plan and assess proposed project alternatives. Soil borings were taken to assess sediment types, to verify foundations for proposed structures, and to determine excavation/dredging constraints. Water quality sampling was initiated as part of the study and will continue through construction.

This report follows a general problem solving format. The purpose and the problems are presented in Section 1. Section 2 provides an overview of how and why Lake Chautauqua was selected as a project within the Environmental Management Program. Section 3 establishes the baseline for existing resources. Section 4 provides the objectives of the project. Sections 5 and 6 propose and evaluate project alternatives. Sections 7 and 8 describe the selected plan. Section 9 assesses the environmental effects from the proposed plan pursuant to the National Environmental Policy Act. Section 10 provides a summary of project accomplishments or benefits. Sections 11, 12, and 13 describe operation and maintenance considerations, performance monitoring, and detailed cost estimates for both initial construction and annual operation and maintenance. Sections 14, 15, 16, and 17 provide a summary of implementation requirements and coordination. Sections 18, 19, 20, and 21 present the conclusions, recommendations, Finding of No Significant Impact, and literature cited, respectively.

Drawings (plates) have been furnished to provide sufficient detail to allow review of the existing features and the proposed plan. Plates 1 through 6 show the project location, the recommended plan, and alternative plans. Plates 7 and 8 provide 16 years of hydrographic record for the Illinois River near the proposed project location. Plates 9 through 12 provide soil borings that were used to evaluate foundation conditions and excavation depths and methods. Plates 13 through 18 provide plan and profiles of the perimeter levee and cross dike. Plates 19 through 21 provide typical sections. Plates 22 through 25 and 27 provide structure details. Plate 26 provides the monitoring plan.

A number of innovative structural and non-structural solutions which address human-induced impacts, particularly those related to navigation traffic and operation and maintenance of the navigation system, could result in significant long-term protection of UMRS habitat. Therefore, proposed projects which include such measures will not be excluded categorically from consideration, but the policy and technical feasibility of each of these measures will be investigated on a case-by-case basis and recommended only after consideration of system-wide effects.

(3) **Subsequent Annual Addenda.** Subsequent annual addenda, of which the Fifth Annual Addendum is the most recent, provide a vehicle for reporting program progress and ensuring thorough coordination between the participating State and Federal agencies.

b. **General Selection Process.** The following steps provide an overview of the process of project selection. The steps are interactive with communication in both directions and occur through a continual process.

(1) **State/USFWS Project Nomination.** Projects are nominated for inclusion in the Rock Island District's habitat program by the respective State conservation agencies and the USFWS based on agency management objectives. Rock Island District assists the States and USFWS agencies in proposing habitat projects through an in-house task force that includes staff members from the Engineering, Planning, Operations, and Construction Divisions. As projects are being conceptualized, this group meets on-site with State and USFWS personnel to examine as fully as possible what site-specific enhancements would be both environmentally desirable and engineeringly feasible.

(2) **Fish and Wildlife Interagency Committee (FWIC) Ratings.** To assist in the project formulation process, the FWIC, a group composed of State and Federal biologists who are assigned to aquatic and terrestrial projects (refuges, wildlife areas) along the Mississippi River and Illinois Waterway, has convened a series of meetings starting in 1986 to consider critical habitat needs along the Mississippi and Illinois Rivers. At these meetings, the available habitat is evaluated on a pool-by-pool basis. These analyses reveal deficiencies (such as feeding, resting, and loafing areas for migratory waterfowl, absence of deep water off the main channel for diving ducks and fish) as well as types of habitat in abundant supply (e.g., mature bottomland hardwood). (With this information, projects being considered can most accurately reflect broader regional needs in addition to representing the best site-specific choices.)

Projects then are ranked by the FWIC according to the biological benefits that they could provide. Each project is considered and evaluated relative to increasing habitat benefits for fish, waterfowl, and other wildlife. Every project is ranked according to the outputs provided as high, medium, or low.

(3) River Resources Coordinating Team (RRCT) Rankings. The FWIC rankings also are forwarded to the RRCT, an interagency policy group which meets to coordinate Mississippi and Illinois River activities. The RRCT examines the FWIC rankings and includes consideration of the broader policy perspectives of the agencies submitting the projects. The RRCT makes a recommended ranking.

(4) **U.S. Army Corps of Engineers District Ranking.** The FWIC and RRCT recommended rankings are evaluated by the District. The District then formulates a recommended program consistent with the EMP program guidance and District requirements.

(5) **U.S. Army Corps of Engineers, North Central Division Prioritizing.** The District then submits a recommended program to the North Central Division. Additional coordination by the Division through the Environmental Management Program Coordinating Committee is effected. North Central Division then submits project fact sheets to the Chief of Engineers and Assistant Secretary of the Army for Civil Works for approval. Fact sheets and schedules are subsequently published in the annual addendums, thereby completing the project selection process.

c. **Specific Site Selection.** Recognition of changes occurring in habitat composition and subsequent declines in waterfowl and fisheries habitat quality and availability along the Illinois Waterway prompted the proposal of several habitat rehabilitation and enhancement projects by the Federal and State agencies responsible for natural resource management in the area. Four of these projects, the Rice Lake Complex; the Banner Marsh State Wildlife Area; the Chautauqua Refuge, encompassing sites adjacent to the LaGrange Pool of the Illinois Waterway; and the Peoria Lake project, located within the Peoria Pool, have been elevated to the active status through the ranking and recommendation process detailed in Section 2.b. of this report. These projects are currently in various stages of planning and design in preparation for implementation under the Environmental Management Program.

Restoration of habitat at Thompson Lake (LaGrange Pool, RM 120 to 126) through the acquisition of the Thompson Lake and Globe Drainage and Levee Districts is being considered by the USFWS. This project has significant land acquisition and development costs associated with it. The USFWS may submit the rehabilitation and enhancement of this site as an EMP habitat project at a later date should acquisition be accomplished.

All of these proposed or under-development projects address the specific need for enhanced aquatic and wetland habitat along the central reach of the Illinois River. The conversion of wetlands to farmlands throughout central Illinois over the past several decades has greatly reduced the availability of prime waterfowl habitat in this region. In addition, increased sedimentation resulting from expanded agricultural activities has brought about tremendous changes in the morphology of the Illinois River, with the primary impacts being the loss of aquatic habitat depth and diversity off the main channel and decreased water quality. Flowing

side channel and deepwater slough habitat is virtually nonexistent along much of the Illinois Waterway, yet it is considered critical to fisheries.

The Lake Chautauqua area historically was part of a highly productive freshwater ecosystem. Flooding in the 1940's started a decline in the value of the lake's habitat. The loss of rooted aquatic plants, combined with sedimentation, has reached a point where wind fetch-generated wave action is capable of resuspending bottom flocculents. The soft bottom sediments are not allowed to compact due to this constant churning. The resulting increase in turbidity levels has reduced photosynthetic activities within the lake. Submergent and emergent vegetation that does develop under these conditions is unable to anchor itself to the lake bed, thereby allowing the natural buoyancy of the vegetation to defeat its establishment.

The Lake Chautauqua project site will provide tremendous opportunities for waterfowl and fisheries habitat restoration and enhancement. The selection of this site was based primarily upon project output potential; however, influencing parameters such as land ownership status, conservation management considerations, and navigational impacts have been considered.

3. ASSESSMENT OF EXISTING RESOURCES

a. **Related Studies and Reports.** A number of studies have been conducted which investigated the sedimentation problem in Lake Chautauqua. These studies are summarized below.

(1) *The Silting of Lake Chautauqua* (Stall and Melsted, 1951) presented a history of the lake and results of a 1950 sedimentation study. The study included analysis of the rising lake bed elevation and the fertility of the sediments. These analyses indicated that the lake was filling in at a rate of 0.38 inch per year, and the sediment in the lake had high fertility as measured in carbon and nitrogen.

(2) *Turbidity and Sedimentation at Lake Chautauqua, Illinois* (Jackson and Starrett, 1959) studied turbidities due to wind and fish resuspension of bottom sediments. This study concluded that due to the soft nature of sediments in Lake Chautauqua, wind and fish activity contributed to turbidity in the lake to the point that the lake rarely became clear. The study also concluded that important duck food plants had been adversely affected by a combination of sedimentation and severe flooding.

(3) *Sediment Deposition of Lake Chautauqua, Havana, Illinois* (Lee, 1976) studied the sedimentation from 1950 to 1976. It concluded that the sedimentation rate during the study period was 0.3 inch per year.

b. **Resource History and Description of Existing Features.** Prior to modern man's arrival, the Illinois River floodplain around Lake Chautauqua consisted of numerous lakes, sloughs, and backwaters. This was part of a river ecosystem that was considered to be one of the most productive freshwater ecosystems in the world. In the early 1900's a combination of deteriorating water quality from the discharge of Chicago sewage into the Illinois River and construction of agricultural levees eliminated most of these floodplain habitats. These and other perturbations have caused a long-term decline in the ecological resources of the Illinois River Valley (Mills, *et al.*, 1966) which includes Lake Chautauqua.

The Chautauqua Drainage and Levee District was organized in 1916. The district then proceeded to drain and levee the sloughs and backwaters of the Illinois River for agriculture. The Lake Chautauqua area was farmed until 1926 when it was abandoned due to recurrent flooding.

The Chautauqua National Wildlife Refuge was created in 1936 with the purchase of the Chautauqua Drainage and Levee District. Approximately 9 miles of levees were repaired and the 4,500-acre area (approximately 3,250 acres of water) began to be managed for migratory waterfowl. Water levels were maintained by gravity flow only, relying on favorable water levels on the river to either flood or to drain the lake.

Present ground elevations of the lake bed are approximately 430.5 NGVD. The present elevations of the perimeter levee range from 441 to 449 NGVD

Immediately adjacent to the levee and surrounding the lake are Liverpool Ditch (lower lake) and Meyer's Ditch (upper lake). These channels were created during the construction of the levee. At a point just above the cross dike, Liverpool Ditch intersects the main river. The additional water from the main river creates a "flowing" side channel for approximately 3 miles until it rejoins the river. It is one of the few remaining side channels on the entire Illinois River (Havera 1980). Sedimentation in the ditch, however, has eliminated most of its aquatic value. When the ditch was excavated in about 1922, its elevation is estimated to have been between 416 and 418 NGVD, or about 13 feet below flat pool elevation of 429.4. The average bottom elevation of the channel presently is 430 NGVD and thus provides no permanent water. High flows during flood episodes appear to maintain the channel boundary between the levee and the land mass between Liverpool Ditch and the Illinois River, created by the silting in of Liverpool Lake, henceforth referred to as Liverpool Island.

Management of the lake for fish is secondary to waterfowl. Fish management is thwarted by the frequent overtopping of the levees which allows reintroduction of rough fish into the lake. Since the lake cannot be completely drained, it is difficult to eliminate rough fish. There is no active fish management other than the permitting of commercial fishermen to harvest rough fish. In 1989, 13 permittees harvested 176,183 pounds of carp, buffalo, and drum. At present, there is no fish sampling program within Lake Chautauqua to provide information on sportfish.

The USFWS plans to reintroduce yellow perch to the refuge following completion of the EMP project. Yellow perch, which were once common in lakes along the Illinois River until 1943, have not been collected at Lake Chautauqua since before 1975. They are now virtually extirpated from the Illinois River. As the aquatic vegetation began to decline, so did the yellow perch population.

f. **Water Quality.** Water quality is possibly the most important single factor that controls the health of the lake's aquatic resources; suspended sediments and dissolved oxygen probably are the two most important parameters for aquatic organisms. The influx of sediments from the Illinois River causes elevated turbidity levels that decrease light penetration. This limits the depth at which rooted aquatic vegetation can survive. As this suspended sediment enters the quiet water of the lake, it settles out on the lake bottom. The levee around the refuge exacerbates this problem by retaining silt-laden floodwaters after floodwaters recede.

Due to the long expanses of open water in the lake, wind-generated waves (and rough fish to a lesser degree) tend to resuspend these sediments during non-flood periods. This resuspension creates an additional problem for aquatic vegetation because the lake bottom never solidifies. Vegetation that does manage to become established often is uprooted by wave/wind action. This problem is well documented and discussed on the Illinois River (Mills, *et al.*, 1966).

g. **Bottomland Hardwoods.** The most significant non-aquatic habitat within the leveed area is Melz Slough (see plate 2), a 100-acre parcel of floodplain forest located in the southwest corner of the upper lake. This is a mature stand of bottomland forest dominated by silver maple, cottonwood, ash, and hackberry. This stand produces most of the wood ducks hatched on the refuge. Melz Slough also provides important habitat for wintering bald eagles. The slough is a designated "Natural Area" representative of high quality bottomland hardwood forest that was once common along the Illinois River. Outside of the leveed area are approximately 800 acres of upland and bottomland forest. There is a wide variation in the quality of this 800 acres. The 374 acres on Liverpool Island is mature floodplain forest similar to that found in other tracts along the river. Cottonwood, silver maple, green ash, and hackberry dominate the canopy.

Among this 800 acres is approximately 118 acres of second growth forest located on the upper and lower lake levees and cross dike. This 118 acres includes all forest growth from the riverward toe of the levee to the lakeside toe. All of this forest has been classified as bottomland hardwoods for this report, in spite of the fact that the elevation of much of the levee is indicative of an upland environment, most noticeably on the crown of the levee. Because of the narrow width of the levee, it was difficult to delineate between upland and bottomland. Except for the highest portions of the levee, where some species of oak (*Quercus* sp.) and mulberry were growing, the species composition was relatively similar to the adjacent floodplain forest. The maturity of these 118 acres varied considerably. All of this forest is second growth timber originating no earlier than when the levee was constructed in the early 1900's. Since its construction, the upper and lower lake levees were repaired, as needed, in specific locations. This has resulted in a patchwork of stands. Some portions of the levee have trees that are up to 70 years old, while at other locations where the levee has recently been repaired they may be less than 10. All the trees on the cross dike have volunteered since its construction in 1965 and consist of very low quality, immature stands that are more of a scrub-shrub environment.

The eastern edge of the refuge is bordered by oak-hickory forest on a sandy bluff about 70 feet above the lake. This eastern boundary is the only portion of the refuge that is virtually free from flooding. Numerous springs emerge from the bluff along the 4 miles of eastern shoreline. These springs sometime generate enough flow to affect lake drawdown.

Approximately 28 species of mammals have been identified on the refuge, the most common of which are red fox, eastern cottontail rabbit, raccoon, fox squirrel, beaver, muskrat, and mice. Muskrats are of particular importance due to the damage they inflict upon the refuge levee. White-tailed deer are also common throughout the refuge.

h. **Endangered Species.** The federally endangered American bald eagle is commonly found on the refuge during the winter months. Eagles commonly use the Melz Slough area during the winter months as a roosting area and feed on winter-killed fish in the refuge.

The peregrine falcon also is observed occasionally during migration but does not nest or remain on the refuge for extended periods.

There is a possibility that the Indiana bat (*Myotis sodalis*) could use the Liverpool Ditch corridor since it provides a habitat very similar to that favored by bats in the summer months. Indiana bats prefer small streams with adequate riparian vegetation to form a closed canopy or tunnel-like environment over the stream. The stream corridor approaches this habitat type at some locations near the junction of Meyer's and Liverpool Ditches. However, to date there is no information to indicate their presence.

The decurrent false aster (*Boltonia decurrens*), which is a federally threatened plant, has historically been found in Mason County and more recently in adjoining Fulton County. No recent specimens have been found in or near the refuge.

Several State-listed species also have been observed in the refuge vicinity. A heron rookery is located north of the project area in Clear Lake. In addition to the great egret and the great blue heron, the black-crowned night heron is known to frequent that area. It is likely that the black crown also uses the refuge area on occasion. The pied billed grebe also is seen regularly on the refuge.

i. **Cultural Resources.** For more than 70 years, the Illinois River has been known for the high frequency of prehistoric cultural resources and major archeological investigations. Archeological assessment and evaluation of the proposed Lake Chautauqua HREP to contain historic properties potentially eligible to the National Register of Historic Places was conducted through a joint effort of the State of Illinois, the Corps, and the USFWS. Coordination with the Illinois State Historic Preservation Office (SHPO) concerning the Lake Chautauqua HREP is required by the National Historic Preservation Act of 1966 (as amended); Executive Order 11593; and Title 36 of the Code of Federal Regulations, Parts 60-66 and 800 (as appropriate). The purpose of this section is to summarize the cultural resources and coordination.

Rock Island District historic/cultural scoping revealed limited potential for historic properties, due to the preponderance of inundated lands. Documentary research indicated that the subject area was formerly wetlands. The Corps provided this information and proposed project details to the USFWS, Fort Snelling, Twin Cities, Minnesota, for coordination with the SHPO.

On November 15, 1989, the SHPO recommended a Phase I archeological survey along the areas of Liverpool and Meyer's Ditches, an archeological survey following dewatering of the lake, and possible trenching to determine if sedimentation had buried cultural deposits (Appendix A, page A-1). To address these concerns, representatives from the SHPO; the Corps; the USFWS; Western Illinois State University, Macomb, Illinois; and the

Illinois State Museum's Dickson Mounds Museum, Lewiston, Illinois, met on site December 11, 1989.

This meeting was convened to address the concerns of the SHPO and interested parties in an attempt to reduce the potential for affecting cultural resources through the avoidance of high potential areas through protection and preservation. An informal reconnaissance of the levee revealed disturbed sandy soil from previous levee construction. Dewatering of the lake bed for historical/cultural investigative purposes would not provide a stable, dry surface conducive to exploratory trenching. By confining proposed construction dredging to historic ditches and areas of low relief, an archeological survey was determined to be unnecessary. Proposed construction details also revealed that lake sediments and slurry remaining after dewatering the lake would not provide suitable survey visibility, and flocculate levels would prohibit surface testing and access.

During the December 1989 meeting, concerns also were expressed on effects to the Liverpool Lake site, a National Register of Historic Places eligible prehistoric occupation or village site, located adjacent to the Lake Chautauqua HREP. Although the Liverpool Lake site is not located directly within the Lake Chautauqua HREP, potential affects to the Liverpool Lake site associated with excavating Liverpool Ditch were considered.

Increased flow and velocities from proposed construction in the area of the entrance to Liverpool Ditch could increase erosion. Therefore, riprap was proposed for this area to reduce erosion to Liverpool Island which contains the NRHP eligible Liverpool Lake site. The riprap would be placed without additional disturbance to the site. This remedial riprap would be monitored annually by USFWS personnel.

On April 26, 1990, the USFWS provided the proposed dredging and riprapping modifications to the SHPO for approval (Appendix A, page A-3). The SHPO concurred with the Corps and USFWS finding of no significant historic properties and stated that the Lake Chautauqua HREP was in compliance with the National Historic Preservation Act of 1966, as amended (Appendix A, pages A-5 and A-7).

Through December 1990 to January 1991, the Corps determined that the level of existing flood protection throughout the Lake Chautauqua HREP was in error due to levee damage from previous overtopping events. For the project to be feasible, levee and cross dike repair became the primary objectives, and the ensuing changes in design plans were provided to the USFWS for recoordination with the SHPO. Due to the proposed cross dike repair, the USFWS also recommended that the Corps consider the construction of a boat ramp and parking area for access to the upper lake.

On January 18, 1991, the USFWS received notification from the SHPO that the levee and cross dike enhancement, related dredging activities, the boat ramp and parking area, and disposal areas would have the potential to affect undocumented, buried historic properties. The SHPO recommended

a Phase I archeological survey of the aforementioned improvements and related activities.

On February 11, 1991, the SHPO requested that the Corps-documented finding of no significant historic properties for the Lake Chautauqua HREP be documented by an Archeological Survey Short Report (ASSR). A documents search and geomorphological analysis were conducted of the areas that the SHPO recommended for a Phase I archeological reconnaissance or avoidance. The Corps ASSR was provided to the USFWS and recommended project approval under compliance with Section 106 of the National Historic Act, as amended, and its implementing regulation, 36 CFR Part 800: "Protection of Historic Properties." On March 20, 1991, the SHPO concurred with the Corps and the USFWS Finding of No Significant Properties for the proposed Lake Chautauqua HREP (Appendix A, page A-29).

j. **Sedimentation.** A sedimentation study was conducted to evaluate sedimentation in Lake Chautauqua. The scope of this study, as presented in this section, consisted of determining net erosion from 1909 (pre-9-foot Illinois Waterway) through 1989 and evaluating proposed project impacts on sedimentation.

Baseline elevations were established from 1909 and 1935 topographic maps. Additional topographic photography was taken during 1988, and hydrographic surveys were performed during 1988, 1989, and 1990. Elevations in 1909 and 1935 were compared with present elevations to determine net changes. All the data were collected and input into a digital terrain modeling program. This program analyzes the modeled surfaces and can produce a report showing the volumetric change between the surfaces as cut (erosion) and fill (sedimentation). This analysis gives an average sedimentation rate of 0.39 inch per year in the entire lake.

Sedimentation in Liverpool Ditch was determined to estimate the life of the proposed channel. The 1909 maps showed what is now Liverpool Ditch as being the same elevation as the surrounding soil, approximately 431 NGVD. The 1935 maps show a clearly defined ditch but give no soundings. It appears that the ditch is actually the result of excavation of borrow for the construction of the perimeter levee. No excavation plans or sections were available. An estimate of the original excavation section was made with knowledge of the original levee section and the borings. This information leads to an original ditch at least 12 feet deep. The estimated annual sedimentation rate in the ditch is approximately 1.94 inches per year.

4. PROJECT OBJECTIVES

a. **Objectives and Potential Enhancement.** The project goals, objectives, and enhancement potential are summarized in table 4-1. The first two columns of numbers indicate the number of Average Annual Habitat Units (AAHUs) calculated over the 50-year project life. For example: Over 50 years, an average of 2,099 Habitat Units (HUs) will be produced on the upper and lower lakes without the implementation of any alternatives. If water control is implemented, this will increase to an average of 3,655 HUs per year over 50 years. The second set of numbers shows that at present there are only 200 acres of submergent/emergent vegetation on the two lakes, but with the project there will be 3,250 acres of submergent/emergent vegetation. Potential alternatives were developed in consideration of improving existing habitat weaknesses and utilizing resource opportunities. Detailed development of alternatives is presented in Section 5.

b. **Criteria for Potential Alternatives.** Table 4-2 presents general and specific criteria developed to evaluate potential alternatives. Potential alternatives are presented in Section 5 and evaluated in Section 6.

c. **Proposed Management Plan.** Tables 4-3 and 4-4 present the proposed management plan for the upper and lower lakes. These plans were prepared by the USFWS and IDOC biologists in conjunction with Corps of Engineers staff.

This proposed management plan is based on management practices implemented at other waterfowl refuges where it has proven to be an effective strategy for establishing submergent vegetation. This management technique has been successfully used at Agassiz National Wildlife Refuge (NWR) in Minnesota, Swan Lake NWR in Missouri, and DeSoto Bend NWR in Nebraska. Water level drawdown with gradually increasing depths also is recommended as a standard management practice in Smith, *et al.* (1989). It also takes fish management objectives into consideration with negligible waterfowl impacts.

generated is due more to the fact that only 11.6 acres of habitat are affected compared to the several thousand improved for waterfowl.

e. **Alternative E - Sediment Reduction.** Sediment reduction would be desirable to prolong the useful life of this valuable wetland habitat. Raising the cross dike to protect from a 50-year event was briefly considered. This level of protection is considered a minimum to significantly reduce sediment. This alternative was eliminated from further consideration because it was prohibitively expensive at $15 million. In addition, 50-year levee elevations have typically not been supported by cost-benefit analyses completed for similar projects.

7. SELECTED PLAN WITH DETAILED DESCRIPTION

a. **General Description.** The alternatives of water control and flowing side channel (see plate 2) were selected to be recommended for project construction. These alternatives were individually evaluated relative to the project goals and objectives as presented in Section 6.

b. **Water Control.** The water control features are summarized in table 7-1.

TABLE 7-1

Water Control Features

Item	Description	Feature's Purpose
1. Existing cross dike and perimeter levee raise	Raised levee to a 10-year elevation (449 NGVD)	Provides flood protection against 10-year events
2. Existing radial gate structure modification	Existing concrete sill elevation raised 4 feet with integral gated gravity openings	Structure modification provides 10-year level of protection and allows gravity drainage to existing sill elevation of 433
3. New pump station	Concrete gated structure with 41,000 gpm capacity	Provides capability to: (1) dewater upper and lower lakes; (2) pump from the river to the upper and/or lower lake; and (3) connect the upper and lower lakes by gravity flow
4. New gravity outlet in upper lake	Concrete gated structure with 60-inch diameter pipe	Provides capability to: (1) gravity control/dewater the upper lake; and (2) allow river water supply to the upper lake
5. New stoplog structure in lower lake	Concrete stoplog structure with 4 bays of 5 feet opening reach	Provides capability to gravity dewater the lower lake

meet the management objectives shown in tables 4-2 through 4-4, a station capacity of 41,000 gpm was selected. Operational drawdown times are presented in table 11-2. The selected pump will be a horizontal propeller type with a 36-inch discharge tube.

(4) **Gravity Outlet for Upper Lake.** A gravity outlet is needed to meet drawdown requirements of the upper lake. This structure will be a 60-inch-diameter culvert with a sluice gate/gatewell on the river side. Trash racks will be provided at both ends due to potential flow reversal and associated debris. The structure will be enveloped with riprap. See discussion in 7b(2) for hydraulic sizing.

(5) **Stoplog Structure for Lower Lake.** The purpose of this structure is to allow gravity drawdown of the lower lake. The structure consists of 4 openings, each 5 feet wide, for a total hydraulic opening of 20 feet. The structure was sized to work in conjunction with the existing west stoplog structure. The existing structure only allows gravity drawdown to 433. The proposed structure will allow complete gravity drawdown under favorable river conditions. (Elevation 431 is considered empty). The sill of the proposed structure at 429 will enhance gravity drawdown and drainage within the lower unit during drawdown. The structure will be enveloped with riprap. The structure was sized to ensure that interior water levels would be within 1 foot of exterior levels within 7 days after the river reaches a constant elevation. Continued gravity drainage could occur if favorable river levels prevail or the pump station could be activated.

(6) **Drainage Channels for Lower Lake.** Both drainage channels are proposed to facilitate drainage to the stoplog structure and the pump station. Typical channels will be approximately 35 feet in width and 2 feet deep with an elevation of 429. Excavated material will be sidecast.

(7) **Replacement Boat Ramp.** Because the existing boat ramp of the south unit will become disfunctional during south unit drawdown, a replacement ramp was selected to meet the changed water control plan. The ramp will be located off of the northern perimeter levee and will include a short access road and improvement of an existing parking lot.

c. **Side Channel Excavation.** The proposed channel excavation located in Liverpool Ditch is shown on plate 2. Table 7-2 provides a summary of the construction features of this alternative.

TABLE 7-2

Side Channel Excavation Features

Item	Description	Feature's Purpose
1. Channel from mouth to pump station	Trapezoidal excavated channel with 35 feet bottom width and initial bottom elevation 10 feet below flat pool	1) Provides reliable water source to the pump station, and 2) Provides flowing side channel habitat
2. Channel from pump station to river confluence	Trapezoidal excavated channel with 35 feet bottom width and initial bottom elevation 10 feet below flat pool	Provides flowing side channel habitat
3. Channel entrance closure structure	Rock-filled closure dam with top elevation at flat pool	1) Prevents excessive diversion of river flows, and 2) Reduces side channel sediment deposition
4. Deepwater slough area	Trapezoidal excavated channel, 300 feet long, with 35-foot bottom width and initial bottom elevation 16 feet below flat pool	Provides deepwater overwintering fish habitat

Excavation depth in Liverpool Ditch was based on providing a flowing side channel for the project life of 50 years. In this phase, "flowing side channel" is defined as providing a minimum water depth of 2 feet in the excavation channel from a flat pool elevation of 429.4 NGVD. With an estimated sedimentation rate of 1.94 inches per year in the ditch, a 10-foot-deep channel would be needed.

(1) Channel from Mouth to Pump Station. The proposed excavation can be divided into two reaches. Both reaches will have the same section, with bottom widths of 35 feet, side slopes of 2:1, and bottom elevations of 419.4. The first reach consists of approximately 2,200 feet which will serve the purpose of providing a reliable water supply for the pump station. Material from the excavation will be placed on the adjacent levee.

(2) Channel from Pump Station to River Confluence. The second reach continues 6,200 feet down Liverpool Ditch and meets the objective of

providing flowing side channel habitat. Material from the excavated channel adjacent to the levee will be placed on the levee. The remainder of the excavated material will be sidecast onto the adjacent willow and brush area. The location of this excavation was selected to take advantage of an existing channel and to minimize cutting through original land.

(3) **Channel Entrance Closure Structure.** Potential problems associated with excavating Liverpool Ditch were considered. The opening of Liverpool Ditch may result in the capture of an unacceptable amount of Illinois River flow. The channel currently captures approximately 2 percent of the river flow. Under the proposed side channel configuration, the side channel would capture 8 to 10 percent of the river flow. A rock control structure is proposed at the entrance of Liverpool Ditch which will limit the diversion of river flow from 4 to 8 percent.

The increased side channel flows also have the potential of increasing the sedimentation rate of the newly excavated channel. The rock structure also will reduce the sedimentation rate in the side channel.

Increased flows and velocities in the area of the entrance to Liverpool Ditch could increase erosion. Therefore, riprap has been recommended for this area to reduce erosion to Liverpool Island which contains the National Register of Historic Preservation (NRHP) eligible Liverpool Lake Site. The riprap would be placed without additional disturbance to the site. This remedial riprap will be monitored annually by USFWS personnel.

(4) **Deepwater Slough Area.** This component of the side channel excavation is proposed to provide deepwater for overwintering fish purposes. This area will be approximately 300 feet long and have the same cross-sectional dimensions as the adjacent side channel, except with a construction depth of 16 feet from flat pool.

8. DESIGN AND CONSTRUCTION CONSIDERATIONS

a. **Levee Heights.** It is proposed to repair both the cross dike and the north levee to a 10-year elevation and to use adjacent borrow as part of Alternative B. The purpose of this section is to present the basis for selection of the level of protection for the cross dike and upper lake levee and to suggest a levee height for the south lake which could be implemented under future stages.

A 10-year event system is the minimum frequency which will allow the proposed management plan (see tables 4-3 and 4-4) to operate. It is noted that a 10-year event has a probability of occurrence in any one year of 10 percent. Because there is a 10-percent chance of this event in any given year, the following 10-year operating scenario is presented to provide "the average" scenario.

The north unit will be dewatered in Year 1. Further dewatering of the north unit should not be needed for the next 9 years (on the average), assuming Year 1 follows a major flood event. During this interval, fish stocking may occur as desired, and water levels may be increased in the north unit as desired by the existing radial gates, or natural seepage/runoff. After Year 1, the pump in the pump station should be operationally changed in position to dewater the south unit. With a 2-year levee in the south (future development), the south unit could successfully operate free of flood events as a moist soil unit 50 out of 50 years during a July, August, and September drawdown based on 50 years of records. Table 8-1 shows overtopping frequencies versus various elevations.

A lower event levee in the north (such as a 2-year or 5-year levee) is not compatible with the desired management plan. It is desired to maintain dewatered conditions in the north for 2 to 4 years to allow submergent/emergent vegetation to become firmly established. Near the end of the 5th year, the north unit would be established and fully available to provide submergent/emergent vegetation in stable water levels. With a 2-year or 5-year levee, the north unit would require full dedication of the pump station due to recurrence of events to maintain low water levels. These events would typically last 1 month and would require at least 1 additional month for dewatering. A 5-year levee also would allow overtopping just when vegetation is predicted to be at a maximum benefit. There would be no stable (flood-free) period following the predicted year of maximum vegetation value. Fish stocking efforts under these scenarios also would be less profitable.

Although a levee higher than a 10-year event height would decrease overtopping events, a higher levee was not selected principally due to significant floodway flood height impacts. The selected 10-year event produces an increase of 0.1 foot in flood heights, which is the maximum allowable under Illinois floodplain permit regulations. For the same reason, freeboard on top of the 10-year elevation was not added.

Because the pump station is economically designed to pump from one unit at a time, the south unit could not be dewatered for moist soil operation during drawdown of the north unit. Without pump dewatering of the south unit, the south unit cannot reliably or consistently be drawn down for moist soil operation due to normal river stages during July, August, and September. For example, river elevation 429 is needed for complete gravity drawdown of the south unit. However, elevation 429 has been exceeded 50 out of 50 years of record during each of the months of July, August, and September (see table 8-1). Consequently, the pump station is needed on an annual basis for the south unit which is only possible with infrequent use for the north unit, such as in once in 10 years. Therefore, a 10-year levee in the north and a 2-year levee in the south meets management objectives and is operationally efficient.

It is suggested that the south lake levee system be constructed at a future date to the 2-year event elevation plus 2 feet. The existing spillways would be modified/raised to the 2-year event with length sized to allow 1 foot of uncontrolled spillway water head to fill the interior lake prior to overtopping with less than 1 foot of head differential from outside to inside.

b. **Levee Embankment Erosion Protection.** Three principal mechanisms have contributed to the erosion of the existing cross dike and perimeter levee system. These mechanisms are interactive and consist of: (a) embankment material type; (b) overtopping erosion; and (c) wave erosion. Each aspect will be discussed separately as a basis of consideration for the proposed design presented in Section 7.

(1) **Embankment Material Type.** Both the north levee sand slopes and the sand cross dike slopes have eroded extensively, principally due to overtopping erosion. The overtopping erosion pattern is evident on the northern dike by a sand plume downstream of the levee and by a virtual lack of dike vegetation on the downstream dike slope due to a continual loss of soil substrate. This same sand plume pattern is evident on the cross dike.

Where woody vegetation has survived on the downstream/inside dike slopes, exposed 2 to 3 feet of upper root masses connect larger trees to the soil substrate. Surviving trees are predominantly anchored into the underlying clay substrate. Previously placed small riprap (2- to 4-inch size pieces) are generally also now lying on the firm underlying clay substrate.

TABLE 8-1

Flood Overtopping Events by Month by Select Elevation [1]

	Number of Times Overtopped in 50 Years					
Month	Elev. 429.0	West Spillway Stoplog Sill Elev. 433.0	West Spillway Stoplog Elev. 437.5	2-Year Event, River Elev. 443.2	5-Year Event, River Elev. 446.8	10-Year Event, River Elev. 449.0
January	50	40	20	2	--	--
February	50	44	24	5	--	--
March	50	49	34	9	3	3
April	50	49	38	11	4	1
May	50	48	36	9	4	1
June	50	43	28	4	2	1
July	50	39	23	1	--	--
August	50	25	7	--	--	--
September	50	17	7	--	--	--
October	50	18	8	1	1	--
November	50	22	8	1	2	--
December	50	35	13	2	--	--

[1] Period of Record - 1940-1989 (50 years), at river mile 129.4 (radial gate structure)

Sand is considered to be a highly erodible material when exposed to running water. Velocities less than 1 foot per second will roll sand particles; velocities greater than 2 feet per second will physically pick up or scour most fine to medium sands. With each overtopping event, the sand was transported downstream and now forms a relatively stable beach with slopes of 10-20:1.

Overtopping damage may have occurred in the past if the existing radial gates were not opened in sufficient time to allow interior pool levels to approximately equalize river stages before levee overtopping. However, overtopping damage is preventable by use of proper soil types and proper operation of the existing radial gates. An embankment constructed from select clay and maintained with seeded turf is considered erosion resistant. Using velocity as an indicator of erosion resistance, clay will tolerate velocities up to approximately 6 feet per second without appreciable scour. Clay with liquid limits greater than 40 and with plasticity index plotting above the "A" line (which is a geotechnical index line used to classify soils based on the soil's fluid properties) is considered erosion resistant. This type of clay is available as adjacent borrow. The adjacent clay borrow consists principally of fat clays with in-situ water contents of 30 to 50 percent. The liquid limits of the actual borrow vary from 46 to 91, and all soils plot above the "A" line.

The erosion-resistant clay will receive additional protection by a maintained seeded turf with foreshore woody vegetation. The perimeter levee and cross dike will be reconstructed to least disturb existing woody vegetation (willows). Eventual dominance by bottomland hardwoods (as on the exterior of the perimeter levee) is anticipated.

(2) Overtopping Erosion. With the proposed cross dike in place, (elevation 449) the existing radial gates, the gravity outlet structure, and the pump station gravity gates can be operated to prevent overtopping damage of the upper lake levee. (A flood monitoring and response plan will be developed as part of the project operation and maintenance manual.) Gates should be fully opened when the river reaches elevation 446 with stages higher than 449 predicted. When the gates are operated in this manner, interior pool levels will equalize with river levels within 2-3 days. Table 8-2 provides a summary of river elevation versus interior pool levels when the gates are fully opened as shown.

TABLE 8-2

Operating Scenario of Upper Chautauqua Lake
for Predicted River Stages Exceeding a 10-Year Event

End Time Period in Days	River Elevation	Upper Lake Elevation	Differential Head Between River and Upper Pool, feet
0.0 [1]	446.0	435.0	11.0
0.5	446.5	437.7	8.8
1.0	447.0	440.5	6.5
1.5	447.5	443.7	3.8
2.0	448.0	447.0	1.0
2.5	448.5	448.0	0.5
3.0	449.0	448.5	0.5

[1] All 4 radial gates fully opened; the upper lake gravity outlet fully opened, and the pump station gravity gates fully opened.

To facilitate opening these gates to minimize overtopping damage, all gates will be fitted with gate operators that allow a portable power wrench to quickly open the gates. A power wrench will be provided to the site manager for off-site storage.

(3) Wave Erosion. Another form of potential erosion on the cross dike is from wind-generated waves. A wave analysis was performed to estimate wave effects. Results of this analysis and other design considerations are presented in table 8-3.

The design wave of 3.5 feet will break on the slope at a water depth of approximately 6 feet. The predominant energy of the wave is released

TABLE 8-3

Wave Analysis for Cross Dike

Design Parameters	Value	Remarks
Wind	70 mph	Fastest mile adjusted for height and over-water conditions (closely approximates 100-year wind with 6-hour duration).
Water depth	8 feet	Normal high water (25 percent exceedence/elevation 437.7).
Fetch for downstream cross dike slope	4 miles	Consistent with design wind direction, averaged over 24-degree arc.
Significant wave on downstream cross dike slope	3.5 feet	At toe of cross dike, period = 3.6 seconds, minimum wind duration = 21 minutes.
Cross dike slope		
- Downstream	6:1 H:V	Based on existing 6:1 stable slopes of north levee, same soil type, adjusted for fetch/wind direction.
- Upstream	4:1 H:V	Same above explanation.
Water depth at wave breaking	6 feet	May vary from 5 feet to 7 feet.
Breaker travel distance	13 feet	Measured from point where water depth causes wave breaking.
Distance to shoreline from end of breaker travel distance	40 feet	May vary from 29 feet to 52 feet.
Cohesive (clay) embankment liquid limit	55 percent	Clay is considered erosion resistant when the liquid limit is greater than 40 and plasticity index plots above the "A" limit line.
Embankment cover	Seeded turf	Eventual dominance by naturally colonized woody growth.

Improved water quality in both the upper and lower lakes also would enhance aesthetics.

c. **Natural Resources Impacts.** Impact of the proposed construction on aquatic, wetland, and terrestrial resources of the refuge was evaluated using a modified Habitat Evaluation Procedure (HEP) developed by the Missouri Department of Conservation and the Soil Conservation Service. This Wildlife Habitat Appraisal Guide (WHAG) compares existing and projected future habitat values with habitat values resulting from the proposed project. The WHAG calculates both positive and negative impacts to habitat. The WHAG evaluation was performed by the USFWS and the Corps of Engineers in coordination with IDOC biologists. Results of the WHAG evaluation are summarized in table 9-1 for the species of primary interest and a more detailed analysis is included in appendix K.

(1) **Aquatic Resources.** A detailed discussion of the aquatic and water quality impacts is contained in Appendix B - Clean Water Act, Section 404(b)(1) Evaluation.

Upper Lake - Improved water level control will result in an increase in submergent aquatic vegetation in the upper lake needed by migratory waterfowl (primarily divers) and fish. Approximately 1,000 acres of low quality wetland will be improved. Aquatic plants such as *Potamogeton* sp., *Valisneria* sp., and *Ceratophyllum demersum* will increase throughout the upper lake as a result of the capability to periodically dewater sediments and maintain stable water levels. As discussed previously under "Wetland and Waterfowl Resources," some submergent aquatic vegetation still reappears in the lake. Although no recent investigations have been done, Illinois Natural History biologists and U.S. Fish and Wildlife Service refuge biologists believe that an ample seed bank still exists (as evidenced by the occasional growths of submergents). The benefits of dewatering upon submergents have been shown at many waterfowl management areas throughout the country. It is recommended as a management practice by Korschgen, Stuzenbaker, and Weller in *Habitat Management for Migrating and Wintering Waterfowl in North America* (Smith, Pederson, and Kaminski, 1989).

Fish kills in the upper lake should decrease with the ability to maintain deeper water in the winter. The ability to dewater the upper lake will allow the eradication of any rough fish that may become established.

Along with a stable water level, the biggest benefit to fish will be an increased habitat diversity created by submergent vegetation. This should create conditions favorable to several species of fish; yellow perch in particular.

Lower Lake - Improvements in Lower Lake Chautauqua will not create or improve permanent deep water aquatic habitat as will the upper lake, since it will be drained yearly. As previously discussed, the lower lake levee is overtopped once or more yearly. During the critical drawdown and

TABLE 9-1

Chautauqua National Wildlife Refuge HREP - WHAG Analysis Summary

ALTERNATIVES
A - NO ACTION
B1 - UPPER POOL WATER LEVEL CONTROL
B2 - LOWER POOL WATER LEVEL CONTROL
C - UPPER POOL BARRIER ISLANDS
D - LIVERPOOL DITCH CLEANOUT - UPPER END

WITHOUT COLUMNS FOR ALL ALTERNATIVES B1 - D = ALTERNATIVE A
NE - NOT EVALUATED
AAHU - AVERAGE ANNUAL HABITAT UNIT
PERCENT CHANGE - POSITIVE NUMBER INDICATES INCREASE IN HABITAT UNITS, NEGATIVE NUMBER INDICATES DECREASE IN HABITAT UNITS

EVALUATION SPECIES	ALTERNATIVE B1 WITHOUT	WITH	PERCENT CHANGE	ALTERNATIVE B2 WITHOUT	WITH	PERCENT CHANGE	ALTERNATIVE C WITHOUT	WITH	PERCENT CHANGE	ALTERNATIVE D WITHOUT	WITH	PERCENT CHANGE	
* MALLARD	412	618	50%	679	1498	121%	412	442	7%	109	124	14%	AAHU'S
* DIVING DUCKS	310	731	136%	698	788	13%	310	333	7%	NE	NE	NE	AAHU'S
WOOD DUCK	88	82	-7%	NE	NE	NE	88	88	0%	212	240	13%	AAHU'S
GREEN-BACKED HERON	819	837	2%	1501	1039	-31%	819	896	9%	178	275	54%	AAHU'S
* CHANNEL CATFISH	100	194	94%	225	225	0%	NE	NE	NE	1	5	400%	AAHU'S
* WALLEYE	110	213	94%	225	225	0%	NE	NE	NE	1	5	400%	AAHU'S
* LARGEMOUTH BASS	110	281	155%	225	225	0%	NE	NE	NE	1	6	500%	AAHU'S

****

* Denotes Target Species

waterfowl migration periods (approximately July-December), it is overtopped every other year on the average. The lower lake gravity drainage improvements will not change the frequency of flooding, but will significantly increase the acreage that can produce moist soil plants from 200 existing to 2,250.

Construction of the new water control structure will allow the lower lake to be completely drained for moist soil plant production. Proper management (and favorable river stages) will promote the growth of annual plants such as smartweed, millet, pigweed, and rice cutgrass favored by dabbling ducks. Other wetland birds such as rails, herons, and songbirds also will benefit. Aquatic mammals such as muskrats will be impacted due to elimination of all standing water during drawdown.

The existing water control structure's elevation of 432.5 NGVD now allows extensive areas of ponded shallow (1 to 2 feet) water to remain over several hundred acres of the lower lake. These shallow areas which contain some fish will be eliminated. Fish that are able to utilize these shallow ponds are mostly rough fish such as carp and buffalo. Elimination of these fish from the lower lake will be beneficial because their activities impact desirable aquatic vegetation. Material excavated from the proposed 7,500 feet of drainage channels will be side cast onto the adjoining wetland. Since the existing lake bottom is mostly devoid of any kind of vegetation (submergent or emergent), the placement of silt on silt will cause no loss of habitat. The slight increase in bottom elevation could be a benefit in terms of vegetation diversity. (See Appendix G - Water Quality and Appendix B - Section 404(b)(1) Evaluation.)

Liverpool Side Channel - Excavation of Liverpool Ditch will create 16.1 acres of 9-foot-deep flowing water. Excavation of the first 2,200 feet upstream of the new pump station is needed for efficient pump station operation. Excavation of the remaining 6,200 feet will provide the downstream connection with the main river. Near the downstream mouth of Liverpool Channel, a backwater "pocket" will be constructed. This 0.7-acre pocket will be 16 feet deep, providing deep oxygenated water with low velocity. This type of habitat is critical to wintering fish but is almost totally absent on the river. Wintering fish must find habitat that is oxygen rich but with little velocity. High velocity waters cause fish to expend energy reserves needed to sustain their metabolism throughout the winter. Most locations on the river with low velocity also are shallow with low dissolved oxygen. Conversely, areas with good dissolved oxygen levels (i.e., main channel) have unacceptably high velocities.

(2) Bottomland Hardwoods. Approximately 48.6 acres of woodland habitat will be impacted by the project. These acres vary markedly in their quality. The 14 acres occurring on the cross dike were not classified as bottomland hardwoods because of their low quality and the fact that they were growing on an almost 100 percent sand substrate (which was transported from an upland location when the cross dike was constructed in the mid-1960's). The remaining 34.6 acres is located on the north levee and along the Liverpool Channel excavation, 17.7 acres and 16.9

acres, respectively. The following discussion focuses on the location and nature of these impacts.

Upper Lake - The most notable effect of the proposed project in the upper lake will be the loss of various types of woodland. Reconstruction of the cross dike will impact about 14 acres of sapling to pole-sized scrub-shrub woodland (consisting mostly of silver maple, cottonwood, and mulberry), not classified as bottomland hardwoods. Approximately 17.7 acres of the north levee from the intersection of the cross dike upstream will be cleared. Most of this clearing will be along the levee top and the interior slope, except for about 3.5 acres of the levee's riverside slope which will be cleared immediately upstream of the cross dike. Several of the trees are mature cottonwood and silver maple.

Most of the levee acreage is second growth, which has developed since the levee was built in the early 1900's. Cottonwood, silver maple, green ash, and mulberry account for more than 80 percent of tree cover. Valuable mast-producing species such as pin oak are virtually absent. Proper maintenance of the levees in past years normally would have prevented this second growth forest from becoming established. Impacts to more valuable, pre-levee bottomland forest along the levee's interior slope and adjacent floodplain in the Melz Slough area will be avoided by transporting borrow from outside the slough.

About 90 percent of the approximately 80 acres of bottomland hardwoods in Melz Slough lie at an elevation below 435.8 NGVD. Melz Slough could experience some minimal adverse effects from the long-term maintenance of 3- to 4-foot water depths in the upper lake. Although Melz Slough is frequently flooded in excess of the projected lake management levels, it is rarely for extended periods of time.

At present, upper lake levels cannot be drawn down below the sill elevation of 433.5 NGVD. The average fall/winter elevations now range from 434 to 436 NGVD. The proposed management plan for the upper lake, after construction, calls for an average summer depth of 3 to 4 feet and a winter depth of 5 to 6 feet, if necessary, to protect fish resources. This would increase the average water depth by approximately 1 foot. Since the increase would occur during the winter months when trees are dormant, it is possible, but unlikely, that the project would cause any impacts to timber. The WHAG evaluation showed no adverse impacts, probably because it was not sensitive enough to discriminate a long-term average increase of 1 foot. USFWS and Corps of Engineers foresters did not believe that any long-term adverse impact to bottomland hardwoods is likely to occur.

Lower Lake - Construction of a water control structure and drainage channels in the lower lake will not adversely impact any bottomland hardwoods. Installation of the new sill (elevation 429 NGVD) will allow water levels to be drawn down 2 feet below the currently obtainable minimum. This could result in an increase of woody vegetation around the lower lake.

Liverpool Channel Excavation - Material excavated from the inlet channel will be placed on the levee. The levee vegetation is predominantly pole/mature size silver maple and cottonwood with mulberry common on the levee tops. A total of 5.0 acres of the lower lake's levee downstream of the cross dike and 6.2 acres on Liverpool Island will be cleared for material placement. Another 5.7 acres of Liverpool Island will be excavated for the channel itself, resulting in a total initial loss of 16.9 acres of bottomland forest from the Liverpool side channel improvement. Except for the 5.7 acres of woodland converted to channel, all of the cleared acreage eventually should succeed to bottomland forest. A backwater slough of .7 acre and 16 feet deep at flat pool will be created just upstream of the mouth. This will remove an equal area of bottomland forest. Excavated material will be placed among the trees adjacent to the slough.

(3) **Endangered Species.** Based on current information and the CAR, no effects to endangered species are anticipated. The USFWS, however, has indicated that they are planning a bat survey for portions of the refuge. They have indicated that even if Indiana bats are found to be present, it will not jeopardize implementation of any recommended alternatives. If necessary, special conditions will be placed in the construction plans and specifications to protect any bat habitat.

(4) **Mineral Resources.** There are no known mineral resources present in the project area.

d. **Cultural Resources.** The documents search revealed that the area was historically comprised of wetlands, sloughs, and intermittently and seasonally inundated floodplain. Little improvements were made to the lands presently contained within the Lake Chautauqua HREP until the early twentieth century. At this time, attempts at draining and diking for cultivation were partially successful under the direction of the Chautauqua Drainage and Levee District between 1916 and 1926, when it was abandoned. For approximately 10 years, the abandoned district was susceptible to flooding and heavy siltation.

In 1936, the land was purchased from the Chautauqua Drainage and Levee District and became part of the National Wildlife Refuge System. Since this time, the levees were repaired to retain water for migratory waterfowl management, but also function as flood storage and for conservation and recreation use. No significant historic properties relative to the historic assessment of the Lake Chautauqua HREP were discovered in the aforementioned articles, river charts, and photographs, nor in the references and sources described and listed within the ASSR.

As a result of the November 15, 1990, request by the SHPO for a Phase I archeological investigation, the Corps undertook a geomorphological analysis to locate historic properties and determine the potential for buried cultural deposits at the Chautauqua Wildlife Refuge on February 7 and 8, 1991. Frozen ground and accessibility precluded more conventional methods of soil investigation. However, the use of a portable gasoline-powered auger, in conjunction with sampling tubes and bucket augers,

provided information regarding subsurface soil conditions along the northeastern and northwestern margins of the refuge.

From the geomorphological analysis, Lake Chautauqua was determined to be a wetland slough and backwater area throughout its recent geologic past. Although the wetland area now included within Lake Chautauqua may have been used during prehistory, wet, riverine histosols were not conducive to occupations. Surface relief within Lake Chautauqua is minimal, further limiting the potential for prehistoric sites.

The documentary search and geomorphological analysis indicate that, as designed, the Lake Chautauqua HREP has little potential for disturbing historic properties eligible for listing on the National Register of Historic Places. It is the documented opinion of the Corps, the USFWS, and the SHPO that no significant historic properties will be affected by the Lake Chautauqua HREP (Appendix A, pages A-1, A-3, A-5, A-7, and A-29).

The Lake Chautauqua HREP has been designed to reduce turbidity and accretion through levee and cross dike repair and to avoid and preserve areas potentially sensitive to buried, undocumented historic properties. Although this is the case, if undocumented significant historic properties are encountered during construction of the proposed Lake Chautauqua HREP, the Corps and the USFWS will resume consultation with the Illinois State Historic Preservation Office, as required by Section 106 of the National Historic Preservation Act of 1966, as amended.

e. **Adverse Effects Which Cannot Be Avoided.** The most significant, unavoidable adverse effect is the clearing of bottomland hardwoods for the cross dike, construction access, and placement of excavated material. These impacts are not permanent, although it will require 50 or more years to replace some of the cleared timber. Liverpool Channel and interior drainage channel excavation temporarily will degrade water quality, primarily from increased turbidity.

Loss of fish due to the complete drawdown of the lower lake is unavoidable.

f. **Short-Term Versus Long-Term Productivity.** Short-term productivity of the refuge is impaired due to the inability to control water levels and halt the ongoing sedimentation in the lake. Refuge productivity will continue to be impaired if the proposed project is not constructed. Continued sedimentation eventually will convert the refuge lakes to woody vegetation. Improved water level control can offset the adverse effects of sedimentation and prolong the refuge's ability to provide waterfowl habitat.

g. **Irreversible or Irretrievable Resource Commitments.** Other than fuel, construction materials, and manpower none of the proposed actions are considered irreversible.

h. **Compliance With Environmental Quality Statutes.** Environmental laws and regulations applicable to the proposed project are listed in table 9-2.

TABLE 9-2

Compliance of the Preferred Plan with
WRC-Designated Environmental Statutes

Federal Policies	Compliance
Archeological and Historic Preservation Act, 16 U.S.C. 469, et seq.	Full compliance
Clean Air Act, as amended, 42 U.S.C. 165h-7, et seq.	Full compliance
Clean Water Act (Federal Water Pollution Control Act) 33 U.S.C. 1251, et seq.	Full compliance
Coastal Zone Management Act. 16 U.S.C. 1451, et seq.	Not applicable
Endangered Species Act, 16 U.S.C. 1531, et seq.	Full compliance
Estuary Protection, 16 U.S.C. 1221, et seq.	Not applicable
Federal Water Project Recreation Act, 16 U.S.C. 460-1(12), et seq.	Full compliance
Fish and Wildlife Coordination Act, 16 U.S.C. 661, et seq.	Full compliance
Land and Water Conservation Fund Act, 16 U.S.C. 4601, et seq.	Full compliance
Marine Protection Research and Sanctuary Act, 33 U.S.C. 1401, et seq.	Not applicable
National Environmental Policy Act, 42 U.S.C. 4321, et seq.	Full compliance
National Historic Preservation Act, 16 U.S.C. 470a, et seq.	Full compliance
River and Harbors Act, 33 U.S.C. 401, et seq.	Full compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	Full compliance
Wild and Scenic Rivers Act, 16 U.S.C. 1271, et seq.	Not applicable

NOTES:

a. Full compliance. Having met all requirements of the statute for the current stage of planning (either preauthorization or postauthorization).

b. Partial compliance. Not having met some of the requirements that normally are met in the current stage of planning. Partial compliance entries should be explained in appropriate places in the report and referenced in the table.

c. Noncompliance. Violation of a requirement of the statute. Noncompliance entries should be explained in appropriate places in the report and referenced in the table.

d. Not applicable. No requirements for the statute required; compliance for the current stage of planning.

i. **Mitigation.** The habitat evaluation (WHAG analysis) performed for this project indicates that, over the 50-year life of the project, there will be a net gain in wildlife habitat. Following the construction phase, the analysis shows a net decrease in habitat for a few years due to loss of forest habitat. However, these losses are overcome by project benefits and reestablishment of forest losses by natural succession. Although not discussed in detail (but a critical part of the WHAG analysis), the future without-project condition of the refuge indicates that a decline in non-forested wetland habitat will occur by the end of the 50 years. Much of the non-forested wetland will succeed to other habitat types of lower value to waterfowl and fish. In other words, if the project is not built, there is a strong likelihood that wetland habitat needed to meet refuge objectives at Lake Chautauqua will decline.

The WHAG analysis has been criticized for being biased toward only a few particular (target) species and failing to consider impacts to other species. There was some concern that these non-target species, impacted by the project, should be mitigated. The primary purpose of the WHAG was to determine the optimum project design for improving fish and waterfowl habitat. According to law, the USFWS must direct their primary management efforts at Chautauqua National Wildlife Refuge toward migratory birds and fish. This was the basis for selection of target species. Analysis of impacts to other species, although important, was considered to be secondary.

The WHAG analysis was performed on 12 species for the forested wetland habitat type (includes bottomland hardwoods). These included such non-target species such as beaver, northern parula, king rail, and others. These species were included in the preliminary analysis but not carried through the complete 50-year evaluation. This preliminary analysis gave an adequate indication as to whether or not any non-target species impacts would be unacceptable. When the consequences of an action are considered for this many species, it is inevitable that some species will gain at the expense of others. No matter how the project is designed, some species will be affected. As stated previously, even the "no action" alternative will result in species impacts. Based on the preliminary analysis, it is felt that no mitigation for any non-target species is needed.

The construction of Liverpool Channel and improvement of the upper lake levee will impact 34.6 acres of bottomland hardwoods of varying quality. Of this 34.6 acres, only the 11.9 acres to be cleared on Liverpool Island is considered to be of any value. No mitigation was considered necessary for two reasons: (1) The resulting deepwater aquatic habitat is much scarcer on the Illinois River and, hence, considerably more valuable on an acre-per-acre basis; and (2) although there is a net loss, the continuity of the forest resource on the entire woodland on Liverpool Island and adjacent areas remains intact. In addition, the refuge has an ongoing forestry program that establishes and improves bottomland forest resources on Lake Chautauqua refuge.

10. SUMMARY OF PROJECT ACCOMPLISHMENTS

The proposed project consists of the construction of water control features in both the upper and lower lake to allow the independent operation of the upper lake as a stable level lake and the lower lake as a moist soil management unit. A selected reach of Liverpool Ditch will be excavated to restore flowing side channel habitat.

Water control features in the upper lake will include raising the upper levee and cross dike to a 10-year event elevation (includes closing an existing breach) construction of a pump station, modification of an existing radial gate structure, and construction of a gravity outlet. These features will provide for annual operation as well as periodic draw down for bed consolidation. These functions will improve water quality and allow establishment of submergent vegetation to benefit the diving duck target species. Also, plans to stock and operate the upper lake in an attempt to reestablish yellow perch, which were abundant in the lake at one time, have been developed.

Water control features in the lower lake will include drainage channel excavation and construction of a stoplog water control structure. The pump station is designed to pump from both lakes. These features will provide the ability to operate the lower lake as a moist soil management unit to the benefit of migrating dabbling ducks.

Excavation of approximately 8,400 feet of Liverpool Ditch will restore flowing side channel habitat at this location. Excavation of a 300-foot slough off the new channel will provide overwintering fish habitat for a significant portion of the LaGrange Pool's fish population.

A summary of habitat unit improvement for the proposed alternatives are presented in figure 9-1. A summary of percentage improvement of habitat for the proposed alternatives is presented in figure 9-2.

11. OPERATION, MAINTENANCE, AND REHABILITATION CONSIDERATIONS

a. **Project Data Summary.** This section provides an overview of the operation, maintenance, and rehabilitation aspects of this project and serves as a preliminary first draft of the Operation and Maintenance manual. Table 11-1 presents a summary of project data.

TABLE 11-1

Lake Chautauqua Project Data Summary

Feature	Measurement	Unit of Measure
Upper Lake Perimeter Levee		
Length	15,400	Feet
Crown width	12	Feet
Side slopes	4:1	Horizontal:Vertical
Level of protection	10	Year event
Elevation	449.0	NGVD
Embankment volume	196,000	Cubic yards
Riprap	2,400	Tons
Cross Dike		
Length	4,950	Feet
Crown width	15	Feet
Side slopes		
Upper lake	4:1	H:V
Lower lake	6:1	H:V
Level of protection	10	Year event
Elevation	449.0	NGVD
Embankment volume	121,000	Cubic yards
Permanent erosion matt	1,500	Square yards
Temporary erosion matt	6,000	Square yards
Crushed stone access road	1,600	Tons
Modification of Radial Gate Structure		
New sill elevation	437.5	NGVD
New level of protection	10	Year event
Top of closed gate elevation	449.5	NGVD
Riprap	3,000	Tons
Hydraulic openings through new sill		
Number of stoplog openings	8	Each, 3 feet x 4 feet
Sill elevation of gates	433.5	NGVD

TABLE 11-1 (Cont'd)

Feature	Measurement	Unit of Measure
Pump Station		
Submersible pump	1	41,000 gpm at 7.0 TDH
Station invert	424.0	NGVD
Trash racks	3	Each, 3" bar spacing
Slide gates	2	Each, 5 feet x 5 feet
Discharge pipe		
Diameter	48	Inches, welded steel
Length	200	Feet
Flap gate diameter	48	Inches
Power		
Electric	3	Phase, 12,500/480 volt
Transformer	150	KVA
Buried primary feeder length	5,500	Feet
Riprap	620	Tons
Gravity Outlet for Upper Lake		
Slide Gate	1	Each, 5 feet x 5 feet
Concrete pipe culvert		
Diameter	60	Inches
Length	140	Feet
Station invert	429.0	NGVD
Trash rack	1	Each, 3" bar spacing
Riprap	380	Tons
Stoplog Structure for Lower Lake		
Hydraulic opening	20	Feet
Concrete sill elevation	429.0	NGVD
Riprap	155	Tons
Drainage Channels for Lower Lake		
Length	7,500	Feet
Invert	429.0	NGVD
Bottom width	50	Feet
Excavation volume	29,500	Cubic yards
Replacement Boat Ramp		
Ramp width	16	Feet
Access road	700	Lineal feet
Parking lot	3	Management vehicles with trailers

TABLE 11-1 (Cont'd)

Feature	Measurement	Unit of Measure
Side Channel from Mouth to Pump Station		
Length	2,200	Feet
Construction bottom elevation	419.4	NGVD (10 feet deep)
Construction bottom width	35	Feet
Side slopes	2:1	H:V
Excavated volume	44,900	Cubic yards
Surface area	4	Acres at flat pool
Side Channel from Pump Station to River Confluence		
Length	6,200	Feet
Construction bottom elevation	419.4	NGVD (10 feet deep)
Construction bottom width	35	Feet
Side slopes	2:1	H:V
Excavated volume	139,000	Cubic yards
Surface area	11	Acres at flat pool
Side Channel Entrance Closure Structure		
Top elevation	429.4	NGVD
Rock fill	800	Tons
Riprap	5,570	Tons
Boat access opening		
Width	15	Feet
Water depth at flat pool	3.5	Feet
Deepwater Slough Area		
Length	300	Feet
Construction bottom elevation	413.4	NGVD (16 feet deep)
Construction bottom width	35	Feet
Side slopes	2:1	H:V
Excavated volume	12,000	Cubic yards
Surface area	0.7	Acres at flat pool

b. **Operation.** Table 11-2 summarizes the general operating requirements to manage water levels in the upper and lower lakes.

Estimated annual operation costs are presented in table 13-2.

c. **Maintenance.** The proposed features have been designed to ensure low annual maintenance requirements with the estimated annual maintenance costs presented in table 13-2. These quantities and costs may change during final design.

TABLE 12-1

Monitoring and Performance Evaluation Matrix

Project Phase	Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Remarks
Pre-Project	Sedimentation Problem Analysis	System-wide problem definition. Evaluates planning assumptions.	USFWS	USFWS (EMTC)	LTRM	--
	Pre-Project Monitoring	Identify and define problems at MREP site. Establishes need of proposed project features.	Sponsor	Sponsor	Sponsor	--
	Baseline Monitoring	Establish baselines for performance evaluation.	Corps	Field station or sponsor thru Cooperative Agreements or Corps.	LTRM	See Table 12-2.
Design	Data Collection for Design	Include quantification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	MREP	See Table 12-2.
Construction	Construction Monitoring	Assess construction impacts; assures permit conditions are met.	Corps	Corps	MREP	See State Section 401 Stipulations.
Post-Construction	Performance Evaluation Monitoring	Determine success of project as related to objectives.	Corps (quantitative) and sponsor (field observations).	Field station or sponsor thru Cooperative Agreement, sponsor thru O&M, or Corps.	LTRM	See Table 12-3.
	Biological Response Monitoring	Evaluate predictions and assumptions of habitat unit analysis beyond the scope of performance evaluation.	Corps	Corps	LTRM	--

TABLE 12-2

Resource Monitoring and Data Collection Summary [1]

Type Measurement	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA			Remarks
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase	
POINT MEASUREMENTS	APR-SEP	OCT-MAR	APR-SEP	OCT-MAR	APR-SEP	OCT-MAR							
Stations [3]													Corps Pre-Project
Turbidity	2W	M											
Photosynthetically Active Radiation	2W	M											
Secchi Disk Transparency	2W	M											
Dissolved Oxygen	2W	M											
Specific Conductance	2W	M											
Water Temperature	2W	M											
Velocity	M	M											
Water Depth	2W	M											
Water Elevation	2W	M											
Percent Ice Cover	-	M											
Ice Depth	-	M											
Percent Snow Cover	-	M											
Snow Depth	-	M											
Substrate Particle Presence	6M	6M											
Substrate Hardness	6M	6M											
pH	2W	M											
Chlorophyll	2W	M											
Suspended Solids	2W	M											
Wind Direction	2W	M											
Wind Velocity	2W	M											
Wave Height	2W	M											

TABLE 12-2 (Cont'd)

Legend

C = Continuous
W = Weekly
M = Monthly
Y = Yearly
nC = n-Day continuous
nW = n-Week interval
nY = n-Year interval
1, 2, 3 --- = number of times data is collected within designated project phase

1 See monitoring plan drawing for locations of sampling points, transects, areas except as noted.

2 See soil boring location drawing.

3 Water Quality Stations, Pre-Project Phase	Current Station Code	Previous Designation	
	W-I126.8T	LCL-1	1987 only
	W-I130.8W	UCL-3	1989 only
4 Water Quality Stations, Design Phase	W-I124.8R	--	initiated 1990
	W-I128.7W	UCL-1	initiated 1989
	W-I128.8F	LD-1	initiated 1990
	W-I129.2W	UCL-2	initiated 1989
5 Water Quality Stations, Post-Construction Phase			
	W-I124.8R	--	--
	W-I127.9W	--	--
	W-I128.8T	--	--
	W-I128.8W	--	--
	W-I129.4T	UCL-2	--
6 Water Quality Bulk Sediment & Elutriate Stations			
	W-I126.6P	LCL-2	Lower Lake
	W-I126.9M	LD-2	Liverpool Ditch
	W-I126.8T	LCL-1	Lower Lake
	W-I128.7W	UCL-1	Upper Lake
	W-I128.8F	LD-1	Liverpool Ditch
	W-I129.4T	UCL-2	Upper Lake
	W-I129.6F	MD-1	Meyer's Ditch

TABLE 12-2 (Cont'd)

7 Corps Lake Sedimentation/Vegetation Transects

S-1124.8P V	Lower Lake
S-1126.0P V	Lower Lake
S-1126.9P V	Lower Lake
S-1127.9P V	Lower Lake
S-1128.8P V	Upper Lake
S-1129.0P V	Upper Lake
S-1129.4P V	Upper Lake

8 Corps Side Channel Sedimentation Transects

S-1127.6M	Liverpool Ditch, Cross Section
S-1128.0M	Liverpool Ditch, Cross Section
S-1128.6M	Liverpool Ditch, Cross Section
S-1128.7M	Liverpool Ditch, Thalweg

TABLE 13-1

CHAUTAUQUA LAKE
REHABILITATION AND ENHANCEMENT EMP
IL RIVER MILE 124 - 129.5

PROJECT COST SUMMARY
DIVISION OF COST

MARCH 1991

ACCOUNT	FEATURE	CURRENT WORKING ESTIMATE (CWE)		FULLY FUNDED ESTIMATE (FFE)	
		FEDERAL	NON-FEDERAL	FEDERAL	NON-FEDERAL
06.	FISH AND WILDLIFE FACILITIES	3,740,000		4,026,110	
30.	PLANNING, ENGINEERING AND DESIGN	669,000		676,309	
31.	CONSTRUCTION MANAGEMENT	245,000		258,990	
	SUBTOTAL	4,654,000	0	4,961,409	0

SUMMARY OF COST APPORTIONMENT

	CWE	FFE
1. TOTAL COST SUMMARY		
TOTAL PROJECT COSTS	4,654,000	4,961,409
NON-FEDERAL LANDS & DAMAGES	0	0
TOTAL PROJECT COSTS SEE NOTE 1.	4,654,000	4,961,409
2. NON-FEDERAL COSTS		
REQUIRED NON-FEDERAL CASH CONTRIBUTION	0	0
NON-FEDERAL LANDS & DAMAGES	0	0
TOTAL NON-FEDERAL COST	0	0
3. FEDERAL COST		
TOTAL FEDERAL COSTS	4,654,000	4,961,409
GENERAL DESIGN, DEFINITE PROJECT REPORT	(541,000)	(541,000)
REMAINING FEDERAL COSTS	4,113,000	4,420,409

NOTES:

1. TOTAL PROJECT COST IS 100% FEDERAL COST; PROJECT LANDS ARE GOVERNMENT OWNED.
2. CONSTRUCTION SCHEDULED FOR MAR 92 - SEP 93. FULLY FUNDED ESTIMATE (FFE) IS BASED ON MIDPOINT OF CONSTRUCTION DATE OF DEC 92, RESULTING IN INFLATION FACTORS OF 1.0571 FOR SALARIES AND 1.0765 FOR ALL OTHER COSTS PER CECW-B MEMO, 3 APR 90, SUBJECT: FACTORS FOR THE FY 1992 BUDGET SUBMISSION.

TABLE 13-1 (Cont'd)

CHAUTAUQUA LAKE
REHABILITATION AND ENHANCEMENT EMP
PROJECT COST ESTIMATE
MARCH 1991 PRICE LEVEL

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	CONTINGENCY	CON %	REASONS
06.	FISH AND WILDLIFE FACILITIES							
06.-.-.-	UPPER LAKE WATER CONTROL, PUMP STATION							
06.0.5.B	DEWATERING	1	LS	22000.00	22,000	5,500	25.0%	1
06.0.5.C	STRUCTURAL CONCRETE	360	CY	450.00	162,000	24,300	15.0%	4,6
06.0.5.E	SLIDE GATES, 5'X 5'	2	EA	12000.00	24,000	3,600	15.0%	3,6
06.0.5.E	TRASH RACK ASSEMBLYS	3	EA	4300.00	12,900	1,935	15.0%	4,6
06.0.5.G	DISCH PIPE 48" STEEL	200	LF	240.00	48,000	9,600	20.0%	4,6
06.0.5.E	FLAP GATE, 48"	1	EA	4000.00	4,000	600	15.0%	3,6
06.0.5.B	RIPRAP	620	TON	27.00	16,740	5,022	30.0%	2,3
06.0.5.R	BURIED PRIMARY FEEDER	5500	FT	11.75	64,625	9,694	15.0%	1,5
06.0.5.R	TRANSFORMER	1	EA	12300.00	12,300	1,845	15.0%	6
06.0.5.R	MISC. ELECTRICAL	1	LS	7670.00	7,670	1,534	20.0%	6
06.0.5.R	ELECT PLATFORM ASSEMBLY	1	LS	15300.00	15,300	2,295	15.0%	6
06.0.5.E	SUBMERSIBLE PUMP & ACCS	1	LS	101000.00	101,000	20,200	20.0%	3,6
	TOTAL				490,535	86,125		
06.-.-.-	NORTHERN LEVEE REPAIR							
06.0.1.B	STRIPPING	5800	CY	1.50	8,700	1,740	20.0%	1,5
06.0.1.B	UNSUITABLE SOIL EXCAVATION	12500	CY	2.40	30,000	4,500	15.0%	1,5
06.0.1.B	CLEARING/GRUBBING	17.7	ACR	1810.00	32,037	6,407	20.0%	1,5
06.0.1.B	SEEDING	17.7	ACR	1150.00	20,355	4,071	20.0%	5,6
06.0.1.B	EMBK FILL, PLACE & SHAPE	176000	CY	3.55	624,800	124,960	20.0%	1,5
06.0.1.B	EMBK FILL, SHAPE	20000	CY	1.60	32,000	6,400	20.0%	1,5
06.0.1.B	RIPRAP	2400	TON	28.00	67,200	20,160	30.0%	2,3,5
	TOTAL				815,092	168,238		
06.-.-.-	CROSS DIKE REPAIR							
06.0.A.-	MOB & DEMOB	1	LS	19100.00	19,100	1,910	10.0%	2
06.0.1.B	EMBK. FILL, PLACE AND SHAPE	121000	CY	3.40	411,400	82,280	20.0%	1,5
06.0.1.B	CLEARING AND GRUBBING	5.2	ACR	1810.00	9,412	1,882	20.0%	1,5
06.0.1.B	SEEDING	11	ACR	1150.00	12,650	2,530	20.0%	5,6
06.0.C.B	CRUSHED STONE (PERM. ACCESS RD.)	1600	TON	19.30	30,880	6,176	20.0%	2,3
06.0.1.B	PERMANENT EROSION MATT	1500	SY	10.00	15,000	3,000	20.0%	1,6,3
06.0.1.B	TEMP EROSION CNTRL MATT	6000	SY	1.25	7,500	1,500	20.0%	1,6,3
	TOTAL				505,942	99,278		

TABLE 13-1 (Cont'd)
CHAUTAUQUA LAKE
REHABILITATION AND ENHANCEMENT EMP
PROJECT COST ESTIMATE
MARCH 1991 PRICE LEVEL

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	CONTINGENCY	CON %	REASONS
06.-.-.-	FISH TOXICANT TREATMENT							
06.0.1.B	FISH TOXICANT TREATMENT, UPPER LAKE	1	LS	60000.00	60,000	12,000	20.0%	4,6
06.-.-.-	UPPER LAKE GRAVITY OUTLET							
06.0.5.B	DEWATERING	1	LS	17000.00	17,000	4,250	25.0%	1
06.0.5.B	STRUCTURAL CONCRETE	47	CY	450.00	21,150	3,173	15.0%	4,6
06.0.5.B	60" RCP	172	LF	240.00	41,280	6,192	15.0%	1,3,5
06.0.5.E	TRASH RACK ASSEMBLY	1	LS	2300.00	2,300	345	15.0%	4,6
06.0.5.E	SLIDE GATE ASSEMBLY	1	LS	12100.00	12,100	1,815	15.0%	3,6
06.0.5.B	RIPRAP	380	TON	27.00	10,260	3,078	30.0%	2,3
	TOTAL				104,090	18,853		
06.-.-.-	MODIFICATION OF EXISTING RADIAL GATE STRUCTURE							
06.0.5.B	SITE PREPARATION	1	LS	10000.00	10,000	3,000	30.0%	1,5,6
06.0.5.B	STRUCTURAL CONCRETE	110	CY	455.00	50,050	7,508	15.0%	4,6
06.0.5.E	STOP LOG ASSEMBLY	8	EA	2000.00	16,000	3,200	20.0%	4,6
06.0.5.E	BAR GRATES	8	EA	1000.00	8,000	1,600	20.0%	4,6
06.0.5.R	PORT GATE POWER GENERATOR	1	EA	3000.00	3,000	600	20.0%	3,6
06.0.5.Q	GEARED GATE LIFTERS	4	EA	1200.00	4,800	960	20.0%	4,6
06.0.5.B	RIPRAP	3000	TON	27.00	81,000	24,300	30.0%	2,3,5
	TOTAL				172,850	41,168		
06.-.-.-	LWR LAKE WATER CONTROL, STOP LOG STRUCTURE							
06.0.5.B	DEWATERING	1	LS	15800.00	15,800	3,950	25.0%	1,4
06.0.5.B	EXCAVATION	325	CY	3.95	1,284	193	15.0%	1
06.0.5.B	STRUCTURAL BACKFILL	250	CY	17.20	4,300	1,075	25.0%	2,3,4
06.0.5.C	STRUCTURAL CONCRETE	211	CY	365.00	77,015	11,552	15.0%	2,3,5
06.0.5.E	STEEL POSTS W/SAFETY CHAIN	25	LF	22.00	550	110	20.0%	6
06.0.5.-	STOP LOGS	310	LF	2.55	791	158	20.0%	6
06.0.5.B	RIPRAP	155	TON	27.00	4,185	1,256	30.0%	2,3
	TOTAL				103,924	18,293		

TABLE 13-1 (Cont'd)

CHAUTAUQUA LAKE
REHABILITATION AND ENHANCEMENT EMP
PROJECT COST ESTIMATE
MARCH 1991 PRICE LEVEL

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	CONTINGENCY	CON %	REASONS
06.0.5.B	LOWER LAKE EXCAVATION	29500	CY	3.80	112,100	28,025	25.0%	1,5
06.-.-.-	BOAT RAMP REPLACEMENT	1	LS	60500.00	60,500	15,433	25.0%	1,4,6
06.-.-.-	SIDE CHANNEL EXCAVATION							
06.0.A.-	MOB AND DEMOB	1	LS	80,200.00	80,200	8,020	10.0%	2
06.0.1.B	CLEARING/GRUBBING	16.9	ACR	1,810.00	30,589	6,118	20.0%	1,5
06.0.1.B	EXCAVATION	195900	CY	1.90	372,210	55,832	15.0%	1,5
06.0.1.B	ROCKFILL	800	TON	29.85	23,880	3,582	15.0%	2,3,5
06.0.1.B	RIPRAP	5700	TON	33.70	192,090	28,814	15.0%	2,3,5
06.0.1.B	SEEDING	19	ACR	1,150.00	21,850	4,370	20.0%	5,6
	TOTAL				720,819	106,735		
	SUBTOTAL, FISH AND WILDLIFE FACILITIES				3,145,852			
	CONTINGENCIES; AVERAGE OF	18.9%				594,148		
06.	TOTAL, FISH AND WILDLIFE FACILITIES				3,740,000			

REASONS FOR CONTINGENCIES: 1. UNKNOWN SITE CONDITIONS, 2. UNKNOWN HAUL DISTANCE, 3. UNIT PRICE UNKNOWN, 4. QUANTITY UNKNOWNS, 5. DIFFICULT SITE ACCESS, 6. UNKNOWN FINAL DESIGN

30.	PLANNING, ENGINEERING AND DESIGN		669,000	
	DEFINITE PROJECT REPORT	541,000		
	PLANS AND SPECIFICATIONS	112,000		
	ENGINEERING DURING CONSTRUCTION	16,000		
31.	CONSTRUCTION MANAGEMENT		245,000	
	CONTRACT ADMINISTRATION	91,000		
	REVIEW OF SHOP DRAWINGS	9,000		
	INSPECTION AND QUALITY ASSURANCE	145,000		
		TOTAL	4,654,000	

14. REAL ESTATE REQUIREMENTS

a. **General**. All project features are located on lands owned by the Department of the Interior, USFWS.

b. **Local Cooperation Agreements/Cost-Sharing**. The project is proposed for 100 percent Federal funding for first costs. The Lake Chautauqua project area is part of the Chautauqua National Wildlife Refuge. The Water Resources Development Act of 1986 (Public Law 99-662) is the basis for first cost Federal funding and provides:

Section 906. FISH AND WILDLIFE MITIGATION.

(e) ... the first cost of such enhancement shall be a Federal cost when -

(3) such activities are located on lands managed as a national wildlife refuge.

c. **Construction Easements**. All project features are located on lands owned by the Federal Government. The USFWS has provided a letter of consent authorizing work on Department of Interior lands.

15. SCHEDULE FOR DESIGN AND CONSTRUCTION

Table 15-1 presents the schedule of project completion steps.

TABLE 15-1

Project Implementation Schedule

Requirement	Scheduled Date
Submission of Draft DPR to Corps of Engineers, North Central Division for Review	Aug 90
Distribution of DPR for Public and Agency Review	Mar 91
Submission of Final and Public Reviewed DPR to North Central Division	Jun 91
Receive Plans and Specifications Funds	Jun 91
Construction Approval by Assistant Secretary of the Army (Civil Works)	Nov 91
Submit Final Plans and Specifications to North Central Division for Review and Approval	Dec 91
Obtain Approval of Plans and Specifications	Jan 92
Advertise Contract	Jan 92
Award Contract	Mar 92
Complete Construction	Sep 93

16. IMPLEMENTATION, RESPONSIBILITIES, AND VIEWS

a. **Corps of Engineers.** The Corps of Engineers, Rock Island District, is responsible for project management and coordination with the USFWS, the State of Illinois, and other affected agencies. The Rock Island District will submit the subject detailed project report; program funds; finalize plans and specifications; complete all NEPA requirements; advertise and award a construction contract; and perform construction contract supervision and administration.

b. **U.S. Fish and Wildlife Service.** The USFWS is the Federal sponsor of the project and will determine that all project features are compatible with Refuge purposes and in compliance with the National Historic Preservation Act. The USFWS will ensure that operation and maintenance functions, described in table 13-2 of this report, are performed in accordance with Section 906(e) of the 1986 Water Resources Development Act. A draft Memorandum of Agreement between the Corps of Engineers and the USFWS is included in appendix C. These functions will be further specified in the Project Operation and Maintenance Manual to be provided by the U.S. Army Corps of Engineers prior to final acceptance of the project by the sponsor. Authorization has been provided to the Corps of Engineers for construction on USFWS-owned lands.

c. **Illinois Department of Conservation.** The IDOC, the non-Federal sponsor of the project, has provided technical and other advisory assistance during all phases of the project and will continue to provide assistance during project implementation. The IDOC will cooperate with the USFWS to ensure that operation and maintenance, and any mutually agreed-upon rehabilitation, will be accomplished in accordance with the Water Resources Development Act of 1986.

17. COORDINATION, PUBLIC VIEWS, AND COMMENTS

a. **Coordination Meetings.** Close coordination between the Corps of Engineers, the USFWS, and the IDOC was effected during the study period. A listing of meetings follows:

(1) November 15, 1988. On-site meeting conducted with IDOC, USFWS, and CENCR to scope proposed project.

(2) November 28, 1989. Off-site meeting conducted with USFWS, IDOC, and CENCR to develop design alternatives.

(3) December 11, 1989. On-site meeting conducted with USFWS, SHPO, and CENCR to discuss archeological sites known to exist on the site and SHPO concerns.

(4) March 26, 1990. On-site meeting conducted with IDOC, USFWS, and CENCR to discuss feasibility of alternatives.

(5) January 3, 1991. Off-site meeting conducted with IDOC, USFWS, and CENCR to coordinate design changes and confirm management plan.

(6) April 15, 1991. A public information meeting was jointly conducted by the USFWS, CENCR, and IDOC.

b. **Environmental Review Process.** This project meets the requirements of the National Environmental Policy Act as evidenced by the attached Environmental Assessment and Finding of No Significant Impact.

18. CONCLUSIONS

Lake Chautauqua has experienced deterioration of its habitat value as a result of sedimentation and inability to manage water levels. Waterfowl usage of this area has declined. Fisheries have been severely impacted by reduced water quality, depths, and lack of preferred habitats. The lake's wetland communities have lost prime habitat as a result of sedimentation. The broad expanse of the lake, in combination with the extremely soft sediments which make up the lake bed, promote wind fetch and rough fish generated turbidity, thereby inhibiting photosynthetic activity and lake bed consolidation. This, combined with the inability to dewater the lakes efficiently, precludes aquatic vegetation rooting, growth, and survival.

The proposed construction features meet the project objectives of increasing submergent and emergent vegetation in the upper and lower lakes and creating flowing side channel and deepwater slough habitat. By reestablishing Liverpool side channel flow and improving water control capability for both the upper and lower lakes of Lake Chautauqua, the project area and its environments should realize improved fisheries and expanded waterfowl usage throughout the 50-year project life expectancy.

Complete implementation of these project features will result in the following habitat outputs: increased submergent vegetation in the upper lake needed by waterfowl (primarily divers) and fish; increased moist soil plants in the lower lake for dabbling ducks and other wetland birds; off-channel deep water for wintering fish; flowing side channel habitat; and stable levels to benefit freshwater fishery resources.

19. RECOMMENDATIONS

I have weighed the accomplishments to be obtained from this habitat rehabilitation and enhancement project against its cost and have considered the alternatives, impacts, and scope of the proposed project. In my judgment, this project, as proposed, justifies expenditures of Federal funds. I recommend that the Secretary of the Army for Civil Works approve construction to include: raising approximately 3.8 miles of existing levee and cross dike; construction of a pump station, 2 gravity outlet structures, and requisite drainage channels; and side channel excavation.

The estimated construction cost of this project is $4,113,000. Total project cost estimate, including general design, is $4,654,000. All project costs are to be 100 percent Federal costs.

At this time, I further recommend that funds in the amount of $112,000 be allocated for the preparation of plans and specifications.

John R. Brown
Colonel, U.S. Army
District Engineer

FINDING OF NO SIGNIFICANT IMPACT
FOR
LAKE CHAUTAUQUA NATIONAL WILDLIFE REFUGE
REHABILITATION AND ENHANCEMENT

Having reviewed the information contained in this Environmental Assessment, I find that the proposed project will have no significant adverse impacts on the environment. This action is not a major Federal action, and therefore preparation of an Environmental Impact Statement (EIS) is not required. This decision may be reevaluated if developments warrant it.

Factors that were considered in making the determination that an EIS is not required were:

a. Implementation of the selected plan will benefit nationally significant waterfowl and wetland resources.

b. The proposed action is complementary to the Lake Chautauqua National Refuge goals and objectives.

c. There were no significant adverse comments received on the project from public review.

d. Adverse effects on fish and wildlife resources from construction are temporary.

18 June 1991
Date

John R. Brown
Colonel, U.S. Army
District Engineer

REVISED JUNE 1991

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-7F)

LAKE CHAUTAUQUA REHABILITATION AND ENHANCEMENT
LA GRANGE POOL, ILLINOIS WATERWAY, RIVER MILES 124-128
MASON COUNTY, ILLINOIS

APPENDIX A
CORRESPONDENCE

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Illinois Historic
Preservation Agency
Old State Capitol Springfield, Illinois 62701 (217) 782-4836
Suite 4-900 State of Illinois Center 100 W. Randolph Chicago, IL 60601 (312) 814-1409

217/785-4997

MASON COUNTY
Lake Chautauqua Habitat
Rehabilitation and Enhancement Project
Alternative levee rehabilitation and boat ramp

IHPA LOG #910104255TRW (89103001)
Corps of Engineers-Rock Island
Acres: 32.0 Sites: 0

March 20, 1991

Mr. Matthias A. Kerschbaum
United States Department of the Interior
Fish and Wildlife Service
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

Dear Sir:

Thank you for submitting the results of the archaeological reconnaissance. Our comments are required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties".

Our staff has reviewed the archaeological Phase I reconnaissance report performed for the project referenced above.

The Phase I survey and assessment of the archaeological resources appear to be adequate. Accordingly, we have determined, based upon this report, that no significant historic, architectural, and archaeological resources are located in the project area.

Please retain this letter in your files as evidence of compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

Sincerely,

Theodore Hild

Theodore W. Hild
Deputy State Historic
Preservation Officer

TWH:TRW:bb1017A/74

cc: CoE-RI

State of Illinois
DEPARTMENT OF AGRICULTURE
Division of Natural Resources
State Fairgrounds, P.O. Box 19281, Springfield, IL 62794-9281, 217/782-6297

Bureau of Farmland Protection Bureau of Soil Conservation

April 16, 1991

Colonel John R. Brown, District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Re: Upper Mississippi River System
Environmental Management Program
Definite Project Report
with Integrated Environmental Assessment (R-7PR)

Lake Chautauqua Rehabilitation and Enhancement
LaGrange Pool, Illinois Waterway, River Miles 124-128
Mason County, Illinois

Dear Colonel Brown:

The Illinois Department of Agriculture has reviewed the Lake Chautauqua Rehabilitation and Enhancement Assessment for its potential impact to agricultural land and submits the following comments.

The boundaries of the project area are approximately the same as those of the refuge. The proposed project includes raising approximately 3.8 miles of existing levee and cross dike to a 10-year level of protection; modifying an existing radial gate structure; providing a pump station with 41,000 gpm capacity; providing gated gravity outlets for the upper and lower lakes; providing drainage channels to the pump station and gravity outlets; providing a boat ramp for upper lake management purposes; excavating a selected reach of side channel; and constructing a side channel entrance closure structure.

All project features are located on lands owned by the Department of the Interior, USFWS. Because the project will utilize government property and prime farmland will not be affected, the Illinois Department of Agriculture does not object to its implementation.

Sincerely,

Teresa J. Savko

Teresa J. Savko
Bureau of Farmland Protection

TJS:mdg

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

MAY 09 1991

5WE-16TC

Colonel John R. Brown
District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Brown:

In accordance with the National Environmental Policy Act and Section 309 of the Clean Air Act, we have reviewed the Definite Project Report with integrated Environmental Assessment (EA) for the Lake Chautauqua Rehabilitation and Enhancement Project in Mason County, Illinois. The purpose of the project is to reduce the sediment load that is threatening the integrity of the fishery and waterfowl of the Lake Chautauqua deep water habitat.

Lake Chautauqua is a 3250 acre floodplain lake and wetland complex along the Illinois River between river miles 124 and 128. The lake is formed by a 9-mile long perimeter levee and is divided into an upper and lower lake by a cross dike. The U.S. Fish and Wildlife Service presently operates the lake for migratory waterfowl as part of the Chautauqua National Wildlife Refuge.

Lake Chautauqua was historically part of a highly productive freshwater ecosystem, but conversion of wetlands to farmland and increased sedimentation resulting from agriculture activities have significantly degraded the aquatic habitat. The Lake Chautauqua project site provides opportunity to restore and enhance habitat for fisheries and waterfowl.

Four alternatives were assessed for the proposed project in addition to the no action alternative. These alternatives are entitled water control, construction of barrier islands, side channel excavation, and sediment reduction. The water control alternative involves raising the cross dike and levee, modifying the radial gate structure, construction of a pump station, construction of a gravity outlet for the upper lake, construction of a stoplog structure in the lower lake, excavation of drainage channels in the lower lake, and construction of a replacement boat ramp. The barrier islands alternative consists of constructing earthen embankments to function as breakwaters to diminish wave impacts. Side channel excavation consists of excavating sediments to provide usable flowing side channel habitat. The sediment reduction alternative involves raising the levee to the 50-year flood event. The EA recommends the incorporation of the water control alternative and the side channel excavation alternative for the rehabilitation and enhancement project, concluding that these actions will result in a net increase in wetland and aquatic values for Lake Chautauqua.

A-111

O

Corps of Engineers' response:

O - This is a fairly accurate description of the project

The EA states that there are 892 acres of bottomland hardwoods and 3320 acres of shallow open water habitat in the Lake Chautauqua area. The water control alternatives would convert 21 acres of bottomland hardwoods to grassland along the levee. An additional 30 acres of bottomland hardwoods would be converted to various habitat types for the side channel excavation.

The EA does not mention compensatory mitigation for the project. According to the Missouri Habitat Appraisal Guide (MHAG) method of analysis of habitat quantification, which fine tunes the U.S. Fish and Wildlife Habitat Evaluation Procedures (HEP) to more efficiently input field data, net environmental benefits for fish and wildlife are expected to result. The evaluation appears to favor waterfowl and fish species. Forested wetlands provide habitat for a variety of upland species, including deer and bat species, so these species should also be factored into the study. The study should be conducted without being biased towards the desired species whose habitat would be most favorably influenced by the project's implementation.

Despite the net MHAG benefits due to the project, you may wish to consider compensatory mitigation for the impacted forested wetlands. The EA is not clear whether natural succession of bottomland forest will occur with the project in place. There may be opportunity for compensatory mitigation on areas of the refuge that have been farmed or otherwise degraded, and these opportunities should be explored. Our guidance for bottomland hardwood mitigation is that compensation be done on a minimal ratio of 3:1 of wetlands created to those lost. This ratio is necessary to help ensure long-term survival of the newly restored wetlands. The compensation should be outlined in a mitigation plan, and included in the Final Definite Project Report with EA.

We are concerned with impacts to the hydrology of the area. The sediment and water control structures will influence the hydrology of the forested floodplain adjacent to Lake Chautauqua. This alteration of water regime may have an adverse impact on the 800+ acres of bottomland hardwoods not directly impacted by the project. This impact should be assessed and discussed in the Final EA.

Water quality should benefit from the project. Decreased sedimentation and wave action should reduce turbidity and introduction of riverine constituents to the lake substrate. However, there are a couple of potential water quality impacts that should be assessed. The dredging will result in temporary increased turbidity due to stirred up sediments, and these sediments may be contaminated. Tests have shown that the Illinois River south of Seneca, Illinois, has PCB concentrations of 1 part per million, and this and other pollution sources may have contributed to lake sediment deposits. The sediments should be tested to assure that the dredged material is uncontaminated. If the sediments contain contaminants, they should not be used to construct islands or side casted to the levee or another location; they will need to be disposed of properly to assure no adverse environmental impacts. If it is still planned to use contaminated sediments for levee construction, then bioassays should be conducted to determine impact upon aquatic species and wildlife that would use the levee.

Corps of Engineers' response:

1. The overall habitat evaluation for the project indicates a net gain of habitat quality over the 50-year project life (net gain of habitat units). Based on this predicted improvement, no mitigation should be necessary. Admittedly, the evaluation species selected do not represent the full range of species present in the Lake Chautauqua Refuge. These species were selected because changes in their habitat will best indicate how the project goals and objectives would be met. The primary goal of Chautauqua Refuge (which is also mandated by law) is enhancement of migratory waterfowl, so, naturally, these species received primary consideration. This does not mean, however, that other species were not considered. The green-backed heron, beaver, northern parula, prothonotary warbler, king rail and the target species (except for the green-backed heron). In addition, the number of species models available in MHAG is limited. Several species of interest could not be evaluated on an equal basis with the target species because individual models have not been developed.

2. MITIGATION OF FORESTED WETLANDS
The DPR indicates that approximately 48.6 acres of woodland will be impacted by the project. Except for the 14.2 acres impacted on Liverpool Island, all of this acreage occurs on the tops and side slopes of the refuge levees. All of this acreage is second growth, which has developed since the levee was built in the early 1900's. Cottonwood, silver maple, green ash, and mulberry account for more than 80% of tree cover. Valuable mast-producing species such as pin oak are virtually absent. Proper maintenance of the levees in past years would normally have prevented this second growth forest from becoming established. Impacts to more valuable, pre-levee bottomland forest in the Melz Slough area will be avoided by transporting borrow from outside the slough. There is no specific mitigation for the 14.2 acres cleared on Liverpool Island. The net increase in wetland and aquatic habitat benefits offsets this loss. Although not specifically intended as mitigation, the refuge has an ongoing forestry program to increase bottomland forest acreage on refuge lands.

3. Impacts to the local water regime have been considered for bottomland forest, located within and outside the leveed area. As discussed under the "Bottomland Hardwoods" subsection in the Natural Resource Impacts discussion, there is a minimal chance of impacts occurring to hardwoods in the Melz Slough area. Outside of the leveed refuge portion, there is no change in water level regime anticipated.

4. In order to evaluate the water quality impacts of proposed HREP projects, a testing protocol has been established which first quantifies a variety of parameters which are reasonably expected to be present within the project site. If evidence of contamination is found, additional testing is performed to determine bioavailability and the potential for impacts to the

-1-

Sediments that are to be dredge should be tested for chemical contamination. Three core samples should be taken at the dredging site. Core depth should extend two feet below project depth to characterize material in the event of over-dredging and to characterize the material exposed by the dredging event. Each core sample should be divided into three foot sections, from bottom to top, with each sub-sample undergoing analysis for the following constituents:

Total Solids	Chlorinated Hydrocarbons
Volatile Solids	-alpha BHC
Chemical Oxygen Demand	-beta BHC
Percent Moisture	-delta BHC
Cyanide	-gamma BHC
Metals	-Chlordane
-Arsenic	-DDD
-Cadmium	-DDE
-Chromium	-DDT
-Copper	-Dieldrin
-Lead	-Endrin
-Mercury	-Heptachlor
-Nickel	-PCBs
-Selenium	Total Phosphate
-Zinc	Total Organic Carbon
-Manganese	Ammonia Nitrogen

The results of the sample tests should be made available to our Agency for review.

The final EA should assess and discuss secondary water quality impacts of the completed project. These impacts include increased recreational use and potential for increased agricultural activities. Impacts due to motor boating and marina development may result in increased turbidity, and the release of hydrocarbons into the lake. Increased agricultural activity may pose a water quality impact of runoff of toxins such as pesticides and fertilizers. The potential for any of these activities should be discussed for the Lake Chautauqua Rehabilitation and Enhancement Project.

Once completed, the project should provide a benefit to the waterfowl and fishery habitat of Lake Chautauqua. The project can further benefit waterfowl by provided nesting habitat through the planting of native vegetation on the islands and dike/levee. Such vegetation could include prairie grasses, which are becoming increasingly rare with the degradation of prairie remnants. We support the project provided that the aforementioned concerns are adequately assessed.

Corps of Engineers' response:

environment. Sediment quality testing was performed at 8 locations representative of the project site (two in upper Lake Chautauqua, two in lower Lake Chautauqua, two in Liverpool Ditch and two in Meyers Ditch) on February 20, 1990. Samples were taken with a 36-inch core sampler. Each sample was analyzed individually for a number of physical and chemical parameters. In addition, elutriate samples were prepared and analyzed from each sediment sample. A description of the test protocols utilized, a complete list of the parameters which were analyzed, and a tabular presentation of the results can be found in Technical Appendix G of the Definite Project Report.

The results of this screening procedure revealed that while the sediment is composed of very fine-grained material and contained notable concentrations of several contaminants, the elutriate test produced only isolated violations of the Illinois General Use Water Quality Standards. The exception to this was ammonia nitrogen which exhibited concentrations which would probably violate the un-ionized ammonia standard in the lower lake, Liverpool Ditch and Meyer's Ditch. It is likely, however, that these impacts will be short-term and limited to a reasonably small mixing zone.

5. Any secondary water quality impacts that are expected to occur are discussed in the 404(b)(1) Water Quality Evaluation of the main report. Recreational use of the upper lake will probably increase as the quality of the fishery resource improves; however, since this is a national wildlife refuge, there are no plans to construct any marina facilities, etc., to accommodate any increase. Any impacts to water quality from increased recreational activity (i.e., boating) are considered negligible.

There will be no change in agricultural activity as a result of the project; hence, no change in agricultural-related water quality.

6. Where possible, the refuge will plant vegetation on levees and other areas that are of benefit to local wildlife.

Thank you for the opportunity to review the Definite Project Report with integrated Environmental Assessment (EA) for the Lake Chautauqua Rehabilitation and Enhancement Project. If you have any questions regarding our comments, please contact Milo Anderson of my staff at 312 886-2467.

Sincerely yours,

Thomas L. Jackson, Acting Chief
Environmental Review Branch

Illinois Department of Conservation
life and land together

LINCOLN TOWER PLAZA • 524 SOUTH SECOND STREET • SPRINGFIELD 62701-1787
CHICAGO OFFICE • ROOM 4-300 • 100 WEST RANDOLPH 60601

BRENT MANNING, DIRECTOR

May 13, 1991

Mr. James H. Blanchar, P.E.
Chief, Operations Division
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Blanchar:

The Department of Conservation has reviewed the project(s) listed below and has no objections to permit issuance:

Application No.	Applicant
20914Z	U.S. Army Corps of Engineers

Sincerely,

Robert W. Schanzle
Permit Program Manager
Division of Planning

RWS:slf

United States Department of the Interior

OFFICE OF THE SECRETARY
OFFICE OF ENVIRONMENTAL AFFAIRS
230 S. DEARBORN, SUITE 3422
CHICAGO, ILLINOIS 60604

TAKE PRIDE IN AMERICA

ER 91/361

May 22, 1991

Colonel John R. Brown
District Engineer
U.S. Army Engineer District
Rock Island
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Brown:

The Department of the Interior (Department) has reviewed the Definite Project Report with Integrated Environmental Assessment for Lake Chautauqua, Illinois, Habitat Rehabilitation and Enhancement Project. The Department has no objections to the proposed project.

We appreciate the opportunity to provide comments.

Sincerely,

Sheila Minor Huff
Regional Environmental Officer

Illinois Environmental Protection Agency • P.O. Box 19276, Springfield, IL 62794-9276

[illegible]

U.S. Army Corps of Engineers (Mason County)
Lake Chautauqua HREP (Illinois River)
Log # C - 864-90 -- [CoE Appl. 209142 #]

June 13, 1991

Mr. James H. Blanchar, P.E.
Chief, Operations Division
Rock Island District
Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Mr. Blanchar:

This Agency received a request on September 4, 1990, from the U.S. Army Corps of Engineers, Rock Island District requesting necessary comments for environmental consideration concerning the Lake Chautauqua Habitat Rehabilitation and Enhancement Project (HREP). The proposed project will consist of raising the existing perimeter levee and cross dike, adding new drainage channels in the south lake, modifications and additions to the water level control structures, construction of a new boat ramp, and excavation of the Liverpool side channel. The project is located at approximate Illinois River Miles 124 to 128, Sections 4-10, T22N, R8W in Mason County, Illinois. We offer the following comments.

Based on the information included in this submittal, it is our engineering judgment that the proposed project may be completed without causing water pollution as defined in the Illinois Environmental Protection Act, provided the project is carefully planned and supervised.

These comments are directed at the effect on water quality of the construction procedures involved in the above described project and is not an approval of any discharge resulting from the completed facility, nor an approval of the design of the facility. These comments do not supplant any permit responsibilities of the applicant towards this Agency.

This Agency hereby issues certification under Section 401 of the Clean Water Act (PL 92-217), subject to the applicant's compliance with the following conditions:

1. [illegible]

a. violation of applicable water quality standards of the Illinois Pollution Control Board, Title 35, Subtitle C: Water Pollution Rules and Regulations;

b. water pollution as defined and prohibited by the Illinois Environmental Protection Act; and

c. interference with water use practices near public recreation areas or water supply intakes.

2. The applicant shall provide adequate planning and supervision during the project construction period for implementing construction methods, processes and cleanup procedures necessary to prevent water pollution and control erosion.

3. Any spoil material excavated, dredged or otherwise produced must not be returned to the waterway but must be deposited in a self-contained area in compliance with all State statutes, regulations and permit requirements with no discharge to the waters of the State unless a permit has been issued by this Agency. Any back filling must be done with clean material and placed in a manner to prevent violation of applicable water quality standards.

4. All areas affected by construction shall be mulched and seeded as soon after construction as possible. The applicant shall undertake necessary measures and procedures to reduce erosion during construction. Interim measures to prevent erosion during construction shall be taken and may include the installation of staked straw bales, sedimentation basins and temporary mulching. All construction within the waterway shall be conducted during zero or low flow conditions.

5. The applicant shall implement erosion control measures consistent with the "Standards and Specifications for Soil Erosion and Sediment Control" (IEPA/WPC/87-012).

6. The applicant shall contain dredge spoil generated by the excavation of the Liverpool Ditch and the new cut from the Ditch to the Illinois River. A containment plan for these areas shall be submitted to the Illinois Environmental Protection Agency for review and approval.

7. This certification becomes effective when the Department of the Army, Corps of Engineers, includes the above conditions #1 through 6 as conditions of the requested permit issued pursuant to Section 404 of PL. 92-500.

This certification does not grant immunity from any enforcement action found necessary by this Agency to meet its responsibilities in prevention, abatement, and control of water pollution.

Very truly yours,

Thomas G. McSwiggin, P.E.
Manager, Permit Section
Division of Water Pollution Control

TGM:JCH:let/1713q, 72-74

cc: IEPA, DWPC, Records Unit
DWPC, Field Operations Section, Region 2
IDOT, Division of Water Resources, Springfield
USEPA, Region V
U.S. Army Corps of Engineers, Rock Island District

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING—P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF

CENCR-PD-E

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-7F)

LAKE CHAUTAUQUA REHABILITATION AND ENHANCEMENT
LA GRANGE POOL, ILLINOIS WATERWAY, RIVER MILES 124-128
MASON COUNTY, ILLINOIS

APPENDIX B
CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

JUNE 1991

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
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LAKE CHAUTAUQUA REHABILITATION AND ENHANCEMENT
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MASON COUNTY, ILLINOIS

APPENDIX B
CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

SECTION 1 - PROJECT DESCRIPTION

LOCATION

Lake Chautauqua is a 4,500-acre National Wildlife Refuge located between Illinois River Miles (RM) 124 and 128 in Mason County, Illinois. The refuge is managed by the U.S. Fish and Wildlife Service (USFWS).

GENERAL DESCRIPTION

Lake Chautauqua is managed primarily for nesting and migratory waterfowl. Water levels are artificially managed on approximately 3,400 acres of lake to provide optimum habitat for migratory waterfowl. This management goal has become increasingly difficult to realize for the past several years because of flooding from the Illinois River and an inability to properly maintain optimum water levels in the lake. Poor water level management capability allows floodwaters to eliminate desirable aquatic plants used by waterfowl. Sediments carried along with the floodwaters from the Illinois River have transformed to lake bottom into a fluffy, colloidal substrate which discourages rooted aquatic plants. Wind-generated waves also resuspend sediments and elevate turbidity levels and decrease light penetration.

Physical limitations, as well, limit the refuge's water control capability. There are no pumping facilities to accomplish lake drawdown or to maintain desired lake levels. Lake Chautauqua is divided into an upper lake and a lower lake by a cross dike constructed in 1969. That cross dike was breached by high water shortly afterward which prevented independent management of each lake. High water levels outside the refuge levee frequently prohibit water level management. Sill elevations of the existing water control structures also are 2 feet above the lake bottom, which reduces the amount of refuge acreage that can be dewatered.

A secondary objective of the refuge is to increase the amount of deep water and side channel habitat for fish on refuge lands. Sedimentation has resulted in a loss of more than 10 feet of depth in the Liverpool side channel. At a flat pool (LaGrange Pool) of 429.0 feet National Geodetic Vertical Datum (NGVD), there is less than 6 inches of water or less in the channel.

The proposed project will reverse the adverse effects of sedimentation by providing improved water level control in both the upper and lower lakes and greater water depth in Liverpool Channel. This will be accomplished by: (1) repairing the cross dike; (2) raising the northern perimeter levee to a 10-year level of protection and constructing a pump station and drainage channels that can control water levels in either lake; (3) constructing a new water control structure in the lower lake with a sill elevation of 429.0 NGVD; and (4) mechanically excavating Liverpool Channel.

The cross dike will be constructed first using mechanical equipment. Borrow material will originate from the new pump station access channel immediately adjacent to the levee. Following repair of the cross dike and construction of the pump station, the upper lake will be dewatered to allow for construction of the drainage channel. Excavated material will be alternately sidecast along the channel to form 6.1 acres of barrier islands. Drainage channels in the lower lake probably will be constructed by mechanical excavation. Excavated material again will be sidecast along the channel, but will not be emergent at most water levels. Approximately 8,400 feet of Liverpool Channel and Liverpool Island will be excavated down to elevation 419.4 NGVD (30-foot bottom width) to provide improved fishery habitat. Material will be placed on the refuge levee and adjacent bottomland hardwoods.

AUTHORITY AND PURPOSE

Authority for this project is contained in Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662). The purpose of Section 1103 is "to ensure the coordinated development and enhancement of the Upper Mississippi River (UMR)."

GENERAL DESCRIPTION OF THE DREDGED AND FILL MATERIAL

General Characteristics of Material - Grain size analysis was conducted by the Geotechnical Branch, U.S. Army Corps of Engineers. Bulk sediment samples were taken from seven locations within the project area. Sediments were all extremely fine grained. Seven out of eight samples had greater than 95 percent of all material passing a No. 230 sieve (less than 0.062 um). The remaining sample passed 86 percent through a No. 230 sieve.

DETERMINATION OF CUMULATIVE EFFECTS ON THE AQUATIC ECOSYSTEM

Any impacts from the proposed discharge will be temporary.

DETERMINATION OF SECONDARY EFFECTS ON THE AQUATIC ECOSYSTEM

No adverse secondary effects from the fill are anticipated.

SECTION 3 - FINDINGS OF COMPLIANCE FOR LAKE CHAUTAUQUA NATIONAL WILDLIFE REFUGE HABITAT REHABILITATION AND ENHANCEMENT PROJECT

1. No adaptations of the guidelines were made in this evaluation.

2. Alternative locations for the proposed project are not possible since the goal was to improve wetlands specific to Lake Chautauqua Refuge. Alternative non-wetland locations for placement of fill such as the refuge levee and cross dike were utilized to the maximum extent possible. Material generated from excavation of the drainage ditches could not be practicably transported to upland sites.

3. State standards for turbidity and ammonia may be temporarily exceeded within the lake during construction. Only the portion of the project occurring outside the levee (i.e., Liverpool Ditch) has the potential to affect the main channel of the Illinois River.

4. The project will not affect Federal or State-listed endangered species.

5. The project is located on the Lake Chautauqua Federal Wildlife Refuge and is in compliance with refuge guidelines.

6. The project will have no effect on public or private water supplies and will benefit recreational and commercial fisheries. No significant adverse impacts to aquatic or terrestrial wildlife will occur.

7. Appropriate measures will be utilized, when necessary, to prevent or minimize any impacts to the aquatic ecosystem.

8. On the basis of the Section 404(b)(1) guidelines, I specify that the proposed placement sites comply with the requirements of the guidelines.

18 June 1991
Date

John R. Brown
Colonel, U.S. Army
District Engineer

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
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ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF

MEMORANDUM OF AGREEMENT
BETWEEN
THE DEPARTMENT OF THE ARMY
AND
THE UNITED STATES FISH AND WILDLIFE SERVICE

SUBJECT: Enhancing Fish and Wildlife Resources of the Upper Mississippi River System at Lake Chautauqua, Illinois

I. PURPOSE

The purpose of this Memorandum of Agreement (MOA) is to establish the relationships, arrangements, and general procedures under which the Department of the Army (DA) and the U.S. Fish and Wildlife Service (USFWS) will operate in constructing, operating, maintaining, and rehabilitating the Lake Chautauqua, Illinois, separable element of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

The project lands of the Lake Chautauqua, Illinois, separable element are owned by the United States and are managed by the Department of the Interior, USFWS, as part of the Chautauqua National Wildlife Refuge.

II. BACKGROUND

Section 1103 of the Water Resources Development Act of 1986, Public Law 99-662, authorizes construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. Under conditions of Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, all construction costs of those fish and wildlife features on the Lake Chautauqua, Illinois, are 100 percent Federal, and all operation, maintenance, repair, and rehabilitation costs are to be cost shared, 75 percent Federal and 25 percent non-Federal.

III. GENERAL SCOPE

The project to be accomplished pursuant to this MOA shall consist of improving water level management capability for approximately 3,250 acres (Upper and Lower Lake Chautauqua) and the restoration of more than 8,000 feet of flowing side channel habitat (Liverpool Ditch).

IV. RESPONSIBILITIES

A. The DA is responsible for:

1. **Construction:** Construction of the project which consists of a pump station, 2 water control structures, cross dike raise, and drainage and side channel excavation at Lake Chautauqua, Illinois.

2. **Major Rehabilitation:** The Federal share of any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the Definite Project Report and that is needed as a result of specific storm or flood events.

3. **Construction Management:** Subject to and using funds appropriated by the Congress of the United States, the DA will construct the Lake Chautauqua, Illinois, Fish and Wildlife Enhancement project as described in the Definite Project Report, *Lake Chautauqua Rehabilitation and Enhancement*, dated June 1991, applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The USFWS will be afforded the opportunity to review and comment on all modifications and change orders prior to the issuance to the contractor of a Notice to Proceed. If the DA encounters potential delays related to construction of the project, the DA will promptly notify the USFWS of such delays.

4. **Maintenance of Records:** The DA will keep books, records, documents, and other evidence pertaining to costs and expenses incurred in connection with construction of the project to the extent and in such detail as will properly reflect total costs. The DA shall maintain such books, records, documents, and other evidence for a minimum of 3 years after completion of construction of the project and resolution of all relevant claims arising therefrom, and shall make available at its offices at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the USFWS.

B. The USFWS is responsible for:

1. **Operation, Maintenance, and Repair:** Upon completion of construction as determined by the District Engineer, Rock Island, the USFWS shall accept the project and shall operate, maintain, and repair the project as defined in the Definite Project Report, *Lake Chautauqua Rehabilitation and Enhancement*, dated June 1991, in accordance with Section 906(e) of the Water Resources Development Act, Public Law 99-662.

2. **Non-Federal Responsibilities:** In accordance with Section 906(e) of the Water Resources Development Act, Public Law 99-662, the USFWS shall obtain 25 percent of all costs associated with the operation, maintenance, and repair of the project from the Illinois Department of Conservation (IDOC).

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LA GRANGE POOL, ILLINOIS WATERWAY, RIVER MILES 124-128

APPENDIX D
COST ESTIMATE

D-1. GENERAL.

This appendix contains the detailed cost estimate prepared for the Lake Chautauqua Rehabilitation and Enhancement project at Illinois River miles 124-128, including Federal construction, planning, engineering and design, and construction management costs. The current working estimate prepared for this Definite Project Report level study was developed after review of project plans, discussion with the design team members, and review of costs for similar construction projects. The Micro-Computer Aided Cost Estimating System (M-CACES), incorporating local wage and equipment rates, was used to assemble and calculate project element costs. Costs, including appropriate contingencies, are presented in accordance with EC 1110-2-536, Civil Works Project Cost Estimating - Code of Accounts.

D-2. PRICE LEVEL.

Project element costs are based on February 1991 prices. These costs are considered fair and reasonable to a well-equipped and capable contractor and include overhead and profit. The Fully Funded Estimate (FFE) was calculated in accordance with guidance from CECW-B, dated March 3, 1990, Factors for Updating Study/Project Cost Estimates for FY 1992 Budget Submission.

D-3. CONTINGENCY DISCUSSION.

After review of project documents and discussion with personnel involved in the project, cost contingencies were developed which reflect the uncertainty associated with each cost item. Per EC 1110-2-263, these contingencies are based on qualified cost engineering judgment of the available design data, type of work involved, and uncertainties associated with the work and schedule. Costs were not added to contingency amounts to cover items which are identified project requirements. The following discussion of major project features indicates the basis for contingency selection and

assumptions made. For other elements not addressed below, the assignment of contingencies was deemed appropriate to account for the uncertainty in design and quantity calculation, and further discussion is not included.

a. **Feature 06, Fish and Wildlife Facilities.** The quantities for this work were developed by Design Branch.

06.-.-.- **Upper Lake Water Control, Pump Station.** The pump station is located in a remote area. Access during construction is along the top of an existing levee which must be constructed into a temporary access road. This temporary road, which is about 3 miles long, will be used to deliver materials and supplies for the pump station construction. Parking is limited at the construction site, and it is assumed that workers will walk or be taxied to the site along the deteriorated cross dike which is 1 mile long. These factors were considered in assigning productivities for the work items. Historical data were used for pricing the pump and discharge line. Available soil borings show the station to be founded on suitable material. Piling or over-excavation of unsuitable material and extensive structural backfill are not anticipated. Dewatering is estimated at 2 months time during construction of the station and is assigned a 25-percent contingency. An overall contingency of 17.5 percent is considered to be satisfactory for the pump station construction.

06.-.-.- **Northern Levee Repair.** This work involves upgrading the existing levee. After clearing and grubbing operations, a dragline will excavate adjacent borrow and place it on the levee for shaping. No compaction is required other than that obtained by tracked equipment working the area. Prior to borrow operations, unsuitable topsoil will be removed and stockpiled. These routine construction activities are given a 20 percent contingency. Riprap is given a 30 percent contingency to account for unknown haul distance and unit price adjustments for difficult site access. An overall contingency of about 21 percent is considered adequate for this work.

06.-.-.- **Cross Dike Repair.** This work is similar to the Northern Levee Repair. An existing breach in the cross dike will be filled by dozers pushing material from the adjacent levee. The remaining fill for constructing the cross dike will be placed by dragline, excavating material from an adjacent ditch borrow. Compaction will be by dozers shaping the material. Erosion control matts will be placed to protect the embankment, which will serve as a permanent roadway to the pump station. This work requires routine construction operations, and an overall contingency of about 20 percent is considered to be adequate.

06.-.-.- **Upper Lake Gravity Outlet.** This gatewell type structure is similar to many others constructed. Other than uncertain dewatering expenditures and potential variance in riprap price, as discussed before, this work uses standard construction techniques. An overall contingency of 18 percent is assigned this work.

06.-.-.- Modification of Existing Radial Gate Structure. This work involves rehabilitating and modifying an existing gate structure at the upper end of the project. No unusual construction techniques or materials are anticipated. Modification of the structure includes raising the sill with reinforced concrete about 4 feet to meet project elevation requirements. The raised sill will form eight openings to be covered with new trash racks with provisions for adding stoplogs. Site preparation will include provisions for dewatering, although the sill work is about 4 feet higher than flat pool. Also included will be positioning or temporary removal of the existing radial gates for work to progress. This work and the riprap cost are assigned a 30 percent contingency. All other work, including new gate lifting machinery, is given a 20 percent contingency. An overall contingency of about 24 percent is considered to be adequate for this work.

06.-.-.- Lower Lake Water Control, Stop Log Structure. This structure is located in a remote area like the pump station, but access should be easier. No major foundation problems are expected, but a 25 percent contingency is used for the structural backfill to account for type and quantity of fill needed. Dewatering has a 25 percent contingency to allow for an increase in amount or duration needed. An overall 17 percent contingency is considered satisfactory for this structure.

06.0.5.B Lower Lake Excavation. This work involves excavating and sidecasting material. Discussion with the project engineer indicates this work will be done by floating plant. Estimated equipment includes a dragline working from portable barges. A 25 percent contingency is used to account for differing site conditions and unexpected difficulties in overland mobilization of portable barges.

06.-.-.- Boat Ramp Replacement. A 25 percent contingency is used for this work to account for unexpected costs in replacing an existing single lane boat ramp and parking lot. Historical costs were used in evaluating the cost of this work.

06.-.-.- Side Channel Excavation. This work requires long boom equipment. Previous and recent contacts with contractors having such equipment show an interest by them to bid this work. The unit price is estimated based on using 180-foot boom equipment with a 6-cubic-yard clamshell bucket working from a spudded barge 24 hours a day. A 15 percent contingency is used to allow for part-time use of land-based equipment for any needed material handling or shaping. The rockfill and riprap placement has a 15 percent contingency to account for material price and haul distance. The unit prices for these items assumes barge delivery.

The average contingency for the project's construction is 18.9 percent.

b. **Feature 30, Planning, Engineering & Design.** The engineering and design for this project includes all planning and design work necessary to complete the Definite Project Report and construction plans and specifications. This cost also includes engineering support during construction,

preparation of as-built drawings, and operation and maintenance manuals. The design effort for the construction was analyzed to determine the man-year effort required. This estimate is based upon monies expended to date, discussions between the project engineer and project manager, and historical data and experience gained on other projects of similar nature.

c. **Feature 31, Construction Management.** Construction management is studies and analyses of project report, plans and specifications, and conferences of construction staff to become familiar with design requirements; biddability, contractibility, and operability reviews; preaward activities to acquaint prospective bidders with the nature of work; administration of construction contracts; administration of A/E contracts which provide for supervision and inspection; establishment of bench marks and baselines required for layouts of construction, relocations, and clearing; review of shop drawings, manuals, catalog cuts, and other information submitted by the construction contractor; assure specifications compliance by supervision and inspection on construction work, conferences with the contractors to coordinate various features of the project and enforce compliance with schedules; sampling and testing during construction phase to determine suitability and compliance with plans and specifications; negotiate with the contractor on all contract modifications, including preparation of all contract documents required therefor; estimate quantities, determine periodic payments to contractors, and prepare, review, and approve contract payments; review and approve construction schedules and progress charts; prepare progress and completion reports; project management and administration not otherwise identified; and district overhead. These costs may be incurred at the job site, an area office, or at the District Office. For the construction of the Chautauqua Lake Rehabilitation and Enhancement EMP project, the estimated cost of construction management is $245,000 for a construction contract with a year and a half duration and an estimated value of $3.7 million.

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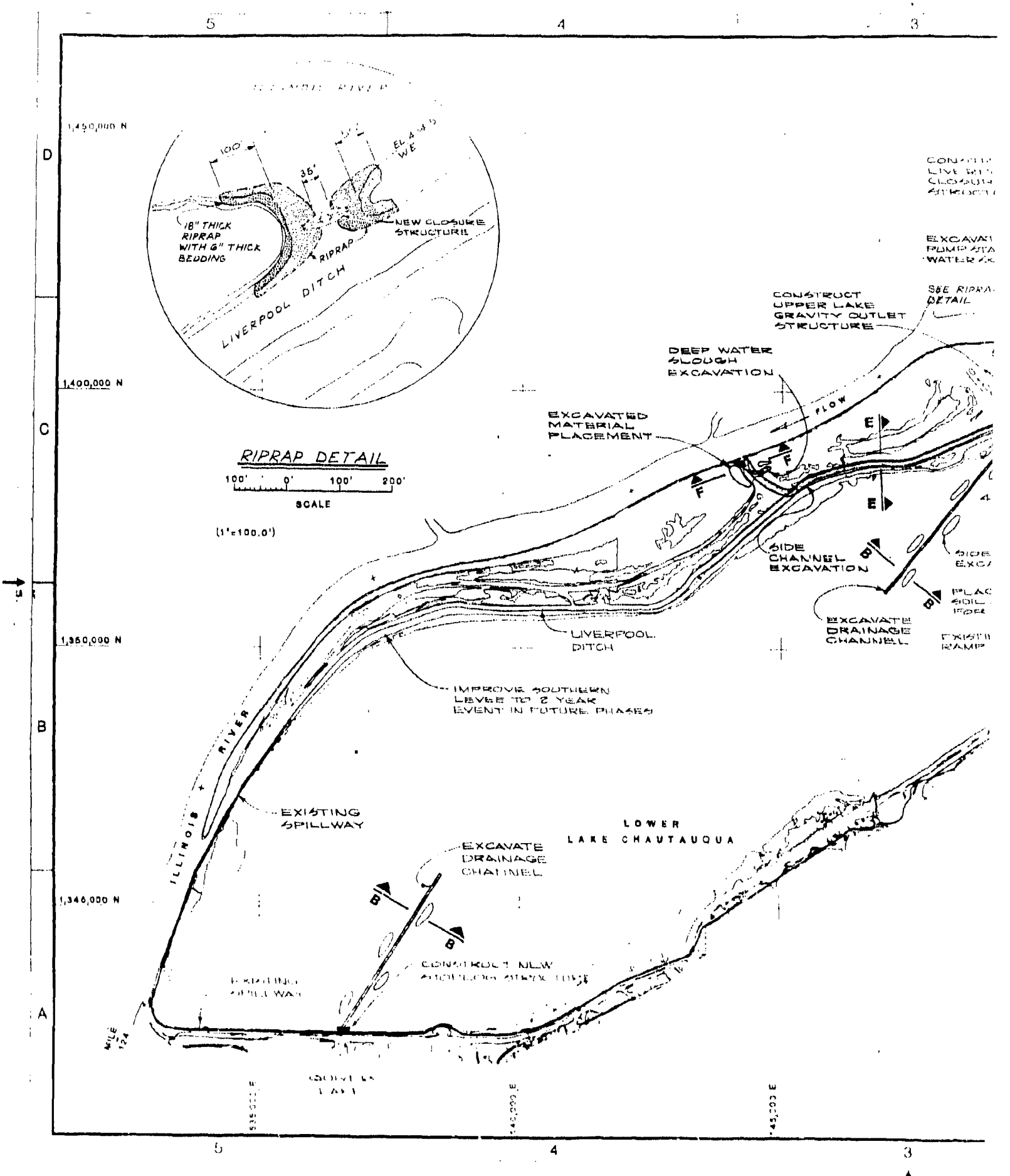
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18" THICK RIPRAP WITH 6" THICK BEDDING
RIPRAP
NEW CLOSURE STRUCTURE
LIVERPOOL DITCH
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(1"=100.0')
CONSTRUCT UPPER LAKE GRAVITY OUTLET STRUCTURE
SEE RIPRAP DETAIL
DEEP WATER SLOUGH EXCAVATION
EXCAVATED MATERIAL PLACEMENT
FLOW
E
F
SIDE CHANNEL EXCAVATION
B
EXCAVATE DRAINAGE CHANNEL
LIVERPOOL DITCH
IMPROVE SOUTHERN LEVEE TO 2 YEAR EVENT IN FUTURE PHASES
ILLINOIS RIVER
EXISTING SPILLWAY
LOWER LAKE CHAUTAUQUA
EXCAVATE DRAINAGE CHANNEL
CONSTRUCT NEW
EXISTING SPILLWAY
MILE 124
SOUTH TAP
535,000 E
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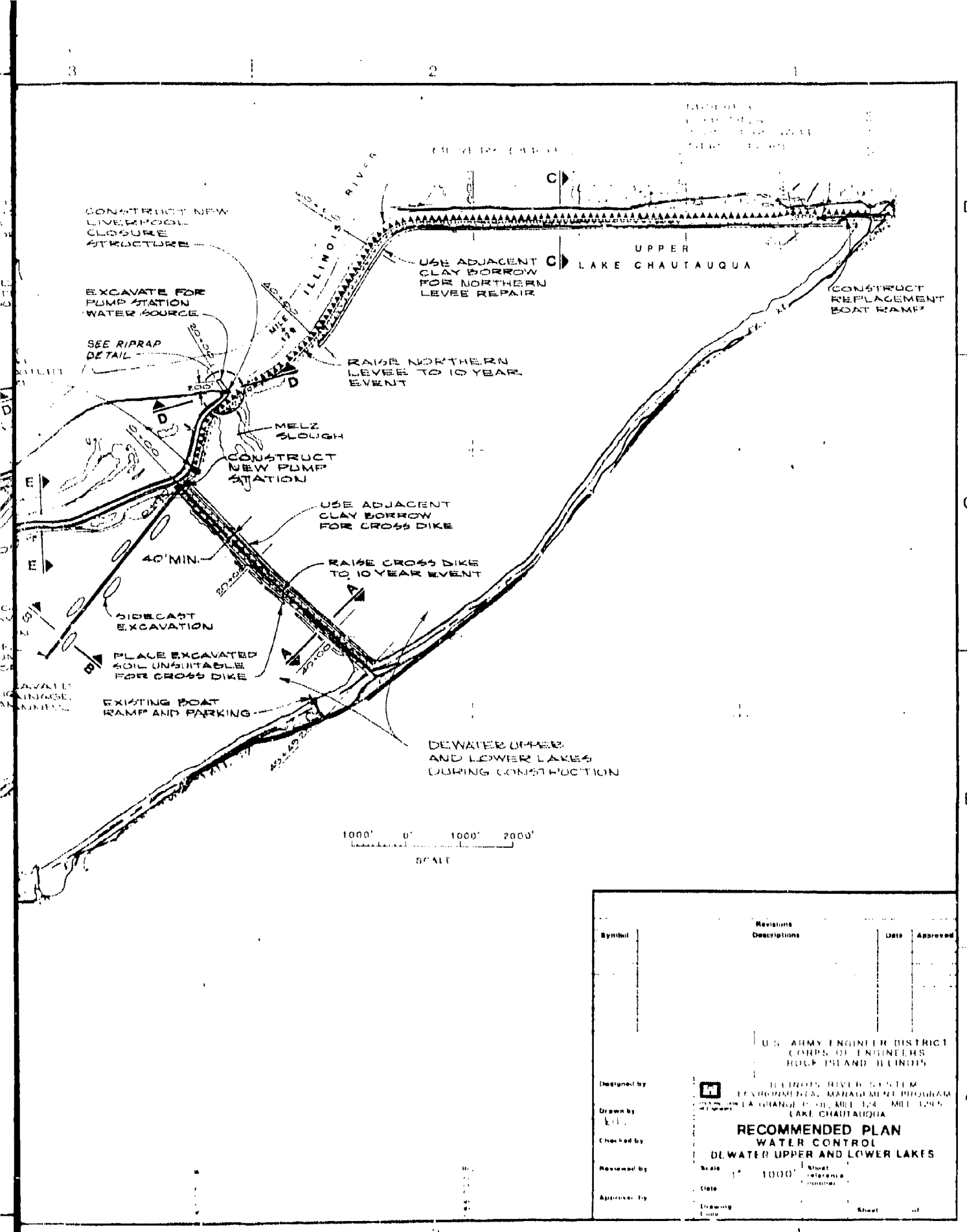

Symbol	Revisions Descriptions	Date	Approved

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
LA GRANGE POOL, MILE 124 - MILE 129.5
LAKE CHAUTAUQUA

RECOMMENDED PLAN
WATER CONTROL
DEWATER UPPER AND LOWER LAKES

Scale 1" = 1000'

Date

Drawing Code

Sheet reference number

Sheet of

PLATE 2