UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17PR)
PUBLIC REVIEW DRAFT

RICE LAKE STATE FISH AND WILDLIFE AREA HABITAT REHABILITATION AND ENHANCEMENT PROJECT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

1. INTRODUCTION

A. Location. The Rice Lake State Fish and Wildlife Area (SFWA) is a 6,800 acre wildlife management area located on the right descending bank of the Illinois Waterway's LaGrange Pool, approximately four miles downstream of Banner, Illinois, between River Miles (RM) 132.0 and 138.0. It is located in Fulton County, Illinois, approximately 24 miles southwest of Peoria, Illinois. The Rice Lake SFWA is managed by the Illinois Department of Natural Resources (ILDNR) to provide quality nesting and mid-migration habitat for migratory and resident waterfowl. The project area is comprised of several backwater lakes, wet floodplain forests, and floodplain agricultural fields. The agricultural fields are located on a large tract of floodplain (Duck Island) that separates the two largest lakes, Rice and Big Lake. Plate 1 provides vicinity and general location maps for Rice Lake SFWA.

B. Purpose. The purpose of this report is to present a detailed proposal for the rehabilitation and enhancement of the Rice Lake SFWA project area. This Definite Project Report (DPR) provides planning, engineering, and sufficient construction details of the recommended plan to allow final design and construction to proceed subsequent to approval of this document.

C. Resource Problems and Opportunities. The Rice Lake SFWA has historically been excellent fisheries and mid-migration waterfowl habitat, but summer flood spikes and the loss of deep water habitat and mast trees has reduced the quality and quantity of habitat available to resident and migratory wildlife and fish species.

The summer flood spikes can kill the vegetation growth on low lying areas that then are unavailable to migratory waterfowl in the fall months. Sedimentation has resulted in the loss of deep water habitat used by fisheries for various life stage needs, including overwinter survival. Mast tree losses can be attributed to the magnitude and duration of the 1993 flood event, which has caused a change in species composition to less valuable species such as silver maple.

This report evaluates opportunities to restore and protect habitat for resident and migratory birds, wildlife, and fish species in existing backwaters of the Rice Lake SFWA.

D. Project Selection. The ILDNR nominated the Rice Lake SFWA Habitat Rehabilitation and Enhancement Project (HREP) for inclusion in the Corps' Environmental Management Program (EMP). The Fish and Wildlife Interagency Committee (FWIC) then ranked the project habitat benefits based on critical habitat needs along the Mississippi River and Illinois Waterway. After considering resource needs and deficiencies pool by pool, the Rice Lake SFWA HREP was recommended and supported by the FWIC and the River Resources Coordinating Team (RRCT) as providing significant aquatic, wetland, and floodplain benefits with opportunities for habitat enhancement. Development of this report was actively coordinated with the project sponsors - the ILDNR and the U.S. Fish and Wildlife Service (USFWS). Coordination occurred during on-site visits to the project area, team meetings, and phone conversations (see Appendix A - Correspondence).

E. Scope of Study. The scope of this study focuses on proposed project features that would improve aquatic, wetland, and floodplain habitat and enhance overall resource values. The project is consistent with agency management goals and was planned for the benefit of resident and migratory birds, fish, and other wildlife.

Field surveys, aerial photography, and habitat quantification procedures were completed to support the planning and assessment of proposed project alternatives. Hydrographic soundings were performed in developing sedimentation rates and estimating excavation quantities. Soil borings were taken to determine sediment types and construction difficulty. Baseline water quality monitoring was performed to define present water quality conditions/problems.

The ILDNR has made wildlife and resident fish observations within the study area. These observations, along with future studies and monitoring, will assist in evaluating project performance.

F. Format of Report. The report is organized to follow a general problem-solving format. The purpose, problems, and project selection process are presented in Section 1. Section 2 establishes the baseline for existing resources. Section 3 provides the goals and objectives of the project. Sections 4 and 5 propose and evaluate project alternatives. Section 6 describes the recommended plan and lists general design and construction considerations. Section 7 describes the schedule for design and construction. Section 8 contains cost estimates for initial construction and annual operation and maintenance. Section 9 assesses the environmental effects of the recommended plan. Section 10 details performance evaluation and monitoring plans. Section 11 describes real estate requirements. Sections 12 and 13 summarize implementation requirements and coordination. Sections 14 and 15 present the conclusions and recommendations. Section 16 contains a Finding of No Significant Impact statement. Drawings (listed on plate 2) and appendices have been furnished to provide sufficient detail to allow review of the existing features and the recommended plan.

G. Authority. The Upper Mississippi River System - Environmental Management Program's (UMRS-EMP) original authorizing legislation was the Water Resources Development Act (WRDA) of 1986 (P.L. 99-662). Section 1103 of this act states: "To ensure the coordinated development and enhancement of the Upper Mississippi River system, it is hereby declared to be the intent of Congress to recognize that system as a nationally significant ecosystem and a nationally significant commercial navigation system. Congress further recognizes that the system provides a diversity of opportunities and experiences. The system shall be administered and regulated in recognition of its several purposes". The EMP was originally comprised of five elements: Habitat Rehabilitation and Enhancement Projects (HREPs); Long-Term Resource

Monitoring Program (LTRMP); Recreation Projects; Economic Impacts of Recreation; and Navigation Monitoring. Currently, EMP is comprised of two elements (1) plan, construct, and evaluate measures for fish and wildlife habitat improvement through HREPs; and (2) monitor the natural resources of the river system through the LTRMP. The other EMP elements have either been successfully completed or are now carried out under other authorities.

The original authorizing legislation has been amended three times since its enactment. The 1990 WRDA, Section 405, extended the original EMP authorization an additional five years to fiscal year 2002, which allowed for ramping up of the program. The 1992 WRDA, Section 107, amended the original authorization by allowing limited flexibility in how funds are allocated between the habitat projects program and the long-term resource monitoring program. WRDA 1992 also assigned sole responsibility for operation and maintenance of habitat projects to the agency that manages the lands on which the project is located. The 1999 WRDA, Section 509, reauthorized EMP as a continuing authority with reports to Congress every six years and changed the cost sharing percentage from 25 percent to 35 percent. The Rice Lake SFWA is located on state owned land managed by the ILDNR and is subject to a 35 percent cost-sharing requirement.

2. ASSESSMENT OF EXISTING RESOURCES

A. Resource History of Study Area. The Illinois Waterway historically functioned as a significant resting and foraging area for waterfowl during spring and fall migration. The shallow floodplain lakes provided abundant aquatic and emergent vegetation utilized as food and cover by diverse species of fish, water birds, and other animals. The wide floodplain also supported extensive bottomland forests with a substantial number of pin oaks, pecan, and hickories. This rich and diverse combination of food and cover supported large populations of waterfowl, fishes, and other wildlife. For these reasons, the Illinois Waterway was once considered one of the most productive riverine systems for fish and wildlife in North America.

B. Description of Project Area and Current Management. The Rice Lake SFWA is located in the LaGrange Pool of the Illinois Waterway. The project area is a complex of natural backwater lakes, sloughs, and floodplain lands located on the west side of the Illinois Waterway between approximate River Miles 132.0 and 138.0, on the east side of U.S. Route 24 in Fulton County. Figure 2-1 shows the dominant land cover types in the La Grange Pool and the Rice Lake SFWA. The project area is located adjacent to and immediately downstream of the Banner Marsh SFWA, the location of another recently constructed HREP.

Rice Lake SFWA encompasses approximately 6,800 acres of the floodplain. Rice Lake, Big Lake, Beebe Lake, and Goose Lake are the principle water bodies. Currently, Big Lake, Goose Lake, Beebe Lake, and the quarry are open to the Illinois Waterway and maintain approximately the same water elevation as the river. Rice Lake has the capability to be held higher (with pumping) because of the Narrows Dam (top elevation 439.0), which separates Rice Lake from Big Lake. The project area also includes several smaller, separate, wetland management units that are managed for native moist-soil vegetation and planted wildlife food crops. The remaining project area is covered by agricultural fields, an active gravel quarry, or bottomland hardwood forest typical of the Illinois Waterway Valley

The Rice Lake SFWA began with an initial purchase of 2,370 acres of land in 1945, through Federal assistance under the Pittman-Robertson Act. The area was designated as a refuge for migratory waterfowl with a portion open to hunting. Additional parcels of land acquired during the 1950s through the early 1980s increased the total acreage to approximately 2,700 acres. The purchase of two major waterfowl clubs in 1986 (2,900 acres) expanded the Rice Lake SFWA to approximately 5,600 acres at the beginning of the HREP planning process.

Following initiation of HREP planning and design, the ILDNR acquired Duck Island, which was a 1,200 acre private inholding that was nearly surrounded by ILDNR owned project lands. Duck Island is a natural floodplain ridge that separates Rice Lake to the west and Big and Goose Lakes on the east. Approximately 600 acres of this property had been leased for agricultural use and is currently planted in row crops (corn and soybeans) during the growing season. A tenant aggregate mining operation encompassing some 300+ acres is also located on Duck Island.

Primary human uses of the Rice Lake SFWA to date have been wildlife observation, waterfowl hunting, sport fishing, camping, and commercial fishing. Constructed facilities for public use include a camping area, a boat channel with floating docks and concrete launching ramp, parking areas, a public access road, administrative and maintenance buildings, and service roads. Most of these facilities are located on the west side of the project area adjacent to U.S. Highway 24. Existing water control structures and other facilities currently operated for habitat management purposes include the Narrows Dam, a pump station used to move water from the Illinois Waterway into Rice Lake, and a number of low water control levees, gated outlets, and drainage ditches associated with the smaller management units. The remnants of a water control berm (known

locally as the Hate Levee) are located at the southern end of Goose Lake. This structure was largely eradicated by repeated flooding and has been nonfunctional since the ILDNR acquired the property it occupies.

The Narrows Dam, located between Rice Lake and Big Lake, is operated by the ILDNR for the benefit of migratory waterfowl. When the stoplogs are removed, the Dam allows for summer drawdowns to promote vegetation growth and when the stoplogs are in, water levels can be maintained up to a 439.0 elevation. The existing 50,000 gpm pump station, located near Copperas Creek, is used to gradually fill Rice Lake over a 21-day period during the fall waterfowl migration. The pump station lies on the downstream end of a 3,900 ft access channel from the Illinois Waterway. This access channel requires periodic dredging every three years to supply adequate water to the pump station. Acceptable placement of this dredged material is becoming an increasing problem as historic adjacent placement may no longer be feasible.

C. Wetland Resources. The topography of the Rice Lake SFWA is primarily a low, relatively flat floodplain landscape that is characterized by a mosaic of backwater lakes, sloughs, floodplain forest, mud flats, and managed fields. Examination of National Wetland Inventory (NWI) maps of the project area indicates that most of the present acreage of the Rice Lake SFWA is classified as palustrine or lacustrine wetland. Big Lake, Rice Lake, and the smaller permanent water bodies comprise over half (>2000 acres) of the total wetland acreage. In addition, over 1,500 acres of nonforested wetland are subject to seasonal or temporary flooding on an annual basis. Annual grasses and forbs dominate the vegetative cover on the majority (>1200 acres) of these areas, with perennial emergents covering less than 10 percent of the non-forested wetland acreage (see Figure 2-1). Several hundred acres of exposed mud flats are normally present during low river stages.

The project area is a haven to numerous species of wildlife, and hosts thousands of migrating waterfowl, herons, and shorebirds. Strategically located within the Illinois Waterway Valley flight corridor of the Mississippi Flyway, this area and other sites in the immediate region are famous as historic resting areas for waterfowl and shorebirds on both their spring and fall migrations to and from their breeding grounds in Canada and their wintering grounds in the Mississippi delta, along coastal marshes, and Central and South America. Historically, the Illinois Waterway Valley has been one of the most important migration areas for mallards in the United States.

A large variety of birds utilize the project area during some part of their annual life cycles. Two hundred thirty-eight species of birds were reported for the Rice Lake SFWA during the 1987-97 periods. Waterfowl species are perhaps the most easily recognized due to their high visibility and recreational and economic value. A mean annual total of 2,517,100 duck use-days were recorded for the project area during the period 1975-1987, as reported in annual aerial inventories conducted by the Illinois Natural History Survey (INHS). The project area also provides extremely important foraging habitat for wading birds such as herons and egrets, and shorebirds such as sandpipers and yellowlegs. In 1997, the ILDNR nominated the Rice Lake SFWA for listing in the Important Bird Area (IBA) program administered by the American Bird Conservancy in cooperation with BirdLife International, a partnership of non-governmental organizations (NGOs) from around the world with a shared interest in bird conservation.

Migration during fall and spring is an energy-demanding activity for birds. Migrants need access to nutritious foods and rest at stopover areas to replenish reserves and satisfy the energetic costs of migration. As a result, waterfowl rely on diverse habitats at mid-migration latitudes to satisfy nutritional needs of various events during their annual cycle. Consequently, wetland programs for waterfowl in Illinois generally are directed at providing mid-migration habitat (Havera 1996).

Bellrose et al. (1979) reported that in the late 1930s some duck clubs in the Illinois Waterway Valley

began to use moist-soil management as a way to attract ducks to their property. Frederickson and Taylor (1982) defined moist-soil management as the manipulation of soil and water to produce food and cover in areas that experience seasonal flooding. The primary objective of moist-soil management is to mimic the natural (historic) water regime by lowering water levels during summer to expose mudflats for germination and growth of native annual plants typically found in seasonally flooded wetlands (generally referred to as “moist-soil” vegetation). Controlling the frequency, timing, length, and depth of water level manipulations can provide necessary habitat resources and conditions at times coincident with migration and other events in the annual life cycle of waterfowl. Moist-soil management continues to be one of the most effective techniques for managing migratory waterfowl habitat on public and private lands.

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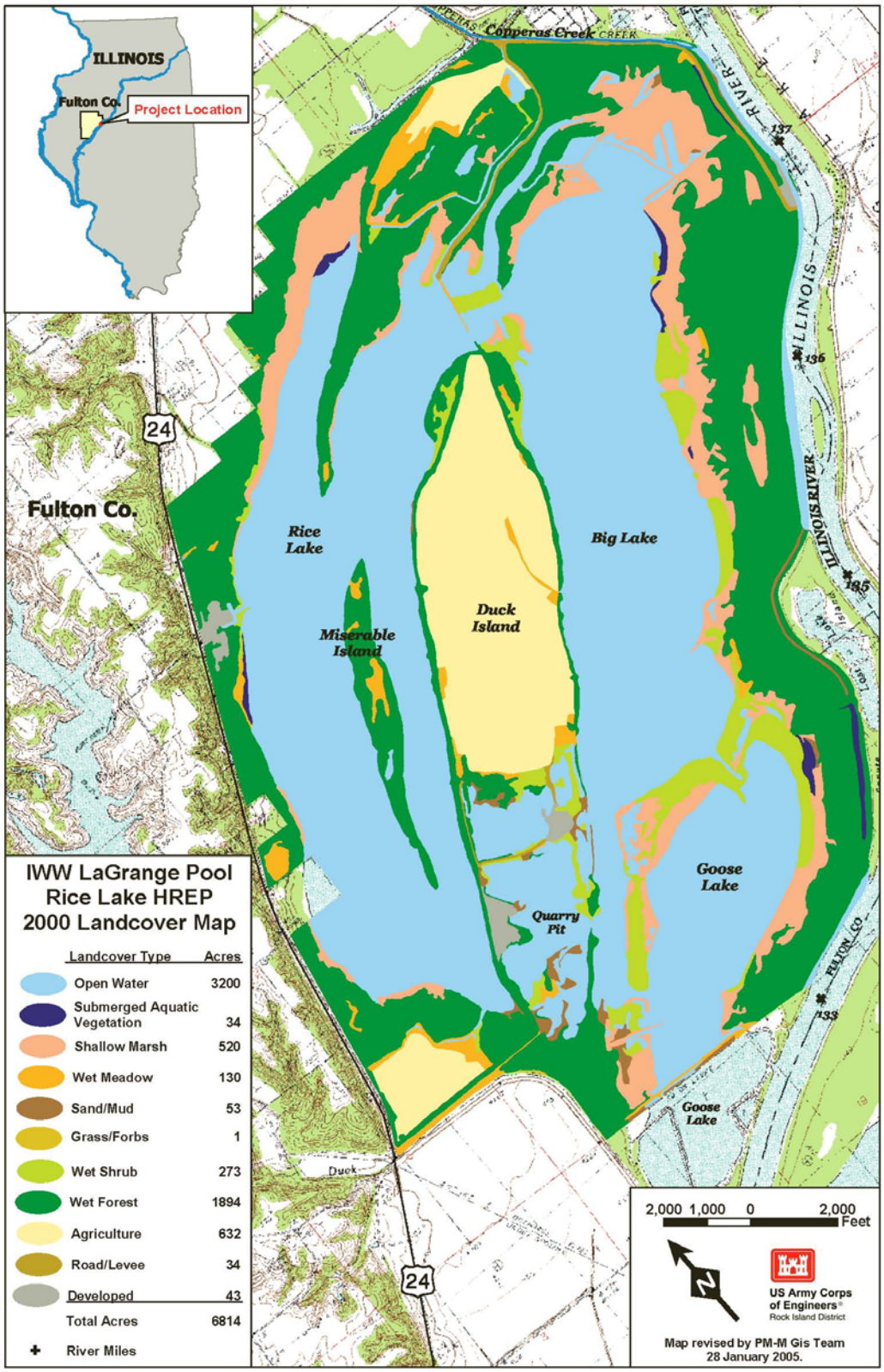

Figure 2-1 – 2000 Land Cover/Land Use, Rice Lake State Fish and Wildlife Area

D. Floodplain Resources. Wet floodplain forest, represents the largest single land cover type in the Rice Lake SFWA (approximately 1,854 acres of the project area). Dominant species include silver maple, cottonwood, green ash, and American elm. The majority of the forested area is composed of pole size to sawlog size material with limited reproduction. Willows and silver maples have invaded the shallow areas of Big Lake and Goose Lake due to the inability to control water levels in these areas. A small percentage of other desirable native species such as pin oak, basswood, river birch, box elder, mulberry, and pecan are also reported as occurring on areas of higher elevation in the project area.

The project area also provides habitat for a number of mammal species. Game and furbearing mammals important to the study area include fox squirrel, rabbit, woodchuck, white-tailed deer, muskrat, raccoon, opossum, skunk, mink, red fox, coyote, and beaver. Small mammal species collected during a 1987 survey of the project area included short-tailed shrew, least shrew, thirteen-lined ground squirrel, western harvest mouse, deer mouse, white-footed mouse, meadow vole, prairie vole, house mouse, little brown bat, Keen's bat, big brown bat, and red bat.

E. Aquatic Resources. The principal water bodies within the project area are Rice Lake, Big Lake, Goose Lake, Slim Lake, and Beebe Lake. These shallow backwater lakes are sustained primarily by groundwater seepage and overflow from the Illinois Waterway. The only deepwater areas within the project area boundary are located in the quarry at the downstream end of Duck Island. Because the Rice Lake SFWA is not separated from the Illinois Waterway by a high levee, its fish populations fluctuate in composition, numbers, and condition as the area is alternately flooded and dewatered by river levels. The basin of Rice Lake is broad and dish-shaped, constraining the quality and quantity of year-round fish cover. Ongoing water level management activities involve midsummer drawdowns to promote moist-soil plant production. As a result, water levels in Rice Lake during July and August are typically no more than 12-16 inches, with water temperatures during drawdown approaching 90 degrees Fahrenheit (F). These conditions severely limit both the composition and survival of fish populations.

Most fish species found in the project area are common to the La Grange Pool of the Illinois Waterway. Thirty-six fish species have been collected from the waters of the Rice Lake SFWA during recent years. Random sampling of Rice Lake conducted during 1991 and 1992, as part of the EMP's Long-Term Resource Monitoring Program (LTRMP), collected 15 species. LTRMP sampling of Big Lake, Goose Lake, Beebe Lake, and the Duck Island quarry during 1994 and 1995 yielded 35 species and one hybrid. The ILDNR's district fisheries biologist reported that several paddlefish were documented as occurring in this area during 1995 and three radio-tagged largemouth bass were documented traveling between Havana and the Duck Island quarry.

F. Water Quality. Baseline water quality monitoring studies conducted at the Rice Lake SFWA from May 1987 through February 1994 have shown that, on occasion, pH values exceed 9.0 and dissolved oxygen concentrations fall below 5 mg/l. Periodic extreme plant photosynthesis/respiration would appear to be the primary factors contributing to these events. The shallow nature of the lakes coupled with the aquatic vegetation present most likely result in wide swings in pH values and dissolved oxygen concentrations during a typical summer day. A combination of resuspended bed material and algal biomass appears to be causing the lakes' relatively high suspended solids concentration. A more detailed analysis of baseline water quality monitoring results can be found in Appendix F.

G Endangered Species. The following is a list of Federally-endangered species known to occur in Fulton County:

Status	Common Name	Scientific Name
Threatened	Bald eagle	*Haliaeetus leucocephalus*
Threatened	Decurrent false aster	*Boltonia decurrens*
Endangered	Indiana bat	*Myotis sodalist*

The bald eagle occurs in the vicinity of Rice Lake during winter months, and in 1997 an active bald eagle nest was located within the SFWA, which produced two fledglings. A portion of the Rice Lake SFWA has been designated as a significant winter roost site, and the present management plan provides for a refuge area for the species.

Decurrent false aster prefers disturbed, open sites of the Illinois Waterway floodplain. This species is under management at the Rice Lake SFWA and is present in two portions of the project area.

The Indiana bat may roost and forage for insects along the Illinois Waterway floodplain during spring and summer months. No records of the species are known for Fulton County, but the USFWS lists the bat as potentially occurring statewide in Illinois, and suitable habitat for the species exists in the floodplain forests of the study area.

At least 10 State listed endangered or threatened species (in addition to the bald eagle) have been recorded on the complex. These species are:

osprey (*Pandion haliaetus*)
little blue heron (*Florida caerulea*)
peregrine falcon (*Falco peregrinus*)
Wilson's phalarope (*Steganopus tricolor)*
American bittern (*Botaurus lentiginosus*)
black tern (*Chilidonias niger*)
black rail (*Laterallus jamaicensis*)
piping plover (*Charadrius melodus*)*
Mississippi kite (*Ictinia mississippiensis*)
black-crowned night heron (*Nycticorax nycticorax*)

*Note: the piping plover is a Federally listed species that has been reported as a rare sighting on the complex and in nearby refuge areas during migration periods, but the USFWS does not list this species for Fulton County and there is no known breeding habitat for the species in the project area.

H. Historic Properties. The Corps coordinated the project features with the ILDNR and the Illinois Historic Preservation Agency (IHPA) requesting comments concerning the possible effects of the project on historic properties. Correspondence from the IHPA, dated July 20, 1995 (Appendix A, IHPA LOG #950706004P-F), deferred comment to the ILDNR.

The ILDNR provided copies of cultural resource management reports documenting historic properties (Schroeder 1990, 1991, 1994). These reports document numerous archeological historic properties. These previously documented historic properties were avoided during the design of this HREP.

In July 1993, the IHPA and the Corps determined that portions of the Illinois Waterway Navigation Channel, from RM 80.2 to 327.0, were determined eligible for listing on the National Register of Historic Places. The Corps and the IHPA have undertaken investigations to determine significant elements and structures within the system.

As a result of the previous study (IHPA & Corps 1993), it is the preliminary opinion of the Corps that the Copperas Creek lock is eligible for the National Register of Historic Places, as documented in Rathbun Associates (1996).

In order to meet the requirements for historic properties identification as set out in 36 CFR Part 800.4 of the Advisory Council on Historic Preservation rules implementing Section 106 of the National Historic Preservation Act, the Corps contracted for the cultural resource survey report by Illinois State Museum (1996), This report investigated 177.87 hectares (439.5 acres) not covered by previous cultural resource studies conducted by the Illinois State Museum and others. The results of the Illinois State Museum (1996) investigation are discussed in Section 9D of this report.

I. Sedimentation. Backwater lakes on the Illinois Waterway from Peoria Pool down to Alton Pool, including Rice Lake, have experienced varying levels of sedimentation since 1903, resulting in significant loss of water depth and capacity. Previous studies have attempted to estimate sedimentation rates in these lakes. Demissie et al. found that sedimentation rates varied based on "lake location with respect to the river, the significance of local sediment inputs, and lake geometry." These rates varied from pool to pool, as well as among lakes in the same pool. Lee and Stall examined four backwater lakes, two in greater detail, and found average sedimentation rates ranging from 0.18 in/year (Swan Lake) to 0.59 in/year (Lake DePue). Demissie et al. used Lee and Stall's findings to estimate an average rate of 0.32 in/year in Rice Lake. This rate is similar to other backwater lakes in La Grange Pool, and is probably an accurate estimate of historical sedimentation.

J. Hazardous, Toxic, and Radioactive Waste. A hazardous, toxic, and radioactive waste (HTRW) site assessment was conducted. The project is located in an area that primarily is and historically has been agricultural, quarry, and outdoor recreational land. There is little evidence that the land has been used for other purposes. There were no obvious indications of potential contamination sources or migration pathways from surrounding properties. It does not appear that there is a risk of hazardous, toxic, or radioactive waste contamination within the project area.

3. PROJECT OBJECTIVES

A. Problem Identification. Over the past century, increased human activity within the Illinois Waterway basin, floodplain, and channel has altered the hydrology, topography, and biotic communities originally present in the project area. These alterations have reduced native plant and animal populations, degraded the quality of remaining natural resources and plant communities, impaired ecosystem functions, and threaten the future sustainability of the river-floodplain ecosystem.

1. Wetland Habitat Problem: Decreased Reliability of Seasonal Food and Cover for Migratory Birds. Alterations of the historic water level regime within the past 70 years have limited the ability of the project area to produce and sustain the native plant community that historically dominated the region and provided habitat for the diverse native wildlife community. Recreating the natural river stage cycle through a combination of active and passive water level management measures is critical to the restoration and protection of natural floodplain and aquatic habitats. Seasonal flooding and dewatering of the lake areas and management units of the Rice Lake SFWA are essential to provide the conditions necessary to promote growth of important native annual plants, which serve as a food resource and seasonal resting area for migratory waterfowl and shorebirds.

Existing facilities at the Rice Lake SFWA provide only very limited water level control capability on Rice Lake and some of the smaller moist-soil management units. Because no facilities for water level management currently exist on Big Lake and its associated management units, water levels in these portions of the project area are entirely controlled by the stage of the Illinois Waterway. Unseasonable midsummer fluctuations in river stage that result from the landscape modifications discussed above frequently prevent or reduce growth of annual native food plants in the area.

2. Aquatic Habitat Problem: Loss of Fish Access to Deep Aquatic Habitat During Low Water Periods. Historically, the frequency and duration of Illinois River flooding has increased over time as upstream development has intensified the rate of runoff. According to a 1979 study conducted by the INHS, increased siltation is reducing water depths in both Big Lake and Rice Lake. While fish isolated from the river in Big Lake during summer low-water periods have access to deepwater areas in the Duck Island quarry, Rice Lake has no interior deepwater areas and no access to the quarry or the river when water levels fall below 439.0 NGVD (the top elevation of the Narrows Dam). Currently, fish that move into Rice Lake during high water events and fail to move out during falling river stages have no avenue of escape from high temperatures or low DO levels, greatly increasing the potential for fish kills. Fish kills may also increase the potential for outbreaks of avian botulism, which can cause mortality in resident and migratory waterbird populations. Avian botulism outbreaks have occurred in the nearby Lake Chautauqua Refuge following fish kills caused by drawdowns for moist soil unit operation. No outbreaks have occurred at Rice Lake SFWA, but conditions similar to Lake Chautauqua could occur if fish have no escape route to deeper water areas.

Avian botulism is a paralytic disease of birds caused by ingestion of a toxin produced by the bacteria, *Clostridium botulinum*. This bacterium is widespread in soil and requires warm temperatures, a protein source, and an anaerobic (depleted oxygen) environment in order to become active and produce toxin. Birds either ingest the toxin directly or may eat invertebrates containing the toxin. A cycle develops in a botulism outbreak when maggots feed on animal carcasses and ingest toxin. Birds that consume toxin-laden maggots can then develop botulism. Birds with the disease are unable to use their wings and legs normally or control other muscles. Birds with

paralyzed neck muscles cannot hold their heads up and often drown. Death can also result from water deprivation, electrolyte imbalance, respiratory failure, or predation.

These conditions reduce the ability of the Rice Lake SFWA aquatic areas to contribute to the long-term sustainability of the larger Illinois Waterway aquatic ecosystem.

3. Floodplain Habitat Problem: Decreased Acreage and Diversity of Native Floodplain Vegetation as Habitat for Resident and Migratory Wildlife. Historic conversions of floodplain forest and wet prairie lands in the Illinois Waterway floodplain to agricultural use reduced the quantity and quality of both mesic bottomland forest and grassland/wet-meadow habitats. In addition, the existing pin oak population within the Rice Lake SFWA was extensively damaged if not eradicated by severe flooding during 1993 and 1995. Lack of mast-tree regeneration, reduction of species diversity, and increased tree mortality can be directly attributed to the increase in flood frequency and duration over time. These past losses in habitat value limit the present and future ability of the project area to attract and support a diverse community of resident and migratory wildlife species.

B. Resource Significance. The UMRS represents the largest riverine ecosystem in North America and the third largest in the world. The UMR ecosystem encompasses over 2.6 million acres of aquatic, wetland, forest, grassland, and agricultural habitats, supporting more than 300 species of birds; 57 species of mammals; 45 species of amphibians and reptiles; 150 species of fish; and nearly 50 species of mussels. More than 40 percent of North America's migratory waterfowl and shorebirds depend on the food resources and other life requisites (shelter, nesting habitats, etc.) that the system provides. The importance of these resources was recognized by Congress in WRDA 1986 by their declaration of the UMRS as a "nationally significant ecosystem", as noted in Section 1.G. of this DPR. Institutional recognition of the significance of this resource was further recognized by Congress' initial and continued authorization of the Environmental Management Program for the planning, construction, and evaluation of measures for rehabilitation and enhancement of fish and wildlife habitat in the UMRS.

The National Research Council recognized the ecological significance of large floodplain rivers and identified the Mississippi and Illinois Waterways as examples of two such rivers in the U.S. that could become healthy again with proper management and restoration.

Floodplain forests are declining in the Mississippi and Illinois Waterway floodplains due to agricultural and urban development, alteration of natural riverine flood pulses, rising water tables, and island loss due to wind and wave action. The remaining forests are changing in composition from high species diversity (including mast producing trees) to a more monotypic forest dominated by silver maple and even aged stands with little to no understory or regeneration of seedlings.

Grasslands are an important ecotype that was common and abundant in the UMRS ecosystem prior to the extensive agricultural development of the floodplain from the late 19th through the mid 20th centuries. Today, wet-mesic native floodplain grasslands are the rarest and most fragmented native ecotype in the UMR ecosystem.

Within La Grange Pool, existing land cover is predominately agricultural (47 percent of total floodplain acreage) and likely to remain so for the foreseeable future. Opportunities for restoration of native floodplain ecotypes and habitats are limited by the small percentage of land in public ownership (16 percent of total floodplain acreage). For this reason, the restoration of land and water resources of the Rice Lake SFWA has an increased importance.

C. Systemic Habitat Goals (Habitat Needs Assessment). The Habitat Needs Assessment prepared for the EMP in October 2000 summarized habitat needs for the Illinois Waterway Reach of the UMRS as follows:

1. Restore existing backwaters so that 25 percent of existing backwater lakes (19,000 acres) have an average depth of 6 ft.

2. Increase depth diversity and connectivity throughout the river.

3. Restore hydrologic variability needed to restore and maintain existing backwater habitats.

D. General Fish and Wildlife Management Goals for Rice Lake SFWA. The primary long-range management goal of the ILDNR at the Rice Lake SFWA is to moderate the historic trend of habitat degradation within the confines of the project area through implementation of a management, development, and acquisition program that will provide quality habitat, attractive to many species of wildlife, while at the same time providing the public with increased hunting, fishing, and other recreational opportunities (Illinois Department of Conservation-IDOC, presently ILDNR, 1989).

The objectives of the Rice Lake SFWA as stated in the ILDNR's Natural Resource Management Plan (1989) are as follows:

Primary Objective: The primary objective of Rice Lake SFWA is to conserve and enhance, where appropriate, essential quality nesting and mid-migration habitat, including refuge, for both migratory and resident waterfowl populations utilizing the Illinois Waterway Valley flight corridor of the Mississippi Flyway.

Secondary Objectives: The following secondary objectives have been developed to provide guidelines for acquisition, development and management, including public usage, of the site:

1. Conserve natural bottomland habitat of migratory and resident, game and non-game fauna inhabiting the site, including rare, threatened, and endangered species.

2. Conserve natural bottomland habitat of native flora inhabiting the site, including rare, threatened, and endangered species.

3. Provide an opportunity for quality public waterfowl hunting to the extent that the primary objective is not jeopardized.

4. Provide an opportunity for other compatible public recreational usage, including sport and commercial fishing, furbearer trapping, vehicular camping, pleasure boating, hiking, wildlife observation, and sightseeing to the extent feasible.

The emphasis on wetland and waterfowl management at the Rice Lake SFWA reflects not only the immediate goals of local resource managers, but also those of the FWIC for habitat enhancement in Pools 11-22 of the Upper Mississippi and Illinois Waterway, Partners in Flight, and the North American Waterfowl Management Plan (NAWMP). The NAWMP aims to increase waterfowl populations and their habitats, particularly those at critically low-levels. It has been estimated that 20 percent of all ducks in North America utilize the Upper Mississippi River System for feeding and resting during migration (Upper Mississippi River Basin Commission, 1981). This statistic points to the need for optimum management of refuge areas such as the Big Lake portion of the Rice Lake SFWA. In fact, a recent study indicates that refuge areas may be necessary to prevent

disturbance of waterfowl during spring and fall migrations (Havera *et al.*, 1992), particularly in areas where waterfowl numbers have declined.

In response to recommendations that the Rice Lake SFWA participate in the Western Hemisphere Shorebird Reserve Network, the ILDNR has recommended that the project area be managed to complement shorebird use, within the context of the primary site objective.

Successful management of the lake areas and management units of the Rice Lake SFWA is dependent on the ability to control water levels in the project area. The success of water level control efforts on Rice Lake is dependent on whether water levels on the Illinois Waterway remain below elevation 439.0 NGVD (the spillway crest elevation of the Narrows Dam) during the critical drawdown period. The water level management plan at Rice Lake, when Illinois Waterway elevations allow, is to hold the lake at a spring pool elevation of 437.0 NGVD, creating an approximately 1,400 surface-acre lake with an average depth of 2.4 ft and a shoreline at the timber's edge. During the third week of June, Rice Lake is drawn down over a 21-day period to elevation 435.0, exposing approximately 500 acres of mudflats. This exposure facilitates firming of the highly flocculent lake-bottom material. This, in turn, encourages production of native moist-soil vegetation and also allows aerial seeding of fast-growing crops when unseasonable river stage fluctuations reduce native food plant production. Both the native moist-soil plants and the non-native crop species provide a high quality food base for resident and migratory wildlife. In mid-September (or earlier during drought conditions), the lake is recharged by pumping to return to elevation 437.0 by the beginning of November.

The preferred management plan for Big Lake would be to hold the lake at a spring pool elevation of 436.0, with drawdown over a 21-day period to elevation 434.0 beginning June 15. Under current conditions, this management plan cannot be reliably implemented due to midsummer fluctuations in Illinois Waterway water levels and the inability to control water levels in the lake independent of river stage.

During initial project planning, the ILDNR's management goals for Duck Island involved restoring a portion of the agricultural fields to native vegetative cover types. Acquisition of the Duck Island property created an opportunity for large-scale restoration of native plant communities, specifically warm season grassland and bottomland hardwood forest dominated by mast-producing (e.g. oaks and hickories) tree species.

E. Project Goals, Objectives, and Potential Enhancement Features. Based on the identified problems, systemic goals of the cooperating agencies, and the overall fish and wildlife management goals of the project sponsor, the following specific goals, objectives, and potential project features have been developed for this HREP (Table 3-1). Potential project features and design alternatives are described in detail in Sections 4 and 5.

Table 3-1. Project Goals, Objectives, and Potential Enhancement Features

GOAL	OBJECTIVE	POTENTIAL REHABILITATION/ ENHANCEMENT FEATURES
Restore and Protect Wetland Habitat	Increase success rate of annual emergent/moist soil vegetation production Reduce adverse effects of river stage fluctuations on wetland habitat	Construct pump station with conveyance ditches Construct low perimeter levee around Big Lake and Goose Lake
Restore and Protect Aquatic Habitat	Increase fish egress opportunities from Rice Lake during drawdown periods Maintain seasonal access between Rice Lake/Big Lake aquatic areas and Illinois Waterway Increase off-main channel aquatic habitat in Illinois Waterway	Provide access from Rice Lake to deepwater areas in quarry Provide access from Goose Lake to Illinois River Dredge Senate Island side channel
Restore and Protect Floodplain Habitat	Increase natural food and cover for resident and migratory wildlife	Establish mast tree and native grass plantings on Duck Island

F. Planning Constraints. The following constraints were considered in plan formulation:

- **Environmental Laws and Regulations.** Construct features consistent with Federal, state, and local laws.
- **Operation and Maintenance.** Restoration features shall be designed to minimize operation and maintenance requirements.
- **Impacts to Flood Heights.** Restoration features should not increase flood heights or adversely affect private property or infrastructure.
- **Hazardous, Toxic, and Radioactive Waste.** Project features should be designed to avoid disturbance of HTRW to minimize and prevent Federal liability under the Comprehensive Environmental Response, Compensation, and Liability Act; to reduce any threats to project workers; and to avoid costly delays associated with environmental abatement activities.

G. Criteria for Potential Enhancement Features. Table 3-2 presents general and specific criteria developed to assess potential project features.

Table 3-2. Development Criteria for Potential Enhancement Features

ITEM	PURPOSE OF CRITERIA
A. General Criteria	
Locate and construct features consistent with EMP directives	Comply with program authorities
Construct features consistent with Federal, State, and local laws	Comply with environmental laws
Develop features that can be monitored	Provide baseline for project effects (e.g., sedimentation, stability, water quality)
Design features to facilitate operation and maintenance	Minimize operation and maintenance costs
B. Restore and Protect Wetland Habitat	
Provide a reliable source of water adequate to manage water levels over entire project area	Provide water level control over the rapid rise and fall of water levels consistent with management goals
Eliminate or reduce rapid water level fluctuations during the growing season	Increase water level control capability beyond simple gravity flow dependent on river stage
Increase flexibility of water level management capability within project area	Increase success rate of management plan implementation
C. Restore and Protect Aquatic Habitat	
Provide fish egress from Rice Lake to deep ($\geq$ 6' year-round) aquatic areas	Increase fish survival during drawdown periods and reduce potential for avian botulism outbreak
Design water control infrastructure to preserve and if practicable, enhance seasonal fish access between Big Lake and Illinois Waterway	Maintain connectivity between main channel of Illinois Waterway and floodplain aquatic habitats
D. Restore and Protect Floodplain Habitat	
Locate plantings in existing agricultural areas on Duck Island; plant multiple species of native woody and herbaceous vegetation	Increase quantity and quality of native bottomland hardwood and native grassland habitat within project area
Locate plantings on higher elevations within floodplain	Maximize survival rate and facilitate growth of plantings
Configure plantings in large single cover tracts	Reduce future habitat fragmentation

4. POTENTIAL PROJECT FEATURES

This section describes and assesses potential enhancement features that will meet the goals of restoring and protecting wetland, aquatic, and floodplain habitat. Potential enhancement features were evaluated based on their ultimate contribution to the project goals and objectives, engineering considerations, and local restrictions or constraints. Features that were determined not feasible or did not meet the criteria of Table 3-2 were not subject to further evaluation and can be found on Plate 5. Once the initial screening was completed, the remaining potential enhancement features were incrementalized and combined, where feasible, to formulate alternatives that fully or partially satisfy the project goals and objectives (Plate 4). For planning purposes, the project life was established as 50 years.

A. Potential Features to Restore and Protect Wetland Habitat. The following features were considered for inclusion in this HREP to contribute to the goal of restoring and protecting wetland habitat: construction of a perimeter water control levee around Big Lake; and construction of a new pump station for interior water level management. Details of these features are discussed below.

1. Improved Water Level Control (Perimeter Levee). This feature would involve construction of a low-level perimeter levee around Big Lake and Goose Lake to protect this area from midsummer river stage fluctuations that currently prevent reliable implementation of the ILDNR's management plan and limit the quality and availability of habitat for migratory waterbirds. The levee would be aligned to take full advantage of natural ground elevations on the east side of the lake and existing remnants of the Hate Levee (shown on Plate 3) to the south to minimize ground disturbance and reduce construction costs. The top elevation of the levee would be optimized to allow control of interior water levels to meet management goals while maintaining connectivity between the project area and the Illinois Waterway. The levee design would include an armored spillway located near the upstream end of the perimeter levee just west of Senate Island with a top elevation approximately two ft lower than the overall levee elevation, to allow the interior water level of Big Lake to equalize with the river level before overtopping. To allow maximum flexibility and to keep the operation and maintenance cost of the project down, the design will include a gravity flow (gatewell) structure installed through the levee at the southwest corner of Goose Lake (see Plate 6).

2. Improved Water Management Capability (Pump Station). A new pump station is proposed as shown on Plate 6. This feature would allow reflooding of the area in the fall, providing access to important food resources and feeding areas for migrating waterfowl. Construction of interior ditches also would be required to convey the water between the pump station and interior areas.

Three potential sources of water were initially considered in developing the pump station feature: the Duck Island quarry, Duck Creek, and the Illinois Waterway. Geotechnical investigations (borings) resulted in the determination that the quarry would not be a feasible source of water due to the degree of hydraulic connection between the lakes (see Plates 28 through 31). Diversion of water from Duck Creek was also investigated because of its potential low cost for construction and maintenance. However, the flow in the creek is largely controlled by outflows from a cooling reservoir for a nearby power plant. This source was not evaluated further because adequate water supply was uncertain and agreements with private entities were logistically impractical. Consequently, the Illinois Waterway was evaluated as the only feasible source of water in formulating and analyzing alternative designs of the pump station.

The location of the new pump station would be chosen to allow accessible water conveyance with minimal maintenance dredging problems. Several thousand ft of discharge channel are required to convey the water to and from the lakes. The discharge channel would be constructed by a combination of mechanical excavation and embankment placement. Water control structures would be constructed at the upstream end of the project along the new discharge channel. These structures would provide water to the Voorhees Unit, Big Lake, and Rice Lake. Water control structures would also be installed to maintain connectivity between Upper Slim Lake and Lower Slim Lake. Two options were considered to optimize the pump station feature.

a. The existing 50,000-gpm pump station would remain to supply Rice Lake, and a new 50,000-gpm pump station would be constructed upstream from the old Copperas Creek Lock to supply Big Lake. This alternative meets the objective of providing control over the water levels on both lakes. However, the inlet channel to the existing pump station is a 3,900 ft channel from the Illinois Waterway that requires maintenance dredging approximately once every three years. Adjacent dredged material placement has become an increasing problem. The total excavation for the discharge channel would be reduced, but the sedimentation problem in the existing channel supplying Rice Lake would not be eliminated.

b. The existing 50,000 gpm pump station would be abandoned. A new pump station would be constructed upstream from the old Copperas Creek Lock. The new pump station would have a capacity of 133,200 gpm to fill both Rice Lake and Big Lake in 14 days. This alternative meets the objective of providing control over the water levels on both lakes. The station would also be located close to the Illinois River to avoid maintenance costs associated with an inlet feeder channel.

B. Potential Features to Restore and Protect Aquatic Habitat (Fish Access). The following features intended to restore and protect aquatic habitat were considered for inclusion in this project.

1. Rice Lake to Quarry Access. This feature would involve construction of a fish passage structure between Rice Lake and the quarry at the downstream end of the Duck Island peninsula. The structure would be designed to operate during periods when water levels on Rice Lake are being lowered, to allow fish in Rice Lake to move into the deeper water of the quarry and escape the potentially lethal aquatic conditions that may occur in Rice Lake during the summer drawdown period. Access between Big Lake and the quarry already exists, so no similar structure was considered necessary for fish passage between the quarry and Big Lake.

2. Rice Lake to Quarry and Goose Lake to Illinois Waterway Access. This feature would involve construction of a fish passage structure between Goose Lake and the Illinois Waterway and would be in addition to option (1) described above. The structure would be designed to facilitate movement of fish between Goose Lake and the Illinois Waterway when water levels on Big Lake are being lowered to drawdown elevation.

3. Senate Island Side Channel Restoration. This feature would involve excavation of the Illinois Waterway side channel between Senate Island and the Rice Lake SFWA. This side channel has silted in over time and provides only limited aquatic habitat value at present. The relatively high value of side channel aquatic habitat for fish and the current scarcity of such habitat on the Illinois Waterway suggests that such a feature could potentially provide substantial fisheries benefits. In addition, material excavated from the channel could potentially be used as borrow material for construction of the perimeter levee. However, the material filling the channel consists of silt along with a large amount of timber and other debris. The quantity of suitable borrow material potentially available from the side channel was estimated to be less than half the quantity

required for construction of the perimeter levee. There are also ownership concerns, as Senate Island and a portion of the Senate Island side channel are privately owned. For these reasons, this feature was not evaluated in detail for this project, although it could be considered as a future habitat restoration proposal for construction either under EMP or other environmental restoration authorities.

4. **Island Building.** Construction of four islands (2 in Rice Lake/2 in Big Lake) to improve water quality by reducing the resuspension of sediments from wave action was considered, but not evaluated in detail for this project due to cost of construction and limited habitat benefits.

C. Potential Features to Restore and Protect Floodplain Habitat. Reestablishment of native plant species on the agricultural field located on the recently acquired Duck Island property was considered for inclusion in this project. The Rice Lake SFWA is currently dominated by two cover types - open water and wet floodplain forest. This feature would provide additional floodplain habitat diversity and would aid the ILDNR in meeting their secondary management objectives listed in Section 3.D.

1. Partial Conversion of Duck Island Agricultural Fields to Native Cover Types/Conversion to Single Native Cover Type. Initial planning of this feature evaluated the feasibility of converting only half of the agricultural field acreage and continuing row crop cultivation on the remaining half, or converting the entire acreage to a single cover type (forest or native grass). Following acquisition of the Duck Island property by the ILDNR, coordination within the interagency team revealed that conversion of only half of the agricultural field, or conversion of the entire agricultural field to native grass habitat, would not be fully compatible with the ILDNR's management objectives for the site. Additionally, conversion of the entire agricultural field to forest cover would not be compatible with the need to protect several historic properties identified during cultural resources surveys of the site (see section 2h. of this DPR for additional information). For these reasons, the alternatives described in this paragraph were subsequently determined not to be feasible and therefore were not included in the incremental analysis of planting alternatives.

2. Conversion of all Duck Island Agricultural Fields to Native Cover (Mast Trees and Native Grasslands). The entire agricultural field acreage of Duck Island would be converted to a combination of forest and grassland cover types featuring plant species historically native to the project area. Restoration of grassland habitat within the Rice Lake SFWA would involve planting a mixture of native warm season grass and forb species on a portion of Duck Island's agricultural field to protect historic properties identified during cultural resources surveys. Restoration of floodplain forest habitat with a substantial component of mast-producing tree species would involve planting a mixture of native tree species on the remaining agricultural field acreage.

5. EVALUATION OF FEASIBLE PROJECT FEATURES AND FORMULATION OF ALTERNATIVES

This section describes features that met the goals and objective of this project. Each feature was evaluated to determine its potential for environmental restoration and enhancement. Cost estimates were also derived for each of the feasible alternatives.

A. Environmental Output Evaluation. A habitat analysis was conducted to assess environmental outputs (benefits) of the proposed project. This analysis employed a multi-agency team approach with participation by resource managers and biologists representing the Corps, the USFWS, and the Illinois DNR.

Assessment of existing study-area conditions, projected future conditions without the project, and expected impacts of proposed project features and alternatives utilized procedures developed by the Missouri Department of Conservation and the Soil Conservation Service. This system, the Wildlife Habitat Appraisal Guide (WHAG), is a numerical habitat appraisal system based on USFWS Habitat Evaluation Procedures (HEP) (1980).

WHAG procedures evaluate the quality and quantity of particular habitats for animal species selected by the WHAG team members. The qualitative component of the analysis is known as the Habitat Suitability Index (HSI) and is rated on a 0.1 to 1.0 scale. The quantitative component of the WHAG analysis is the measure of acres of habitat that are available for the selected evaluation species. From the qualitative and quantitative determinations, the standard unit of measure, the Habitat Unit (HU) is calculated using the formula (HSI x Acres = HUs). Changes in HUs will occur as a habitat matures naturally or is influenced by development. These changes influence the cumulative HUs derived over the life of the project. Cumulative HUs are annualized and averaged to determine Average Annual Habitat Units (AAHUs). AAHUs are used as the output measurement to compare all the features and alternatives for the proposed project.

The WHAG analysis evaluated the effects of proposed project features on habitat availability and quality for 23 wildlife and fish species. Seven species (mallard, Canada goose, least bittern, king rail, lesser yellowlegs, green-backed heron, and muskrat) were used to assess the effects of the levee and pump station features. Seven fish species (channel catfish, crappie, largemouth bass, bluegill, gizzard shad, carp, and black bullhead) were used to evaluate the fish access structures. Nine wildlife species (white-tailed deer, wild turkey, bobwhite, eastern cottontail, fox squirrel, eastern bluebird, wood thrush, Kentucky warbler, and indigo bunting) were used to evaluate native forest and grassland restoration. A detailed description of the habitat analysis is provided in Appendix D of this report.

B. Feasible Project Features. Plate 4, *Project Enhancement Features Evaluated,* shows the locations of all feasible project features described in Section 4. Project feature alternatives were identified and evaluated by the interagency team to aid in development of a recommended plan. These alternatives are described as follows.

1. Perimeter Water Control Levee (L)

a. No Action (L0). No action would result in no additional water control efforts. No AAHU gain or loss would be realized other than what may occur naturally. If no action is taken, it is anticipated that uncontrolled water level fluctuations will continue to substantially limit the habitat value of wetlands in the project area, particularly in Big Lake.

b. Levee at Elevation 440.0 (L1). This alternative would involve constructing the

perimeter water control levee with a top elevation of 440.0 and a spillway crest elevation of 438.0. Gravity drawdown of the Big Lake portion of the project area would be possible when river stage is below elevation 436; drawdown could be maintained as long as river stage remained below elevation 438.0. This alternative would provide protection to Big Lake, but would not improve conditions at Rice Lake. This option also includes the construction of a gatewell structure upstream of the two existing structures to facilitate drawdown in a 14 day period. This feature yields a net benefit of 1,529 AAHUs.

c. Levee at Elevation 442.0 (L2). This alternative would involve constructing the perimeter water control levee with a top elevation of 442.0 and a spillway crest elevation of 440.0. Gravity drawdown of the Big Lake portion of the project area could be maintained as long as river stage remained below elevation 440.0. This alternative would provide some additional protection from river stages below elevation 440.0, and would provide a slight increase in operating flexibility for the Rice Lake portion of the project area in addition to the Big Lake portion. This option also includes the construction of a gatewell structure upstream of the two existing structures to facilitate drawdown in a 14 day period. This feature yields a net benefit of 3,503 AAHUs.

2. Pump Station and Conveyance Facilities (P)

a. No Action (P0). No action would result in no additional water level management capability. No AAHU gain or loss would be realized other than what may occur naturally. If no action would be taken, it is anticipated that uncontrolled water level fluctuations will continue to substantially limit the habitat value of wetlands in the project area, particularly in Big Lake.

b. Pumping Facility for Big Lake (P1). This alternative would involve construction of a 50,000 gpm pump station, a 4,200 ft discharge channel, and water control structures to fill Big Lake. The existing pump station would remain to supply Rice Lake. This alternative would provide the capability to manipulate water levels on Big Lake, while separately maintaining existing water level management facilities on Rice Lake. This feature yields a net benefit of 1,274 AAHUs.

c. Pumping Facility for Big Lake and Rice Lake (P2). This alternative would involve abandoning the existing Rice Lake pump station, and constructing a 133,200 gpm pump station, a 7,000 ft discharge channel, and water control structures to fill Big Lake, Rice Lake, and the Voorhees Unit. Abandonment of the existing pump station and transfer of its function to the new pumping station would optimize management and operational flexibility for the entire project area, while reducing maintenance costs from a second pump station and its 3,900 ft access channel. This feature yields a net benefit of 2,866 AAHUs.

3. Fish Access (F)

a. No Action (F0). No action would result in no increase in fish access between Rice Lake and the deepwater areas of the Duck Island quarry, and no increase in fish access between Big Lake and the Illinois Waterway. No AAHU gain or loss would be realized other than what might occur naturally.

b. Rice Lake to Quarry Access (F1). This alternative would involve constructing a single structure to allow fish access between Rice Lake and the Duck Island quarry. Because a connection between Big Lake and the quarry already exists, this alternative would affect only Rice Lake. Access between the entire SFWA and the Illinois Waterway would be unaffected. This feature yields a net benefit of 2,329 AAHUs.

c. Rice Lake to Quarry and Goose Lake to Illinois Waterway Access (F2). This

alternative would involve constructing the Rice Lake-quarry access described above and also constructing a second structure between Goose Lake and the Illinois Waterway that would function both as a gravity drain and fish access for the entire SFWA during the summer drawdown. This feature yields a net benefit of 5,501 AAHUs.

4. Duck Island Native Vegetation Plantings (T)

a. No Action (T0). No action would result in no change in existing land cover or land use practices on Duck Island. Assuming continuation of Duck Island's current agricultural use, no AAHU gain or loss would be realized for the 548-acre site.

b. Conversion of Agricultural Fields to Forest and Native Grassland Cover (T1-T5). These alternatives involve conversion of Duck Island agricultural fields to native forest and grassland cover through active planting of native vegetation, in varying proportions described as follows:

(T1) 352 acres grassland, 57 acres forest, 594 AAHUs
(T2) 272 acres grassland, 137 acres forest, 604 AAHUs
(T3) 204 acres grassland, 205 acres forest, 611 AAHUs
(T4) 137 acres grassland, 272 acres forest, 619 AAHUs
(T5) 57 acres grassland, 352 acres forest, 629 AAHUs

C. Cost Estimates for Habitat Improvement Measures. Table 5-1 shows the estimated outputs (in AAHUs) and annualized costs for each feature alternative. The annualized costs are based on construction and real estate estimates. A detailed breakdown of costs for the recommended plan is outlined in Section 8 - Cost Estimates.

Table 5.1 Environmental Output and Costs of Each Feature

Feature	Symbol	Output [1]	Annualized Cost in $ [2]
Perimeter Levee			
No action	L0	0	0
Levee spillway 440, no pump	L1+P0	2229	131,000
Levee spillway 440, Big Lake pump only	L1+P1	2484	315,000
Levee spillway 442, no pump	L2+P0	2484	167,000
Levee spillway 440, Big/Rice Lake pump	L1+P2	2739	348,000
Levee spillway 442, Big Lake pump only	L2+P1	3949	351,000
Levee spillway 442, Big/Rice Lake pump	L2+P2	6369	384,000
Fish Access Structures			
No Action	F0	0	0
Passage from Rice Lake to Duck Island quarry	F1	2329	9,500
Passage from Rice Lake to Duck Island quarry pit and passage from Big Lake to Illinois River	F2	5501	19,800
Duck Island Native Vegetation Planting			
No action	T0	0	0
352 acres grassland, 57 acres forest	T1	594	34,400
272 acres grassland, 137 acres forest	T2	604	36,500
204 acres grassland, 205 acres forest	T3	611	39,000
137 acres grassland, 272 acres forest	T4	619	41,500
57 acres grassland, 352 acres forest	T5	629	43,500

[1] Outputs are calculated as Average Annual Habitat Units (AAHUs).
[2] Annualized cost is initial construction cost based on a 50-year project life, 5-5/8 percent interest rate.

D. Incremental Analysis of Project Alternatives. Cost effectiveness and incremental cost analysis (CE/ICA) was used to assist the process of determining what project features and design alternatives should be built based on comparison of quantified habitat benefits (outputs) and estimated costs of alternative feature designs. This process identifies alternative features or combinations of features that partially or fully meet the goals and objectives of the project and at the same time are the most cost effective. A cost effectiveness analysis is conducted to ensure that least cost alternatives are identified for various levels of output. After the cost effectiveness of the alternatives has been established, subsequent incremental cost analysis is conducted to reveal and evaluate changes in cost for increasing levels of environmental output.

CE/ICA is basically a three-step procedure: (1) calculate the environmental outputs of each feature; (2) determine a cost estimate for each feature; and (3) combine the features to evaluate the best overall project alternative based on habitat benefits and cost. A detailed description of habitat evaluation and benefit quantification is provided in Appendix D of this report. Costs were annualized by applying a 5-5/8 percent interest rate to the construction cost over the life of the project, estimated at 50 years for planning purposes. The incremental analysis of alternatives was accomplished following guidance prepared by the Corps' Institute for Water Resources and using the methodology described in Robinson, *et al*. (1995).

Primary assumptions and constraints used in conducting CE/ICA for this HREP are as follows:

1. AAHUs for all analyzed fish and wildlife species were assumed to have equal value in comparing alternative plans.

2. Alternatives analysis was limited to combinations that at least partially met all three project objectives listed in Table 3.1.

3. Feature P (pump station) was assumed to be dependent on Feature L (perimeter levee). Because both the perimeter levee and pump station address the project objective of restoring and protecting wetland habitat, alternatives that included P0 were included in the CE/ICA analysis provided they also met the conditions of assumption No. 2 above.

A total of 61 plans were evaluated (out of a total of 162 possible combinations). Of these, 26 plans (including the no-action alternative L0+P0+F0+T0) were identified as being cost-effective using CE/ICA analysis. These plans are listed in Table 5-2 below.

Table 5-2. Cost-Effective Alternative Combinations

Plan	Outputs (AAHU)	Annualized Cost ($)	Avg. Cost ($/AAHU)
L0P0F0T0 (No Action)	0	0	0
L0P0F1T0	2329	$10,000	$4.30
L0P0F2T0	5501	20,000	3.60
L0P0F1T1	6095	55,000	9.00
L0P0F2T1	6105	57,000	9.30
L0P0F2T3	6112	59,000	9.70
L0P0F2T4	6120	62,000	10.10
L0P0F2T5	6130	64,000	10.40
L1P0F2T0	7730	151,000	19.50
L1P0F2T1	8324	186,000	22.30
L1P0F2T2	8334	188,000	22.60
L1P0F2T3	8341	190,000	22.80
L1P0F2T4	8349	193,000	23.10
L1P0F2T5	8359	195,000	23.30
L2P0F2T1	8579	222,000	25.90
L2P0F2T2	8589	224,000	26.10
L2P0F2T3	8596	226,000	26.30
L2P0F2T4	8604	229,000	26.60
L2P0F2T5	8614	231,000	26.80
L2P1F2T0	9450	371,000	39.30
L2P2F2T0	11870	404,000	34.00
L2P2F2T1	12464	439,000	35.20
L2P2F2T2	12474	441,000	35.40
L2P2F2T3	12481	443,000	35.50
L2P2F2T4	12489	446,000	35.70
L2P2F2T5	12499	448,000	35.80

Incremental cost analysis identified five of the above plans as “Best Buy” plans, defined as those cost-effective plans which provide the greatest incremental increase in output (benefits) for the lowest incremental increase in cost. These “Best Buy” plans are listed in Table 5-3.

Table 5-3. "Best Buys" of Cost-Effective Alternative Combinations

Plan	Output	Cost($)	$/Output	Inc. Output	Inc. $	Inc.$/ Output
NO ACTION	0	0	0	0	0	0
L0P0F2T0	5501	20,000	3.60	5501	20,000	3.60
L2P2F2T0	11870	404,000	34.00	6369	384,000	60.29
L2P2F2T1	12464	439,000	35.20	594	35,000	58.92
L2P2F2T5	12499	448,000	35.80	35	9,000	257.14

E. Selection of Recommended Plan. Federal planning for water resources development is conducted in accordance with the requirements of *the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G). The P&G provide a decision rule for selecting a recommended plan where both outputs and costs are measured in dollars. Under this rule, "the alternative plan with the greatest net economic benefit consistent with protecting the Nation's environment (National Economic Development Plan, NED Plan) is to be selected..." (paragraph 1.10.2). There is no similar rule for plan selection where outputs are not measured in dollars, as is the case in planning for environmental restoration and rehabilitation projects such as this HREP.

Neither cost effectiveness analysis nor incremental cost analysis includes a plan selection rule similar to the NED rule. In the absence of such a decision-making rule, neither analysis will indicate what choice to make. The information developed by CE/ICA will assist in making informed decisions and, once a decision is made, will help in better understanding its consequences in relation to other choices. However, this procedure should not be the sole source of information on which to base a decision. Other factors considered in this analysis were landscape of the site (including physical dynamics associated with the large river-floodplain ecosystem), management objectives of the resource agencies, critical needs of the region, and ecosystem needs of the Upper Mississippi River System.

The question posed to the interagency team involved in this analysis was, "Is the cost of the added increment in output worth the added costs?" The Rice Lake HREP team concluded that the alternative plan that best meets the goals and objectives of each agency and the EMP program is **L2P2F2T5** (perimeter levee at 442 top elevation/440 spillway elevation, new pumping capacity for Big Lake and Rice Lake, fish access to Duck Island quarry and Illinois Waterway, and conversion of Duck Island agricultural fields to 352 acres native forest and 57 acres native grassland). While the other cost-effective alternatives evaluated for this project would partially address the goals and objectives of the project, the consensus of the interagency team was that the recommended alternative would reasonably maximize net environmental benefits for the greatest diversity of wildlife and fish species, and that other alternatives would be less effective in optimizing habitat benefits for the overall project.

The recommended alternative addresses all three of the identified key problems: decreased reliability of seasonal food and cover for migratory birds, loss of fish access to deep aquatic habitat during low water periods, and decreased acreage and diversity of native floodplain vegetation as habitat for resident and migratory wildlife. The perimeter levee project feature increases native floodplain vegetation acreage by allowing water level management on ~700 acres that were previously uncontrolled and unprotected. The perimeter levee, in conjunction with the pump station project feature, will improve the success rate of seasonal food and cover plants from one in 10 years to four in 10 years by allowing timely filling, draining, and water elevation control. The

perimeter levee will also stop summer water elevation spikes (up to elevation 440.0) from flooding the area and killing the young plants. The mast tree and native grassland planting project features will increase and diversify the native floodplain vegetation by converting 409 acres of row crops on Duck Island to native grasses and trees. The two fish egress structures will restore access to deeper aquatic habitat during low water periods by allowing fish to move from Rice Lake into the Quarry and then to the Illinois Waterway via Big and Goose Lakes. The fish in Big and Goose lakes could move directly to the Illinois Waterway.

6. RECOMMENDED PLAN: DESCRIPTION WITH DESIGN, CONSTRUCTION, OPERATION, AND MAINTENANCE CONSIDERATIONS

The recommended plan for habitat rehabilitation and enhancement of the Rice Lake SFWA includes a Perimeter Water Control Levee (L2), Pump Station and Conveyance Facilities (P2), Fish Access (F2), and Duck Island Native Vegetation Plantings (T5). The details of this plan are described below and illustrated on Plate 6.

A. Perimeter Water Control Levee (L2). This feature consists of a levee, approximately 15,000 ft long, a 2,500-ft overflow spillway, and a 60-inch (in) gatewell structure. These structures would be designed to provide protection from low level summer flooding 4 out of 10 years, which would allow for moist soil plant production to benefit resident and migratory waterfowl.

The proposed perimeter water control levee would be aligned to take full advantage of natural ground elevations on the east side of Big and Goose lakes and existing remnants of the Hate Levee to the south, which would minimize ground disturbance and reduce construction costs (see Plates 7 through 14). The levee would be constructed to elevation 442 ft NGVD using adjacent clay material or clay material dredged from Goose Pond (55,000 cubic yards). The levee slopes would be a minimum three horizontal ft (run) on one vertical ft (rise) (3:1) in areas of dry construction and 4:1 where material dredged from Goose Lake is used.

The spillway would be located near the upstream end of the perimeter levee just west of Senate Island. It will be constructed using adjacent clay borrow to elevation 440 ft NGVD, which corresponds to approximately a five-year level of protection. Concrete matting (116,100 square foot (sq ft)) would be placed on both side slopes and the crown.

A new gatewell structure would be installed adjacent to the two existing gatewell structures. The 60-in gatewell would consist of reinforced concrete piping (RCP) and an interior sluice gate (see Plate 15).

B. Pump Station and Conveyance Facilities(P2). A new 133,200 gpm pump station and conveyance system would be constructed to allow for water management of Rice Lake, Big Lake, Goose Lake, and the Voorhees Unit.

Four 33,300 gpm pumps would be installed as shown on plates 25 and 26. Four smaller pumps were selected over larger pumps because of their reduced power requirements, greater management flexibility, and reduced operating expenses. The pump station building would be a weather-tight, vandal-resistant concrete structure. The intakes to the pump station would have steel trash racks and bulkheads to protect the pump from debris and sedimentation.

Seven thousand ft of clearing, grubbing, and channel excavation would be completed to convey the water between the pump station and the project's lakes (see Plates 18 and 19). The channel would be between an existing road embankment (on the southern side) and a newly constructed berm on the opposite side. The berm would be constructed from the channel excavation material with a top elevation of 440 ft NGVD, side slopes of 3:1, and a top width of 10 ft (minimum). The channel would have a bottom elevation of 430 ft NGVD and side slopes of 3:1. There would be a 10 ft buffer between the top bank of the channel and the toe of both the existing levee and the new berm.

Water control structures would be constructed along the new discharge channel (see Plates 20-24). Two (2) 24-in CMP stoplog structures and three (3) 48-in CMP stoplog structures would be installed to provide water to the Voorhees Unit and Big Lake, respectively. Three (3) more 48-in

CMP structures would be installed to connect the new discharge channel to the existing channel that leads to Rice Lake. In order to maintain connectivity between the upper and lower portions of Slim Lake, two water control structures (one going from the new discharge channel into the upper Slim Lake and the other to the lower portion of Slim Lake) will be installed. These two structures will be prefabricated Agridrain ® or similar type structures.

C. Fish Access (F2). Two reinforced concrete fish egress structures will be constructed as shown on Plates 16 and 17. These structures will be designed to provide passage of fish from Rice Lake and Goose Lake to the quarry and Illinois Waterway, respectively, during drawdown periods.

These fish egress structures will be 9 ft wide inside reinforced concrete structures able to support vehicular traffic. A stoplog structure will be included on the Rice Lake side and the Illinois Waterway side of the two structures. Both stoplog structures will have two bays to minimize length of stoplogs thus minimizing efforts for installation and removal of stoplogs. The invert elevations of both structures will be 430 ft NGVD. Structures will be constructed and designed such that the substrate of the fish egress is consistent with the surrounding substrate.

D. Duck Island Native Vegetation Plantings (T5). Approximately 409 acres will be planted in mast-producing trees and native grasses. The site of the planting will be the agricultural areas on Duck Island.

Mast-producing tree plantings will occur on approximately 352 acres of the site. Pin oak, swamp white oak, bur oak, northern pecan, hackberry, black cherry, shingle oak, Kentucky coffee tree, persimmon, red oak, shellbark hickory, and black walnut will be planted at an approximate 100 trees per acre. Species will be intermixed to avoid solid blocks of individual species (monoculture).

Per recommendation of the Illinois DNR, bare root seedlings approximately 12 to 24 inches in height will be planted. Trees will be planted on a 10’ by 10’ maximum spacing (=435 trees/acre). Species will be planted according to suitable site location on Duck Island (based on soils maps) and well mixed within planting rows. Following a three-year establishment period, the surrounding ground in all mast-tree planting areas will be allowed to assume natural growth.

Establishing the approximately 57 acres of grasslands on Duck Island will require tilling and seeding the area with a native grass mixture. Native grass and forbs species will be selected based on their historical range, their affinity for open, somewhat sandy conditions, and their ability to withstand some flooding. Candidate grass species include, but may not be limited to, big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), side oats grama (*Bouteloua curtipendula*), and perennial rye grass (*Lolium perenne*). Some areas will require clearing of recent growth. Weed control will be required until the preferred vegetation becomes well established. This can be accomplished through a combination of herbicides, mowing, and seasonal burning as appropriate.

Seeding will begin in the spring no earlier than March 15th and will be completed no later than May 5th. If planted in the fall, starting and ending dates will be October 1st and November 15th, respectively. Species will be intermixed to avoid solid blocks of individual species (monoculture).

E. Project Summary. Table 6-1 summarizes project data.

Table 6-1. Rice Lake HREP Feature Summary

Feature	Measurement	Unit of Measure
Perimeter Water Control Levee		
Length (excluding spillway)	15,000	Ft
Top Elevation	442	Ft NGVD
Crown Width	10	Ft
Side Slopes	3:1 and 4:1	H:V
Embankment	55,000	Cubic Yards
Overflow Spillway		
Length	2,500	Ft
Top Elevation	440	Ft NGVD
Concrete Matting	116,100	Square Ft
Side Slopes: Interior	3:1	H:V
Gatewell Structure		
Number	1	Each
Diameter	60	In
Length	100	Ft
Invert Elevation	430	Ft NGVD
Slide Gates	1	Each
Pump Station		
Pumps		
Number	4	Each
Flow	33,300	Gallon/Minute
Riverside Sill Elevation	419	Ft NGVD
Landside Sill Elevation	430	Ft NGVD
Trash Rack	1	Each
Slide Gate	4	Each
Discharge Pipe		
Number	4	Each
Diameter	42	In
Length	400	Ft
Discharge Channel		
Length	7,000	Ft
Berm Top Elevation	440	Ft NGVD
Channel Bottom Elevation	430	Ft NGVD
Channel Bottom Width	30	Ft
Side Slopes	3:1	H:V
Clearing/Grubbing	33	Acres
Excavation	100,000	Cubic Yards

Table 6-1 continued. Rice Lake HREP Feature Summary

Feature	Measurement	Unit of Measure
Water Control Structures		
Voorhees Unit (CMP)	2	Each
Diameter	24	In
Riprap	14	Tons
Slim Lake (Agridrain ®)	2	Each
Diameter	24	In
Riprap	14	Tons
Rice Lake (CMP)	3	Each
Diameter	48	In
Riprap	22	Tons
Big Lake (CMP)	3	Each
Diameter	48	In
Riprap	22	Tons
Invert Elevation (all structures)	430	Ft NGVD
Average Length (all structures)	80	Ft
Fish Egress Structures		
Number	2	Each
Opening Width	9	Ft
Opening Height	7	Ft
Approx. Length to Illinois Waterway	50	Ft
Approx. Length to Quarry	70	Ft
Invert Elevation	430	Ft NGVD
Stoplog structure	2	Each
Duck Island–Mast Tree Plantings		
Black Cherry	12,760	Trees
Black Walnut	12,760	Trees
Bur Oak	12,760	Trees
Hackberry	12,760	Trees
Kentucky Coffee Tree	12,760	Trees
Northern Pecan	12,760	Trees
Persimmon	12,760	Trees
Pin Oak	12,760	Trees
Red Oak	12,760	Trees
Shellbark Hickory	12,760	Trees
Shingle Oak	12,760	Trees
Swamp White Oak	12,760	Trees
Total Trees	153,120	Trees
Annual Grains + Red Top Grass (ground cover)	352	Acres
Duck Island - Native Grass Plantings		
Surface Area	72	Acres

F. Design Considerations

1. Existing Site Elevations. The entire Rice Lake HREP is located within the floodplain of the Illinois Waterway. Flat pool elevation is 429 ft NGVD. The land surface elevation in the Rice Lake SFWA ranges from 429 to 438 ft NGVD. Big Lake, Goose Lake, Beebe Lake, and the Quarry are open to the Illinois Waterway, which causes their water elevations to vary with the river stage. The Rice Lake elevation can be managed by the Narrows Dam stoplog structures, which allows for a water elevation up to 439 ft NGVD. It is anticipated that shallow borrow and subsequent embankment construction can be accomplished using traditional earth-moving equipment. Dewatering likely will be required for foundation work associated with the pump station, gatewell structure, fish egress structures, and water control structures.

2. Permits. A public notice, as required by Section 404 of the Clean Water Act, will be made prior to submission of this report for final approval. A Section 401 water quality certificate will be received from the State of Illinois during the plans and specifications phase. A Section 404(b)(l) Evaluation will be included in the final submission of this report (Appendix B). Because all land disturbances associated with this project are addressed in the 404(b)(l) Evaluation, a National Pollutant Discharge Elimination System (NPDES or Section 402) permit for storm water discharges will not be required.

3. Construction Materials. Suitable clay borrow material will be obtained from areas within Goose Lake. This will enhance benefits of wetland habitat obtained by construction of the perimeter water control levee and resulting water management. Borrow for topsoil shall be obtained from strip material that is free of objectionable material or shall be trucked in.

Only common construction materials are required for this project. Crushed stone and ready mix materials are available locally and can be trucked to the site. Riprap can be barged or trucked to the site. Construction areas are easily accessible, and construction materials can be transported on site by conventional equipment.

4. Storm Water Pollution/Erosion Control. The potential for storm water pollution during construction is minimal for this project. Stormwater runoff from the majority of the disturbed areas will be contained within the Rice Lake SFWA. Temporary stabilization measures will be employed on disturbed areas of the perimeter water control levee until final seeding and stabilization occurs. Stabilization practices may include mulching, temporary seeding, and/or the erection of silt fencing. Overall, the long-term storm water runoff characteristics of the site are not expected to change; all disturbed areas will be reseeded with similar vegetation types as before project conditions.

5. Construction Sequence. The probable construction sequence is summarized in Table 6-2. The contractor will be required to start pump station and discharge channel construction prior to initiating any of the other project features. All construction should be accomplished within two construction seasons and adhere to any endangered or threatened species restrictions in the area. Mast tree plantings should be accomplished within four construction seasons with weed control continuing an additional three years for the last plantings.

Table 6-2. Rice Lake HREP Probable Construction Sequence

Sequence	Construction Work Item	Instructions	Purpose
1	Install/Construct new pump station facility	Area of construction is restricted to the 100 ft wide area identified on plate 25.	Construction during low water levels will minimize dewatering operations.
2	Excavate discharge channel and construct berm	Use excavated material for berm.	Maximize use of on-site materials to minimize costs.
3	Restore perimeter levee	Clay material will be obtained within Goose Lake.	Maximize use of on-site materials to minimize costs.
4	Construct spillway	Use articulated concrete matting to reduce maintenance costs.	Provides access to operate downstream water control structures.
5	Install/Construct water control structures	Construct in manner that minimizes damage to existing berms and maintains access into refuge.	This will allow habitat management and public use to continue during project construction.
6	Plant mast trees	Trees will be planted in 100 acre increments.	Spreading plantings over four years will reduce losses from a major flood.
7	Plant native grass	Plant during dormant season (Nov 5 - Feb 5).	Sowing seeds during dormant season allows incorporation of the seed into the soil through frost heaving.

G. Operational Considerations. Operation of water supply and water control features enhances habitat for fall waterfowl migration. To that effect, the wetlands may be drained in the spring to allow establishment of vegetation, and flooded in the fall to provide resting habitat for migrating waterfowl. Controlled water level fluctuations provide a wider variety and dependable supply of food for migrating waterfowl and resident species.

H. Maintenance. The proposed features have been designed to ensure low annual maintenance requirements. Routine maintenance would include periodic inspection and lubrication of the pumps and water control structures. Pumps should be exercised periodically to ensure operational readiness. The discharge channel and perimeter levee should be routinely inspected for evidence of erosion. Debris removal along the perimeter levee and spillway will be required. Debris and sediment removal within the discharge channel and pump station forebay will also be required every one or two years. Weed control will be required around the trees three years following the plantings. Weed control may involve mowing and/or herbicides application. Additional maintenance may be required after flood events. The estimated annual maintenance costs are presented in Section 8 of this DPR. Maintenance requirements will be further detailed in the project's O&M manual published after construction is finished.

I. Value Engineering. A Value Engineering (VE) study was completed in May 2005 for this project in accordance with ER 11-1-321, Army Programs, Value Engineering, dated 28 February 2005. The VE study recommendations have been reviewed for technical acceptance and coordinated with the sponsor. The adopted recommendations have been incorporated into this DPR and are as follows: adjacent borrow for the overflow spillway, and articulated mat

construction for the spillway. A VE study was also completed in October 1998, which recommended a reduced length for the spillway and perimeter levee and a shorter fish passage structure. These recommendations from the 1998 study have also been incorporated into this DPR. Additional opportunities to provide added value to the project will be pursued during the development of the plans and specifications and construction phases of the project.

7. SCHEDULE FOR DESIGN AND CONSTRUCTION

Table 7-1 presents the schedule of project completion steps.

Table 7-1. Project Implementation Schedule

Event	Scheduled Date
Distribute draft DPR for agency review	Sep 97
Distribute public and agency review draft DPR	Jan 10
Submit Final DPR to Mississippi Valley Division	Mar 10
Approve plans and specifications	Apr 10
Construction approval by Mississippi Valley Division	Apr 10
Execute the Project Partnership Agreement	Jun 10
Advertise contract	Jul 10
Award contract	Aug 10
Complete construction	Dec 14

8. COST ESTIMATES

Table 8-1 compares costs for the fully funded estimate (FFE) and the current work estimate (CWE) (Appendix J, *Cost Estimate*.) The FFE was calculated based on the proposed construction schedule, expected escalation costs, and a contingency factor, and represents the money expected to be spent at the end of project construction. The CWE, with a 25 percent contingency factor, is shown in a detailed estimate of project design and construction costs as presented in table 8-2. A detailed estimate of operation, maintenance, and rehabilitation costs is presented in table 8-3. Table 8-4 presents the annual monitoring costs. Quantities and costs may vary during final design. All cost estimates are calculated using present worth (January 2010) and do not include future inflation escalation.

Table 8-1. Project Design and Construction Cost Estimates

Account	Feature	Fully Funded Estimate[1] (FFE) ($)	Current Working Estimate (CWE) ($)
01	Lands and Damages	$7,653,000	$7,653,000
02	Relocations	0	0
06	Fish and Wildlife Facilities	$9,608,614	$9,307,294
30	Planning, Engineering and Design	$1,683,576	$1,670,359
31	Construction Management	$791,530	$766,615
	Project Costs Subject to Cost Sharing	**$19,736,720**	**$19,397,268**
	Non-Federal Cost[2]	**$6,907,852**	**$6,789,044**
	Estimated non-Federal Lands and Damages	$7,653,000	$7.653,000
	Required non-Federal Cash or Work In-Kind Contribution	0	0
	Excess non-Federal Lands and Damages	$745,148	$863,956
	Federal Cost[3]	**$12,083,720**	**$11,744,268**
	Ecosystem Restoration Report	$(1,200,000)	$(1,200,000)
	Remaining Federal Costs	**$10,883,720**	**$10,554,268**

1. Fully funded estimate is marked up to midpoint of construction
2. All project features are subject to 65 percent Federal and 35 percent non-Federal cost share.
3. The Federal cost is 65% of the Project Costs Subject to Cost Sharing line less the Excess non-Federal Lands and Damages line.

Table 8.2. Detailed Project Cost Summary, January 2010 Price Level

Acct Code	Item	Quantity	Unit	Unit Price	Cost	Contingency
01	**Lands and Damages**					
	Real Estate	1	LS	$7,653,000	$7,653,000	$0
	TOTAL Lands and Damages				**$7,653,000**	
02	**Relocations**	-	-	-	-	-
06	**Fish and Wildlife Facilities**					
	Mob & Demob	1	LS	$193,133	$193,133	$48,283
	TOTAL Mob & Demob				**$193,133**	**$48,283**
06.10	**Perimeter Control Dike**					
	Access Road Improvement	1	LS	$130,772	$130,772	$32,693
	Overflow Spillway	1	LS	$389,093	$389,093	$97,273
	Articulated Concrete Block Mat	116100	SF	$7.57	$878,877	$219,719
	Perimeter Control Dike	55000	CY	$17.71	$974,050	$243,513
	TOTAL Perimeter Dike				**$2,372,792**	**$593,198**
	Gravity Outlet (Gatewell) Structure					
	Excavation	1	LS	$1,112	$1,112	$278
	Slide gate Structure	1	LS	$71,827	$71,827	$17,957
	60" RCP	1	LS	$52,435	$52,435	$13,109
	Backfill & Compaction	1	LS	$1,212	$1,212	$303
	TOTAL Gatewell Structure				**$126,586**	**$31,647**
06.20	**Pump Station**					
	Pump Station	1	LS	$1,373,900	$1,373,900	$343,475
	Added Pipe Length Costs	1	LS	$800,849	$800,849	$200,212
	Access Road to Pump Station	1	LS	$57,943	$57,943	$14,486
	Pavement Replace Over Pipe Trench	1	LS	$21,703	$21,703	$5,426
	TOTAL Pump Station				**$2,254,395**	**$563,599**

Table 8.2 Detailed Project Cost Summary, January 2010 Price Level (Continued)

Acct Code	Item	Quantity	Unit	Unit Price	Cost	Contingency
	Discharge Channel					
	Clearing and Grubbing	33	AC	$816.09	$26,931	$6,733
	Channel Excavation	100000	CY	$9.92	$992,000	$248,000
	Dewatering at Slim Lake	1	LS	$8,558	$8,558	$2,140
	Seeding	33	AC	$1,875.61	$61,895	$15,474
	Riprap Erosion Protection	1	LS	$186,776	$186,776	$46,694
	Articulated Concrete Block Mat	3000	SF	$7.72	$23,160	$5,790
	TOTAL Discharge Channel				**$1,299,320**	**$324,830**
	Water Control Structures					
	2 - 24" Control Voorhees	2	EA	$23,326.50	$46,653	$11,663
	2 - 24" Agri-drain Slim Lake	2	EA	$14,166.50	$28,333	$7,083
	3 - 48" Control Rice Lake	3	EA	$32,990.33	$98,971	$24,743
	3 - 48" Control Big Lake	3	EA	$32,990.33	$98,971	$24,743
	Riprap Scour Protection at Outfall	1	LS	$1,861	$1,861	$465
	TOTAL Control Structures				**$274,789**	**$68,697**
	Existing Voorhees Pump Station					
	New 36" Slide Gate	1	LS	$10,836	$10,836	$2,709
	New 36" Flap Gate	1	LS	$8,029	$8,029	$2,007
	Pump Removal	1	LS	$4,141	$4,141	$1,035
	Riprap Protection	1	LS	$14,282	$14,282	$3,571
	Remove Existing 36" Pipe	100	LF	$31.17	$3,117	$779
	Install New 36" Pipe	100	LF	$102.93	$10,293	$2,573
	TOTAL Voorhees Pump Station				**$50,698**	**$12,675**

Table 8.2 Detailed Project Cost Summary, January 2010 Price Level (Continued)

Acct Code	Item	Quantity	Unit	Unit Price	Cost	Contingency
	Existing Rice Lake Pump Station					
	Building Removal	1	LS	$4,566	$4,566	$1,142
	Electrical Removal	1	LS	$11,909	$11,909	$2,977
	Pump Removal	1	LS	$3,499	$3,499	$875
	Cap 36" Pipes	1	LS	$4,357	$4,357	$1,089
	Fill and Cap Pump Station	1	LS	$5,129	$5,129	$1,282
	TOTAL Existing Pump Station				**$29,460**	**$7,365**
06.30	**Fish Egress for Rice Lake**					
	Culvert Fish Egress	1	LS	$152,434	$152,434	$38,109
	Granular Surfacing Road Repair	1	LS	$2,277	$2,277	$569
	TOTAL Rice Lake Fish Egress				**$154,711**	**$38,678**
	Fish Egress for Big Lake					
	Culvert Fish Egress	1	LS	$156,131	$156,131	$39,033
	TOTAL Big Lake Egress				**$156,131**	**$39,033**
06.40	**Vegetation Plantings**					
	Mast Tree Plantings	352	AC	$1,299.04	$457,262	$114,316
	Warm Season Grass Plantings	57	AC	$1,343.12	$76,558	$19,139
	TOTAL Plantings				**$533,820**	**$133,455**
	SUBTOTAL Fish and Wildlife Facilities Cost				**$7,445,835**	
	SUBTOTAL Contingencies					**$1,861,459**
	TOTAL Fish and Wildlife Facilities Cost				**$9,307,294**	
30	**Planning, Engineering and Design**					
	Plans and Specifications				$300,000	
	Engineering During Construction				$170,359	
	Definite Project Report				$1,200,000	
	SUBTOTAL				**$1,670,359**	
31	**Construction Management**					
	Contract Administration				$766,615	
	Shop Drawing Review					
	Inspection and Quality Assurance					
	SUBTOTAL				**$766,615**	
	Total Project Cost				**$19,397,268**	

Table 8-3. Estimated Annual Operation and Maintenance Costs (January 2010 Price Level**)**

	Quantity	Unit	Unit Price ($)	Total Cost ($)
Operation				
Pump Operation [1]	336	Hours	$40	$13,440
Site Inspection [2]	40	Hours	48	1,920
Maintenance				
Mowing	32	Acres	9	272
Mowing, Mast Tree Plantings	352	Acres	17	5,984
Mowing/burning Grassland [3]	57	Acres	18	1,015
Road Gravel	200	CY	5	1,000
Debris Removal (channel/forebay /water controls)	100	Hours	48	4,800
Subtotal				28,431
Rehabilitation [4]				
Contingencies (20%)				5,686
Total				34,117

[1] Pump operation costs include utility and upkeep costs for all pumps.

[2] Yearly cost to inspect all items.

[3] Represents an average cost over the first five years. Includes mowing four times the first year, two times the second year, and burning one time per year for years three through five. After year five, field will be burned off every three years at $12 per acre.

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

Table 8-4. Estimated Post-Construction Annual Monitoring Costs ($) (January 2010 Price Level)

Item	Annual Cost ($)
Engineering Data [1]	$6,000
Natural Resource Data [1]	4,000
Subtotal	**10,000**
Contingencies (20 percent)	2,000
Subtotal	**12,000**
Planning, Engineering, Design [2]	3,000
Total	**$15,000**

[1] Reference Tables 10-2 and 10-3.
[2] Includes cost of annual evaluation report.

9. ENVIRONMENTAL EFFECTS

A. Summary of Effects. The Rice Lake SFWA is a large and complex site with a variety of resources that vary greatly in quantity and quality. The goals for the project are to restore and protect wetland, aquatic, and floodplain habitat. For proposed wetland and aquatic habitat rehabilitation/enhancement (perimeter levee, pump station, and fish access structures), no alteration of vegetative cover type is anticipated, with the exception of the immediate construction footprint. The proposed measures are expected to have a net positive effect on the quality of existing habitat in the project area. For proposed floodplain habitat rehabilitation/enhancement, one cover type (agricultural field on Duck Island) would be converted to two other cover types (native grassland and mast-dominant floodplain forest). The expected increases in habitat quality and quantity would help to fulfill management objectives to meet the State's goals for the site, as outlined in Section 3(D) of this DPR.

Operation of the project to meet the management objectives of the Rice Lake SFWA is expected to have a positive effect on natural floodplain values. Because the perimeter levee would provide only a low level of protection from seasonal river stage fluctuations, no measurable change in floodplain storage is anticipated and no change in flood heights is expected to result from this action. The project is expected to have a net positive effect on wetland wildlife habitat. Despite the footprint impacts associated with construction of the discharge channel and perimeter levee, the overall wetland function within the complex will remain and be enhanced.

B. Economic and Social Impacts

1. Community and Regional Growth. No short-term or long-term impacts to the growth of the neighboring community or region would be realized as a result of the project. The project would improve recreation opportunities at the Rice Lake SFWA, increasing the attractiveness of the area for wildlife observation, waterfowl hunting, sport fishing, camping, canoeing, photography, and commercial fishing.

2. Community Cohesion. The proposed wildlife habitat restoration project has positive impacts on community cohesion as the wildlife area attracts many visitors and recreationists from other communities. Overall, the project would have no adverse impacts to the quality of the human environment.

3. Displacement of People. There are no residential properties in the study area that would be displaced by the proposed project.

4. Property Values and Tax Revenues. Approximately 507 acres on Duck Island are currently leased for crop production. The project proposes to convert 409 acres of agricultural field to a combination of forest and grassland cover types, thus removing the acreage from production.

5. Public Facilities and Services. The Rice Lake SFWA attracts over 150,000 visitors each year. The proposed wildlife habitat restoration project would positively impact public facilities and services by enhancing outdoor recreational opportunities.

6. Life, Health, and Safety. The project poses no threats to the life, health, or safety of recreationists in the area. A hazardous, toxic, and radioactive waste (HTRW) assessment was conducted and no obvious indications of potential contamination sources or migration pathways from surrounding properties were noted.

7. Business and Industrial Activity. No significant changes in business and industrial activities would occur during project construction. Long-term impacts to business and industrial development would be related to tourism and recreational activities. Duck Island is the site of a small sand and gravel operation that is permitted through 2010 with an option for renewal.

8. Employment and Labor Force. Short-term employment opportunities in the area may increase slightly during project construction. The project would not directly affect employment of the labor force in Fulton County, Illinois.

9. Farm Displacement. No farms would be displaced as a result of the proposed project. Conversion of Duck Island agricultural fields would remove 409 acres from crop production. This is leased land, and is not a main source of income for the tenant.

10. Aesthetic Values. The enhancement of the wildlife area would ensure continued waterfowl utilization of the complex and surrounding areas, and make the complex more aesthetically pleasing to visitors.

11. Noise Levels. Heavy machinery would generate a temporary increase in noise levels during project construction, disturbing wildlife and recreationists in the area. The project area is basically rural in nature, and no significant, long-term impacts would result.

C.. Natural Resources Impacts. Effects of the project on the quality and quantity of fish and wildlife habitat were evaluated using WHAG (Urich, *et al.*, 1984) methodologies, as described in Section 5 and Appendix D of this report. These habitat evaluation methods were used during project planning to evaluate features in terms of increased benefits to wildlife resources. Optimization of AAHUs in relation to project costs for evaluated species is considered the goal of feature selection. Results of the habitat evaluations are summarized in Table 5-1, with a more detailed analysis in Appendix D. Assessment of project impacts also was based on experience from past and current management practices.

Construction of the perimeter levee will require clearing approximately 4.8 acres of bottomland hardwood vegetation, primarily second growth silver maple with occasional large cottonwoods. The levee will be constructed using adjacent material or material mechanically dredged from Goose Lake. The levee will be reseeded with flood-tolerant grass species to control erosion and protect the integrity of the structure. Construction of pumping and drainage facilities will occur primarily in areas that have been previously disturbed; however, approximately 20 acres of forested and nonforested wetland will be impacted by construction activity. Clearing in all areas will be limited to the minimum necessary for construction. Operation of the project will not create conditions new to the plant species bordering the water level management structures.

1. Aquatic Resources. Additional discussion of aquatic and water quality impacts is contained in Appendix B - Clean Water Act, Section 404(b)(1) Evaluation. A slight increase in turbidity in Goose Lake may occur from mechanical dredging and stockpiling of borrow material. The increased turbidity is expected to have negligible impact considering existing turbidity levels in the Illinois Waterway and the backwaters of the Rice Lake SFWA. As indicated in the WHAG analysis, the fish passage structure should benefit fisheries by providing access to deepwater habitat during drawdown periods.

2. Wetland and Floodplain Resources. The proposed plan would benefit more than 3,054 acres of nonforested wetland/shallow aquatic habitat through enhancement of water level control capability. The primary benefits would be increased reliability of moist-soil food production and access to feeding areas during fall and spring migration. Migratory waterfowl, shorebirds, and wading birds would benefit from more reliable feeding and resting areas. Muskrat populations should not be negatively affected, and would be expected to benefit from an increase in emergent and moist-soil vegetation, as indicated by the WHAG analysis. Wetland and floodplain resources would benefit from the increased habitat diversity provided by the proposed warm season grassland and mast tree planting on approximately 409 acres of existing agricultural field on the Duck Island peninsula. While some loss of habitat to mallard and goose is expected to result from the agricultural field conversion, no overall loss of habitat value to these or any of the other evaluated species is expected if the recommended plan is implemented.

3. Endangered Species. The federally threatened bald eagle (*Haliaeetus leucocephalus*) occurs within the Rice Lake SFWA during the winter months. Construction of the perimeter levee is not expected to directly impact any trees regularly used by eagles during nesting or foraging activities. If necessary, construction activities will be scheduled for periods when few, if any, eagles are present (usually April 1 - October 30). The USFWS, in their 1997 Coordination Act Report (Appendix A), stated that the proposed project would not affect bald eagles or their habitats. The ILDNR has identified at least one bald eagle nest within the Rice Lake SFWA; however, no construction activities are expected to occur within close proximity ($\leq$ 0.25 mile) of this nest.

The Federally threatened decurrent false aster (*Boltonia decurrens)* is known to occur within the project area. Incidental impacts to individual specimens of decurrent false aster may occur during construction of the perimeter levee or conveyance channels. These effects would be minor and short-term. Clearing for construction of the perimeter levee could have a slight positive effect on decurrent false aster in the long term by expanding openings in the existing tree canopy and exposing previously shaded areas to full sun. Decurrent false aster populations in the Rice Lake SFWA are not expected to be adversely affected by operation of the proposed project. Impacts to the documented population located along the northern portion of the water control levee will be avoided by installing a temporary protective fence, if necessary, during construction work in the area.

The Federally endangered Indiana bat (*Myotis sodalis*) may roost and forage for insects along the Illinois Waterway floodplain during spring and summer months. The USFWS lists the bat as potentially occurring statewide in Illinois, and suitable habitat for the species exists in the floodplain forests of the study area. Prior to initiation of any activities that could disturb Indiana bat habitat, such as tree clearing, the Corps will consult with the USFWS to determine appropriate measures to establish the presence or absence of the species in the project vicinity, and to avoid or minimize potential harm to individuals if the species is found to be present.

D. Historic Properties. Illinois State Museum (1996:25) documents 27 archeological sites within the 177.87 hectares (439.5 acres) investigated, including seven prehistoric isolated finds, 14 prehistoric sites, one historic site, and five mixed component historic and prehistoric sites.

The Illinois State Museum recommended four of these sites as potentially eligible for listing to the National Register of Historic Places (NRHP): 11F2745, 11F2746, 11F2895, and 11F2886. Based on these NRHP-eligibility recommendations, the Corps has designed this project with a 30-meter (m) easement along the perimeter of these four sites, so that no trees are planted within this buffer. This avoids disturbance by both the tree planting process and by any future disturbance by mature tree roots.

In addition, the Corps has determined that the Copperas Creek Lock (11F2723) is individually eligible for listing to the NRHP under Criteria A and C. This lock was constructed by the Corps and the State of Illinois between 1873 and 1877 as part of the Illinois Waterway navigation improvement and is presently owned by the city of Canton, Illinois. The history and significance of this lock and the NRHP eligible Multiple Property Chicago to Grafton, Illinois, Navigable Water Link, 1836-1945, is extensively documented by American Resources Group Ltd. (1996).

The proposed pump station location is adjacent to the Copperas Creek Lock and is buffered by mature trees and undergrowth. Therefore, those significant characteristics of the Copperas Creek Lock under Criteria A and C [as documented by American Resources Group Ltd. (1996)] will remain. The primary visual boundaries of the lock are between the ground surface and waterline, while the proposed Pump Station will be visually hidden from Copperas Creek Lock by vegetation, and have a low profile well below extant tree height. By applying the Criteria of Effect under 36 CFR Part 800.9(a): "Protection of Historic Properties," the Corps determined that No Effect to the NRHP eligible Copperas Creek Lock would occur from the construction of the Rice Lake HREP and associated pump station feature.

Because of the potential for effects to the archaeological component of site 11F2723, the Corps provided Phase II testing at this location. In the report of this work, Illinois State Museum (2002:4) stated that 11F2723 did not meet the requirements for listing on the National Register of Historic Places and recommended project clearance.

The IHPA, Springfield, Illinois, concurred with the recommendations of the draft archeology reports prepared by Illinois State Museum, and with the Corps findings, recommendations, and determination of effect by letter dated December 6, 1996 (Appendix A, IHPA LOG# 961205001P-F), and letter, dated June 18, 2003 (Appendix A, IHPA LOG#010051503). A final copy of the archeology report: *Phase I Intensive Archaeological Survey for Historic Properties Within the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central, Illinois,* dated January 1997, and a final copy of the ASSR: *Subsurface Testing of Portions of 11F2723 for the Rice Lake Habitat Rehabilitation and Enhancement Project*, dated March 4, 2002, were provided to the IHPA and the ILDNR, as evidence of the Corps' compliance pursuant to Section 106 of the NHPA, and determination of No Effect pursuant to 36 CFR Part 800.5(b). All consulting parties must be aware that the specific locations of historic and archaeological properties are subject to protection through nondisclosure under Section 304 of the National Historic Preservation Act. This information is not to be released in order to protect the resources at the sites and any request for site reports and site location information shall include comment from the IHPA, Springfield, Illinois.

In a letter to the IHPA dated November 29, 1996 (Appendix A, an identical Corps letter was provided to the ILDNR), the Corps proposed avoidance of sites 11F2745, 11F2746, 11F2895, and 11F2886 by use of a 30-meter buffer around each site and determined that this project would have "no effect" on the Copperas Creek Lock. In a reply dated December 6, 1996 (Appendix A), the IHPA concurred with the Corps, stating "the project, as proposed, will have no effect on sites or structures eligible or potentially eligible for listing on the National Register of Historic Places."

If human remains, funerary objects, sacred objects, or objects of cultural patrimony are encountered or collected, the Corps will comply with all provisions outlined in the appropriate state acts,

statutes, guidance, provisions, etc., and any decisions regarding the treatment of human remains will be made recognizing the rights of lineal descendants, Tribes, and other Native American Indians and under consultation with the SHPO/THPO(s) and the other consulting parties, designated Tribal Coordinator, and/or other appropriate legal authority for future and expedient disposition or curation. When finds of human remains, funerary objects, sacred objects, or objects of cultural patrimony are encountered or collected from Federal lands or federally recognized tribal lands, the Corps will coordinate with the appropriate federally recognized Native American Tribes, pursuant to the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001 *et seq*.) and its implementing regulations (43 CFR Part 10).

The Corps has met its legal and regulatory requirements for compliance with historic properties laws and regulations. If any historic properties are encountered, uncovered, or discovered, indirectly or directly associated with the Rice Lake HREP construction, all disturbance activities will halt which could potentially affect the historic properties. The Corps will notify the IHPA to coordinate measures to determine significance, and avoid and minimize any potential effects to any significant historic properties.

E. Mineral Resources. No significant impacts to mineral resources are expected to occur as a result of this project. The remaining supply of aggregate material is variously estimated from approximately 6,400 tons per acre to 9,000 tons per acre with approximately 375 acres estimated suitable for potential mining. The mining activity on Duck Island has been seasonal and is subject to closure during high water. The minerals extracted are of average quality and when processed correctly meet the Illinois Department of Transportation standards. The mine operators lease was extended through 2010 with an option for renewal. The native grassland and mast tree planting feature could potentially affect future mining activity at the Duck Island quarry if the ILDNR does not continue the commercial lease beyond 2011.

F. Farmland Protection. There are approximately 507 acres of existing cropland on the Duck Island peninsula. The proposed planting features would convert 409 acres of this cropland through planting of warm season grasses and mast producing trees. Examination of the Fulton County Soil Survey indicates that most of the agricultural field soils are classified as prime farmland soils. An updated U.S. Department of Agriculture Form AD-1006 will be submitted to the Natural Resources Conservation Service (NRCS) for review. Full compliance under Farmland Protection Policy Act will be completed prior to implementation of the planting features.

G. Cumulative Impacts. Although minor short-term impacts are likely to occur to local animals and plants within the construction footprint, no significant cumulative adverse impacts are expected. The habitat restoration measures proposed as part of this HREP should have long-term benefits to the fish and wildlife populations utilizing the site. This project, cumulatively with other HREPs and other ecosystem restoration efforts on the Illinois Waterway, should help to counter other past and ongoing adverse impacts to the river ecosystem such as sedimentation, pollution, and general decline in riverine and floodplain habitat.

H. Adverse Impacts Which Cannot Be Avoided. The most notable unavoidable adverse impact would be the clearing of vegetation for construction of project features. The perimeter levee was designed to follow the alignment of the existing access road and the natural levee along the Illinois Waterway. Construction of the levee will involve placement of fill material in areas that currently are lower than the design crest elevation of 442.0. Approximately 4.8 acres of woody vegetation are expected to be cleared as a result of construction. Most of this clearing would occur along the downstream portion of the perimeter levee alignment, where more extensive filling would be required to meet the 442.0 crest elevation. Another 20 acres of forested and nonforested wetland are expected to be cleared for construction of pumping and drainage facilities. Clearing of existing vegetation, particularly mature woody vegetation, would be kept to the minimum required for construction activities and post-construction maintenance.

I. Short-Term versus Long-Term Productivity. Construction activities would temporarily disrupt wildlife and human use of the project area. Long-term productivity for natural resource management would benefit considerably by the construction of this project. Long-term productivity would be enhanced through increased reliability of seasonal water levels, promoting the success of emergent and moist-soil vegetation and providing more dependable feeding and resting areas for migratory and resident wildlife. Overall habitat diversity would be increased, and both game and nongame wildlife species would benefit from the proposed project. In turn, both consumptive and nonconsumptive users would realize heightened opportunities for recreational use of the Rice Lake SFWA.

J. Irreversible or Irretrievable Resource Commitments. The purchase of materials and the commitment of man-hours, fuel, and machinery to perform the project are irretrievable. Other than the aforementioned, none of the proposed actions are considered irreversible.

K. Relationship of the Proposed Project to Land-Use Plans. The proposed project is in compliance with the Rice Lake SFWA Natural Resource Management Plan (ILDNR, 1989). The proposed project is not in conflict with any land-use plans currently being used for the site.

L. Compliance With Environmental Statutes. Compliance with applicable statutes is summarized in Table 9-1.

Table 9-1. Relationship of Plans to Environmental Protection Statutes and Other Environmental Requirements

Federal Environmental Protection Statutes and Requirements	**Applicability/ Compliance**
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 11 Aug 80)	Full Compliance
Archaeological and Historic Preservation Act, 16 U.S.C. 469, et seq.	Full compliance
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	Full compliance
Clean Water Act, Sections 404 and 401	Full compliance
Endangered Species Act of 1973, as amended, 16 U.S.C. 1531, et seq.	Full compliance
Farmland Protection Policy Act. 7 U.S.C. 4201, et seq.	Full compliance
Federal Water Protection Recreation Act, 16 U.S.C. 460-(12), et seq.	Full compliance
Flood Plain Management (Executive Order 11988)	Full compliance
Land and Water Conservation Fund Act, 16 U.S.C. 460/-460/-11, 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
Protection of Wetlands (Executive Order 11990)	Full compliance
Rivers and Harbors Act, 33 U.S.C. 403, et seq.	Full compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	Not applicable
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.

b. Not applicable. No requirements for the statute required.

10. PROJECT PERFORMANCE ASSESSMENT MONITORING

This section summarizes the monitoring and data collection aspects of the project. The primary project objectives have been summarized elsewhere in this document, and the performance assessment is designed to gauge progress toward meeting these objectives.

Table 10-1 presents overall types, purposes, and responsibilities of monitoring and data collection.

Table 10-2 presents actual monitoring and data parameters grouped by project phase, as well as data collection intervals.

Table 10-3 presents the post-construction evaluation plan, which displays the specific parameters and the levels of enhancement that the project hopes to achieve.

Table 10-1. Monitoring and Performance Evaluation Matrix

Project Phase	Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Implementation Instructions
Pre-Project	Pre-Project Monitoring Baseline Monitoring	Identify and define problems at HREP site. Establish need of proposed project features. Establish baselines for performance evaluation.	Sponsor Corps	Sponsor Field Station or Sponsor through Cooperative Agreements or Corps	Sponsor HREP/-Sponsor	See Table 10-2
Design	Data Collection for Design	Include quantification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP	See Table 10-2
Construction	Construction Monitoring	Assess construction impacts; assures permit conditions are met.	Corps	Corps	HREP	See State Section 401 Stipulations
Post-Construction	Performance Evaluation Monitoring Biological Response Monitoring	Determine success of project as related to objectives. Evaluate predictions and assumptions of habitat unit analysis. Study beyond scope of performance evaluation.	Corps (quantitative) Sponsor (field observations) Corps	Field Station or Sponsor through Cooperative Agreement, Sponsor thru O&M, or Corps Corps	HREP/-Sponsor HREP	See Table 10-3

Table 10-2. Resource Monitoring and Data Collection Summary [1]

	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
TYPE MEASUREMENT	**Apr-Sep**	**Oct-Mar**	**Apr-Sep**	**Oct-Mar**	**Apr-Sep**	**Oct-Mar**							**Sampling Agency**	**Remarks**
Point Measurements														
Water Quality Stations [2]													Corps	
Turbidity														
Secchi Disk Transparency														
Suspended Solids														
Dissolved Oxygen														
Specific Conductance														
Water Temperature														
PH														
Total Alkalinity														
Chlorophyll														
Velocity														
Water Depth														
Water Elevation														
Percent Ice Cover														
Ice Depth														
Percent Snow Cover														
Snow Depth														
Wind Direction														
Wind Velocity														
Wave Height														
Air Temperature														
Percent Cloud Cover														
Elutriate Test Stations														
Column Settling Stations														
Column Settling Analysis								1					Corps	
Boring Stations [3]														
Geotechnical Borings								1					Corps	
Fish Stations														
Electrofishing/Seining										1		1Y 1-2	ILDNR	

Table 10-2 continued. Resource Monitoring and Data Collection Summary [1]

	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
TYPE MEASUREMENT	**Apr-Sep**	**Oct-Mar**	**Apr-Sep**	**Oct-Mar**	**Apr-Sep**	**Oct-Mar**							**Sampling Agency**	**Remarks**
Transect Measurements														
Vegetation Transects														
Mast Tree Survey												5Y	Corps	
Area Measurements														
Mapping														
Vegetation Mapping										1		1Y 1-5	Corps	
Grassland Plant Survey												5Y 6-50	Corps	
Aerial Photography/ Remote Sensing							1					5Y	Corps	

Legend

W = Weekly — nW = n-Week Interval
M = Monthly — nY = n-Year Interval
Y = Yearly — 1,2,3 = Number of times data is collected within designated project phase

[1] See plate 32 for active monitoring sites.
[2] Water Quality Station (W-I135.4B)
[3] Corps of Engineers Geotechnical Borings - See Plates 28 through 31 for locations and boring dates.

TABLE 10-3. Post-Construction Evaluation Plan

Enhancement Potential									
Goal	**Objective**	**Enhancement Features**	**Unit**	**Year 0 w/out Alt.**	**Year 1 w/Alternative**	**Year 25 [1] w/ Alternative**	**Year 50 Target w/Alt.**	**Feature Measurement - See. Table 10-2**	**Annual Field Observations b Site Manager**
Restore and Protect Wetland Habitat	Increase success rate of annual emergent/moist soil vegetation production Reduce adverse effects of river stage fluctuations on wetland habitat Increase natural food and cover for wildlife during critical migration periods	Construct low perimeter levee around Big Lake and Goose Lake Construct pump station with conveyance ditches	probability of successful operation (%)	18	65	65	65	manager observation on whether the site achieved drawdown and flooding at the desired time	record observations fo both drawdown and flooding; inspect and rec discharge chan and water contr structures condition

TABLE 10-3 continued. Post-Construction Evaluation Plan

Restore and Protect Aquatic Habitat	Increase fish egress opportunities from Rice Lake during drawdown periods Maintain seasonal access between Rice Lake/Big Lake aquatic areas and Illinois Waterway Increase off-main channel aquatic habitat in Illinois Waterway	Provide access from Rice Lake to deepwater areas in quarry Provide access from Goose Lake to Illinois River Dredge Senate Island side channel	fish movement from Rice Lake to quarry and from Goose Lake to Illinois Waterway	0	structures accessible to fish during lowering of interior water levels	structures accessible to fish during lowering of interior water levels	structures accessible to fish during lowering of interior water levels	outlet side fish egress structure net sampling	record observations or fish kills, avian botulism cases
Restore and Protect Floodplain Habitat	Increase natural food and cover for resident and migratory wildlife	Establish mast tree and native grass plantings on Duck Island	survival (%) acre	0 0	100 57	50 57	25 57	tree count/random sampling vegetation survey	estimate effecti acreage and rec observed wildli use estimate area of established/ regenerated vegetation

[1] The year of monitoring varies with purpose and nature of goal and feature.

11. REAL ESTATE REQUIREMENTS

The project will be cost-shared by the ILDNR, as the non-federal sponsor, and will include the Rice Lake SFWA as well as a portion of Duck Island. All of the lands currently required for the project are owned in Fee Simple Title by the ILDNR. A portion of the Rice Lake SFWA was purchased using Federal funds through the Federal Aid in Wildlife Restoration Program. This portion of Rice Lake does not fall within the proposed project boundary. The lands proposed for the Rice Lake Habitat Rehabilitation and Enhancement Project currently do not entail previous Federal involvement. The real estate interests required for the project consist of Fee Simple Title. Detailed information relating to the real estate aspects of the project can be found in the Real Estate Plan included as Appendix L to this report.

The ILDNR will be required to enter into a Project Partnership Agreement (PPA) which includes the following responsibilities:

a. Provide all lands, easements, rights-of-way, relocations, and suitable borrow and disposal sites (LERRD).

b. Operate, maintain, repair, or replace the project, at no cost to the Government, in a manner compatible with the project's authorized purpose, in accordance with applicable Federal and State laws, and in accordance with specific directions prescribed by the Government. The non-Federal sponsor is required to grant the Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of inspection, and if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project. Operation or maintenance by the Government shall not relieve the ILDNR of their responsibility to meet its obligation as set forth in the PPA (see Appendix C).

c. Save and hold the Government free from all damages arising from the construction, operation, maintenance, and repair of the project, except for damages due to the fault or negligence of the Government or its contractors.

Upon execution of the PPA, lands acquired for project purposes may be eligible for credit against the non-Federal sponsor's 35 percent requirement. Lands already owned as part of a previous Federal project cannot be considered for credit.

12. IMPLEMENTATION RESPONSIBILITIES AND VIEWS

A. U.S. Army Corps of Engineers, Rock Island District. The Corps is responsible for project management and coordination with the ILDNR, USFWS, and other affected agencies. The Corps will submit the subject Definite Project Report (DPR); program funds; finalize plans and specifications; complete all NEPA requirements; advertise and award a construction contract; and perform construction contract supervision and administration. Section 906(e) of WRDA 1986 states that first cost funding for enhancement features will be cost shared with the State of Illinois because the project features will be located on state owned land. Section 509 of WRDA 1999 indicates that the non-Federal share of the costs shall be 35 percent. Any mutually agreed upon major rehabilitation of the project that exceeds the identified annual operation and maintenance cost requirements will be the Corps' responsibility. Major rehabilitation would be considered as a result of specific storm or flood events and is not included in the project cost estimate (Tables 8-2 and 8-3). The Corps has agreed to support this HREP's monitoring and data collection needs as outlined in Tables 10-1 and 10-2.

B. U.S. Fish and Wildlife Service. The USFWS will produce a Coordination Act Report (CAR) for this project. The USFWS has agreed to support this HREP's monitoring and data collection needs as outlined in Tables 10-1 and 10-2.

C. Illinois Department of Natural Resources. The ILDNR, as the non-Federal Sponsor, will be required to provide all lands, easements, rights-of-way, relocations, and borrow and disposal sites. In addition, a cash contribution is needed if the creditable cost of the aforementioned real estate actions is less than 35 percent of total project costs. Operation and maintenance of the project is also the responsibility of the ILDNR in accordance with Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580. These functions will be further specified in the Project Operation and Maintenance Manual to be provided by the Corps prior to final acceptance of the project by the Sponsor. The ILDNR has agreed to support this HREP's monitoring and data collection needs as outlined in Tables 10-1 and 10-2.

13. COORDINATION, PUBLIC VIEWS, AND COMMENTS

Coordination has been made throughout the planning and design process with the following State and Federal agencies:

Illinois Department of Agriculture
Illinois Department of Natural Resources
Illinois Historic Preservation Agency
Illinois Department of Transportation
Natural Resources Conservation Service
U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency

A. Coordination Meetings. Ongoing coordination among the Corps, the USFWS, and the ILDNR was demonstrated by the following meetings:

1. November 30, 1987. Plan formulation meeting with the Corps, the ILDNR, and the USFWS.

2. June 19, 1995. Corps in-house meeting; general project discussion.

3. June 22, 1995. General project discussion with the Corps and the ILDNR.

4. January 23, 1996. General coordination meeting with the Corps and the ILDNR.

5. February 5, 1996. General project discussion with the Corps and the ILDNR.

6. March 27, 2003. General project discussion with the Corps and the ILDNR.

7. June 2, 2004. General project discussion with the Corps and the ILDNR.

8. October 1, 2009. General project discussion with the Corps and the ILDNR.

B. Coordination by Correspondence. The following letters are contained in Appendix A - Correspondence:

1. Letter dated January 30, 1987, from the Illinois Department of Conservation to District Engineer, U.S. Army Engineer District, Rock Island District.

2. Rock Island District letter, dated June 29, 1995, to the Illinois Historic Preservation Agency.

3. Rock Island District letter, dated June 29, 1995, to the Illinois Department of Conservation.

4. Letter dated July 20, 1995, from the IHPA deferring comment to the ILDNR.

5. Rock Island District Memorandum for Record, dated June 6, 1996.

6. Rock Island District Memorandum for Record, dated June 8, 1996.

7. Letter dated September 9, 1996, from the Corps to project proponents and other reviewing agencies requesting preliminary comments concerning the proposed project.

8. Letter dated September 10, 1996, from the Corps to the ILDNR providing Scope of Work for Phase I Intensive Archeological Survey for Historic Properties.

9. Letter dated September 10, 1996, from the Corps to the IHPA providing a Scope of Work for Phase I Intensive Archeological Survey for Historic Properties.

10. Letter dated October 11, 1996, from the Corps to the Natural Resources Conservation Service requesting determination of whether the proposed project site contains farmland subject to the provisions of the Farmland Protection Policy Act of 1981.

11. Farmland Conversion Impact Rating, dated November 5, 1996, prepared by the Natural Resources Conservation Service for the proposed project site.

12. Letter dated November 29, 1996, from the Corps to ILDNR forwarding results of the project's archeological investigation.

13. Letter dated November 29, 1996, from the Corps to the IHPA forwarding results of the project's archeological investigation.

14. Letter dated December 6, 1996, from the IHPA stating compliance of the proposed project with Section 106 of the National Historic Preservation Act of 1966.

15. Draft Fish and Wildlife Coordination Act Report, dated February 24, 1997, from the USFWS, Rock Island Field Office.

16. Rock Island District Memorandum for Record, dated March 9, 1998.

17. Letter dated January 9, 2005, from Sac and Fox Nation of Missouri in Kansas and Nebraska to District Engineer, U.S. Army Corps of Engineers, Rock Island District.

18. Letter dated December 27, 2005, from Winnebago Tribe of Nebraska to District Engineer, U.S. Army Corps of Engineers, Rock Island District.

19. Letter dated January 4, 20006, from Fish and Wildlife Service, Rock Island Field Office, to Colonel Duane P. Gapinski, District Engineer, U.S. Army Engineer District, Rock Island District.

14. CONCLUSIONS

The habitat value of the Rice Lake SFWA is not being fully realized due to frequent summer/fall flooding events that reduce food production and subsequent use by migrating birds.

The recommended project features (perimeter water control levee, pump station and discharge channel, fish egress structures, and native grass and mast-tree plantings) are designed to meet the project's goal of restoring and protecting wetland, aquatic, and floodplain habitat by increasing the success ratio of moist-soil/emergent vegetation, improving fish egress from Rice Lake during drawdown conditions, and increasing food, shelter, and cover for migrating birds, resident birds, mammals, and other wildlife.

Assessment of the future with-project scenario shows definite increases in total habitat units over the 50-year project life for the target species, as well as a majority of other wetland-dwelling species considered. These increases represent quantification of the projected outputs - improved habitat quality and increased preferred habitat quantity.

This project is consistent with and fully supports the overall goal and objectives of the UMRS-EMP, the North American Waterfowl Management Plan, and the Partners in Flight program.

15. RECOMMENDATIONS

I have weighed the outputs to be obtained from the full implementation of this habitat rehabilitation and enhancement project against its estimated cost and have considered the various alternatives proposed, impacts identified, and overall scope. In my judgment, this project, as proposed, justifies expenditure of Federal funds. I recommend that the Mississippi Valley Division Engineer approve the proposed project to include constructing a perimeter water control levee with overflow spillway and gatewell structure, constructing a 133,200 gpm pump station and discharge channel, installing water control structures, planting 57 acres of native grasses and 352 acres of mast trees, and installing two reinforced concrete fish egress structures.

This project will be constructed on State-owned lands and will require cost-sharing with the non-Federal Sponsor, the Illinois Department of Natural Resources (ILDNR). Implementation will be cost shared 65 percent by the Federal government and 35 percent by the ILDNR. Total project costs subject to cost sharing are $19,397,268. This total includes construction of the project features, planning, engineering and design, construction management, and real estate. The ILDNR's 35 percent cost share is $6,789,044, which will be met using land credits totaling $7,653,000 (excess of $836,956). The total Federal cost (65 percent) less the excess land credits is $11,744,268. Operation and maintenance of the project is the responsibility of the ILDNR and is estimated to cost approximately $34,117 annually.

At this time, I further recommend that funds in the amount of $300,000 be allocated for the preparation of project plans and specifications.

_____ _____

(Date)

Shawn P. McGinley
Colonel, U.S. Army
District Engineer

16. FINDING OF NO SIGNIFICANT IMPACT

I have reviewed the information provided by this Environmental Assessment, along with data obtained from Federal and State agencies having jurisdiction by law or special expertise, and from the interested public. I find that the proposed habitat enhancement project at the Rice Lake State Fish and Wildlife Area would not significantly affect the quality of the human environment. Therefore, it is my determination that an Environmental Impact Statement is not required. This determination may be reevaluated if warranted by further developments.

An array of potential features and alternatives were considered for habitat enhancement. Features evaluated in detail were:

A. No Federal Action

B. Perimeter Levee

C. New Pump Station and conveyance channel

D. Native Forest/Grassland Planting

E. Fish Egress Structures

The preferred alternative consists of: constructing a perimeter levee with a top elevation of 442.0 and a spillway at elevation 440.0; constructing a new pump station and associated channels and structures to manage water levels on Big Lake and Rice Lake; converting cropland on Duck Island to grassland and forest habitat by planting 57 acres to native grassland species and 352 acres to mast-producing tree species; and constructing fish egress structures between Rice Lake and the Duck Island quarry, and between Goose Lake and the Illinois Waterway.

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

A. The project is anticipated to produce a net increase in the value of the Rice Lake area for migratory and resident birds, fish, and wildlife species.

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

C. The project is in compliance with Sections 401 and 404 of the Clean Water Act.

D. No significant economic or social impacts are expected to occur in the project area.

_____ _____

(Date)

Shawn P. McGinley
Colonel, U.S. Army
District Engineer