



U.S. Army Corps  
of Engineers®

# A Collection Of Ecosystem Restoration Projects

(Corps of Engineers Section 1135)

Decision Support Technologies  
Research Program

February 2000

IWR Report 00-R-2

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# **A COMPILATION OF COMPLETED SECTION 1135 PROJECTS**

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## **PREFACE**

The work presented in this document was conducted as part of the Decision Support Technologies Research Program. The Program is sponsored by the Headquarters, U.S. Army Corps of Engineers and is assigned to the Water Resources Support Center, Institute for Water Resources. Mr. Michael Krouse is the Program Manager at the Institute for Water Resources. Mr. Harry Kitch, Planning Division, Mr. Jerry Foster, Engineering Division, and Mr. Harold Tohlen, Operations, Construction and Readiness Division, are the Headquarters' Program Monitors. Field Review Group Members that provide overall Program direction include: Mr. William Fickel of the Fort Worth District, Mr. Martin Hudson of the Portland District, Mr. Matt Laws of the Charleston District, and Ms. Pat Obradovich of the Portland District. This paper was prepared under the general supervision of Mr. Michael Krouse, Chief of the Technical Analysis and Research Division (TARD), Institute for Water Resources, and Mr. Kyle Schilling, Director of the Institute for Water Resources and Acting Director of the Water Resources Support Center. Ms. Joy Muncy of the TARD prepared this document.

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## **Chapter I – Introduction**

Ecosystem restoration is one of the primary missions of the Corps's Civil Works program. The purpose of Civil Works ecosystem restoration activities is to restore significant ecosystem function, structure and dynamic process. Most of the restoration in which the Corps participates involves wetlands, riparian, or aquatic ecosystems.

Ecosystem restoration projects can be implemented via a variety of authorities and programs. Studies can be individually authorized as single purpose or a part of studies to address multiple water resources needs, including ecosystem restoration. Projects may also be pursued through one of several programmatic authorities. This report examines projects implemented using the authority provided by Project Modification for Improvement of the Environment, Section 1135 of the Water Resources Development Act of 1986, as amended (Section 1135). Using this authority, the Corps can review existing projects to determine the need for modifications that would help improve the quality of the environment. Modifications can be made to the physical infrastructure itself or to project operation. Restoration initiatives implemented under Section 1135 must be consistent with the authorized purposes of the project being modified. Project costs are shared with a non-Federal sponsor (75 percent Federal and 25 percent non-Federal), and Federal costs must not exceed \$5,000,000 per project.

This report was prepared under the Watershed Management work unit of the Institute for Water Resources (IWR) Decision Support Technologies Research Program.

### **PURPOSE AND SCOPE**

This report compiles information on 28 Section 1135 projects completed as of October 1998. The projects occur in 21 different Corps districts and in 22 different states. The information is descriptive, and intended to be useful to water resources planners and managers in formulating and evaluating Section 1135 and other Corps ecosystem restoration projects. The report is not intended to be a critique of the 28 projects, but rather a summary of these types of projects, and information related to resource problems, objectives, management measures, benefits/outputs, total costs (before final accounting), concerns, level of certainty, and lessons learned.

A fact sheet is provided for each of the 28 projects. Each fact sheet contains the following information shown in Table 1.

**TABLE 1 – FACT SHEET HEADINGS**

<b>Project</b>	<b>Contribute to Goals of the North American Waterfowl Management Plan</b>
<b>State</b>	<b>Benefit Endangered Species</b>
<b>Corps District</b>	<b>Cost Sharing Sponsor</b>
<b>Project Modified and Authorized Project</b>	<b>Views of the Sponsor</b>
<b>Congressional District</b>	<b>Other Contributing and Supporting Agencies</b>
<b>Location</b>	<b>Corps Project Manager</b>
<b>County</b>	<b>Monitoring Plan</b>
<b>USGS Topographic Map(s)</b>	<b>Benefits/ Outputs</b>
<b>Nearest City or Town</b>	<b>Cost of the Project before Final Accounting</b>
<b>Watershed</b>	<b>Schedule of Project</b>
<b>Resource Problem</b>	<b>Site Visits</b>
<b>Objective/ Goals</b>	<b>Level of Certainty that Project is Trending Toward Desired Goals</b>
<b>Description of Proposed Modification</b>	<b>Lessons Learned and Assistance Desired</b>
<b>Significant Design Changes</b>	<b>Recreation Uses</b>
<b>Future with Project Condition</b>	<b>Available Photographs</b>
<b>Concerns/ Issues</b>	
<b>Coastal America Project</b>	

**ORGANIZATION OF REPORT**

The report consists of four sections. The first section includes the introduction, background information, the purpose, scope, organization of the report, and a summary table of the Corps completed Section 1135 projects.

The second section includes the conclusions and recommendations.

The third section contains the fact sheets of the 28 completed Section 1135 projects, which were described in the Scope. Many of these fact sheets include photographs, which depict various stages of the projects (i.e., before construction, during construction, and after construction).

The report concludes with a reference section as an appendix.

The organization of the report was done this way in order to be able to add more projects easily and, if applicable, add more information to an existing project, such as photographs.

### **SUMMARY TABLE OF COMPLETED PROJECTS**

Table 3 illustrates in a database spreadsheet the 28 completed Section 1135 projects described earlier. This spreadsheet would serve as a quick reference, as the fact sheets show more detailed information.

A few details need to be made clear on the information from this table and the fact sheets to follow. The “Authorized Purpose” from the table has been abbreviated as in the following Table 2.

**TABLE 2: Authorized Purposes**

<b>Authorized Purposes</b>	
<b>FC</b>	<b>Flood Control</b>
<b>BS</b>	<b>Bank Stabilization</b>
<b>N</b>	<b>Navigation</b>
<b>WS</b>	<b>Water Supply</b>
<b>R</b>	<b>Recreation</b>
<b>WQ</b>	<b>Water Quality</b>
<b>PA</b>	<b>Pollution Abatement</b>
<b>H</b>	<b>Hydropower</b>
<b>EP</b>	<b>Electric Power</b>
<b>F&amp;W</b>	<b>Fish &amp; Wildlife</b>
<b>C</b>	<b>Conservation</b>

The “Total Cost” from the table and fact sheets is the cost before final accounting. The North American Waterfowl Management Plan has been abbreviated to “NAWMP” in the table. The level of “Certainty (1 to 5)” relates to “1” being “very certain” and “5” being “very doubtful.”

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**TABLE 3**  
**SECTION 1135 PROJECTS**  
**CONSTRUCTION COMPLETED AS OF 1 OCTOBER 98**

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<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>			
<b>Project</b>	<b>State</b>	<b>District</b>	<b>Project being modified</b>
Anacostia River and Tributaries	Maryland	Baltimore	Anacostia River and Tributaries
<b>Boyer Chute</b>	<b>Nebraska</b>	<b>Omaha</b>	<b>Missouri R. Bank Stblztn Proj.</b>
Calcasieu River and Pass	Louisiana	New Orleans	Calcasieu River and Pass
<b>Cape Fear L&amp;D No. 1, Fish Ladder</b>	<b>North Carolina</b>	<b>Wilmington</b>	<b>Cape Fear R. abv. Wilmington L&amp;D No. 1</b>
Fern Ridge Lake, Long Tom River	Oregon	Portland	Fern Ridge Lake
<b>Fishery Habitat Restoration Project, Arcadia Lake</b>	<b>Oklahoma</b>	<b>Tulsa</b>	<b>Arcadia Lake</b>
Fishery Habitat Restoration Project, El Dorado Lake	Kansas	Tulsa	El Dorado Lake
<b>Galilee Salt Marsh Restoration</b>	<b>Rhode Island</b>	<b>New England</b>	<b>Point Judith Harbor of Refuge</b>
Green Island Headwall Modification	Iowa	Rock Island	Mississippi R. 9-foot Navigation Channel
<b>Hidden Lake Restoration</b>	<b>Nebraska</b>	<b>Omaha</b>	<b>Missouri R. Bank Stblztn/Nav. Proj.</b>
Homme Lake	North Dakota	St. Paul	Park River Flood Control Project/Homme Reservoir and Dam
<b>Laguna Madre Seagrass Enhancement Project</b>	<b>Texas</b>	<b>Galveston</b>	<b>Gulf Intracoastal Waterway</b>
Lake O' the Pines (Ferrells Bridge Dam)	Texas	Fort Worth	Lake O' the Pines
<b>Little Pitcher Lake</b>	<b>Indiana</b>	<b>Louisville</b>	<b>J.T. Myers L&amp;D, Ohio R.M. 846</b>
Mississippi River Mast Tree Planting Project	Iowa and Illinois	Rock Island	Mississippi River 9-Foot Channel Nav. Project
<b>Munyon Island Wetland Restoration</b>	<b>Florida</b>	<b>Jacksonville</b>	<b>Atlantic Intracoastal Waterway</b>
Murphy Island, Santee Wildlife Refuge	South Carolina	Charleston	Atlantic Intracoastal Waterway
<b>Narrows Dam - Lake Greeson</b>	<b>Arkansas</b>	<b>Vicksburg</b>	<b>Narrows Dam/Lake Greeson</b>
Nimrod Waterfowl Levee	Arkansas	Little Rock	Nimrod Lake
<b>Orwell Lake</b>	<b>Minnesota</b>	<b>St. Paul</b>	<b>Orwell Dam/Lake</b>
Salt Bayou, McFaddin Ranch Wetlands	Texas	Galveston	Gulf Intracoastal Waterway
<b>Sammamish River Restoration</b>	<b>Washington</b>	<b>Seattle</b>	<b>King County</b>
Savannah Harbor	Georgia	Savannah	Savannah Harbor
<b>Sea Lamprey Barrier, Soo Lock Complex</b>	<b>Michigan</b>	<b>Detroit</b>	<b>Old U.S. Hydroelectric PowerHouse</b>
Trestle Bay Restoration	Oregon	Portland	Columbia River S. Jetty
<b>Twentymile Creek Habitat Restoration</b>	<b>Mississippi</b>	<b>Mobile</b>	<b>Tombigbee River and Tributaries; Twentymile Creek</b>
Waterfowl Ponds - Lake Winnibigoshish	Minnesota	St. Paul	Mississippi River Headwaters Project, Winnibigoshish Dam
<b>Carlyle Lake Wildlife Management Area</b>	<b>Illinois</b>	<b>St. Louis</b>	<b>Carlyle Lake, Kaskaskia River</b>

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>			
<b>Project</b>	<b>Authorized Purpose</b>	<b>Congressional District</b>	<b>County</b>
Anacostia River and Tributaries	FC	MD 5	Prince George's, MD
Boyer Chute	BS, N	???	Washington
Calcasieu River and Pass	N	LA 7	Cameron Parishes
Cape Fear L&D No. 1, Fish Ladder	N	NC 7	Bladen
Fern Ridge Lake, Long Tom River	FC	???	Lane
Fishery Habitat Restoration Project, Arcadia Lake	FC, WS, R	OK 5	Oklahoma
Fishery Habitat Restoration Project, El Dorado Lake	FC, WS, WQ, R	KS 4	Butler
Galilee Salt Marsh Restoration	N	RI 2	Washington
Green Island Headwall Modification	N	IA 2	Jackson
Hidden Lake Restoration	N, BS	NE 2	Sarpy
Homme Lake	WS, PA	ND 1	Walsh
Laguna Madre Seagrass Enhancement Project	N	TX 27	Cameron
Lake O' the Pines (Ferrells Bridge Dam)	FC	TX 1	Marion
Little Pitcher Lake	N	IN 8	Posey
Mississippi River Mast Tree Planting Project	N	IA 2,3 and IL 17	Jackson C. & Des Moines C., IA; Adams C., IL
Munyon Island Wetland Restoration	N	FL 22	Palm Beach
Murphy Island, Santee Wildlife Refuge	N	SC 1	Charleston
Narrows Dam - Lake Greeson	FC, H, R	AR 4	Pike
Nimrod Waterfowl Levee	FC, WR	AR 2	Yell
Orwell Lake	FC	MN 7	Otter Tail
Salt Bayou, McFaddin Ranch Wetlands	N	TX 9	Jefferson
Sammamish River Restoration	FC	WA 7, WA 8	King
Savannah Harbor	N	GA 1 and SC 2	Chatham
Sea Lamprey Barrier, Soo Lock Complex	EP	MI 1	???
Trestle Bay Restoration	N	???	Clatsop
Twentymile Creek Habitat Restoration	FC	MS 1	Itawamba, Lee, Prentiss
Waterfowl Ponds - Lake Winnibigoshish	N, FC,R, H, WS, F&W	MN 8	Cass
Carlyle Lake Wildlife Management Area	FC, WS, R, C, WQ, N	IL 22	Fayette

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>			
<b>Project</b>	<b>USGS Map</b>	<b>City or Town</b>	<b>Watershed</b>
Anacostia River and Tributaries	Washington East	Bladensburg & Hyattsville, MD	Anacostia River
Boyer Chute	Loveland	Fort Calhoun, NE; Omaha, NE	Missouri River
Calcasieu River and Pass	Hackberry and Cameron	Cameron, LA	Calcasieu River
Cape Fear L&D No. 1, Fish Ladder	Kelly	Elizabethtown, NC	Cape Fear
Fern Ridge Lake, Long Tom River	???	Eugene/Springfield, OR	Long Tom River
Fishery Habitat Restoration Project, Arcadia Lake	???	Oklahoma City and Edmond	Deep Fork River
Fishery Habitat Restoration Project, El Dorado Lake	Rosalia NW, Pontiac, El Dorado, DE Graff	El Dorado, KS	Walnut River
Galilee Salt Marsh Restoration	Narragansett Pier	Narragansett, RI	Point Judit Harbor
Green Island Headwall Modification	Green Island	Bellevue	Mississippi River
Hidden Lake Restoration	Omaha South; Council Bluffs South	Bellevue	Missouri River
Homme Lake	Edinburgh	Park River & Grand Forks	Park River
Laguna Madre Seagrass Enhancement Project	Port Isabel NW & La Coma	Port Isabel, TX	Gulf Intracoastal Waterway
Lake O' the Pines (Ferrells Bridge Dam)	Kellyville, Lassater	Jefferson, TX	Red River Basin
Little Pitcher Lake	???	Uniontown, KY	Wabash River
Mississippi River Mast Tree Planting Project	Green Island, Keithsburg, Long Island	Bellevue & Burlington, IA & Quincy, IL	Mississippi River
Munyon Island Wetland Restoration	Riviera Beach	North Palm Beach, FL	Lake Worth Lagoon
Murphy Island, Santee Wildlife Refuge	Minim Island & Cape Romain	Charleston	AIWW
Narrows Dam - Lake Greeson	Narrows Dam; Murfreesboro	Murfreesboro	Little Missouri River
Nimrod Waterfowl Levee	Rover, Plainview, Nimrod Dam	Plainview, Arkansas	Fourche LaFave River
Orwell Lake	Orwell Lake	Fergus Falls, MN	Ottertail River
Salt Bayou, McFaddin Ranch Wetlands	Big Hill Bayou	Port Arthur	Gulf Intracoastal Waterway
Sammamish River Restoration	???	Seattle, WA	Sammamish River
Savannah Harbor	Savannah, Port Wentworth, Limehouse	Savannah, GA	Savannah River
Sea Lamprey Barrier, Soo Lock Complex	???	Sault Ste. Marie	St. Mary's River
Trestle Bay Restoration	???	Astoria, OR	Columbia River
Twentymile Creek Habitat Restoration	Ratliff	Tupelo, MS	Twentymile Creek/Tombigbee River
Waterfowl Ponds - Lake Winnibigoshish	Little Winnibigoshish Lake	Duluth, MN	Mississippi River
Carlyle Lake Wildlife Management Area	Wildcat Lake	Carlyle, IL	Kaskaskia River

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>	
<b>Project</b>	<b>Resource Problem</b>
Anacostia River and Tributaries	Impeding the passage of anadromous fish; Little F&W habitat.
Boyer Chute	Bank Stblztn & Nav. Proj.
Calcasieu River and Pass	Salinity Intrusion and Subsidence.
Cape Fear L&D No. 1, Fish Ladder	Construction of 3 L&D's
Fern Ridge Lake, Long Tom River	Reduction in quantity and quality of waterfowl habitat.
Fishery Habitat Restoration Project, Arcadia Lake	Deteriorating spawning and nursery habitat.
Fishery Habitat Restoration Project, El Dorado Lake	Deteriorating spawning and nursery habitat.
Galilee Salt Marsh Restoration	Marsh cut off from tidal; Degradation-severely reduced f&w.
Green Island Headwall Modification	Slide gates failure assemblies - high water.
Hidden Lake Restoration	Sediment
Homme Lake	Habitat conditions for waterfowl deficient.
Laguna Madre Seagrass Enhancement Project	Seagrass decline ~ 60%; barren bottom increase~280%.
Lake O' the Pines (Ferrells Bridge Dam)	Closed Canopy
Little Pitcher Lake	Lake altered by human encroachment; water regime is too unstable.
Mississippi River Mast Tree Planting Project	Project impacts altered historic forest.
Munyon Island Wetland Restoration	Sediment
Murphy Island, Santee Wildlife Refuge	Erosion
Narrows Dam - Lake Greeson	Water temp./Dissolved Oxygen problems
Nimrod Waterfowl Levee	Drainage structures do not adequately drain waterfowl area.
Orwell Lake	Water level fluctuations decreased aquatic veg. in littoral areas
Salt Bayou, McFaddin Ranch Wetlands	Saltwater intrusion into fresh to brackish marshlands.
Sammamish River Restoration	Deepening and channelization-negative fish & wildlife impacts.
Savannah Harbor	Increased salinity levels.
Sea Lamprey Barrier, Soo Lock Complex	Sea lampreys - adult parasitic
Trestle Bay Restoration	Jetty blocked fish access 603 acres of habitat.
Twentymile Creek Habitat Restoration	Aquatic and riparian corridor habitat degradation.
Waterfowl Ponds - Lake Winnibogishish	Fish rearing ponds/wetlands taking onto other characteristics.
Carlyle Lake Wildlife Management Area	Poor water transfer capacity between leveed compartments.

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>	
<b>Project</b>	<b>Objective/Goals</b>
Anacostia River and Tributaries	Restore F&W habitat to the stream.
Boyer Chute	Restore diversity of velocities & depths & substrates.
Calcasieu River and Pass	Reduce salinity and subsidence.
Cape Fear L&D No. 1, Fish Ladder	Improve passage of anadromous fish.
Fern Ridge Lake, Long Tom River	Provide increase Waterfowl Use Days.
Fishery Habitat Restoration Project, Arcadia Lake	Restore spawning and nursery fishery habitat.
Fishery Habitat Restoration Project, El Dorado Lake	Restore spawning and nursery fishery habitat.
Galilee Salt Marsh Restoration	Restore former salt marsh from degraded condition.
Green Island Headwall Modification	Solve the undesired, uncontrolled flooding of wildlife refuge.
Hidden Lake Restoration	Restore aquatic habitat values.
Homme Lake	Enhance habitat value;Increase nesting habitat;Increase overall value.
Laguna Madre Seagrass Enhancement Project	Increase seagrass colonization rate;improve habitat value for estuarine fauna.
Lake O' the Pines (Ferrells Bridge Dam)	Improve bottomland hardwood habitat.
Little Pitcher Lake	Improve the water regime of the lake.
Mississippi River Mast Tree Planting Project	Re-establish a mast tree component on floodplain bottomlands.
Munyon Island Wetland Restoration	Improve habitat value for fisheries and wildlife.
Murphy Island, Santee Wildlife Refuge	Prevent erosion and improve plant food sources.
Narrows Dam - Lake Greeson	Improve fisheries and water quality.
Nimrod Waterfowl Levee	Restore waterfowl area.
Orwell Lake	Restore wetlands;increase habitat value;restore upland nesting habitat;increase overall value.
Salt Bayou, McFaddin Ranch Wetlands	Reduce saltwater intrusion.
Sammamish River Restoration	Restore stream channel to provide suitable fish and wildlife habitat.
Savannah Harbor	Reduce salinity and reduce velocities.
Sea Lamprey Barrier, Soo Lock Complex	Reduce # of fish killed annually by sea lamprey.
Trestle Bay Restoration	Develop fish access: egress for fish and detritus.
Twentymile Creek Habitat Restoration	Restoration of aquatic and riparian corridor habitat.
Waterfowl Ponds - Lake Winnibigoshish	Restore wetlands to higher productivity.
Carlyle Lake Wildlife Management Area	Restore existing wetlands habitat to modern historic condition.

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>	
<b>Project</b>	<b>Management Measure</b>
Anacostia River and Tributaries	High-Speed channel;Weirs;Drop Structure;Riparian Habitat;Terrestrial Habitat;Aquatic Habitat
Boyer Chute	Excavate pilot channel; notch in revetment; 2 grade control structures; road; widened outlet opening.
Calcasieu River and Pass	Pumping dredged material to another site; constructing retaining dikes.
Cape Fear L&D No. 1, Fish Ladder	Installed prefabricated fish ladder and monitoring.
Fern Ridge Lake, Long Tom River	Three Impoundments.
Fishery Habitat Restoration Project, Arcadia Lake	Establishing fish nursery areas using aquatic and semi-emergent aquatic plants.
Fishery Habitat Restoration Project, El Dorado Lake	Establishing fish nursery areas using aquatic and semi-emergent aquatic plants.
Galilee Salt Marsh Restoration	Twin 6' x 10' box culverts with self regulating tide gates.
Green Island Headwall Modification	New water control structure, reuse of existing structure maximized, riprap, seeding
Hidden Lake Restoration	Inlet channel, gated control structure w/ 3 culverts, excavation, islands, harvesting.
Homme Lake	4 pair-ponds; nesting structures; four diameter culverts used as nesting structures; culvert for water levels.
Laguna Madre Seagrass Enhancement Project	Transplanting seagrass from nearby undisturbed seagrass meadow on freshly deposited dredged material.
Lake O' the Pines (Ferrells Bridge Dam)	Selective forest thinning, food plots, wood duck boxes.
Little Pitcher Lake	Water control structure, planting hardwoods and prairie grasses, and clearing of exotic weedy species.
Mississippi River Mast Tree Planting Project	Planting - Restoring oak-walnut-pecan component by direct seeding or planting of seedling stock.
Munyon Island Wetland Restoration	Remove exotic plants, regrading and protecting shoreline, revegetation, create buffer zone, filling anoxic dredged hole.
Murphy Island, Santee Wildlife Refuge	Setback dikes, 7 additional water control structures
Narrows Dam - Lake Greeson	Three low head weirs,boulders,replace trash racks,modify cooling water supply
Nimrod Waterfowl Levee	Gate well structure
Orwell Lake	Two controlled subimpoundments; plantings.
Salt Bayou, McFaddin Ranch Wetlands	Five Gated Water Control Structure.
Sammamish River Restoration	Bank excavation, installation of log structures, low flow deflectors, footbridge, revegetation.
Savannah Harbor	Constructing a Closure Plug across New Cut with a hydraulic pipeline dredge.
Sea Lamprey Barrier, Soo Lock Complex	Six permanent sea lamprey traps.
Trestle Bay Restoration	Open 500' gap in existing jetty.
Twentymile Creek Habitat Restoration	Constructing weirs and appurtenant structures;planting willows and bottomland hardwoods.
Waterfowl Ponds - Lake Winnibigoshish	A 30-foot extension on existing 24-inch water intake line; Culvert.
Carlyle Lake Wildlife Management Area	Levee alterations and placement of culverts to improve water control on 2,565 acres.

SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98	
Project	Without Project
Anacostia River and Tributaries	F&W habitat would continue to degrade.
Boyer Chute	Chute continue to fill; fish pop. greatly declined.
Calcasieu River and Pass	Continue to erode and subside. Shallow water areas would become deeper. Increase erosion.
Cape Fear L&D No. 1, Fish Ladder	Fish stocks depressed and possibly declined.
Fern Ridge Lake, Long Tom River	Area remains as reed canarygrass monoculture.
Fishery Habitat Restoration Project, Arcadia Lake	Fisheries habitat would continue to decline.
Fishery Habitat Restoration Project, El Dorado Lake	Fisheries habitat would continue to decline.
Galilee Salt Marsh Restoration	Area would remain in a degraded condition of <i>Phragmites australis</i> .
Green Island Headwall Modification	Refuge continue flooding, negative habitat value.
Hidden Lake Restoration	Continue loss of open water & wetland habitat values.
Homme Lake	Underutilized by F&W. WQ & substrate conditions in oxbow marginal.
Laguna Madre Seagrass Enhancement Project	State/Federal resource agencies press for other disposal method.
Lake O' the Pines (Ferrells Bridge Dam)	Habitat Values would continue to decrease.
Little Pitcher Lake	Open/ old field habitat and unstable water levels would continue.
Mississippi River Mast Tree Planting Project	Mast tree component in floodplain eventually disappear.
Munyon Island Wetland Restoration	Exotic species would continue to dominate the island.
Murphy Island, Santee Wildlife Refuge	Erosion - resulting in eventual failure.
Narrows Dam - Lake Greeson	Limited warmwater fishery; reduced water quality.
Nimrod Waterfowl Levee	Productivity would decrease 25% with further acreage destruction.
Orwell Lake	Underutilized by F&W.
Salt Bayou, McFaddin Ranch Wetlands	Gradual conversion to open water; erosion; F&W continue decline.
Sammamish River Restoration	Continue to have minimum benefits to f&w, temp remain high, wq poor, limited cover would exist
Savannah Harbor	Degradation and loss of irreplaceable tidal fresh water marsh.
Sea Lamprey Barrier, Soo Lock Complex	Depletion of fish population in St. Mary's River.
Trestle Bay Restoration	Jetty remains in place; no fisheries access
Twentymile Creek Habitat Restoration	Channel instability problems continue, adverse impacts to aquatic/riparian corridor habitat continue.
Waterfowl Ponds - Lake Winnibigoshish	Unlikely Pond characteristics would continue to exist.
Carlyle Lake Wildlife Management Area	Inadequate water transfer capability watering/dewatering; sub-optimal pool water depths unresolved

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>		
<b>Project</b>	<b>Coastal America Project</b>	<b>Goals for NAWMA</b>
Anacostia River and Tributaries	No	Yes
Boyer Chute	No	No
Calcasieu River and Pass	Yes	Yes
Cape Fear L&D No. 1, Fish Ladder	Yes	No
Fern Ridge Lake, Long Tom River	No	Yes
Fishery Habitat Restoration Project, Arcadia Lake	No	Yes
Fishery Habitat Restoration Project, El Dorado Lake	No	Yes
Galilee Salt Marsh Restoration	Yes	Yes
Green Island Headwall Modification	No	Yes
Hidden Lake Restoration	No	Yes
Homme Lake	No	Yes
Laguna Madre Seagrass Enhancement Project	No	Unknown
Lake O' the Pines (Ferrells Bridge Dam)	No	Yes
Little Pitcher Lake	No	Yes
Mississippi River Mast Tree Planting Project	No	Yes
Munyon Island Wetland Restoration	Yes	Yes
Murphy Island, Santee Wildlife Refuge	No	Yes
Narrows Dam - Lake Greeson	No	No
Nimrod Waterfowl Levee	No	Yes
Orwell Lake	No	Yes
Salt Bayou, McFaddin Ranch Wetlands	No	Yes
Sammamish River Restoration	No	No
Savannah Harbor	No	No
Sea Lamprey Barrier, Soo Lock Complex	No	No
Trestle Bay Restoration	No	No
Twentymile Creek Habitat Restoration	No	Yes
Waterfowl Ponds - Lake Winnibigoshish	No	Yes
Carlyle Lake Wildlife Management Area	No	Yes

**SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98**

<b>Project</b>	<b>Benefit Endangered Species</b>
Anacostia River and Tributaries	No
Boyer Chute	Unknown
Calcasieu River and Pass	No
Cape Fear L&D No. 1, Fish Ladder	No
Fern Ridge Lake, Long Tom River	Bald Eagles, Peregrine Falcons
Fishery Habitat Restoration Project, Arcadia Lake	No
Fishery Habitat Restoration Project, El Dorado Lake	No
Galilee Salt Marsh Restoration	Unknown - Maybe Black Ducks
Green Island Headwall Modification	No
Hidden Lake Restoration	Possibly Bald Eagles & Pallid Sturgeon
Homme Lake	No
Laguna Madre Seagrass Enhancement Project	Green Seaturtle
Lake O' the Pines (Ferrells Bridge Dam)	No
Little Pitcher Lake	No
Mississippi River Mast Tree Planting Project	No
Munyon Island Wetland Restoration	Wdstrk,Pngrn Flcn,Manatee,Lst Turn,Cmmn Snook,Lit/Grt Blue Heron,Reddish & Snowy Egret,Gphr Tort.,Br.Pel., Wht Ibis, Osp.
Murphy Island, Santee Wildlife Refuge	Woodstork, Bald Eagle
Narrows Dam - Lake Greeson	No
Nimrod Waterfowl Levee	No
Orwell Lake	No
Salt Bayou, McFaddin Ranch Wetlands	No
Sammamish River Restoration	All fish including Chinook Salmon
Savannah Harbor	No
Sea Lamprey Barrier, Soo Lock Complex	No
Trestle Bay Restoration	Bald Eagles, all list Columbia R. fish stocks
Twentymile Creek Habitat Restoration	No
Waterfowl Ponds - Lake Winnibigoshish	No
Carlyle Lake Wildlife Management Area	Eagles

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>	
<b>Project</b>	<b>Cost Sharing Sponsor</b>
Anacostia River and Tributaries	Prince George's County
<b>Boyer Chute</b>	<b>Papio-Missouri River Natural Resources District</b>
Calcasieu River and Pass	Louisiana Dept. of Natural Resources
<b>Cape Fear L&amp;D No. 1, Fish Ladder</b>	<b>State of North Carolina</b>
Fern Ridge Lake, Long Tom River	Oregon Dept. of Fish and Wildlife
<b>Fishery Habitat Restoration Project, Arcadia Lake</b>	<b>Oklahoma Department of Wildlife Conservation</b>
Fishery Habitat Restoration Project, El Dorado Lake	Kansas Department of Wildlife and Parks
<b>Galilee Salt Marsh Restoration</b>	<b>Rhode Island Department of Environmental Management</b>
Green Island Headwall Modification	Iowa Dept. of Natural Resources (IA DNR)
<b>Hidden Lake Restoration</b>	<b>Papio-Missouri River Natural Resources District</b>
Homme Lake	North Dakota Game and Fish Department
<b>Laguna Madre Seagrass Enhancement Project</b>	<b>Texas Department of Transportation</b>
Lake O' the Pines (Ferrells Bridge Dam)	Texas Parks and Wildlife Department
<b>Little Pitcher Lake</b>	<b>Indiana Dept of Natural Resources</b>
Mississippi River Mast Tree Planting Project	Trees Forever, Global ReLeaf (American Forests).
<b>Munyon Island Wetland Restoration</b>	<b>Palm Beach County</b>
Murphy Island, Santee Wildlife Refuge	South Carolina Department of Natural Resources
<b>Narrows Dam - Lake Greeson</b>	<b>Arkansas Game and Fish Commission</b>
Nimrod Waterfowl Levee	Arkansas Game and Fish Commission
<b>Orwell Lake</b>	<b>Minnesota Department of Natural Resources</b>
Salt Bayou, McFaddin Ranch Wetlands	Texas Parks and Wildlife Department
<b>Sammamish River Restoration</b>	<b>King County, WA</b>
Savannah Harbor	Georgia Ports Authority
<b>Sea Lamprey Barrier, Soo Lock Complex</b>	<b>Great Lakes Fishery Commission</b>
Trestle Bay Restoration	Oregon Parks and Recreation Department
<b>Twentymile Creek Habitat Restoration</b>	<b>Tombigbee River Valley Water Management District</b>
Waterfowl Ponds - Lake Winnibigoshish	Leech Lake Band of Chippewa
<b>Carlyle Lake Wildlife Management Area</b>	<b>Carlyle Lake Wildlife Management Area/Illinois DNR</b>

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>		
<b>Project</b>	<b>Concerns</b>	<b>Monitoring Plan</b>
Anacostia River and Tributaries	High Cost of Study and Design to inexpensive construction.	No
Boyer Chute	Dispose spoil material on higher ground.	Yes
Calcasieu River and Pass	No provisions for degrading dredged material confinement dikes.	No
Cape Fear L&D No. 1, Fish Ladder	None	Yes
Fern Ridge Lake, Long Tom River	Costs - but resolved by using BLM.	No, but ODFW does.
Fishery Habitat Restoration Project, Arcadia Lake	Significant public information effort was initiated to explain the project ot lake users.	Yes
Fishery Habitat Restoration Project, El Dorado Lake	None	Yes
Galilee Salt Marsh Restoration	Flooding of properties/ cottages.	No
Green Island Headwall Modification	None	No
Hidden Lake Restoration	Maximizing gate operation to max. fish use; minimize incoming sedimentation.	Yes
Homme Lake	None	No
Laguna Madre Seagrass Enhancement Project	Identifying solution to problem of open-bay disposal; loss of seagrass.	Yes
Lake O' the Pines (Ferrells Bridge Dam)	None	No
Little Pitcher Lake	Cost - Fed and State agencies felt cost of project was about 25-30% too costly.	Yes
Mississippi River Mast Tree Planting Project	Site preparation, planting, control of competing weeds for successful mngt.	No
Munyon Island Wetland Restoration	First Section 1135 constructed by the District.	Yes
Murphy Island, Santee Wildlife Refuge	None	Yes
Narrows Dam - Lake Greeson	Cost LS; Avoid. Adverse impacts to hydrpwr; Impact fishery; Rec. opport.; Imprvd WQ	Yes
Nimrod Waterfowl Levee	None	No
Orwell Lake	None	No
Salt Bayou, McFaddin Ranch Wetlands	Difficult to identify outputs.	No
Sammamish River Restoration	None	No
Savannah Harbor	None	No
Sea Lamprey Barrier, Soo Lock Complex	None	Yes
Trestle Bay Restoration	Costs	Yes
Twentymile Creek Habitat Restoration	Working with flood control project.	Yes
Waterfowl Ponds - Lake Winnibigoshish	None	No
Carlyle Lake Wildlife Management Area	None	No

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>		
<b>Project</b>	<b>Benefits/Outputs</b>	<b>Total Cost</b>
Anacostia River and Tributaries	Riparian=8ac&16.4aahu;Terr.=4.2ac&8.2aahu;Aq.=12ac&19.5aahu	\$ 759,700
<b>Boyer Chute</b>	<b>3 mi &amp; 50 ac of flowing water area</b>	<b>\$ 2,323,000</b>
Calcasieu River and Pass	800 ac of shrub-scrub habitat; 50 ac of shallow, open water.	\$ 260,000
<b>Cape Fear L&amp;D No. 1, Fish Ladder</b>	<b>Modifications made in 1998 - but a two-fold in shad passing.</b>	<b>\$ 104,000</b>
Fern Ridge Lake, Long Tom River	200,000 Waterfowl Use Days	\$ 298,600
<b>Fishery Habitat Restoration Project, Arcadia Lake</b>	<b>Restoration centrarchid species; creation additional wetland hab.</b>	<b>\$ 264,000</b>
Fishery Habitat Restoration Project, El Dorado Lake	Fish nursery-rearing = doubles per acre; shoreline/migratroy = 3x	\$ 265,000
<b>Galilee Salt Marsh Restoration</b>	<b>34 ac</b>	<b>\$ 1,548,000</b>
Green Island Headwall Modification	Maximizes wildlife values of the 3,722-acre area.	\$ 191,152
<b>Hidden Lake Restoration</b>	<b>50 ac-lake; 30% marsh size increase.</b>	<b>\$ 2,725,000</b>
Homme Lake	Improved vegetative substrate;increase aquatic invert., breeding/nesting.	\$ 29,800
<b>Laguna Madre Seagrass Enhancement Project</b>	<b>Partial rest. of declining fishery hab.;aesthetic improv.;work w/others.</b>	<b>\$ 316,000</b>
Lake O' the Pines (Ferrells Bridge Dam)	3,500 Acres of Bottomland Hardwoods	\$ 62,500
<b>Little Pitcher Lake</b>	<b>26 ac + 1,960 feet of outlet channel.</b>	<b>\$ 146,000</b>
Mississippi River Mast Tree Planting Project	558 acres	\$ 371,000
<b>Munyon Island Wetland Restoration</b>	<b>20 ac</b>	<b>\$ 1,460,000</b>
Murphy Island, Santee Wildlife Refuge	Increase of 50,000 to 56,000 migratory waterfowl annually.	\$ 325,630
<b>Narrows Dam - Lake Greeson</b>	<b>Increase in seasonal trout catch. Est. 32,800 man-days fishing.</b>	<b>\$ 299,800</b>
Nimrod Waterfowl Levee	Restore or prevent the destruction of 2,400 acres of greentree reservoir.	\$ 96,300
<b>Orwell Lake</b>	<b>66 acres of wetland directly affected and managed.</b>	<b>\$ 224,000</b>
Salt Bayou, McFaddin Ranch Wetlands	60,000 acres of wetlands can be actively managed.	\$ 1,945,000
<b>Sammamish River Restoration</b>	<b>Three sites per year: 352 adults; 360 adults; 360 adults.</b>	<b>\$ 413,000</b>
Savannah Harbor	Thousands of acres of tidal fresh water would be restored.	\$ 3,260,000
<b>Sea Lamprey Barrier, Soo Lock Complex</b>	<b>2% reduction = \$80,000 (annually)</b>	<b>\$ 243,900</b>
Trestle Bay Restoration	105K-315K Chinook Salmon Smolts; 79K-158K Dungeness Crabs	\$ 238,250
<b>Twentymile Creek Habitat Restoration</b>	<b>Create depth, velocity, substrate diversities, slow/halt channel widening.</b>	<b>\$ 1,165,000</b>
Waterfowl Ponds - Lake Winnibigoshish	44 acres of wetlands.	\$ 78,000
<b>Carlyle Lake Wildlife Management Area</b>	<b>Increase 691 AAHUs migratory birds; Increase 938 AAHUs vegetation.</b>	<b>\$ 1,156,000.00</b>

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>		
<b>Project</b>	<b>Number of Visits to Site</b>	<b>Certainty (1 to 5)</b>
Anacostia River and Tributaries	None	3
Boyer Chute	Few times annually.	3
Calcasieu River and Pass	Once.	1
Cape Fear L&D No. 1, Fish Ladder	Daily by Lockmaster. Intensive monitoring Mar-Jun '96, '97, '98.	2
Fern Ridge Lake, Long Tom River	Visited by ODFW.	2
Fishery Habitat Restoration Project, Arcadia Lake	Several times by the Ok. Dept. of Wildlife Conservation	1
Fishery Habitat Restoration Project, El Dorado Lake	Unknown	1
Galilee Salt Marsh Restoration	None by Corps but sponsor will visit periodically.	1
Green Island Headwall Modification	Zero. DNR Manager on site. Provides feedback.	1
Hidden Lake Restoration	Monthly during non-navigation season.	1
Homme Lake	Occasionally by Corps natural resource managers.	3
Laguna Madre Seagrass Enhancement Project	Four sampling periods over 2 year period.	5
Lake O' the Pines (Ferrells Bridge Dam)	Routinely view area by Corps.	2
Little Pitcher Lake	Two times	2
Mississippi River Mast Tree Planting Project	4 times	3
Munyon Island Wetland Restoration	15 visits	1
Murphy Island, Santee Wildlife Refuge	None by Corps	2
Narrows Dam - Lake Greeson	Weekly collection of field data for WQ managers.	1
Nimrod Waterfowl Levee	Several times by Resident Engineer.	1
Orwell Lake	Occasionally by Corps natural resource managers.	3
Salt Bayou, McFaddin Ranch Wetlands	Four times.	2
Sammamish River Restoration	Twice a year.	2
Savannah Harbor	None by Corps. USFWS makes visits.	1
Sea Lamprey Barrier, Soo Lock Complex	Very often by USFWS.	1
Trestle Bay Restoration	Four times or more.	1
Twentymile Creek Habitat Restoration	Quarterly.	2
Waterfowl Ponds - Lake Winnibigoshish	None by Corps	4
Carlyle Lake Wildlife Management Area	Twice a year by Corps; occasionally by local sponsor	1

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>	
<b>Project</b>	<b>Lessons Learned - Success or Limiting Success</b>
Anacostia River and Tributaries	Large amount of existing info on area and flood control project - Success. But little to none monitoring info from other projects.
Boyer Chute	Hydraulic modeling sized a chute that leaves main channel navigation undiminished but which is self-scouring & self-maintaining.
Calcasieu River and Pass	Site Design - conservatively low estimates of the area of marsh created were used in report.
Cape Fear L&D No. 1, Fish Ladder	Pleased with output; however, room for improvement. Used in-house staff for planning, design, construction.
Fern Ridge Lake, Long Tom River	Avail. Of info, avail. of monitor info,avail. of suitable work force,site design,applic. of const/treat. practices,lcl spnsr interest-Success
Fishery Habitat Restoration Project, Arcadia Lake	Tomato cages to be constructed wider than standard size;Sophisticated dog pen cages not necessary.
Fishery Habitat Restoration Project, El Dorado Lake	None
Galilee Salt Marsh Restoration	Avail of monitoring info, Avail of suitable work force, Site design, Follow-ups, Interest of local sponsor - Success
Green Island Headwall Modification	Site Design and Application of construction or treatment practices - Success.
Hidden Lake Restoration	Site Design, Follow-up, Local sponsor interest - success
Homme Lake	Due to it's small size and relatively straight forward nature, no lessons learned.
Laguna Madre Seagrass Enhancement Project	Needed detailed circulation data;Data from another project helpful if avail.;Site-problem;Better techniques may have helped.
Lake O' the Pines (Ferrells Bridge Dam)	Availability of info about area and Interest and Cooperation from local sponsor - success
Little Pitcher Lake	Except for preparing an EIS, about the same amount of documentation for this "small" project as done for constr. of reservoir proj.
Mississippi River Mast Tree Planting Project	Interest and cooperation of local sponsor(s) and successful, competent contractor - Success. Limited implementation window.
Munyon Island Wetland Restoration	Avail. monito info, sponsor previously restored part of isl., Interest/coop. of lcl spnsr(s)-success; Avail.suit. work force-limited.
Murphy Island, Santee Wildlife Refuge	Site Design - worry with soils and bearing capacity. Used amphibious backhoe. Sponsor did construction and is impressed.
Narrows Dam - Lake Greeson	Excellent contractors; weir site selections were critical; unique engineering designs;close coordination;Excellent coop. with LS.
Nimrod Waterfowl Levee	Site design and Interest and Cooperation by local sponsor - Success
Orwell Lake	Better develop the project design during feas. phase for more accurate cost estimate to local sponsor.
Salt Bayou, McFaddin Ranch Wetlands	Info available on area, other projects;site design appropriate;constrctn/trtmnt practices-adequate/approp;local sponsor-cooprtv.
Sammamish River Restoration	Avail. of suit. work force,site design,applica. of construct/treat. Pract.,follow-ups,int/coop local sponsor-Success; Avail. Monit-Limited
Savannah Harbor	Avail. Of info broad geogr.area; Appl.of constr.or treat. pract.-good: Avail. Monit. and follow-up to assure implem./correct. Act.-LL
Sea Lamprey Barrier, Soo Lock Complex	None
Trestle Bay Restoration	Avail. of info about broad geo. area, Interest and cooperation of local sponsor-Success; Application of constr/treat. Pract-Limiting
Twentymile Creek Habitat Restoration	Avail. monitoring info,site design,applic. constrct/treatmnt practices, follow-up, interest local sponsor-Success
Waterfowl Ponds - Lake Winnibigoshish	No particular lessons learned, probably due to its small, straight forward nature.
Carlyle Lake Wildlife Management Area	See Fact Sheet.

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>	
<b>Project</b>	<b>Recreation Uses</b>
Anacostia River and Tributaries	Wildlife watching;Fishing;Hiking/Walking;Group activities;Picnicking
Boyer Chute	Wildlife watching, Hunting, Group Activities, Educational Activities, Picnicking
Calcasieu River and Pass	Hunting, Fishing, Wildlife Watching.
Cape Fear L&D No. 1, Fish Ladder	Shad fishing
Fern Ridge Lake, Long Tom River	Wildlife watching, Canoeing, Hunting, Photography/Painting
Fishery Habitat Restoration Project, Arcadia Lake	Wildlife watching;Hunting;Fishing;Camping/Hiking/Walking;Group activities;Educational activities;Picknicking;Photo/Paint
Fishery Habitat Restoration Project, El Dorado Lake	Wildlife watching;Canoeing;Hunting;Fishing;Camping/Hiking/Walking;Group activities;Educational act.;Picnic;Photo/Paint;Sailboat
Galilee Salt Marsh Restoration	Wildlife watching, Walking, Educational activities, Photography/Painting, etc.
Green Island Headwall Modification	Wildlife watching, Canoeing, Hunting, Fishing, Hiking/Walking, Educational Activities, Picnicking, Photo/Paint, Boating.
Hidden Lake Restoration	Wildlife watching, Canoeing, Hunting, Camping/Hiking/Walking, Group activities, Picnicking, Photography/Painting
Homme Lake	Wildlife watching, Hunting.
Laguna Madre Seagrass Enhancement Project	Fishing
Lake O' the Pines (Ferrells Bridge Dam)	Wildlife watching, Camping/Hiking/Walking, Educational activities.
Little Pitcher Lake	Wildlife watching, Hunting, Fishing, Hiking, Walking, Group activities, Educational activities, Picnicking, Photography/Painting
Mississippi River Mast Tree Planting Project	Wildlife watching, Hunting, Hiking/Walking, Educational activities, Photography.
Munyon Island Wetland Restoration	Wildlife watching, Camping/Hiking/Walking, Educational activities.
Murphy Island, Santee Wildlife Refuge	Wildlife watching, Hunting, Group Activities, Educational Activities
Narrows Dam - Lake Greeson	Wildlife watching, Canoeing, Hunting, Group Activities, Educational Activities, Picnicking.
Nimrod Waterfowl Levee	Hunting.
Orwell Lake	Wildlife watching; Hunting.
Salt Bayou, McFaddin Ranch Wetlands	Bird Watching;Canoeing;Powered watercraft;Hunting-Waterfowl;Fishing;Photography/Painting
Sammamish River Restoration	Wildlife watching, Canoeing, Camping/Hiking/Walking
Savannah Harbor	Wildlife watching, Fishing, Educational Activities, Photography/Painting
Sea Lamprey Barrier, Soo Lock Complex	Fishing, Group Activities, Educational Activities, Picnicking, Photography/Painting
Trestle Bay Restoration	Wildlife watching, Hunting, Photography/Painting.
Twentymile Creek Habitat Restoration	None
Waterfowl Ponds - Lake Winnibigoshish	None
Carlyle Lake Wildlife Management Area	Wildlife Watching, Wildlife Photography, Hunting

<b>SECTION 1135 PROJECTS - COMPLETED AS OF 1 OCT 98</b>	
<b>Project</b>	<b>Photos</b>
Anacostia River and Tributaries	Yes
Boyer Chute	Yes
Calcasieu River and Pass	Yes
Cape Fear L&D No. 1, Fish Ladder	Yes
Fern Ridge Lake, Long Tom River	No
Fishery Habitat Restoration Project, Arcadia Lake	Yes
Fishery Habitat Restoration Project, El Dorado Lake	Yes
Galilee Salt Marsh Restoration	Yes
Green Island Headwall Modification	Yes
Hidden Lake Restoration	Yes
Homme Lake	Yes
Laguna Madre Seagrass Enhancement Project	No
Lake O' the Pines (Ferrells Bridge Dam)	No
Little Pitcher Lake	Yes
Mississippi River Mast Tree Planting Project	Yes
Munyon Island Wetland Restoration	Yes
Murphy Island, Santee Wildlife Refuge	Yes
Narrows Dam - Lake Greeson	Yes
Nimrod Waterfowl Levee	No
Orwell Lake	Yes
Salt Bayou, McFaddin Ranch Wetlands	Yes
Sammamish River Restoration	Yes
Savannah Harbor	No
Sea Lamprey Barrier, Soo Lock Complex	No
Trestle Bay Restoration	Yes
Twentymile Creek Habitat Restoration	Yes
Waterfowl Ponds - Lake Winnibigoshish	No
Carlyle Lake Wildlife Management Area	Yes

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## Conclusions and Recommendations

### Conclusions

Twenty-eight Section 1135 studies from 21 different Corps of Engineers districts and 22 different states in their completed construction phase was presented. A lot of useful information was extracted from each of these projects. This information would be viable for project managers and team members conducting Section 1135 projects or other environmental type projects.

During the preparation of this document, many individuals within the Corps of Engineers, as well as outside of the Corps, has had interest in the information from this document. Many, if not all, requested the information from this document as soon as made ready which shows the importance and usefulness of this data. Another important element is the project photographs the districts provided.

The projects presented covered a large array of project types which included: lakes, ponds, a chute, rivers, streams, a cape, a bay, a salt marsh, islands, a harbor, wetlands, and a seagrass enhancement. Many different resource problems affected these areas, and as much innovative management measures (alternatives) were developed and applied to these resource problems. Each study presented “the without project” condition, which means, what would the scenario be if nothing was done to alleviate these resource problems.

Situations of “the without project” condition described include the following:

- degrade
- decline
- erode
- subside
- depress
- monoculture
- negative habitat value
- underutilized
- decrease
- unstable
- disappear
- domination of exotic species
- reduced/poor water quality
- depletion
- no fisheries access
- instability

The objectives and goals shown in this report included:

- restore the fish and wildlife
- restore diversity
- reduce subsidence
- improve/develop passage of fish
- enhance/improve habitat value
- re-establish a component
- prevent erosion
- improve food sources
- improve fisheries
- improve water quality
- reduce fish kills

As mentioned before, many innovative management measures were designed for each of these projects. Some of the management measures were of the same type, but they had a few twists to them, such as water control structures, weirs, and planting vegetation. Of the twenty-eight projects, four were Coastal America Projects, twenty contributed to the Goals of the North American Waterfowl Management Plan, and nine benefited endangered species. Nearly half of the project managers had some concerns when preparing their studies with costs being a popular issue. Fourteen of the projects have a monitoring plan.

The benefits/ outputs for these projects were very diverse. These include:

- acres of wetland
- number of fish
- increase a number of waterfowl
- acres of bottomland hardwood
- lineage of river channel
- improved vegetative substrate
- increase aquatic invertebrates
- increase breeding and nesting
- acres of lake
- maximize wildlife value
- increase waterfowl used days
- average annual habitat units
- several others

The total cost for these projects ranged from \$29,800 to \$3,260,00. Most if not all of the projects are visited by either a Corps employee, USFWS, or by the sponsor. The level of certainty averaged just below “2” which is near the “very certain” part of the scale.

The project managers for each of the projects presented a variety of lessons learned. In most cases, the availability of data and monitoring information were available

or sufficient, where in some of the other cases the project managers would have liked more information. Working with the local sponsor and other agencies appeared to be successful among the projects. In several instances, site designs, costs, outputs, and implementation window were somewhat of a limiting success.

Many different recreational uses were listed for all except two projects. Wildlife watching, hunting and fishing appeared to be very popular recreation uses with all project types. However, several other uses were catalogued, which in some cases would depend on the project type area. Twenty-one of the twenty-eight projects have some sort of photograph(s) depicting either before, during and after construction. These photographs are attached at the end of each project fact sheet.

## **Recommendations**

It is recommended that another series of completed Section 1135 studies be compiled and presented in similarity as to this report. This is a new, evolving, and growing program for the Corps. There is a need to track these projects and analyze lessons learned, both in the areas of formulation and design. We also need to be able to assess the performance of these projects. This information is essential for improving future investment decisions. Also, a series of completed Section 204 and Section 206 studies be compiled and presented in the same fashion. There have been many requests from inside and outside the Corps for this type of information, and it should be kept updated.

Section 204, (Beneficial Uses of Dredged Material) Water Resources Development Act of 1992, as amended, authorizes projects for the protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands, in connection with dredging an authorized Federal navigation project. Non-Federal sponsors are responsible for 25% of the project cost and 100% of the cost of operation, maintenance, replacement, and rehabilitation. There is an annual appropriations limit of \$15 million. For projects with an estimated Federal cost of less than \$5 million, divisions have approval authority. Larger projects are approved by headquarters.

Section 206 (Aquatic Ecosystem Restoration) of the Water Resources Development Act of 1996 authorizes the Secretary to carry out aquatic ecosystem restoration projects that will improve the quality of the environment, are in the public interest, and are cost-effective. Individual projects are limited to \$5 million in Federal cost. Non-Federal interests must contribute 35% of the cost of construction and 100% the cost of operation, maintenance, replacement, and rehabilitation. The program has an annual program limit of \$25 million. This program received initial funding of \$6 million in FY 1998.

If you have completed any projects covered by any of these authorities, we would like to include them in our database and website. Please contact Joy Muncy, USACE, Institute for Water Resources, 7701 Telegraph Road, Casey Building, Alexandria, VA 22315; or email [joy.d.muncy@usace.army.mil](mailto:joy.d.muncy@usace.army.mil). Also a blank fact sheet is included as Appendix DD at the end of this document if you would prefer to complete it as a

hard copy and fax your project information to: Joy Muncy, IWR, fax number 703-428-8435.

## **APPENDIX A**

**PROJECT: Anacostia River and Tributaries**

**PROJECT: Anacostia River and Tributaries**

**STATE:** Maryland

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Baltimore

**PROJECT TO BE MODIFIED:** Anacostia River and Tributaries, D.C. and Maryland and Anacostia River and Tributaries, Prince George's County, MD.

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood Control

**CONGRESSIONAL DISTRICT:** MD 5

**LOCATION:** Prince George's County, MD, just east of Washington, D.C. The proposed modifications are located within the limits of the existing flood control and navigation project near Bladensburg and Hyattsville, MD. From the confluence of the Northeast and Northwest branches, the modifications extend approximately 800 feet downstream along the Anacostia River, approximately 7,000 feet upstream along the Northeast Branch, and approximately 4,000 feet along the Northwest Branch. One of the project features is located along Paint Branch just upstream of the confluence with Indian Creek.

**COUNTY (S):** Prince George's

**USGS TOPOGRAPHIC MAP (S):** Washington East

**NEAREST CITY OR TOWN:** Bladensburg and Hyattsville, MD

**WATERSHED:** Anacostia River

**RESOURCE PROBLEM:** The anadromous fish passage portion of the project involves the removal of three blockages to fish migration. These structures, which were constructed by the Corps during previous flood control projects, currently impede the passage of anadromous fish during low flows. Many miles of stream habitat were lost when these structures were built. One of the main goals of the Anacostia Watershed Restoration Committee (which is comprised of several local, State and Federal governmental agencies) is to restore the spawning runs to their historical limits. In addition to having fish blockages, the streams also had little fish and wildlife habitat. The streams had been straightened and the floodplains were stripped of trees as part of the flood control project.

**OBJECTIVE/GOALS:** The objective of the project was to restore fish and wildlife habitat to the streams by removing fish blockages, adding variation to the straight channels, and planting trees along the river corridor.

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):**

**High-Speed Channel.** A 4-foot wide, 1-1/2-foot high concrete channel with 5 steel weirs was constructed on the surface of the existing supercritical channel in order to concentrate and deepen the flows and reduce the velocity to allow the passage of fish.

**PROJECT: Anacostia River and Tributaries, cont.**

**38<sup>th</sup> Street Drop Structure.** The notches in the upstream and downstream metal drop structures were cut 4 and 8 inches lower, respectively. Rock was placed upstream and downstream to reduce sediment transport, concentrate the flow, maintain a gradual vertical gradient, and provide resting-places for the fish.

**Paint Branch Drop Structure.** Modifications involved cutting the drop structure down to the upstream streambed elevation and cutting the existing notch 6 inches lower to allow fish passage. In order to protect the existing fish pool, banks were stabilized with rock and vegetation. Two twin wing deflectors were constructed upstream of the drop structure to concentrate and deepen the low flows and provide additional habitat.

**Riparian Habitat.** Modifications lie within a 15-foot wide corridor on both sides of the Anacostia River, Northeast and Northwest Branches. Within this corridor, 610 trees were planted and a delayed mowing schedule was implemented. For the delayed mowing, the 15-foot corridor will be mowed once annually, as opposed to the current schedule of three annual mowings, to allow the growth of taller vegetation. Ten bluebird boxes were installed.

**Terrestrial Habitat.** Within the 4.2-acre area just north of the confluence, modifications included the planting of 40 trees and 115 shrubs. A portion of the area was placed on a delayed mowing schedule.

**Aquatic Habitat.** In the Northeast Branch, 10 twin rock wing deflectors and 20 boulders were installed. In the Northwest Branch, 4 deflectors were constructed.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**BRIEFLY DISCUSS FUTURE WITH PROJECT CONDITION:** Fish will be able to reach further upstream, there will be more fish habitat created by the placement of rock in the stream, and the trees will provide shade and detritus to the streams.

**CONCERNS/ISSUES (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?)** Biggest concern was high cost to study and design this project, which was relatively inexpensive to construct. Study costs are high because we had to ensure that the project would not adversely affect the flood control project.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE North American WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**NAME OF COST SHARING SPONSOR:** Prince George's County.

**PROJECT: Anacostia River and Tributaries, cont.**

**VIEWS OF THE SPONSOR:** The sponsor above was in favor of the recommended project. A PCA was signed in March 1995. This sponsor owns the project lands and share O&M responsibilities.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** U.S. Fish and Wildlife Service, National Marine Fisheries Services, U.S. Environmental Protection Agency, Maryland Department of Natural Resources, Maryland Department of the Environment, Interstate Commission on the Potomac River Basin, Maryland Washington Council of Governments, Prince George’s County Department of Environmental Resources, and Maryland Historical Trust. They all supported the plan. The Anacostia Watershed Restoration Committee, who is leading the Anacostia restoration effort, supported the plan.

**NAME OF CORPS PROJECT MANAGER:** Stacey Underwood

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No, unfortunately there was no monitoring plan developed for this project.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number and Significance such as: Acres of Wetlands; River/Stream Miles; Endangered Species Benefited).** The Riparian Habitat plan restored 8 acres and 16.4 AAHU’s of riparian habitat. The Terrestrial Habitat plan restored 4.2 acres and 8.2 AAHU’s of terrestrial habitat. The Aquatic Habitat plan restored 12 acres and 19.5 AAHU’s of aquatic habitat.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

- The riparian habitat portion of the project had a construction cost of approximately \$111,800.
- The terrestrial habitat portion of the project had a construction cost of approximately \$17,500.
- The aquatic habitat portion of the project had a construction cost of approximately \$99,000.
- Reports - \$224 Federal
- P&S - \$144 Federal
- Construction - \$189.9 Non-Federal; \$201.8 Federal
- Total - \$189.9 Non-Federal; \$569.8 Federal for a grand total of \$759,700.00.

**IMPLEMENTATION SCHEDULE:**

Project approval	March 1994
P&S submittal to NAD	November 1994
Contract Award	30 June 1995
Construction	July 1995 – January 1996

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** None

**PROJECT: Anacostia River and Tributaries, cont.**

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

3 – Many of the trees were lost immediately after construction (due to storm) and had to be replaced. It is to project manager’s understanding that the trees are not doing well and local groups would like to replant many of the trees.

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

Availability of information about broad geographical area: Large amount of existing information on area and flood control project.

Availability of monitoring information from other projects: Little to none.

**Using the same attributes above, select the ones most likely in limiting success potential:**

Availability of monitoring information from other projects: Little to none.

Follow-up to assure implementation and corrective action when needed: After project was completed, this was not done. No monitoring.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Fishing
- Hiking/Walking
- Group activities
- Picnicking

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes



**38th Street Drop Structure  
(pre-construction)**





**38th Street Drop Structure  
(pre-construction)**



**38th Street Drop Structure  
Notch Modification and Boulders Placed  
(post-construction)**



**38th Street Drop Structure  
Notch Modification and Boulders Placed  
(post-construction)**





**Northeast Branch  
(pre-construction)**



**Anacostia River and Tributaries  
Random Boulders  
(post-construction)**



**Anacostia River and Tributaries  
Tree Planting & Rock Deflectors  
(post-construction)**





**Anacostia River and Tributaries  
Tree Planting & Rock Deflectors  
(post-construction)**



**Paint Branch  
Drop Structure  
(pre-construction)**



**Paint Branch  
Drop Structure  
(pre-construction)**





**Paint Branch  
Drop Structure  
(pre-construction)**



**Paint Branch  
Cut Drop Structure & Placed Stone  
(post-construction)**



**Paint Branch  
Cut Drop Structure & Placed Stone  
(post-construction)**





**Northwest Branch  
High Speed Channel  
(pre-construction)**





**Northwest Branch  
High Speed Channel  
Constructed Fish Ladder  
(during-construction)**





**Northwest Branch  
High Speed Channel  
Constructed Fish Ladder  
(During-construction)**

## **APPENDIX B**

**PROJECT: Arcadia Lake, Oklahoma, Fishery Habitat Restoration  
Project**

**PROJECT:** Arcadia Lake, Oklahoma, Fishery Habitat Restoration Project

**STATE:** Oklahoma

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Tulsa

**PROJECT TO BE MODIFIED:** Arcadia Lake

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood Control, Water Supply, and Recreation

**CONGRESSIONAL DISTRICT:** OK 5

**LOCATION:** Located within the metropolitan area of Oklahoma City and Edmond.

**COUNTY (S):** Oklahoma

**USGS TOPOGRAPHIC MAP (S):**

**NEAREST CITY OR TOWN:** Oklahoma City and Edmond

**WATERSHED:** Deep Fork River

**RESOURCE PROBLEM:** The lake fishery ecosystem has declined, primarily due to the deteriorating spawning and nursery habitat for centrarchid species. Operation of the reservoir for flood control and water supply purposes has prevented establishment of aquatic vegetation to replace terrestrial habitat loss through decomposition and water level fluctuation.

**OBJECTIVE/GOALS:** To restore spawning and nursery fishery habitat for centrarchid species (sunfish family – bass, crappie, bluegills) in Arcadia Lake.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The project consisted of establishing fish nursery areas using aquatic and semi-emergent aquatic plants to revitalize habitat lost as a result of operating Arcadia Lake. Additionally, the project contributes to the replenishment of wetland habitat for migratory waterfowl, since this type of habitat is in limited supply around the lake.

**PROJECT: Arcadia Lake, Oklahoma, Fishery Habitat Restoration Project, cont.**

The establishment of aquatic plants in Arcadia Lake utilized the application of recently developed methods for establishment of aquatic plants in man-made reservoirs, based on research from the Lewisville Aquatic Ecosystem Research Facility (LAERF) provided by Michael Smart, Ph.D., et al.

The restoration project was planned in two planting seasons. The first year plantings of 12 different species of healthy transplants of aquatic vegetation (either submersed, floating-leafed or emergents) occurred at 15 locations around the lake. These transplants provided the founder colonies to identify the most successful species. The plants were contained within protective enclosures to protect them from herbaceous predators such as carp or turtles. The founder colonies would provide new growth from runners or large stem fragments, as well as a source of seeds for a seed bank. Along with the transplants, tubers of some species were also planted to identify the types of plants and the propagation methods that would succeed in reestablishment within the lake environment. Staff of ODWC gathered information during the monitoring period that followed the first planting season. The data was used by Dr. Michael to evaluate species survival rates and the environmental factors influencing establishment. This information was used to adjust the plantings of the second season to identify successful species and additional accommodations to ensure survivals.

Good performers were the water star grass; American pondweed and bulrush.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** There were no design changes that resulted in significant change in project cost or schedule.

**DISCUSS FUTURE WITHOUT PROJECT MODIFICATION:** If no action were taken, the fisheries habitat for the centrarchid species would continue to decline as the shoreline vegetation is diminished. The centrarchids are heavily dependent on sheltered shoreline areas for survival after hatching.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem recreation, others?).** Prior to Phase I planting, a significant public information effort was initiated to explain the project to lake users. The project had public support early in the implementation process. The City of Edmond was also very supportive of the project.

**NAME OF COST SHARING SPONSOR:** Oklahoma Department of Wildlife Conservation

**PROJECT: Arcadia Lake, Oklahoma, Fishery Habitat Restoration Project, cont.**

**VIEWS OF THE SPONSOR:** The Oklahoma Department of Wildlife Conservation signed the Project Cooperation Agreement on 19 June 1997. The restoration project also provided a significant opportunity for technology transfer. The Oklahoma Department of Wildlife Conservation is using the technology for other projects.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** The U.S. Fish and Wildlife Service has expressed its support of the proposed project.

**NAME OF CORPS PROJECT MANAGER:** Gene Lilly

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** Monitoring was done between Phase I and Phase II plantings. Phase II plantings focused on Phase I species that performed well the first year.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, and Endangered Species Benefited).** Significant effects include restoration of the standing crop of centrarchid species and the creation of additional wetland habitat. Additional effects include improvements to water quality, sediment stabilization, and reduced shoreline erosion. It is expected that the plantings will restore the overall ecology in the lake.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Planning and Design Analyses - \$48,000 Federal  
Construction - \$150,000 Federal; \$66,000 Non-Federal  
Total - \$264,000

**IMPLEMENTATION SCHEDULE:**

Initiate Phase I Construction – 30 June 1997  
Monitoring/ Construction – 18 months  
Project Physically Complete – October 1998

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** The staff of the Oklahoma Department of Wildlife Conservation accomplished additional monitoring following the Phase II plantings.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”)**

1 - At this time, it is believed that the project is trending toward desired goals. A final assessment will be made in the 3<sup>rd</sup> quarter of FY99.

**PROJECT: Arcadia Lake, Oklahoma, Fishery Habitat Restoration Project, cont.**

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

*Problems encountered:* lake level fluctuations that exceeded the historical averages. A week after planting in the first season, heavy rains brought lake levels to 18-inches over normal pool. The plants used a lot of energy to get growth up to the light. When the water receded, the spindly stems and leaves were trapped in the upper areas of the tomato cages because the cages weren’t wide enough to allow the leaves and stems to float back down and stay within the cage. Too much of the new growth was left high and dry. The second year, lake levels were 3-feet below normal pool during the later summer. This was the lowest level that the lake had ever reached in its 11-year history. Deer and geese were able to reach the tomato cages and forage on the new plants. Turtles, carp and beaver continued to be a problem. Beaver breached the cove fencing allowing the carp and turtles to reenter the coves and feed on the new growth.

*Lessons learned:* tomato cages need to be constructed wider than standard size; the sophisticated dog pen cages were not necessary. Less complex fencing materials will work and it was cheaper to fence off the cove or a smaller area than to construct the free standing dog pens. The orange webbing enclosures, the tomato cages and the simpler fencing concept (steel posts like you use for cattle fencing, and the woven wire) worked just as well as the dog pen materials and would be far easier to remove). In this lake, protective enclosures were needed for the plants to survive because of the predation. Only the bulrush was able to expand outside the protective enclosures.

**Select the attributes most likely contributing to project success:**

- Availability of information about broad geographical area,
- Availability of monitoring information from other projects,
- Availability of suitable work force,
- Site design,
- Application of construction or treatment practices,
- Follow-up to assure implementation and corrective action when needed,
- Interest and cooperation of local sponsor(s).

**Using the same attributes above, select the ones most likely in limiting success potential:**

- Availability of information about broad geographical area,
- Availability of monitoring information from other projects,
- Availability of suitable work force,
- Site design,
- Application of construction or treatment practices,
- Follow-up to assure implementation and corrective action when needed,
- Interest and cooperation of local sponsor(s).

**PROJECT: Arcadia Lake, Oklahoma, Fishery Habitat Restoration Project, cont.**

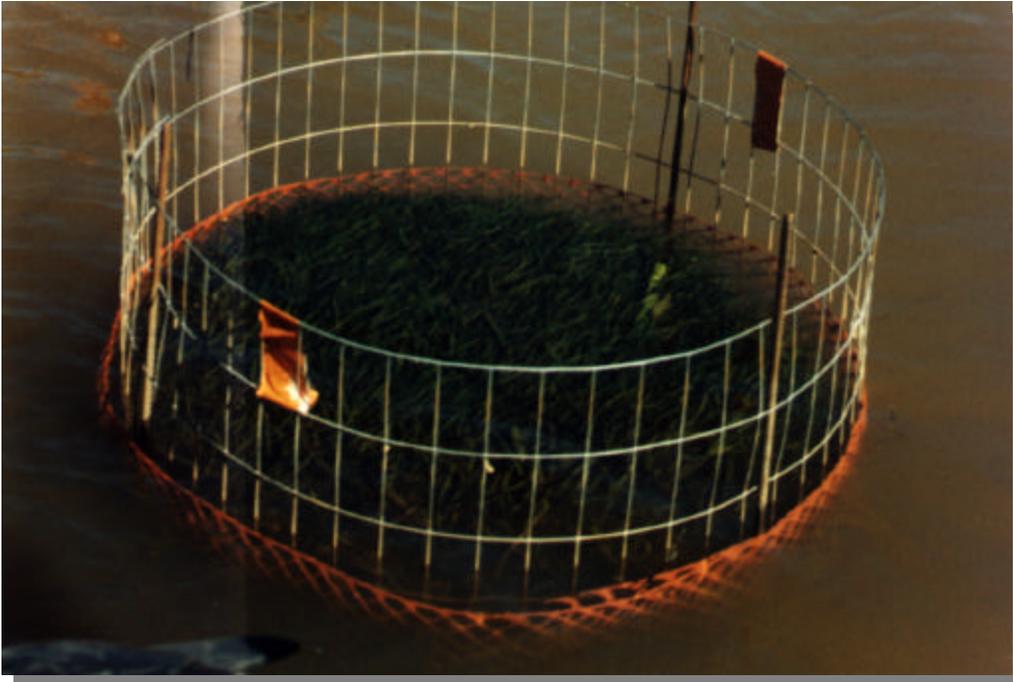
**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching,
- Hunting,
- Fishing,
- Camping/Hiking/Walking,
- Group activities,
- Educational activities,
- Picnicking, Photography/Painting, etc.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes

**Arcadia Lake  
October 1998**





**Arcadia Lake  
October 1998**





**Arcadia Lake  
October 1998**

**APPENDIX C**

**PROJECT: Boyer Chute Channel Restoration**

**PROJECT: Boyer Chute Channel Restoration**

**STATE:** Nebraska

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Omaha

**PROJECT TO BE MODIFIED:** Missouri River Bank Stabilization and Navigation Project

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation and bank stabilization

**CONGRESSIONAL DISTRICT:** NE 2

**LOCATION:** Side channel from river mile 633.5 to 637.7 on the Missouri River

**COUNTY (S):** Washington County

**USGS TOPOGRAPHIC MAP (S):** Loveland, NE - IA

**NEAREST CITY OR TOWN:** Fort Calhoun, NE – 4 miles west; Omaha, NE – 7 miles south.

**WATERSHED:** Missouri River

**RESOURCE PROBLEM:** Missouri River ecosystem is declining in part due to construction and operation of the Corps' Missouri River Bank Stabilization and Navigation Project. Native fisheries have declined due to a loss of habitat including chutes and side channels.

**OBJECTIVE/GOALS:** Restore diversity of velocities and depths and substrates to Missouri River system by restoring flows through a historic chute.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** No

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?**  
Unknown

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The Corps cleared and grubbed vegetation from the parts of the old channel which had become filled in and had vegetative encroachment; then excavated a pilot channel for new inflows, created a notch in the upstream revetment to let river flows into the chute at navigation flow levels,

**PROJECT: Boyer Chute Channel Restoration, cont.**

built two grade control structures across the channel bed, replaced the road crossing with a bridge, and widened the outlet opening. Measured velocities and discharges fall within the modeled range, and are lower than in the navigation channel, providing better habitat conditions.

The sponsor secured a much larger area of land in conjunction with the Corps Project, developed recreational and education facilities on it, and has turned the entire area over to the U.S. Fish and Wildlife Service, which has in turn designated it as a National Wildlife Refuge. The USFWS is now trying to expand the refuge by 6,000 to 8,000 acres.

Bridge and main channel construction were completed in March 1993. Minor construction increments were added in March 1994.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF, TO PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No.

Coordinated closely with sponsor's recreation plans. Canoeing is not feasible as planned because of eroding banks, unstable launch area, dangerous debris piles and bridge pilings, and low bridge deck elevation. Also, the trail that is too near the chute was washed out, and one parking lot may eventually wash out. But these have not required any Corps changes.

**DISCUSS FUTURE WITHOUT PROJECT MODIFICATION:** Remnant chute would have continued to fill with sediment and grow up in forest. Existing backwater with great pan fish population would have gradually declined and filled.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** See above for recreation vs. ecosystem restoration. Design – the material was spoiled along the pilot channel, creating a levee; should have tried to find the land and money to dispose on higher ground. The spoil piles have partly washed away as intended, but slowly.

**NAME OF COST SHARING SPONSOR:** Papio-Missouri River Natural Resources District (NRD)

**VIEWS OF SPONSOR:** Provided all needed LERRD and cash, and will be responsible for OMRR&R. The NRD rated Corps performance on this project very high in a recent survey.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** U.S. Fish and Wildlife Service supported project during planning design, have restored habitat on the NRD land, and now manage the entire area as a refuge. The Nebraska Game and Parks

**PROJECT: Boyer Chute Channel Restoration, cont.**

Commission supported the project during planning and design, and finds the results to date encouraging.

**NAME OF CORPS PROJECT MANAGER:** Steven C. Rothe

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** Some monitoring was done, more is ongoing independent of Corps. Several reports.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** The channel restoration has restored about 3 miles and 50 acres of flowing water area for river fish spawning, rearing, feeding, and resting. Also, the restored chute is providing restored waterfowl and wading bird habitat as well as turtle and furbearer habitat, though waterfowl use may have declined with increased flow and human use. The adjacent lands are being restored into forest and prairie. The NRD has constructed extensive recreational roads, trails and parking facilities on the land.

The reintroduction of seasonal flows into the chute has restored riverine habitat and will benefit the ecosystem as a whole.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Feasibility Report - \$105,000 (Total); \$0 (Non-Federal)

Plans & Specifications - \$110,000 (Total); \$0 (Non-Federal); \$110,000 (Federal)

Construction - \$2,108,000 (Total); \$581,000 (Non-Federal); \$1,527,000 (Federal)

Non-Federal Requirements:

Lands, easements, row, relocations, disposal areas, related costs - \$534,000

Cash - \$47,000

Annual OM&R - \$3,000

**Total \$2,323,000.00**

**IMPLEMENTATION SCHEDULE:**

Feasibility Study – 5 months

Review/Revision & Approval – 6 months

Plans and Specifications – 3.5 months

Contract Award – 2 months

Construction – 6 months (through main physical construction completions; minor excavation adds, plantings and turnover were completed 1995)

**PROJECT: Boyer Chute Channel Restoration, cont.**

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** A few times annually.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

3

**PERFORMANCE:** The channel and bridge functioned very well during the 1993, 1995, and 1996 floods, surviving complete inundation several times. At last report (7 Oct 96), a 54-foot deep hole has developed downstream of the inlet structure, but no damage or threat to the structure has yet been identified. Woody debris collects at the bridge at a higher rate than the sponsor and FWS would prefer, in part due to the many piling piers that were required to meet the sponsor’s bridge design needs; sponsor and FWS may pursue removal of some piers now that farm truck loads no longer pass on the bridge. Some high bank scouring is visible, implying ultimate reforming of the chute as hoped for.

Fish surveys since 1993 have shown significant use by the target fish species. Large numbers of sturgeon used the chute at least temporarily in 1993, as did large numbers of catfish in 1994/1995. Gar is common and appears to spawn in the chute. Young sturgeon has been found in the chute, indicating either spawning or successful use of the chute as a refuge from river flows. The Nebraska Game and Parks Commission reported it to be the best fishing site for catfish on at least one occasion. Pre-existing slack-water species declined after construction and remain low, e.g., crappie, bluegill, bass, and paddle fish.

The area officially opened to the public on Labor Day weekend, following an earlier ground opening ceremony hosted by Sen. Bob Kerrey. Public perception is mixed, depending on original expectations and recreational desires. Sierra Club local unit has issued a third criticism of the project in its newsletter, not yet seen in this office, but has little readership or impact on public views.

Recreational use compromises the shoreline habitat values for waterfowl, wading birds, and raptors; but the project was justified for aquatic values.

**WHAT WERE THE LESSONS LEARNED AND ASSISTNACE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Site design: Hydraulic modeling sized a chute that leaves main channel navigation undiminished, but which is self-scouring and self-maintaining.

**PROJECT: Boyer Chute Channel Restoration, cont.**

**Using the same attributes as above, select the one(s) most likely limiting success potential:**

- Other: Bed degradation of main channel creates incised chute banks, regulated hydrograph prevents natural flooding and drawdowns, existing project prevents meandering, degraded state of entire river ecosystem limits potential of each individual site.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Canoeing – Seldom
- Hunting – Some days
- Fishing
- Hiking/Walking
- Group activities
- Educational activities
- Picnicking
- Photography/Painting, etc. – Little

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes



**INLET 1972**  
**INLET CUTOFF DIKE AND CHUTE BEFORE CHUTE BECAME FILLED WITH SEDIMENT**



**INLET 1989**  
**INLET VIEWED FROM CUTOFF DIKE AFTER CHUTE FILLED WITH SEDIMENT, 1989**



**INLET CULVERTS - 1989**  
INLET BEFORE RESTORATION, 1989, VIEWED FROM CHUTE SIDE, FILLED WITH SEDIMENT



**INLET NOTCH  
CONSTRUCTION OF NEW INLET NOTCH THROUGH CUTOFF DIKE, 1993  
RIVER AT LOW WINTER LEVELS**



**INLET EXCAVATION  
PILOT CHANNEL EXCAVATION DOWNSTREAM FROM INLET**



**INLET 98  
THE RESTORED CHUTE FLOWING THROUGH ITS INLET AND RE-OPENED CHANNEL, 1993**



**UPSTREAM CHANNEL 89  
UPSTREAM CHUTE FILLED WITH SEDIMENT, 1989  
NOTE: BURIED FENCE POSTS, SAPLING TREES**



**UPSTREAM CHANNEL 89  
UPSTREAM CHUTE FILLED WITH SEDIMENT, 1989.  
NOTE: WILLOWS AND SAPLING TREES**



**CHANNEL EXCAVATION  
UPSTREAM CHUTE EXCAVATION TO A PILOT CHANNEL. 1993**



**UPSTREAM CHUTE AFTER RESTORATION, AT HIGH FLOWS.  
NOTE: SNAG HABITAT DEVELOPING. 1997**



**BRIDGE UPSTREAM 74  
CHUTE VIEWED UPSTREAM FROM ROAD CROSSING BEFORE IT  
BECAME FILLED WITH SEDIMENT, 1976**



**BRIDGE UPSTREAM 89  
CHUTE VIEWED UPSTREAM FROM ROAD CROSSING AFTER  
EXTENSIVE SEDIMENT FILLING, 1989**



**BRIDGE DOWNSTREAM 1989**  
**AN ISOLATED POOL, VIEW DOWNSTREAM FROM THE ROAD CROSSING**



**SPOIL PILES 93  
EXCAVATION SPOIL PILES NEXT TO PILOT CHANNEL SLOWED CHUTE WIDENING,  
BUT WASHED AWAY GRADUALLY**



**BRIDGE 96  
THE RESTORED CHUTE FLOWING UNDER THE NEW BRIDGE, 1996**



**DOWNSTREAM BACKWATER 89**

**PRE-RESTORATION DOWNSTREAM PORTION OF CHUTE WAS A NICE POOL OCCASIONALLY CONNECTED TO THE RIVER, BUT PONDS AND THEIR FISH ARE NOT AS RARE AS ARE CHUTES AND THEIR SPECIES. 1989**



**OUTLET 1993**  
**THE RESTORED OUTLET OF THE CHUTE MERGING INTO THE MISSOURI RIVER**



**OUTLET AERIAL 1996  
THE RESTORED CHUTE AFTER THE 1996 FLOOD PEAK**



**TREE PLANTING  
PLANTING OF 7,000 TREES AND SHRUBS, 1994**



#### **SNAG AND NOTCH**

**SPOIL BANKS WERE NOTCHED AND TREE SNAGS WERE PLACED TO FACILITATE HABITAT RESTORATION. BOTH WERE OF LIMITED VALUE RELATIVE TO THE NATURAL PROCESSES RESTORED.**



**BRIDGE DEBRIS**



**TRAIL BANK EROSION**

**DESIRABLE CHUTE WIDENING DOWNSTREAM OF BRIDGE ERASED A NEW TRAIL BUILT BY SPONSOR. 1995.  
FACILITIES SHOULD BE KEPT FAR FROM DESIRED MEANDER ZONE**

## **APPENDIX D**

**PROJECT: Calcasieu River and Pass**

**PROJECT: Calcasieu River and Pass**

**STATE:** Louisiana

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** New Orleans

**PROJECT TO BE MODIFIED:** Calcasieu River and Pass

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:** LA 7

**LOCATION:** The proposed modification is located along the west side of the Calcasieu River and Pass Ship Channel in Calcasieu and Cameron Parishes, Louisiana, approximately 10 miles north of the Gulf of Mexico, and 25 miles south of Lake Charles Louisiana.

**COUNTY (S):** Cameron Parish

**USGS TOPOGRAPHIC MAP (S):** Hackberry, LA and Cameron, LA

**NEAREST CITY OR TOWN:** Cameron, LA

**WATERSHED:** Calcasieu River

**RESOURCE PROBLEM:**

Historically, the proposed marsh creation site was high-quality marsh that, as a result of salinity intrusion and subsidence, has severely eroded. Approximately 20 percent of the area is composed of deteriorated marshes and the remainder is open water. One third of the open water is less than a foot deep and supports some submergent vegetation, primarily widgeon grass. Without the proposed modification, the remaining marsh and shallow water will eventually erode and subside to deeper water.

**OBJECTIVE/GOALS:** Reduce salinity and subsidence.

**IS THIS A COASTAL AMERICA PROJECT?** Yes

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES THIS BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**PROJECT: Calcasieu River and Pass, cont.**

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):**

The modification provided for the disposal of approximately 1,530,000 cubic yards of dredged material to a 480-acre site in the Sabine National Wildlife Refuge west of mile 10 of the Calcasieu River and Pass Ship Channel. The proposed modification also includes the construction of retaining dikes in the refuge along the Calcasieu River and Pass Ship Channel and along the West Cove Canal to prevent the flow of dredged material into these waterways. Without the proposed modification, the material would be placed in a confined disposal area located along either side of the Calcasieu River and Pass Ship Channel. The material would be placed in an area comprised of open water and deteriorated marsh. Following consolidation of the material, it is estimated that approximately 120 acres of marsh substrate will remain. There are no provisions for the operation, maintenance, repair, or replacement of the proposed modification, and after initial consolidation the marsh is expected to erode and subside at a rate of approximately 1- percent per year.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?**

The area constructed with the cubic yardage available was twice the size estimated in the report.

**DISCUSS FUTURE WITHOUT PROJECT MODIFICATION:**

Without the project modification, the dredged material from the maintenance of the navigation channel would be placed in confined disposal areas along either side of the Calcasieu River and Pass Ship channel, impacting shrub habitat in these upland areas. The marsh in the 480-acre area of open water and deteriorating marsh would continue to erode and subside to shallow water. The shallow water areas would become deeper. The loss of this area would increase erosion of adjacent marsh areas.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).**

When the project was constructed, there were no provisions for degrading the dredged material confinement dikes because the manager of the Sabine National Wildlife Refuge, where the project modification is located, was opposed. The National Marine Fisheries Service (NMFS) wanted the dikes degraded to advance the restoration of fisheries access to the area. A new refuge manager now concurs with the NMFS, and

**PROJECT: Calcasieu River and Pass, cont.**

measures are being considered to degrade the dikes. Degradation of the dikes may be considered under the authority of Section 1135.

**NAME OF COST SHARING SPONSOR:** Louisiana Department of Natural Resources

**VIEWS OF THE SPONSOR:** The sponsor supported the project and paid 25 percent of the project cost.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:**

Coordination has been maintained with the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the Environmental Protection Agency, and the Louisiana Departments of Environmental Quality, Natural Resources, and Wildlife and Fisheries.

**NAME OF CORPS PROJECT MANAGER:** Joey Dykes

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).**

The creation of an estimated 120 acres of brackish/saline marsh in the Sabine National Wildlife Refuge would result in increases in the habitat value of the area for fish and wildlife species, and would prevent a loss in habitat value to wildlife species of approximately 800 acres of shrub-scrub habitat and 50 acres of shallow, open water located in the confined disposal area adjacent to the Calcasieu River and Pass Ship Channel.

An abundant variety of wildlife would be expected to benefit by the creation of the marshes and adjacent shallow open water areas. Waterfowl expected in the marsh include geese, mallards, pintail, teals, widgeon, and scaup. Waterbirds include cormorants, egrets, ibis, herons, and seabirds such as gulls. Mammals expected in the area include skunks, opossum, nutria, mink, otter, and raccoon. An abundant variety of brackish water fish and shellfish would be expected in the open water areas adjacent to the marsh creation site, including shrimp, crabs, drum seatrout, menhaden, flounder, and mullet.

A HEP was used to assess impacts of the proposed project modification. The HEP analysis indicated that a net gain of approximately 26 AAHU over the 20-year project life would result from the creation of the 150 acres of marsh in the Sabine National Wildlife Refuge. A net gain of about 10 AAHU would result from delaying the

**PROJECT: Calcasieu River and Pass, cont.**

use of 850 acres of the confined disposal area for a 3-year period. Residual benefits are expected for another 30 years as the marsh subsides to shallow, vegetated open water.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

The total cost of the project was \$260,000, of which \$195,000 was Federal and \$65,000 was non-Federal. There are no operation, maintenance, repair, rehabilitation, and replacement costs.

**IMPLEMENTATION SCHEDULE:**

Submit Final Feas. Report to HQ	23 March 1992
Signing of Local Cooperation Agreement	15 February 1993
Complete Construction	01 June 1993

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Once

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

1

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

Site design: Conservatively low estimates of the area of marsh created were used in the report. The collection of topographic and soils data to develop more accurate estimates was not warranted since the consequences of an error were the creation of more marsh. The environmental documentation covered a much larger area than the construction site to provide for this event. Experience gained from this project is being used to develop plans for similar projects in the area under the authority of Section 204.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Hunting
- Fishing

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** No

## **APPENDIX E**

**PROJECT: Cape Fear Lock and Dam No. 1 Fish Ladder**

**PROJECT: Cape Fear Lock and Dam No. 1 Fish Ladder**

**STATE:** North Carolina

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Wilmington

**PROJECT TO BE MODIFIED:** Cape Fear River above Wilmington, Lock and Dam No. 1

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:** NC 7

**LOCATION:** Cape Fear River, 39 miles upstream (northwest) of Wilmington, North Carolina.

**COUNTY (S):** Bladen

**USGS TOPOGRAPHIC MAP (S):** Kelly

**NEAREST CITY OR TOWN:** Elizabethtown, NC

**WATERSHED:** Cape Fear

**RESOURCE PROBLEM:** The Cape Fear River is known to provide spawning habitat for anadromous fish species including sturgeon, striped bass, shad, and river herring. Populations of all these species are seriously depleted in the Cape Fear River system. Reduced access to spawning habitat caused by the construction of three locks and dams on the Cape Fear River from 1915 to 1934 has contributed to the decline of these species. These structures have prevented spawning fish from entering the upstream portions of the river, except during locking and periods of high flow. Lock and Dam No. 1 is the first obstruction in the river. Data from state and university studies indicated that the locks and dams were a significant impediment to the spawning migration of anadromous fishes. Prior to implementation of this Section 1135 project, it was estimated that less than a third of the American shad population passed upstream of Lock and Dam Number 1 and even fewer passed Locks 2 and 3.

**OBJECTIVE/GOALS:** To improve passage of anadromous fish to upstream spawning areas. The goal is to help restore historic populations of river herring and American Shad.

**IS THIS A COASTAL AMERICA PROJECT?** Yes. This project is expected to help restore American shad and river herring populations in the Cape Fear River. These are important coastal fish stocks.

**PROJECT: Cape Fear Lock and Dam No. 1 Fish Ladder; cont.**

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** No

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The project included the installation of a prefabricated fish ladder at Lock and Dam No. 1 and monitoring of anadromous fish movement upstream. The fish ladder was installed to provide improved upstream passage of American shad and river herring. Monitoring was conducted to assure the effective operation of the fish ladder and optimize passage of anadromous fish through the ladder and lock. The fish ladder was attached to the existing lock and dam structure and therefore, no lands (LERRDS) were required.

Monitoring provided new insights on the behavior of anadromous fish while inside the lock chamber. These insights resulted in improved fish locking procedures. It was found that most shad that were eventually passed upstream had previously entered and left the chamber on several occasions and that the longer the fish were retained in the chamber, the better their chance to be passed upstream. Locking procedures were modified by leaving the outside (northernmost) gate closed between lockages to increase fish resident time. Lockage is now conducted more frequently to move more fish upstream. These procedures have been implemented at all three Cape Fear Locks and Dams, extending project benefits beyond the proposed 33 river miles to over 76 river miles.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IS SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** The fish ladder was placed at a site on the dam where American shad were known to congregate. It was expected that fish would not have difficulty finding the ladder at this location. However, after the fish ladder was in place and water flow through and around the ladder could be observed, it was determined that the attraction flow produced by the ladder was likely lost in the noise of the adjacent flows. Several surplus concrete buoy anchor blocks were placed adjacent to the ladder to help segregate fish ladder attraction flows from adjacent flows. Subsequent monitoring of fish movement confirmed that American shad could navigate the ladder, however; fish use was lower than expected. The USFWS inspected the site and made recommendations for minor structural additions to further segregate water flow and help guide fish to the mouth of the ladder. These modifications were made using materials on hand and construction was completed within the original construction scope and budget. Improved fish use of the ladder is expected. According to the USFWS, this type of construction procedure is a routine part of fish ladder installation and is to be expected; therefore changes in the planning process are not warranted.

**PROJECT: Cape Fear Lock and Dam No. 1 Fish Ladder, cont.**

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** If no action had been taken to improve fish passage on the Cape Fear, it is expected that fish stocks would have remained depressed and possibly decline.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** No known concerns or issues.

**NAME OF COST SHARING SPONSOR:** State of North Carolina

**VIEWS OF THE SPONSOR:** The State of North Carolina has strongly supported this project. Prior to the Section 1135 project, the North Carolina Wildlife Resources Commission, the North Carolina Division of Marine Fisheries, and the University of North Carolina at Wilmington conducted preliminary studies to determine the feasibility of proposed fish sampling techniques at the locks and dams. The nonreimbursable state funded effort, which required over \$9,000 in labor and equipment, was a clear, example of the non-Federal interest in the habitat values that will be restored. The state provided 25% of project cost through a working in-kind contribution and was an active participant in installation and monitoring of this project.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** Broad support among State and Federal resource agencies exists for improving anadromous fish access to the upper Cape Fear River. Improvements of anadromous fish passage on the Cape Fear River at the locks and dams was one of the top three priority projects identified by the North Carolina Coastal America Advisory Committee. This committee consists of the U.S. Fish and Wildlife Service, national Marine Fisheries Service, U.S. Geological Survey, North Carolina Division of Marine Fisheries, North Carolina Wildlife Resources Commission, North Carolina Division of Water Resources, and North Carolina Department of Transportation. The U.S. Fish and Wildlife Service supported this effort by providing technical guidance regarding the use of fish ladders at this site and two prefabricated fish ladder sections at no cost to the project. The National Marine Fisheries Service has voiced their support of this effort. There was no agency opposition to this proposal.

**NAME OF CORPS PROJECT MANAGER:** Chuck Wilson

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** Fish passage at Lock and Dam 1 was monitored prior to installation of the fish ladder and for 2 years after it was in place. Monitoring was conducted to assure the effective operation of the fish ladder and to optimize passage of anadromous fish through the ladder and lock. Monitoring consisted of tagging American shad with sonic transmitters and using receiving stations to track movement of target fish through the lock and fish ladder. Visual monitoring of the ladder by the lockmaster was conducted concurrent with fish lockages. Visual and/ or sonic monitoring was conducted in 1996,

1997, and 1998 during the spawning season of March-June. It is proposed that visual monitoring by the lockmaster will continue as a part of his normal duties. Procedures were modified at all three locks in response to monitoring results. A final monitoring report is available.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).**

The U.S. Bureau of Commercial Fisheries and the North Carolina Wildlife Resources Commission investigated upstream passage of anadromous fish through locks and dams on the Cape Fear River. Nichols and Louder reported a reduction in commercial catches of American shad in the Cape Fear River of about 67 percent between pre-dam and post-dam periods. In 1896 and 1906, the commercial shad catch was about 240,000 pounds. By the late 1950's to mid 1960's, the catch averaged about 77,000 pounds. The attribute this reduction to blockage of anadromous fish from about 76 miles of spawning and nursery grounds and elimination of productive fishing grounds due to the construction of locks and dams on the Cape Fear River. Based on this finding it is anticipated that opening passage to the entire length of the river could restore the historic population of shad and river herring that existed around 1900.

Prior to implementation of this project, it was estimated that less than a third of the American shad population successfully passed upstream of Lock and Dam number 1 and fewer numbers passed Locks 2 and 3. Monitoring of American shad movement upstream after installation of the fish ladder and modification of the locking procedures indicate a two-fold improvement in fish passage upstream. While most of this increase was a result of improved fish passage via the lock chamber, a portion of population (about 8%) are using the fish ladder. Fish ladder modifications made in 1998 are expected to further increase fish passage upstream.

Monetary benefits of this project have not been quantified, but would include improved commercial and recreational fish harvest, which are expected to exceed the project cost over the long term.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Total project costs were about \$104,000. The U.S. Army Corps of Engineers share is \$78,000. The non-Federal share is \$26,000. Approximately \$10,000 was expended for planning, design analysis and coordination of environmental clearances. Construction was completed at a cost of \$94,000, including about \$46,000 for monitoring. The U.S. Fish and Wildlife Service provided two sections of prefabricated fish ladder, at no cost to the project.

No significant maintenance or replacement of the fish ladder is anticipated over the project life. It is anticipated that removal of debris from the fish ladder will be

**PROJECT: Cape Fear Lock and Dam No. 1 Fish Ladder, cont.**

required 2 to 3 times per year at an additional cost of about \$2,000 per year. Maintenance will be conducted as part of the normal annual maintenance for the lock and dam and in accordance with the provisions of paragraph 9h of EC 1105-2-206, the Corps of Engineers will assume responsibility for OMRR&R.

**IMPLEMENTATION SCHEDULE:**

The project was initiated April 1996. However, installation of the fish ladder was delayed until April 1997 due to high river flows. Construction was completed with addition of features to improve water flow and fish guidance in December 1998. The Corps snagboat SNELL and crew installed the fish ladder and modifications. Pre-construction monitoring was conducted in the spring of 1996. Monitoring continued during the 1997-1998 spawning seasons (March-June) after modified locking procedures and the fish ladder were in place.

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?**

The project is visited daily by the Lockmaster. Intensive monitoring was conducted during March – June of 1996, 1997, and 1998. A multi-agency team including District, state, federal and university staff inspected the project in 1997 to make recommendations for fish ladder improvements. District Design and/or Environmental staff was onsite during team meetings and fish ladder installation and modifications.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

2. Pleased with output; however, there is still room for improvement. Hopeful that modifications implemented this winter will provide additional fish passage. It is expected that about 1/3 of the American shad population is still blocked from the spawning grounds.

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

Able to use in-house staff for planning, design, and construction. The Debris Boat SNELL installed the ladder and Lock and Dam staff assisted with monitoring keeping the District in close touch with the project from start to finish. A simple design using a prefabricated structure and readily available materials minimized problems. Monitoring was an important part of the plan from the start. A supportive local sponsor and cooperation from the USFWS was a valuable asset contributing to the success of this project.

**PROJECT: Cape Fear Lock and Dam No. 1 Fish Ladder; cont.**

**Using the same attributes above, select the ones most likely in limiting success potential:**

None known.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

Shad fishing is an important recreational activity at Lock and Dam 1 on the Cape Fear River. Fishing success for this species has improved in upstream waters since the implementation of this project. This project has been the subject of several scientific reports and newspaper articles and has provided educational benefits.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes

Lock and Dam 1 Fish Ladder, Cape Fear River North Carolina

Sections of prefabricated steeppass Denil fishway were assembled on site.



The fishway was lowered into position by the Wilmington District's debris boat Snell.



The crew of the Snell secures the fishway to existing sheet piles at the Lock.



Fish lockage procedures modified based on fish monitoring by nets, sonic tracking and visual observation.



**APPENDIX F**

**PROJECT: El Dorado Lake, Kansas, Fishery Habitat Restoration  
Project**

**PROJECT: El Dorado Lake, Kansas, Fishery Habitat Restoration Project**

**STATE:** Kansas

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Tulsa

**PROJECT TO BE MODIFIED:** El Dorado Lake

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood Control, water supply, water quality control, and recreation.

**CONGRESSIONAL DISTRICT:** KS 4

**LOCATION:** Located about 2 miles northeast of El Dorado in Butler County, Kansas, on the Walnut River at RM 100.2. El Dorado, Kansas, is about 35 miles east of Wichita.

**COUNTY (S):** Butler

**USGS TOPOGRAPHIC MAP (S):** Rosalia NW, Pontiac, and El Dorado, DE Graff

**NEAREST CITY OR TOWN:** El Dorado, Kansas

**WATERSHED:** Walnut River

**RESOURCE PROBLEM:** The lake fishery ecosystem has declined, primarily due to the deteriorating spawning and nursery habitat for centrarchid species. Operations of the reservoir for flood control and water supply purposes has prevented establishment of aquatic vegetation to replace terrestrial habitat lost through decomposition and water level fluctuation. The resultant loss of nursery habitat is related to the observed decline in the standing crop of centrarchid species (sunfish family), which are heavily dependent on sheltered shoreline areas for survival after hatching.

**OBJECTIVE/GOALS:** To restore spawning and nursery fishery habitat for centrarchid species (sunfish family – bass, crappie, bluegills) in El Dorado Lake.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The project consisted of establishing fish nursery areas using aquatic and/or semi-emergent aquatic

**PROJECT: El Dorado Lake, Kansas, Fishery Habitat Restoration Project, cont.**

plants to revitalize habitat lost as a result of operating El Dorado Lake. Additionally, the project contributes to the replenishment of wetland habitat for migratory waterfowl, since this type of habitat is in limited supply around the lake.

The establishment of aquatic plants in El Dorado Lake will utilize the application of recently developed methods for establishment of aquatic plants in man-made reservoirs, based on research from the Lewisville Aquatic Ecosystem Research Facility (LAERF) provided by Michael Smart, Ph.D., et al. The restoration project was planned in two construction phases. The first year of plantings consisted of small-scale, caged test plots of several species in various locations of the reservoir. The plots were evaluated for successful establishment of the plants within the protective cages for growth outside the cages. (The test plots were protected in cages to prevent grass carp and turtles from feeding on them). Survival and growth within the cages also indicate that environmental conditions are suitable for that species. Phase I of the restoration plan provides information needed to identify cost-effective methods for plant establishment. The successful plots also form the founder colonies that will expand naturally to fill available niches in the lake.

Phase I, the test plots, were planted in June 1996, following the spring high water period. Plant species will include candidates from submersed forms, floating-leafed forms and emergent forms. Protective enclosures (cages) were used around the plots to protect them from predation by herbivores; e.g., turtles or carp. In addition, whole-cove protection from herbivores will be achieved by construction of fences at selected sites. The cove fencing will consist of both fixed and floating sections to accommodate the water level fluctuations in the lake. Installation of the cove fencing occurred during the winter low water period. Variations in plant protection, types of plants, and planting depths will occur at selected sites. About 780 planting units (1 mature transplant or 4 bags of 5 tubers or winterbuds) will be planted overall at the eight locations. The test plots will require 428 protective cages. These eight sites encompass an area of about 125 acres around the lake.

Based on the results of the test plots, site specific species plantings for each of the eight sites will be made for the Phase II plantings. Phase II planting began in the third quarter of FY97. The Phase II founder colony plantings were similar to those in Phase I.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** The only significant project change was the scheduled start of Phase I planting. Phase I planting was delayed one year due to drought conditions. Minor changes, typical of any project, were handled in the field.

**PROJECT: El Dorado Lake, Kansas, Fishery Habitat Restoration Project, cont.**

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** If no action were taken, the fisheries habitat for the centrarchid species would continue to decline as the shoreline vegetation is diminished. The centrarchids are heavily dependent on sheltered shoreline areas for survival after hatching. The construction of rearing ponds or nursery ponds as an alternative to the proposed plan is significantly more costly and does not provide the overall ecosystem restoration benefits. The use of artificial plant materials is also very expensive and is not self-perpetuating. It would not provide the overall ecosystem restoration benefits of the implemented plan.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** There were no major issues.

**NAME OF COST SHARING SPONSOR:** Kansas Department of Wildlife and Parks (KDWP)

**VIEWS OF THE SPONSOR:** The KDWP provided both cash and work-in-kind-services. These services included preparation of cove-fencing, protective cages, planting assistance, and monitoring. They also provided equipment and technical expertise.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** The U.S. Fish and Wildlife Service expressed its support of the project in its letter dated 21 Feb 95. The city of El Dorado, Kansas, which uses the lake for water supply also was supportive of the proposed project.

**NAME OF CORPS PROJECT MANAGER:** Gene Lilly

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** Monitoring was done between Phase I and Phase II plantings. The purpose of the monitoring was to observe which species in the Phase I planting performed the best. That information was used to focus on the more successful species in the Phase II planting effort.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** It is conservatively estimated that for each acre of fish nursery-rearing habitat restored, it directly doubles the centrarchid standing crop in pounds per acre and substantially increases young of the year survival rates and recruitment and standing crop for a 20-25 surface acre area. Although much more difficult to quantify, such nursery-rearing areas have a measurable influence on fish recruitment (in pounds per acre). This substantially contributes to and influences the fish community considerable distances from nursery areas. This estimate does not include the benefits to desirable catfish species (channel and flathead catfish), that utilizes such habitats. It is estimated that the existing standing crop for game fish is about 12 lbs./acre,

**PROJECT: El Dorado Lake, Kansas, Fishery Habitat Restoration Project, cont.**

which is substantially below the 45-lbs./acre average for lakes of similar age. With the reestablishment of nursery areas, it is estimated that game fish standing crop could be increased 30-35 lbs./acre. The restoration is particularly important to large mouth bass, the most significant species influencing overall lake fishery balance. Prior to the plantings, large mouth bass population levels are about 2 lbs./acre primarily because the absence of nursery habitat. It is estimated that large mouth bass could be restored to 10-12 lbs./acre. For shoreline and migratory waterfowl, the value of these wetlands in the habitat suitability index (HSI) would increase from 0.2 under the existing condition to 0.7 HSI, or a three fold increase in productivity per unit area. Thus on an annualized habitat unit (HU) basis the value to waterfowl would increase to 87.5 HU's (125 acres x 0.7 HSI) compared to existing value of 25 HU's. On a cost per acre basis, the total cost to obtain restoration benefits is very low costing about \$2,120 per acre to construct.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Planning and Design Analysis	\$48,000 – Federal
Construction	\$150,000 – Federal; \$67,000 – Non-Federal

**IMPLEMENTATION SCHEDULE:**

Phase I Construction: June 1997  
Phase II Construction: June 1998

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING? ???**

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”)**

1

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Availability of information about broad geographical area:
- Availability of monitoring information from other projects:
- Availability of suitable work force:
- Site design:
- Application of construction or treatment practices:
- Follow-up to assure implementation and corrective action when needed:
- Interest and cooperation of local sponsor(s):

**PROJECT: El Dorado Lake, Kansas, Fishery Habitat Restoration Project, cont.**

**Using the same attributes above, select the ones most likely in limiting success potential:**

- Availability of information about broad geographical area:
- Availability of monitoring information from other projects:
- Availability of suitable work force:
- Site design:
- Application of construction or treatment practices:
- Follow-up to assure implementation and corrective action when needed:
- Interest and cooperation of local sponsor(s):

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

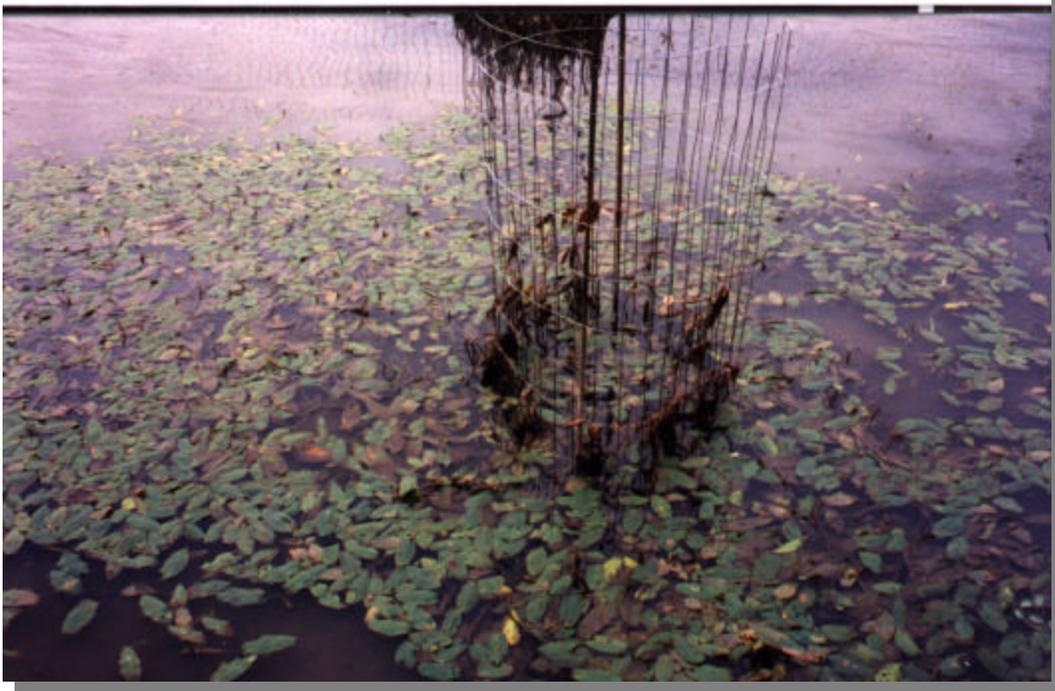
- Wildlife watching
- Hunting
- Fishing
- Camping/Hiking/Walking
- Group activities
- Educational activities
- Picnicking
- Photography/Painting, etc.
- Other: Sailboating

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes



**EL DORADO  
SEPTEMBER 1998**





**EL DORADO  
SEPTEMBER 1998**

## **APPENDIX G**

**PROJECT: Fern Ridge Lake, Long Tom River, Oregon**

**PROJECT: Fern Ridge Lake, Long Tom River, Oregon**

**STATE:** Oregon

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Portland

**PROJECT TO BE MODIFIED:** Fern Ridge Lake

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood Control

**CONGRESSIONAL DISTRICT:**

**LOCATION:** Fern Ridge Lake is located in Lane County, Oregon, about six miles west of the Eugene/Springfield metropolitan area. The lake lies at the upper (southern) end of the Willamette Valley near the east slope of the Coast Range. Fern Ridge Dam crosses the Long Tom River 23.6 miles above its confluence with the Willamette River. The Long Tom River drains an area of 275 square miles above the dam.

**COUNTY (S):** Lane

**USGS TOPOGRAPHIC MAP (S):**

**NEAREST CITY OR TOWN:** Eugene/Springfield, Oregon

**WATERSHED:** Long Tom River

**RESOURCE PROBLEM:** The entire Willamette Valley of Oregon has experienced a significant reduction in the quantity and quality of waterfowl habitat due to agricultural conversion and urban/industrial development. Waterfowl are keyed to habitat availability, thus species are more prone to stay in the northern Willamette Valley where suitable habitat for foraging, loafing, and roosting are prevalent. The development of waterfowl habitat in southern Willamette Valley, as evidenced at Fern Ridge Lake with partial development of the ODFW Management Area, will lead to increased numbers of waterfowl in the southern Willamette Valley and an overall increase in wintering waterfowl in the Willamette Valley.

**OBJECTIVE/GOALS:**

- a) provide for an increase of 200,000 WUD;
- b) increase survivorship of wintering waterfowl;
- c) increase the number of waterfowl returning to the breeding grounds and thereby increase waterfowl production and population levels;
- d) increase quantity and quality of winter forage for waterfowl;
- e) provide for a more equitable distribution of waterfowl in the Willamette Valley;
- f) lessen disease concerns from concentrating birds in just a few areas;

**PROJECT: Fern Ridge Lake, Long Tom River, Oregon, cont.**

- g) provide a greater impetus for the private sector to develop and/or maintain wetlands for waterfowl harvest/management; and
- h) provide for non-game wildlife and wetland habitat.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** Yes, Bald Eagles and Peregrine Falcons.

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The proposed plan includes creation of three impoundments comprising 115 acres by constructing levees and ditches, installing an irrigation water supply pump and 8-inch diameter water supply pipeline, construction of overflow spillways, and installation of drainage culverts with positive closure gates. This site is part of the current license to ODFW for wildlife management purposes. Each spring the impoundments would be drained and planted to cereal grains and/or managed for moist soil plant communities to provide food for waterfowl. The crops would be irrigated during the summer, if fall and winter the impoundments would be flooded to improve waterfowl use of forage crops. Management for moist soil plant communities would entail periodic shallow flooding of impoundments during the growing season and prolonged flooding during the late fall, winter and early spring.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?**

No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Area remains as reed canarygrass monoculture.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** Costs resolved by using BLM.

**NAME OF COST SHARING SPONSOR:** Oregon Department of Fish and Wildlife.

**VIEWS OF THE SPONSOR:** The Oregon Department of Fish and Wildlife (ODFW) and the Portland District Corps of Engineers executed a Local Cooperation Agreement on 15 July 1993. ODFW's share of \$75,000 was provided on or about 21 July 1993. As

**PROJECT: Fern Ridge Lake, Long Tom River, Oregon, cont.**

stated in the Feasibility Report and the LCA between the Department of Army and The Oregon Department of Fish and Wildlife, the Department of Interior, Bureau of Land Management (BLM) will be utilized to construct this project on a cost reimbursable basis.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** Ducks Unlimited.

**NAME OF CORPS PROJECT MANAGER:** Taunja Berquam

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No, ODFW already monitors locale and will continue to do so.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of wetlands, River/Stream miles, Endangered Species Benefited).** The principal **nonmonetary benefit** would accrue from the projected increase of 200,000 Waterfowl Use Days (WUD) at Fern Ridge Lake. Additional nonmonetary benefits for waterfowl consist of: a) increased survivorship of wintering waterfowl; b) increase in the number of waterfowl returning to the breeding grounds and thereby increases in waterfowl production and population levels; c) increase in quantity and quality of winter forage for waterfowl; d) more equitable distribution of waterfowl in the Willamette Valley; e) lessening of disease concerns from concentrating birds in just a few areas; and f) greater impetus for the private sector to develop and/or maintain wetlands on adjacent lands for waterfowl habitat.

Economic benefits are based on the monetary value of the net change in user days resulting from the improvements. The net increase in waterfowl hunter use days attributable to the proposed development is estimated between 95 and 286 hunter days annually. With a value of \$15.41 per user day, the benefit associated with increased hunter use days ranges between \$1,464 and \$4,407 annually. The net increase in primary nonconsumptive user days attributed to the proposed development is estimated between 1,500 and 3,000 nonconsumptive user days. With a value of \$17.75 per user day, the benefit associated with increased primary consumptive user days ranges between \$26,625 and \$53,250. These are 1991 prices.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Feasibility Study - \$50,200 Federal; \$16,800 Non-federal

Plans & Specs - \$22,500 Federal; \$7,500 Non-federal

Construction - \$151,200 Federal; \$50,400 Non-federal

Total Project Cost - \$223,900 Federal; \$74,700 Non-federal

Total of \$298,600.

**IMPLEMENTATION SCHEDULE:** Construction initiated in August 1993 and completed in October 1994.

**PROJECT: Fern Ridge Lake, Long Tom River, Oregon, cont.**

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** ODFW monitors the site.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

2

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success,**

- Availability of information about broad geographical area,
- Availability of monitoring information from other projects,
- Availability of suitable work force,
- Site design,
- Application of construction or treatment practices,
- Interest and cooperation of local sponsor(s).

**Using the same attributes above, select the ones most likely in limiting success potential:** None

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Canoeing
- Hunting
- Educational activities
- Photography/Painting, etc.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** No

## **APPENDIX H**

**PROJECT: Galilee Salt Marsh Restoration**

**PROJECT: Galilee Salt Marsh Restoration**

**STATE:** Rhode Island

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** New England

**PROJECT TO BE MODIFIED:** Point Judith Harbor of Refuge

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:** RI 2

**LOCATION:** The Galilee Salt Marsh is located between the Point Judith Harbor of Refuge and Bluff Hill cove in the town of Narragansett, Rhode Island. The Galilee Escape Road separates the interior marsh from Bluff Hill Cove.

**COUNTY (S):** Washington County

**USGS TOPOGRAPHIC MAP (S):** Narragansett Pier

**NEAREST CITY OR TOWN:** Narragansett, Rhode Island

**WATERSHED:** Point Judith Harbor

**RESOURCE PROBLEM:** The marsh has been cut off from tidal exchange for many years. This had led to the degradation of the majority of the marsh from high value salt marsh habitat to lower value common reed marsh. The restoration tidal flushing to this area will reestablish this important regional resource.

**OBJECTIVE/GOALS:** The restoration of 34 acres of former salt marsh from a degraded condition which consisted primarily of fresh water wetland overgrown with common reed (*Phragmites australis*) and shrubs is being implemented. The degradation had severely reduced the fish and wildlife habitat value of the marsh. The Sec. 1135 project is restoring the site to its modern historic conditions as a coastal salt marsh with high value fish and wildlife habitat.

With tidal flushing reintroduced in the marsh, salinity levels are being restored and improvements to estuarine habitat will follow. The salt marsh restoration will discourage the growth of common reed and allow the recolonization of the marsh by salt marsh cordgrass (*Spartina alterniflora*), salt meadow grass (*Spartina patens*) and other salt marsh grasses. Restoration of Galilee Salt Marsh will provide a significant increase in habitat for nesting and migratory birds and estuarine fish and wildlife, and will help restore aquatic productivity. The increase in salt marsh will result in increased value of

**PROJECT: Galilee Salt Marsh Restoration, cont.**

the site for waterfowl, including black ducks, a species of National concern, wading birds, salt marsh nesting birds, and estuarine fish.

**IS THIS A COASTAL AMERICA PROJECT?** Yes

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** It is unknown if the project will benefit endangered species, however it will benefit black ducks, a species of National concern.

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** Restoration of up to 34 acres of former salt marsh from a degraded condition which consisted primarily of fresh water wetland overgrown with common reed (*Phragmites australis*) and shrubs. This degradation has severely reduced the fish and wildlife habitat value of the marsh. The proposed modification would restore the site to its modern historic condition as a coastal salt marsh with high value fish and wildlife habitat.

Disposal of dredged material from the navigation improvements at the Point Judith Harbor of refuge filled in a portion of the historic salt marsh. Restoration of the historic channel network is completed. New, twin 6 foot by 10-foot box culverts with self-regulating tide gates were constructed to conduct flows beneath the Galilee Escape Road. The gates will assure that properties adjacent to the interior marsh will not be flooded due to the project modifications. The salt marsh restoration is discouraging the growth of common reed and allowing the recolonization of the marsh by salt marsh cordgrass (*Spartina alterniflora*), salt meadow grass (*Spartina patens*) and other salt marsh grasses.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?**

The feasibility report called for installation of a single 12-foot by 10-foot culvert. This was changed because the smaller culverts would be cheaper and easier to install. The change also allowed for the installation of smaller automatic tide gates that were cheaper since they would be of a size currently being manufactured and did not need to be “special ordered.” These changes were not considered as significant design changes since the location and cross-sectional area of the culverts was the same as that in the feasibility report.

**PROJECT: Galilee Salt Marsh Restoration, cont.**

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Without the reintroduction of tidal flushing, the area would remain in a degraded condition, which consists primarily of fresh water wetland overgrown with common reed (*Phragmites australis*) shrubs. This type of wetland is considered a low fish and wildlife valued common reed marsh.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** After the marsh had been filled in, cottages were constructed on the fringe of the marsh. Over the years, these cottages were converted to year-round residences. Local officials were concerned that installation of culverts could cause flooding of these properties. During the feasibility investigation, these concerns were addressed by proposing the installation of automatic tide gates. These gates assure that properties adjacent to the interior marsh will not be flooded due to the project modifications. The Sponsor will be monitoring gate operation to insure that the gates are properly calibrated and maintained.

**NAME OF COST SHARING SPONSOR:** Rhode Island Department of Environmental Management

**VIEWS OF THE SPONSOR:** The Rhode Island Department of Environmental Management, the non-Federal sponsor, has consented to a partnership to restore the Galilee Salt Marsh. They have executed an approval Project Cooperation Agreement for this project and now is operating and maintaining the completed project.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** The U.S. Fish and Wildlife Service, the Federal Highway Administration, the Rhode Island Department of Environmental Management, the U.S. Environmental Protection Agency and Ducks Unlimited support the project. The restoration is also supported by the Coastal America implementation team and is part of the strategy to restore degraded salt marsh habitat in the northeast region.

**NAME OF CORPS PROJECT MANAGER:** David Larsen

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No monitoring period was recommended for the project. The sponsor will be providing periodic information on the amount of salt marsh that is restored.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, and Endangered Species Benefited).** The project will result in the restoration of 34 acres of salt marsh from its former condition of common reed dominance to its modern historic condition. The increase in salt marsh will result in increased value of the site for

**PROJECT: Galilee Salt Marsh Restoration, cont.**

waterfowl, including black ducks, a species of National concern, wading birds, salt marsh nesting birds, and estuarine fish.

Restoration of Galilee Salt Marsh will provide a significant increase in habitat for nesting and migratory birds and estuarine fish and wildlife, and will help restore aquatic productivity. The project will increase the quantity of salt marsh habitat, which is declining both regionally and nationally.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?** The cost of the Section 1135 project was \$1,548,000. This included \$215,000 for preparation of the Feasibility Report and Environmental Assessment, about \$160,000 for Plans and Specifications and approximately \$1,173,000 for construction.

	<b>Totals</b>	<b>Non-Fed</b>	<b>Fed</b>
<b>Report</b>	\$215,000	\$0	\$215,000
<b>P&amp;S</b>	\$160,000	\$0	\$160,000
<b>Construction</b>	\$1,173,000	\$387,000	\$786,000
<b>Totals</b>	<b>\$1,548,000</b>	<b>\$387,000</b>	<b>\$1,161,000</b>

**IMPLEMENTATION SCHEDULE:** The Feasibility Study report was completed in April 1994. The Plans and Specifications were issued on 31 May 1996. New England District (formerly Division) awarded a construction contract in August 1996. The project was turned over to the project sponsor for operation and maintenance on 10 March 1998.

Annual OMRR&R are estimated at \$11,530.

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?**

A Federal monitoring program was not included in the project.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

1

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.** The project is transforming from a Phragmites-dominated marsh to a Spartina grass salt marsh and appears likely to continue the transformation until all of the area is salt marsh. It should function as designed and has benefited from all of the listed factors.

**PROJECT: Galilee Salt Marsh Restoration, cont.**

**Select the attributes most likely contributing to project success:**

Availability of monitoring information from other projects: This was available and assisted in determining possible restoration potential during feasibility phase.

Availability of suitable work force: Sufficient number of contractors bid on project so that the contract price was below the estimate for the work.

Site design: NAE staff had required expertise for design of culverts and channels system that was responsible for restoration.

Follow-up to assure implementation and corrective action when needed: NAE will conduct annual inspections to insure that the sponsor is maintaining the project. The sponsor has developed a monitoring program in cooperation with the University of Rhode Island. The sponsor committed to local residents that will monitor site to insure proper calibration and function of the automatic gates to avoid flooding impacts to abutters of the project.

Interest and cooperation of local sponsor(s): The RIDEM Division of Fish and Wildlife was a cooperative, committed sponsor.

**Using the same attributes above, select the ones most likely in limiting success potential:** None. NAE has not identified any potential factors that would limit the project's success.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Camping/Hiking/Walking – Eventually the sponsor hopes to install a walkway around/ through project area.
- Educational activities – Yes, URI intends to use the marsh restoration as demonstration for students.
- Photography/Painting, etc.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Photographs and a video are available. See the following photos.

**GALILEE, RHODE ISLAND  
SALT MARSH**



*Phragmites australis*  
(Before Construction)



**Twin Culverts Before Construction  
Galilee Salt Marsh, Rhode Island**



**Aerial Photos of Galilee Salt Marsh  
Before Construction**





**Construction at Galilee Salt Marsh, Rhode Island**



**New Twin Culverts – Galilee Salt Marsh, Rhode Island**



**Galilee Salt Marsh Restoration, Rhode Island  
South Side  
After Construction**

## **Appendix I**

**PROJECT: Green Island Headwall Modification Project**

**PROJECT: Green Island Headwall Modification Project**

**STATE:** Iowa

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Rock Island

**PROJECT TO BE MODIFIED:** Mississippi River 9-Foot Channel Navigation Project

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:** IA 2

**LOCATION:** Located on the Green Island Levee and Drainage District in Jackson County, Iowa, immediately downstream of the confluence of the Maquoketa and Mississippi Rivers. The water control structure is located at RM 546.5. Bellevue, Iowa, is approximately 9.6 miles to the north.

**COUNTY (S):** Jackson

**USGS TOPOGRAPHIC MAP (S):** Green Island, Iowa and Illinois

**NEAREST CITY OR TOWN:** Bellevue

**WATERSHED:** Mississippi River

**RESOURCE PROBLEM:** The Green Island Wildlife Area is a backwater complex of marsh, forested floodplain, and cropland lying within the 6-mile, U-shaped levee. The original water control structure for the lower impoundment (Blakes Lake) consisted of three gated 36-inch diameter Corrugated Metal Pipe (CMP) tubes that run through the Green Island Levee. The slide gates for the CMP tubes were attached to a concrete headwall on the interior side of the levee. High Mississippi River water levels exerted pressure on these slide gates assemblies causing them to tear loose from the inside headwall. This type of structure failure damaged the wildlife habitat and wildlife food resources within the Green Island Wildlife Area for multiple growing seasons. To prevent future flooding of the wildlife area due to the gatewell failure, a new structure with the gate/headwall on the riverside was proposed.

**OBJECTIVE/GOALS:** To solve the undesired, uncontrolled flooding of the wildlife refuge.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**PROJECT: Green Island Headwall Modification Project, cont.**

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No, not directly.

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The new water control structure was designed to provide the equivalent hydraulic capacity of the existing structure. To facilitate operation of the structure, concrete gatewells with steel gate assemblies were constructed on the riverside of the levee. Reuse of the existing structure was maximized. The existing landside headwall was also left in place. After dewatering and excavation, the riverside headwall was removed to allow construction of the new gatewells. The construction area was then backfilled with granular bedding materials, riprap was placed as needed, and disturbed areas were reseeded. The proposed modification greatly improves the operational capabilities of the impoundment and maximizes the 3,722 acres of habitat managed by the Iowa Department of Natural Resources.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** The refuge behind the levee will continue to be flooded on a periodic but frequent basis. When this happens, the habitat value is significantly (negatively) effected for up to 3 years following the event.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?)** None

**NAME OF COST SHARING SPONSOR:** Iowa Department of Natural Resources (IA DNR)

**VIEWS OF THE SPONSOR:** IA DNR assumed 25 percent of the project cost. They also agreed to assume 100 percent of future operations and maintenance costs associated with this modification. The project was transferred to the state for management on 18 March 1996.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** USFWS, EPA (Region 7), and Iowa State Department of Agriculture. The Iowa State Historic Preservation Office concurred with the modification. The Green Island Wildlife Area is part of the Mississippi Flyway Management Plan and complements the adjacent Upper Mississippi River National Fish and Wildlife Refuge.

**NAME OF CORPS PROJECT MANAGER:** Dorie Bollman

**PROJECT: Green Island Headwall Modification Project, cont.**

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** The modification to the water control system maximizes the wildlife values of the 3,722-acre area by protecting the habitat and food source from inundation by the river during the growing season. Inundation of food and habitat plots could affect habitat values for up to three growing seasons. This modification represented a cost-efficient means of maintaining the wildlife area and maximizing the wildlife value. The project is consistent with the goals stated in the North American Waterfowl Management Plan for protection and enhancement of migration and breeding habitat. The increased reliability of this area now ensures a good food source and diverse habitat for migratory waterfowl, as well as other game and non-game species. Mallards, Canada geese, wood ducks, herons, white-tailed deer, wild turkeys, and pheasants are examples of some of the wildlife species that utilize the food plots and wetland vegetation as part of their diet.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Report	\$36,869 – Federal
P&S	\$12,114 – Federal
Implementation	\$142,169 – Federal; \$63,717 – Non-Federal
Totals	\$191,152 – Federal; \$63,717 – Non-Federal
<b>Total</b>	<b>\$254,869</b>

**IMPLEMENTATION SCHEDULE:**

Submit Fact Sheet	Oct 93
Approval of Fact Sheet/Initial Work Allowance	Nov 93
Submit Feas. Report & Draft PCA(s) for approval by HQ USACE	May 94
Report Approval by HQ USACE	Aug 94
Complete P&S	Aug 94
PCA Approval by NCR	Aug 94
Contract Advertisement and Award	Sep 94
Begin Construction	Mar 95
Complete Construction	Jul 95

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Zero. DNR Manager on site, provides feedback. Corps has no funding for monitoring.

**PROJECT: Green Island Headwall Modification Project, cont.**

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

1

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Site design,
- Application of construction or treatment practices.

**Using the same attributes above, select the ones most likely in limiting success potential:** None

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Canoeing
- Hunting
- Fishing
- Hiking/Walking
- Group activities
- Educational activities
- Picnicking
- Photography/Painting, etc.
- Other: Boating

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes – During construction.

**GREEN ISLAND HEADWALL WATER CONTROL STRUCTURE  
UNDER CONSTRUCTION**



## **Appendix J**

**PROJECT: Lake Greeson/Little Missouri River**

**PROJECT: Lake Greeson/Little Missouri River**

**STATE:** Arkansas

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Vicksburg

**PROJECT TO BE MODIFIED:** Narrows Dam/Lake Greeson

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood control, hydropower, recreation

**CONGRESSIONAL DISTRICT:** AR 4

**LOCATION:** Narrows Dam/Lake Greeson is located on the Little Missouri River 64 miles southwest of Hot Springs, Arkansas. The modifications are located in Narrows Dam and in the 6.5-mile reach of the Little Missouri River downstream of Narrows Dam.

**COUNTY (S):** Pike County

**USGS TOPOGRAPHIC MAP (S):** Narrows Dam and Murfreesboro, Arkansas

**NEAREST CITY OR TOWN:** Murfreesboro, Arkansas

**WATERSHED:** Little Missouri River

**RESOURCE PROBLEM:** Prior to this project, no opportunity existed for modifying the water temperatures or dissolved oxygen content of downstream releases. Flows below Narrows Dam typically ranged from a minimum of 15 cubic feet per second (fps) to a maximum of 3,000 cfs during hydropower generation. The fluctuating water flow and cold water releases resulted in an extremely poor warm water fishery and a limited “put and take” trout fishery downstream of the dam. The project modification effectively increased the level of the intake resulting in higher water temperatures and dissolved oxygen downstream. The temperature and dissolved oxygen level in the hypolimnium in Lake Greeson was also increased. The downstream weirs provide additional aquatic habitat and modify water flow fluctuations. The boulders provide more aeration and a “riffing effect”, and provide needed resting and cover habitat for aquatic species. As a result, warm water fishery downstream will be reestablished over time and the trout fishery will be improved. Periodic fish kills in Lake Greeson will be alleviated. All modifications are located on project lands except for the weirs, which required limited easements.

**OBJECTIVE/GOALS:** Improve fisheries and water quality of the Little Missouri River below Narrows Dam and in Lake Greeson. This included increasing water temperature of the tailwater, increasing the dissolved oxygen level, and ponding water between hydropower generation for increased habitat.

**PROJECT: Lake Greeson/Little Missouri River, cont.**

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** No

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):**

The completed project modifications included replacing some of the trash racks in front of hydroelectric turbines 1 and 2 in Narrows Dam to elevation 519.0 NGVD with solid steel plates, and constructing three low head weirs and random placement of boulders in the Little Missouri River downstream of Narrows Dam. The cooling water supply for the third unit was modified to provide cooler water for the unit to prevent overheating.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** The fisheries resource would have been confined to a limited put and take trout fishery, an extremely limited warmwater fishery in the river, and reduced water quality in the reservoir.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).**

1. Cost to local sponsor.
2. Avoidance of adverse impacts to hydropower production and food control.
3. Neutral or positive impact to trout fishery.
4. Restored warmwater fishery with increased recreational opportunities.
5. Improved overall water quality.

**NAME OF COST SHARING SPONSOR:** Arkansas Game and Fish Commission (AGFC)

**VIEWS OF THE SPONSOR:** AGFC indicated its support for the proposed modification, provided a letter of intent to cost share in the project, and provided partial funding for the endeavor.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** The U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the Arkansas Natural Heritage Commission, the Arkansas Department of Pollution Control and Ecology, and

**PROJECT: Lake Greeson/Little Missouri River, cont.**

other Federal and State agencies concurred with the project. The Southwestern Power Administration and the Northeast Texas Electric Cooperative, Inc., also concurred with the project provided that there were no adverse impacts on hydropower and that there would be compensation for any future loss of hydropower benefits. Both hydropower organizations concurred with the modification to the cooling water supply for turbine 3 and felt that it would prevent hydropower loss from overheating.

**NAME OF CORPS PROJECT MANAGER:** Julie B. Marcy

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** The results of a 1-year monitoring effort by both the Vicksburg District and the AGFC was prepared and distributed. Water quality monitoring continues.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** The project modification is resulting in the restoration of the warmwater fishery on the Little Missouri River to modern historic conditions and associated improvement in water quality. Fishery improvements are resulting from the increase in fishery habitat and dissolved oxygen, minimized water level fluctuations, and the reduction of dissolved metal precipitation downstream of the dam. These improvements include: an anticipated average increase of 5.3 degrees Celsius discharge temperature, an increase of 2.4 mg/L of dissolved oxygen in the discharge, an additional 30 surface acres of water in the weir pools, and an additional 5 square feet of improved aquatic habitat per boulder. There could be up to a fourfold increase in fish biomass with the project over time. A significant increase in the growth rates of desirable sportfish and an overall production increase in all species of the aquatic food chain (benthos to fish) should occur. AGFC is implementing a substantial stocking program to reestablish the warm water fishery. An estimated increase of 32,800 man-days of warm water fishing with an estimated dollar value of \$224,000 is anticipated. Water quality improvements should result in an estimated saving of \$14,000 annually in reduced water treatment costs for downstream communities.

The AGFC announced in January 1998 that they were increasing the seasonal trout catch and release on the Little Missouri River below Narrows Dam May 1 through October 15.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?** The estimated cost of the modification including report costs was \$360,000. The actual project cost was \$299,821.24. The estimated annual operation and maintenance cost is \$150, which will cover the cost of maintaining the weirs.

**PROJECT: Lake Greeson/Little Missouri River, cont.**

	<b>Actual Total</b>	<b>Non-Fed</b>	<b>Fed</b>
<b>Report</b>	\$34,000	\$8,500	\$25,500
<b>PED</b>	\$42,000	\$10,500	\$31,500
<b>Construction</b>	\$223,800	\$46,200	\$177,600
<b>Totals</b>	<b>\$299,800</b>	<b>\$65,200</b>	<b>\$234,600</b>

**IMPLEMENTATION SCHEDULE:**

Complete Plans and Specifications	Oct 94
Construction Completed	Nov 95
Final Completion Report	Jul 96

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Project site visits consist of weekly collection of field data for water quality manager.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

1

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Availability of information about broad geographical area: Little impact.
- Availability of monitoring information from other projects: Very little was available.
- Availability of suitable work force: Very important, excellent contractors.
- Site design: Weir site selections were critical to ensure desired ponded water.
- Application of construction or treatment practices: Unique engineering designs were used to construct the project.
- Follow-up to assure implementation and corrective action when needed: Important, frequent amendments required close coordination.
- Interest and cooperation of local sponsor(s): Very important, excellent coordination.

**Using the same attributes above, select the ones most likely in limiting success potential:**

- Availability of suitable work force: Good contractors are critical when flood control and hydropower operations are suspended.
- Application of construction or treatment practices: If the engineering designs fail, the Corps loses credibility.
- Interest and cooperation of local sponsor(s): Extremely critical for funding and to ensure local support.

**PROJECT: Lake Greeson/Little Missouri River, cont.**

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Canoeing
- Hunting
- Group activities
- Educational activities
- Picnicking
- Photography/Painting, etc.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes

## **NARROWS DAM/LAKE GREESON/LITTLE MISSOURI**



**PROJECT: Lake Greeson/Little Missouri River, cont.**

**BOULDER PLACEMENT**



**PROJECT: Lake Greeson/Little Missouri River, cont.**

## PLACING BOULDERS

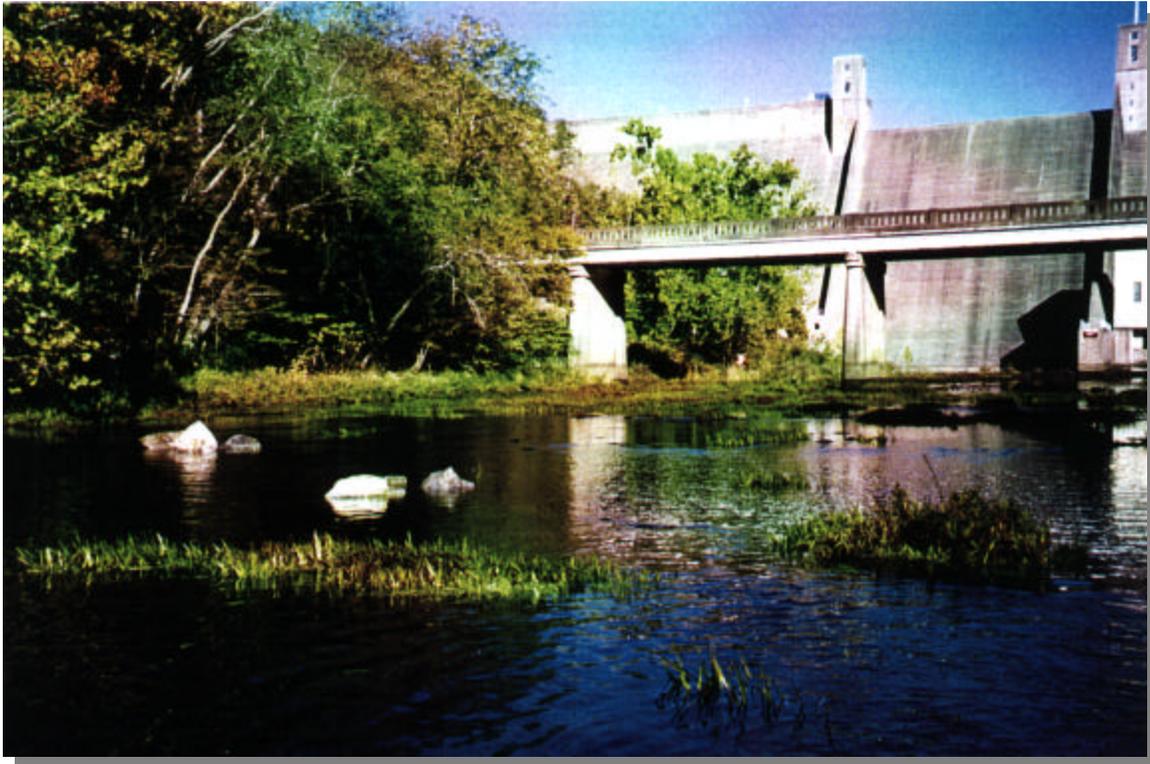


## FINISHED BOULDER PLACEMENT

**PROJECT:** Lake Greeson/Little Missouri River, cont.



## **FINISHED BOULDER PLACEMENT**



**PROJECT: Lake Greeson/Little Missouri River, cont.**

## FINISHED BOULDER PLACEMENT



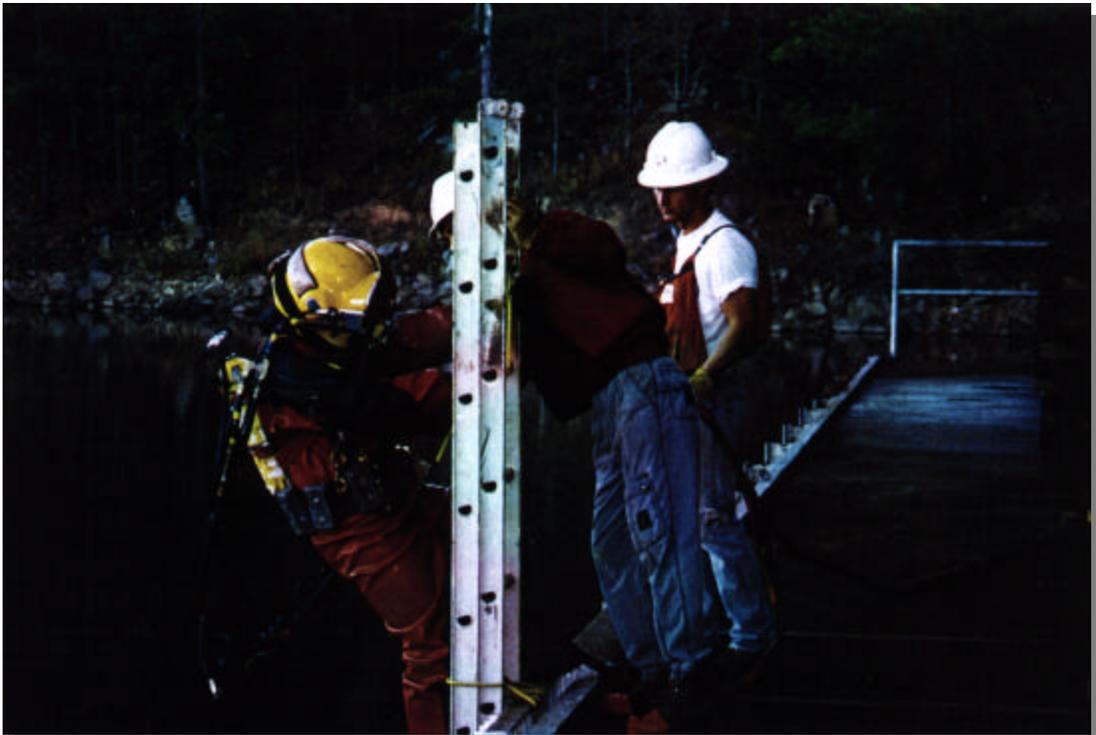
## EQUIPMENT TO REMOVE/INSTALL RACKS



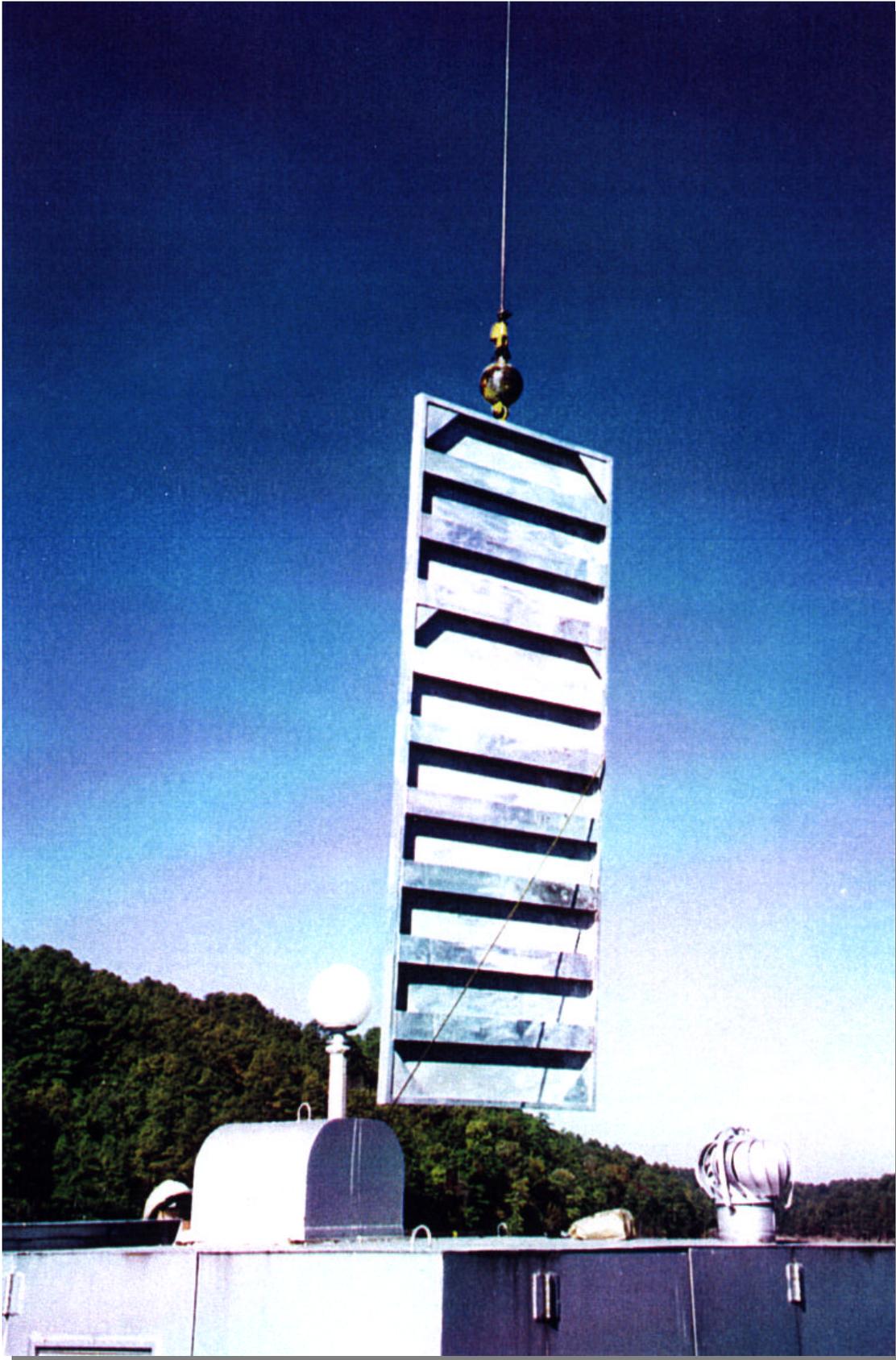
## EXISTING TRASH RACKS



## DIVER ASSISTED REMOVAL OF RACKS



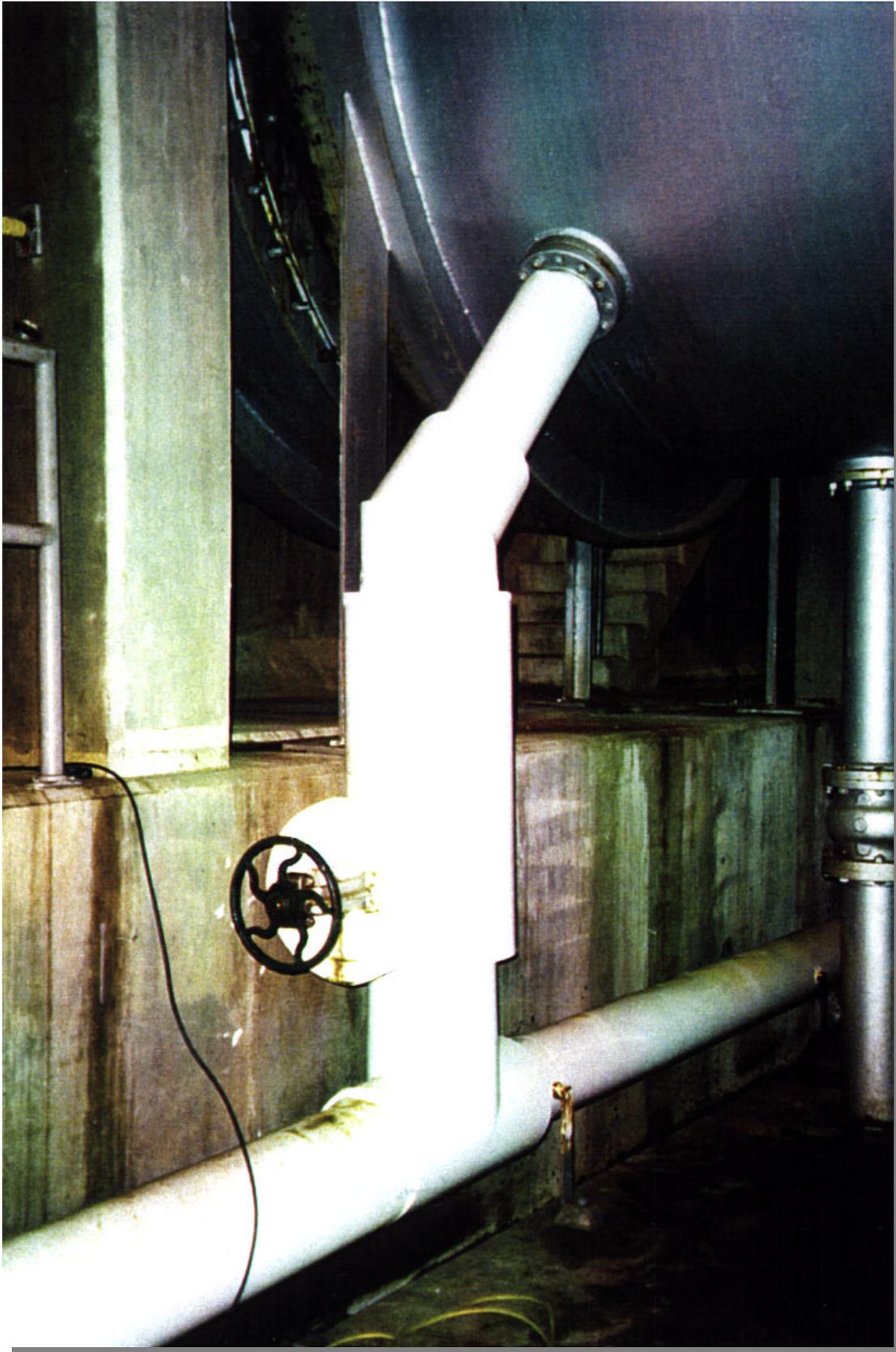
## INSTALLATION OF SOLID PLATE



## INSTALLATION OF SOLID RACK



## MODIFICATION OF COOLING INTAKE



## **APPENDIX K**

**PROJECT: Hidden Lake/Great Marsh Restoration Project**

**PROJECT: Hidden Lake/Great Marsh Restoration Project**

**STATE:** Nebraska

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Omaha

**PROJECT TO BE MODIFIED:** Missouri River Bank Stabilization and Navigation Project, constructed from 1935 to 1982

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation and Bank Stabilization

**CONGRESSIONAL DISTRICT:** NE 2

**LOCATION:** On the Nebraska side of the Missouri River at river mile 602.5, approximately 1 mile east of Bellevue, Nebraska, on the southeast edge of Omaha's metro area.

**COUNTY (S):** Sarpy County

**USGS TOPOGRAPHIC MAP (S):** Omaha South and Council Bluffs South

**NEAREST CITY OR TOWN:** Bellevue

**WATERSHED:** Missouri River

**RESOURCE PROBLEM:** Corps projects for river channelization, flood control, and bank stabilization affect the project reach. These projects and resulting floodplain development have removed thousands of acres of aquatic habitat along the river and diminished the connection between the river and its adjacent floodplain and aquatic communities. Losses continue today while operation of Corps projects prevents new lakes or wetlands from being formed.

Backwater lakes are very rare on the channelized Missouri River, Hidden Lake was a backwater lake in an old oxbow of the Missouri River, but it is currently filled with sediment.

Great Marsh is a wetland in a nearby old channel of the river, which is filling with sediment and organic matter.

**OBJECTIVE/GOALS:** To resolve aquatic habitat values in Hidden Lake and in Great Marsh by removing sediment in a manner providing long term benefits with cost-efficiency and minimal O&M costs or concerns.

**PROJECT: Hidden Lake/Great Marsh Restoration Project, cont.**

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** Bald Eagle and Pallid Sturgeon

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** For Hidden Lake, under this project, sediments are being excavated from the lake to restore its aquatic potential while leaving 2 or 3 high points unexcavated as islands for diversity. The project will create an inlet channel with a gated control structure to reconnect the downstream end of the lake to the river, allowing river flows to back up into the lake during navigation season.

For Great Marsh, sediments are being excavated from the marsh bottom and shoreline to extend its lifetime and expand its area from 34 to 47 acres, simultaneously removing much of the dominating American lotus plants and seeds.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?**

Several minor modifications were made to the selected plan from the PMR in P&S phase. Notably, instead of one standard size gate in the control structure, three culverts with oversize gates will be used to improve access and egress of fish. Also, the permanent OMRR&R easement has been eliminated except on Fontenelle Forest property. Major repair or rehabilitation would be accomplished from the Missouri River. Access for operation will be accomplished by existing trails within the Forest.

The overbank channel from Great Marsh to Hidden Lake which had been eliminated in favor of retaining natural drainage over the affected area, has again been added. As an increment that was proposed in feasibility, some overflow is being rerouted through a constructed channel that offers a benefit to Hidden Lake by introducing overflow closer to the Lake's midpoint, thereby aiding dispersion of nutrients, life forms, and whatever else the Marsh had to contribute to the Lake. The relocated channel has approximately the same timing of overflow as the existing natural channel.

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Continued loss of open water and wetland habitat values due to vegetation encroachment and other successional changes.

**PROJECT: Hidden Lake/Great Marsh Restoration Project, cont.**

**CONCERNS/ISSUES: (Such as: cost, identification of outputs, conflicting planning objectives, recreation vs. ecosystem recreation, flood control vs. ecosystem recreation, others?).** Maximizing operation of gates on Hidden Lake to maximize use by fish and minimize incoming sedimentation from the river.

**NAME OF COST SHARING SPONSOR:** Papio-Missouri River Natural Resources District (NRD)

**VIEWS OF THE SPONSOR:** The sponsor signed The PCA on 7 December 1995. The NRD served as non-Federal sponsor of the recently constructed Section 1135 Boyer Chute Restoration project. The landowner, Fontenelle Forest Association, strongly supports the project.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** The U.S. Fish and Wildlife Service and the Nebraska Game and Parks Commission both believe this project has potential to make a valuable contributing to habitat diversity along the Missouri River. Water quality certification has been secured for the dredge discharge. Cultural resource clearance has been received.

**NAME OF CORPS PROJECT MANAGER:** David Brandon

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** Yes and Yes.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species).** Fish, waterfowl, wading birds, eagles, and furbearers will benefit from these restorations.

The lake reconnection and marsh expansion will help restore diversity to the aquatic community of the Missouri River.

The lake restoration will restore about 50 acres of water area up to 6 feet deep, at most times, available to river fish for spawning, rearing, feeding, and resting; fish wintering will not occur because it will be shallow or will drain in winter. The restored backwater lake will allow waterfowl use again. Increased fish and waterfowl presence could benefit bald eagles. Furbearers will also benefit.

The marsh deepening and expansion will increase marsh size by about 30 percent, reduce lotus dominance, enhance fish production, increase waterfowl habitat, and increase other wetland functions.

**PROJECT: Hidden Lake/Great Marsh Restoration Project, cont.**

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

	<b>Total</b>	<b>Non-Federal</b>	<b>Federal</b>
<b>Report</b>	\$199,000	\$0	\$199,000
<b>Plans/Specifications</b>	\$194,000	\$0	\$194,000
<b>Construction</b>	\$2,332,000	\$682,000	\$1,651,000
<b>Totals</b>	<b>\$2,725,000</b>	<b>\$682,000</b>	<b>\$2,044,000</b>

**IMPLEMENTATION SCHEDULE:**

Feasibility Study	13 months
Review/Revision & Approval	9 months
Plans and Specifications	10 months
Contract Award	3 months
Construction	12 months

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Monthly during non-navigation season.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

1

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Site design,
- Follow-up to assure implementation and corrective action when needed,
- Interest and cooperation of local sponsor(s).

**Using the same attributes above, select the ones most likely in limiting success potential:**

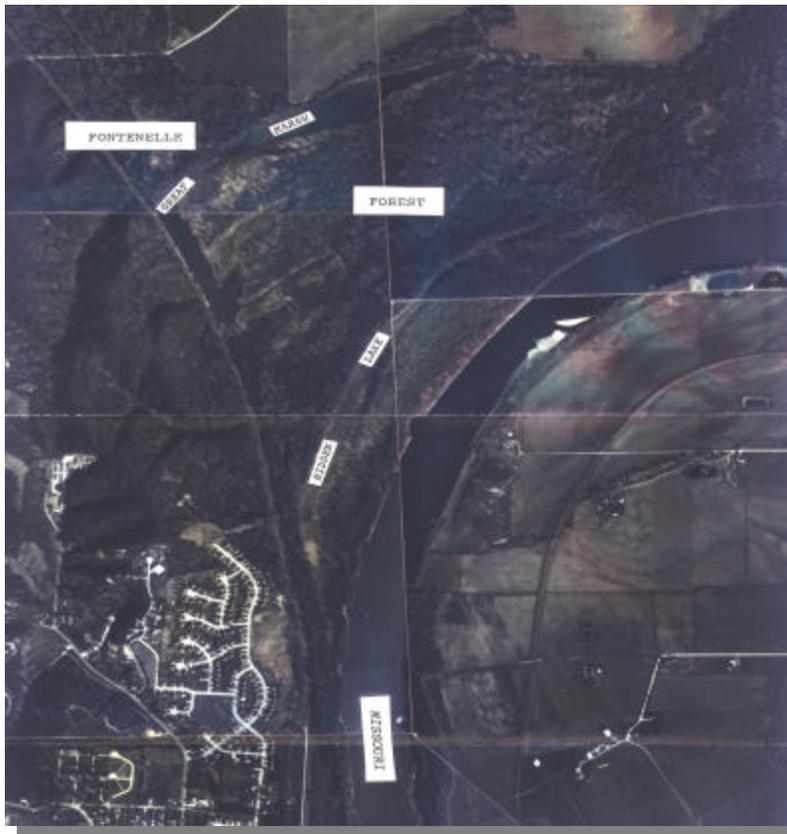
- Site design,
- Follow-up to assure implementation and corrective action when needed,
- Interest and cooperation of local sponsor(s).

**PROJECT: Hidden Lake/Great Marsh Restoration Project, cont.**

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Canoeing
- Hunting
- Camping/Hiking/Walking
- Group activities
- Educational activities
- Picnicking
- Photography/Painting, etc.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes.



**Hidden Lake/ Great Marsh Project Area**



**Hidden Lake – A View of the Former Lake Bed (5/31/89), a Dry Year, Supporting Reed Canarygrass, Cottonwood Seedlings, and Other Vegetation**



**Great Marsh – Two Views of the Marsh's North Arm, a Dry Year (above – 5/31/89) and a Wet Year (below – 5/25/93) Showing Shallow Depths and American Lotus Dominance**



**APPENDIX L**

**PROJECT: Homme Lake Reservoir**

**PROJECT: Homme Lake Reservoir**

**STATE:** North Dakota

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** St. Paul

**PROJECT TO BE MODIFIED:** Park River Flood Control Project/Homme Reservoir and Dam

**AUTHORIZED PURPOSE/CORPS PROJECT:** Water Supply and Pollution Abatement during low-flow periods and secondarily for storage of spring runoff.

**CONGRESSIONAL DISTRICT:** ND 1

**LOCATION:** Homme Dam/Lake is in northeastern ND, about 60 miles northwest of Grand Forks, ND, and about 6 miles west of Park River, ND. The dam is on the south branch of the Park River approximately 62 miles upstream from where the main stem of the Park River joins the Red River of the North.

**COUNTY (S):** Walsh

**USGS TOPOGRAPHIC MAP (S):** Edinburgh, North Dakota

**NEAREST CITY OR TOWN:** Park River and Grand Forks

**WATERSHED:** Park River

**RESOURCE PROBLEM:** Habitat conditions for waterfowl at Homme Lake are presently deficient. A small percentage of the area has aquatic vegetation, most of that is limited to the upper end of the lake. Homme Lake lacks habitat interspersed because the lower end of the lake has no aquatic vegetation. There 95% of the lake is deep, open, and at times used intensely for recreation. The surrounding area is heavily cultivated, and waterfowl nesting sites are limited. The oxbow channel is separated from the reservoir by a collapsed small culvert under an unimproved road. Only minor flows can be passed through this culvert, and no water level manipulations are possible. Future habitat degradation is expected in the oxbow because of stagnant water conditions.

**OBJECTIVE/GOALS:** The general goals of this project are to:

- 1) enhance the habitat value of the existing wetlands in the project area;
- 2) 2) increase the nesting habitat for wildlife; and
- 3) 3) to increase the overall value of Homme Lake and the surrounding area for fish and wildlife.

**PROJECT: Homme Lake Reservoir, cont.**

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** To meet the objectives for the area, four 1,000-foot square pair-ponds were excavated in a dense cattail stand at the upper end of Homme Lake. Also, nesting structures were placed in the area of the pair-ponds. Four 48-inch-diameter culverts were installed upright near the ponds at a height of 3 to 4 feet above the normal water surface. Once the culverts were firmly seated, they were filled with topsoil to the top, and mulched and seeded. The vertical culvert planted with nesting cover would provide nesting sites secure from predators for ducks and geese.

An oxbow channel in the upper end of Homme Lake is cut off from the main pool by a gravel road, which at one time provided access to a local park. The area no longer functions as a county park. The road, which remains in place, however, has created a smaller backwater area in the oxbow. Although some water is ponded behind the road, the oxbow wetland could be improved by the addition of a structure to control water levels. A collapsed culvert was replaced by 3-foot-diameter culvert with a 6-foot-diameter half-round standpipe/stoplog control structure to allow water in and out of the oxbow channel and to allow control of water levels in the oxbow.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?**

No significant design changes after project approval.

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Without the proposed project, Homme Lake would continue to be underutilized by fish and wildlife. Water quality and substrate conditions in the oxbow at the upper end of the lake would remain marginal for aquatic plant growth. Without the ability to manipulate water levels so actions such as periodic drawdown could occur, conditions for plant germination are expected to decline. In turn, waterfowl habitat quality in this area would deteriorate due to the degrading vegetative cover and the decline in aquatic invertebrate production. Waterfowl production would also remain low because of the lack of pair and nesting habitat in Homme Lake itself.

**PROJECT: Homme Lake Reservoir, cont.**

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** None

**NAME OF COST SHARING SPONSOR:** North Dakota Game and Fish Department.

**VIEWS OF THE SPONSOR:** Satisfied with the project.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** North Dakota State Historic Preservation Office, North Dakota State Archaeologist, National Park Service, and U.S. Fish and Wildlife Service

**NAME OF CORPS PROJECT MANAGER:** Gary Palesh

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** Installing the culvert and control structure would make possible periodic drawdowns and other water level manipulations in the oxbow. Occasional drawdowns can be completed here which would consolidate bottom sediment, provide seed germination, and release important nutrients back into the soil through oxidation. This would improve vegetative substrate with a concurrent increase in aquatic invertebrates. The combination of these factors would increase breeding and nesting waterfowl habitat. Other groups of wildlife that would benefit from improved habitat conditions in the project area would be migrating waterfowl, aquatic and terrestrial furbearers, songbirds, amphibians, reptiles, and raptors.

The nesting culverts improve the distribution of secure waterfowl nesting sites in the cattail stand. The creation of potholes improve the distribution of open water areas in the dense, unbroken cattail stand and provide waterfowl courtship and brood rearing habitat.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?** The total project cost of selected plan was estimated to be \$29,800 of which \$7,450 was Non-Federal and \$22,350 was Federal.

**IMPLEMENTATION SCHEDULE:**

Letter of intent from local sponsor	17 Jul 1991
Submit final Feasibility Report to HQ	18 Sep 1991
Completion of plans and specifications	15 Aug 1992
Signing of local cooperation agreement	26 Jun 1992
Advertise for bids	26 Aug 1992

**PROJECT: Homme Lake Reservoir, cont.**

Receipt of local cost-share dollars	13 Aug 1992
Contract award	30 Sep 1992
Complete construction	30 Mar 1994

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?**

Never for monitoring. The site is visited on occasion by Corps natural resource managers when in the area for other purposes.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

3

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

Due to it’s small size and relatively straightforward nature, there were no lessons learned associated with this project.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching,
- Hunting.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes - during construction.

**BACKHOE WORKING ON DUGOUT  
NEAREST OBSERVATION DOCK.  
HOMME LAKE TO THE RIGHT.**



**GENERAL SHOT OF DUGOUT/ISLAND/STRUCTURE  
HOMME LAKE**



**RCP INSTALLATION FOR NESTING STRUCTURES.  
RCP IS 48" DIAMETER.  
HOMME LAKE**



**PAIR POND AND LOAFING ISLANDS.  
HOMME LAKE**



**36" CMP AND CONTROL STRUCTURE  
HOMME LAKE**



**SETTING CMP IN PLACE.  
HOMME LAKE**



**CMP IN PLACE IN ROAD AREA.  
HOMME LAKE**



**CMP IN PLACE THROUGH ROAD AREA.  
HOMME LAKE**



**INLET CHANNEL FROM HOMME LAKE TO  
SUBIMPOUNDMENT.  
HOMME LAKE**



**APPENDIX M**

**PROJECT: Laguna Madre Seagrass Project**

**PROJECT: Laguna Madre Seagrass Project**

**STATE:** Texas

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Galveston

**PROJECT TO BE MODIFIED:** Gulf Intracoastal Waterway (GIWW)

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:** TX 27

**LOCATION:** The project is located in the Laguna Madre about 7 miles north of Port Isabel, Texas.

**COUNTY (S):** Cameron

**USGS TOPOGRAPHIC MAP (S):** Port Isabel NW, TX and La Coma, TX

**NEAREST CITY OR TOWN:** Port Isabel, Texas

**WATERSHED:** GIWW

**RESOURCE PROBLEM:** The coverage of seagrass meadows (primarily shoalgrass) in the lower Laguna Madre has declined by about 60% while the area of barren bottom has increased by about 280% in the last 20 years due to changes in lagoon circulation, salinity, and turbidity brought on by dredging navigation channels through the extensive shallow flats and opening new passes to the Gulf of Mexico. The seagrass habitat in subtropical lagoons is important to the estuarine ecosystem because it serves the same functions as the more familiar saltmarsh habitat in temperate estuaries along the upper Gulf and Atlantic coasts. Many sports and commercial species of fish and shellfish such as redfish, speckled trout, southern flounder, crabs, and shrimp and their food species depend on seagrass meadows as a nursery for their young and as a refuge from predators. Also, some waterfowl (redhead ducks) and sea turtles (green sea turtles) feed exclusively on the vegetation or associated flora and fauna.

The continuing decline in seagrass coverage can be offset to some extent by planting seagrass inside open-bay disposal areas between maintenance dredging cycles to replace the lost seagrass. This will help maintain or perhaps increase populations of many estuarine species and provide habitat for endangered species (sea turtles). This habitat is also critical to the survival of the redhead duck since approximately 78% of the world's population overwinter in the area.

**PROJECT: Laguna Madre Seagrass Project, cont.**

**OBJECTIVE/GOALS:** To determine whether disposal operations can be modified to increase the seagrass colonization rate between dredging cycles and improve habitat value for estuarine fauna in open-bay disposal areas.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Unknown

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** Green Seaturtle

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** Consists of transplanting seagrass from nearby undisturbed seagrass meadows onto freshly deposited dredged material from the GIWW. Demonstration plots at two different transplant sites will be sampled in the spring and fall of 1996 and 1997 for certain growth, sediment characteristics, and densities of fishery species and other large mobile animals. Vegetated control plots in nearby undisturbed seagrass beds and a non-planted control plot in the disposal area will be sampled in the same manner to establish the success of the demonstration project in restoring fishery habitat in a disposal area.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No. However, the demonstration sites were planted a second time after the first plantings failed to survive. The reason for non-survival was determined about a year later after more expensive environmental monitoring studies associated with another project determined the Section 1135 sites were in the path of a circulation current that scoured the area. This created higher turbidity, which prevented the plants from receiving enough light for survival for at least 2 years after disposal was completed. Current erosion was also a problem for plant survival.

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** If the open-bay disposal sites cannot be rehabilitated to match the nearby seagrass habitat, state and Federal resource agencies will continue to press for some other disposal method that removes the maintenance material from the Laguna Madre. This will result in increased costs for maintenance of the GIWW.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** The major concern was identifying a solution to the problem of open-bay disposal smothering or shading seagrass at the disposal site and in near-by areas. Loss of seagrass in a seagrass-dominated ecosystem is a major concern.

**PROJECT: Laguna Madre Seagrass Project, cont.**

**NAME OF COST SHARING SPONSOR:** Texas Department of Transportation.

**VIEWS OF THE SPONSOR:** The sponsor submitted a letter of intent based on project costs of about \$316,000. The local sponsor's 25% share of the cost is \$79,000.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** Meetings have been held with State and Federal resource agencies to solicit their advice and comments on the proposed project. Favorable comments and suggestions from their seagrass experts resulted in some modifications to the original proposed project, which will contribute to the success of the project and significantly increase the amount of information gained from the demonstration. The Corps will contract the National Marine Fisheries Service to monitor, collect, analyze, and report on the results of the demonstration project.

**NAME OF CORPS PROJECT MANAGER:** Terrell W. Roberts

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** The National Marine Fisheries Service monitored the project for 2 years and prepared a report that was submitted to HQ upon completion of the report.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** The results of this demonstration will be useful to other Corps Districts around the Gulf and south Atlantic by demonstrating one simple method for restoring fishery habitat in an open-bay disposal area.

Project benefits include partial restoration of a declining fishery habitat, possible aesthetic improvements of barren disposal areas, and an continuing commitment from the Corps to work with other State and Federal resource agencies and universities in solving environmental problems associated with Federal projects. Additional benefits include a possible reduction in wave-induced turbidity and dredged sediment flow back into channel by seagrass stabilization of the soft sediments. Although benefits from fishery habitat restoration cannot be quantified, past studies have shown that seagrass habitat is important to many estuarine species, including sports and commercial species. Some seagrass species are also the sole source of food for some endangered species (sea turtles) and other species that may be listed soon due to large population declines (redhead ducks). Therefore, the project will have a positive impact on endangered species and will indirectly benefit the North American Waterfowl Management Plan by providing additional waterfowl feeding area for the redhead duck. Information gathered from the project can be used by other coastal Districts to help restore fishery habitat in their open-bay disposal areas or as mitigation for estuarine habitat losses associated with present or future civil works projects.

Benefits (mostly unquantifiable) from restoration of declining seagrass habitat are expected to exceed the transplanting costs associated with this procedure.

**PROJECT: Laguna Madre Seagrass Project, cont.**

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Project costs are about \$316,000. The local sponsor's 25% share of the cost is \$79,000.

Report - \$25,000 Federal

P&S - \$5,000 Federal

Construction - \$79 Non-Federal; \$207 Federal

Total - \$79 Non-Federal; \$237 Federal

**IMPLEMENTATION SCHEDULE:**

The proposed project is dependent on the O&M maintenance dredging schedule since the purpose of the project is to demonstrate the success of planting seagrass on freshly deposited dredged material. Maintenance dredging occurred in October 1994.

Shoalgrass was initially transplanted in June 1995 after the very fine, silty-clay material had consolidated for about seven months. Two months later, survival of the transplants varied from about 10 to 40%. Another transplanting effort was completed in September 1995 in order to have enough seagrass habitat for monitoring. Environmental monitoring of physical parameters started just before dredging and will continue until September 1997. Quantitative sampling of seagrass and marine organisms started in April 1996 and will continue until September 1997. Another three months will be required to complete data analysis after sampling is completed. A report on the results of the sampling will be prepared in February 1998. The total time required from construction (second planting) start to report completion is 29 months.

Maintenance Dredging	Sep 94 – Nov 94
Start Project (planting)	Sep 95
Start Data Collection	May 96
Finish Data Collection	Sep 97
Finish Analysis, Start Report	Dec 97
Finish Report and Project	Feb 98

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Samples were collected in the spring and fall for two years (total of four samplings) plus initial site visits to determine when transplanting could begin.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS "VERY CERTAIN" AND 5 IS "VERY DOUBTFUL")**

5. The seagrass plantings failed to survive.

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE "DO'S AND DON'TS" LEARNED FROM THE PROJECT.**

## **PROJECT: Laguna Madre Seagrass Project**

### **Select the attributes most likely contributing to project success:**

- Availability of information about broad geographical area: Needed detailed circulation data (hydrodynamic and sediment transport modeling)
- Availability of monitoring information from other projects: Data from another project in the area would have benefited the study. However, the other project started after this study.
- Availability of suitable work force: Not a problem.
- Site design: Not a problem. Site location was the problem.
- Application of construction or treatment practices: Better techniques may have helped the project succeed, but only if data from the other project had been available.
- Follow-up to assure implementation and corrective action when needed: None.
- Interest and cooperation of local sponsor(s): Adequate.

### **Using the same attributes above, select the ones most likely in limiting success potential:**

- Availability of information about broad geographical area: Greatest need.
- Application of construction or treatment practices: Needed after circulation and sediment transport problems identified.

### **INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Fishing

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** There are no pictures of the project available. It is a seagrass transplanting site located in open water. The water after disposal was usually turbid, so nothing of any interest would be visible in a photo.

## **APPENDIX N**

**PROJECT: Lake O' the Pines (Ferrells Bridge Dam)**

**PROJECT: Lake O' the Pines (Ferrells Bridge Dam)**

**STATE:** Texas

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Fort Worth

**PROJECT TO BE MODIFIED:** Lake O' the Pines

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood Control

**CONGRESSIONAL DISTRICT:** TX 1

**LOCATION:** Nine miles west of Jefferson, Texas, along Cypress Creek.

**COUNTY (S):** Marion

**USGS TOPOGRAPHIC MAP (S):** Kellyville and Lassater, Texas

**NEAREST CITY OR TOWN:** Jefferson, Texas

**WATERSHED:** Red River Basin

**RESOURCE PROBLEM:** The relatively young age of the forest, combined with a closed canopy and relatively high total basal area per acre, has resulted in a scarcity of nesting cavities in live trees and large, dead trees. The closed canopy has prevented the establishment of herbaceous ground cover and understory species beneficial to both nesting Wood Ducks and other wildlife species to bottomland hardwood forests.

**OBJECTIVE/GOALS:** To improve bottomland hardwood habitat.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERD SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** Selective thinning, the establishment of food plots and wood duck boxes within a 3,900-acre area.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID**

**PROJECT: Lake O' the Pines (Ferrells Bridge Dam), cont.**

**THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Habitat values would continue to decrease due to lack of establishment of herbaceous ground cover and understory species.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** None

**NAME OF COST SHARING SPONSOR:** Texas Parks and Wildlife Department

**VIEWS OF THE SPONSOR:** Fully supported project.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** U.S. Fish and Wildlife.

**NAME OF CORPS PROJECT MANAGER:** Eli Kangas

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** Improved habitat throughout 3,500 acres of bottomland hardwood.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Federal	\$46,900
Non-Federal	\$15,600
<b>Total</b>	<b>\$62,500</b>

**IMPLEMENTATION SCHEDULE:**

Study initiated	Apr 1991
Completed	Feb 1998

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Personnel from Corps Lake Office routinely view area.

**PROJECT: Lake O' the Pines (Ferrells Bridge Dam), cont.**

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS "VERY CERTAIN" AND 5 IS "VERY DOUBTFUL").**

2

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE "DO'S AND DON'TS" LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Availability of information about broad geographical area - Yes
- Interest and cooperation of local sponsor(s) - Yes

**Using the same attributes above, select the ones most likely in limiting success potential:**

- Other – This was a very simple project. Given it was one of the first Section 1135's initiated, it suffered from lack of program direction/ guidance.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Camping/Hiking/Walking
- Educational activities

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** No

## **APPENDIX O**

**PROJECT: Lake Winnibigoshish, Minnesota**

**PROJECT: Lake Winnibigoshish, Minnesota**

**STATE:** Minnesota

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** St. Paul

**PROJECT TO BE MODIFIED:** Mississippi River Headwaters Project,  
Winnibigoshish Dam

**AUTHORIZED PURPOSE/CORPS PROJECT:** Increase Mississippi River discharges during low-flow periods to aid navigation between St. Paul, Minnesota, and Lake Pepin near Lake City, Minnesota, as well as, flood control, recreation, hydropower, water supply, and enhanced fish and wildlife production.

**CONGRESSIONAL DISTRICT:** MN 8

**LOCATION:** It is located in north central Minnesota approximately 100 miles west of Duluth, Minnesota, and 150 miles northwest of St. Paul, Minnesota. Winnibigoshish Dam is located at the outlet of the lake on the Mississippi River about 15 miles northwest of Deer River, Minnesota. The Mississippi River in this location serves as the boundary between Cass and Itasca Counties.

**COUNTY (S):** Cass

**USGS TOPOGRAPHIC MAP (S):** Lake Winnibigoshish

**NEAREST CITY OR TOWN:** Duluth, Minnesota

**WATERSHED:** Mississippi River

**RESOURCE PROBLEM:** In the 1950's, the Minnesota Department of Natural Resources constructed four fish rearing ponds immediately below the Winnibigoshish Dam. These ponds were constructed in floodplain marsh habitat, resulting in the loss of approximately 85 acres of wetlands. The Corps of Engineers cooperated in this effort by allowing the MDNR to use Lake Winnibigoshish as a source of water supply and allowing the installation of the water intake pipe through Winnibigoshish Dam.

These ponds have not been actively managed by the MDNR since the 1970's. Since that time, the ponds have taken on wetland characteristics in terms of vegetation and water levels. However, these wetlands do not function like natural floodplain wetlands because the dikes have cut off overland flow and prevent the river from flooding the wetlands during high water periods. The lack of natural water level fluctuation prevents the development of a natural diversity of wetland and aquatic vegetation, and results in less interspersed open water and wetland vegetation than would occur naturally.

**PROJECT: Lake Winnibigoshish, Minnesota, cont.**

The Leech Lake Band of Chippewa is interested in restoring the wetlands within three of these ponds (ponds 2-4) to benefit migratory and other wildlife. The Band proposes to restore pond 1 for intensive fish propagation. The Band is in the process of acquiring the ponds from the MDNR. In the interim, the Band has a lease that allows them to begin restoration work.

The water intake pipe for the ponds passes through Winnibigoshish Dam and extends approximately 110 feet into the lake. A gate valve is located on the upstream face of the dam, while on the downstream face is a small structure housing a system of valves that regulates flow into the ponds. Each pond also has water inlet and outlet structures.

The primary problem associated with the water intake pipe is its location in an area subject to littoral drift of sand. The sand can plug the intake, or enter the water supply system and foul other gates and valves. One factor contributing to the MDNR's abandonment of the ponds was the operation and maintenance difficulties this sand contamination presented.

If the sand problem with the water intake structure can be solved, restoration of ponds 2-4 for waterfowl habitat can take place. The remaining pond facilities, such as the dikes, gates, and valves, are in good working order.

**OBJECTIVE/GOALS:** To restore the wetlands within ponds 2-4 to higher productivity by permitting management of water levels within the ponds using water from Lake Winnibigoshish.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** Involves placing a 30-foot extension on the existing 24-inch water intake line. The purpose is to extend the intake pipe out to deep water to curtail the problem of sand clogging the intake and downstream water lines.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** During a post-authorization inspection, it was discovered that the corrugated metal outlet culvert to the ponds had become seriously deteriorated. This culvert was

**PROJECT: Lake Winnibigoshish, Minnesota, cont.**

replaced with a new 36-inch corrugated metal culvert with a bolt-on slide gate. A closer inspection of this structure during the planning phase would have revealed its deteriorated condition.

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Without the project modification, the wetland habitat in the ponds would continue to exist in the condition described previously.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** None

**NAME OF COST SHARING SPONSOR:** Leech Lake Band of Chippewa

**VIEWS OF THE SPONSOR:** Satisfied with the project.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** U.S. Fish and Wildlife Service.

**NAME OF CORPS PROJECT MANAGER:** Gary Palesh

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Qualitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species).** Installing the extension on the intake pipe would make water level management possible in ponds 2-4, restoring habitat quality to 44 acres of wetlands. The wetlands would be transformed from emergent wetland marsh, with little standing water, to wetlands with an average water depth of 2 feet with an emergent vegetation to open water ratio of 1:1, which is considered optimum for dabbling ducks. This would improve the habitat conditions for submergent vegetation with a concurrent increase in aquatic invertebrate production. The combination of these factors would increase the breeding and nesting waterfowl habitat. Other groups of wildlife that would benefit from improved habitat conditions in the project area are migrating waterfowl, aquatic and terrestrial furbearers, songbirds, amphibians, and reptiles.

**PROJECT: Lake Winnibigoshish, Minnesota, cont.**

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Feasibility Study	\$14,000
Plans and Specifications	\$12,000
Construction	
Water Intake Pipe Extension	\$36,000
Gated Outlet Culvert	\$16,000
<b>Total</b>	<b>\$78,000</b>

Federal (75%) - \$58,500      Non-Federal (25%) - \$19,500

**IMPLEMENTATION SCHEDULE:**

Submit final PMR to HQ, USACE	08 Oct 1993
Project Approved	03 Aug 1994
Signing of LCA	15 Dec 1994
Receipt of local cost-share dollars	04 Nov 1994
Advertise for bids	15 Mar 1995
Contract award	19 Apr 1995
Complete construction	26 Sep 1995
Project turned over to local sponsor	02 Nov 1995

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Site never visited for monitoring.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS "VERY CERTAIN" AND 5 IS "VERY DOUBTFUL").**

4

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE "DO'S AND DON'TS" LEARNED FROM THE PROJECT.** There were no particular lessons learned from this project, probably due to its small, straightforward nature.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:** None

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes - Lake Picture from WEB Site.

**PHOTO OF LAKE WINNIBIGOSHISH**



**PROJECT: Lake Winnibigoshish, Minnesota**

**APPENDIX P**

**PROJECT: Little Pitcher Lake**

**PROJECT: Lake Winnibigoshish, Minnesota**

**STATE:** Indiana

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Louisville

**PROJECT TO BE MODIFIED:** J.T. Myers Locks and Dam, Ohio River Mile 846

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:** IN 8

**LOCATION:** The J. T. Myers Locks and Dam is located on the Ohio River about 3-1/2 miles downstream from Uniontown, Kentucky, 846 miles below Pittsburgh, Pennsylvania. The locks are located on the Indiana side of the river.

**COUNTY (S):** Posey

**USGS TOPOGRAPHIC MAP (S):**

**NEAREST CITY OR TOWN:** Uniontown, Kentucky

**WATERSHED:** Wabash River

**RESOURCE PROBLEM:**

The proposed Section 1135 project site is a small natural lake on Corps' property downriver of the locks, and adjacent Indiana's Hovey State Game Preserve. The "lake" is a natural, seasonally wet swale, probably a remnant of an abandoned channel of the Wabash River. The lake has been altered by human encroachment, but never directly modified. Much of the extreme outer edge of the 'lake' area is forested because the area is too wet to plow, the water regime in the intermediate zone of the lake is too ephemeral to allow good cover with either wetland or xeric vegetation, the lowest area is covered by water or saturated most of the growing season in most years. Overall the water regime of the lake is too unstable for a good wetland cover mosaic of vegetation and open water to develop.

**OBJECTIVE/GOALS:** Improve the water regime of the lake.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**PROJECT: Lake Winnibigoshish, Minnesota, cont.**

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):**

The proposed project includes a water control structure in the outlet channel between the existing 26 (+ or -) acre Little Pitcher Lake and the Ohio River, planting 5,000 hardwood tree seedlings around the lake and the establishment of 25+ or - acres of prairie grasses. The water control structure is a standard, commercially constructed in-line, flashboard control structure similar to the project. Local farmers and wildlife managers commonly use this type of structure. The berm is compacted earth and clay, about 12 feet high across the narrow outlet channel. The berm is not designed to meet small dam standards since there is not, and never would be development downstream of the structure.

The 5,000 seedlings are a mix of hardwood species native to the region. The seedlings would be 2 to 3-year old stock planted randomly in designated areas around the lake. These areas would require limited maintenance until the trees are well established.

Approximately 25 acres of 'old fallow field' habitat, which was being mowed by the L&D personnel, has been cleared of exotic weedy species, the ground scarified, and seed of several native prairie species broadcast. The prairie will require annual maintenance.

The only O&M required beyond annual weed removal will be adjusting the flashboard setting and control of burrowing mammals at the berm.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:**

The open/ old field habitat and unstable water levels in Little Pitcher Lake would continue without the project. The 25-acre open filed, next to the project offices presently being mowed 3 to 4 times yearly would continue to be mowed. Maintaining water levels in Little Pitcher Lake to enhance the lake fishery, benefit waterfowl and other game and nongame wildlife would not occur without the project.

**PROJECT: Lake Winnibigoshish, Minnesota, cont.**

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control. Vs. ecosystem restoration, others?).**

Cost. A number of Federal and State agencies felt the cost of this project was about 25 – 30% to costly.

**NAME OF COST SHARING SPONSOR:** Indiana Department of Natural Resources.

**VIEWS OF THE SPONSOR:**

The state of Indiana has a great interest in this project because it enhances their existing fish and wildlife lands in the area. The area is easily managed and maintained by the personnel of the adjacent Hovey State Game Preserve.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:**

The proposed project is being developed in cooperation with the Indiana Department of Natural Resources and is consistent with the goals of the North American Waterfowl Management Plan. The project is also consistent with a proposal by the Indiana Chapter of the Nature Conservancy for an Indiana Bottomland Hardwood Forest Wetlands Project to be located in bottomlands and flood plains of southwestern Indiana at and near the mouth of the Wabash River. The Conservancy's proposal is being developed in accordance with the North American Wetlands Conservancy Act.

**NAME OF CORPS PROJECT MANAGER:** Van V. Shipley

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** Yes

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).**

The water level control structure will allow stabilization and management of water levels in the 26 + or – acre Little Pitcher Lake and about 1,960 feet of the outlet channel. Managed water levels will encourage the development of a well-vegetated wetland zone at the edge of the lake. As the wetland matures habitat for aquatic species that use aquatic vegetation for food, cover and in their reproductive cycles will benefit directly, e.g., amphibians, 'bugs,' and fishes. Aquatic and terrestrial species that incorporate these wetland species into their food web will benefit indirectly. Most obvious would be the benefits to birds. Stable wet areas are particularly important as a "source of invertebrate and vertebrate protein for pre-breeding avian and other wildlife species." Improvements to Little Pitcher Lake would improve resting and wintering

**PROJECT: Lake Winnibigoshish, Minnesota, cont.**

habitat for migrating non-game birds and waterfowl. The unstable swale has only minimal value to these groups.

Improvements to the existing terrestrial habitats surrounding Little Pitcher lake would expand and enhance the remnant of bottomland hardwood forest wetland ecosystem that was endemic to extensive areas of the project region prior to man clearing and draining the flood plains. Establishing prairie areas would replace non-diversity, mowed open grassland habitat with a diverse plant mix that will enrich populations of upland animal species.

Generally, the proposed 130 + or – acre project would restore critical habitats that historically occurred over great expanses of the area, protect the lands around Little Pitcher Lake and assure the biodiversity necessary for maximum wildlife value. Additionally, the bald eagle, interior least tern and the Indiana bat, three endangered species that occurs in the area, could benefit from these habitat improvements.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

The total project implementation cost, including the Planning and Design costs is expected to be about \$146,000. P&A is about \$23,000. Construction of the proposed water control structure and the associated berm will cost about \$100,000. Preparing the ground, sowing 100 + or – acres with native prairie species and planting 5,000 seedlings will cost about \$23,000. The total implementation costs of the project will be about \$123,000. The contractor’s bid for construction is \$114,000, Corps S&A is \$9,000. The non-Federal share is \$36,400, thus Federal share is \$109,400.

**IMPLEMENTATION SCHEDULE:**

The Planning and Design phase is complete. Construction will take about 8 months. Construction funds are needed immediately as construction is scheduled to start on the berm and water control structure on November 5, 1996. Planting of vegetation is scheduled to start in April 1997 and be completed by July 1997. All plant material must be ordered by December 1996 to guarantee that the material is available for spring planting.

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING? 2 times.**

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

**PROJECT: Lake Winnibigoshish, Minnesota, cont.**

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

Except for preparing and EIS, project manager did about the same amount of documentation for this “small” environmental project as would be done for the construction of a reservoir project.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Hunting
- Fishing
- Hiking/Walking
- Group activities
- Educational activities
- Picnicking
- Photography/Painting

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** No

## **APPENDIX Q**

**PROJECT: Mississippi River Mast Tree Planting Project**

**PROJECT: Mississippi River Mast Tree Planting Project**

**STATE:** Iowa, Illinois

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Rock Island

**PROJECT TO BE MODIFIED:** Mississippi River 9-Foot Channel Navigation Project

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:** Iowa 2,3 and Illinois 17

**LOCATION:** At Pleasant Creek, Huron Island, and Long Island. These three sites are adjacent to the Mississippi River in Pools 13, 18, and 21, respectively. Two planting areas are located at the Pleasant Creek Site, Pool 13, River Mile 552, approximately 4 miles south of the town of Bellevue in Jackson County, Iowa. The Huron Island Site contains 8 planting areas, and is located in Pool 18, River Mile 424, in Des Moines County, Iowa. A large planting area is located on Long Island, Pool 21, River Miles 334-340, 5 miles north of the city of Quincy in Adams County, Illinois.

**COUNTY (S):** Jackson County, Iowa; Des Moines County, Iowa; and Adams County, Illinois

**USGS TOPOGRAPHIC MAP (S):** Green Island, Iowa; Keithsburg, Illinois-Iowa; Long Island, Illinois-Missouri.

**NEAREST CITY OR TOWN:** Bellevue, Iowa; Quincy, Illinois; Burlington, Iowa

**WATERSHED:** Mississippi River

**RESOURCE PROBLEM:** Pre- and post-project impacts along the Mississippi River have altered the character of the historic forest. A portion of Long Island was cleared for agriculture prior to the construction of the 9-Foot Channel Navigation Project. During the 1940s and 1950s, COE logging reduced the amount of mast-producing trees, which provided a valuable source of food for wildlife. Subsequent Federal protection and changes in land use practices allowed a natural reversion of much of the affected area back to forest. This new forest growth is dominated by early succession species such as cottonwood, silver maple, and elm, rather than mast-producing trees.

**OBJECTIVE/GOALS:** To re-establish a mast tree component on floodplain bottomlands.

**IS THIS A COASTAL AMERICA PROJECT?** No

**PROJECT: Mississippi River Mast Tree Planting Project, cont.**

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No, not directly.

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The proposed project would restore an oak-walnut-pecan component to 558 acres of bottom land forest by either direct seeding or planting of seedling stock. The tree establishment process would consist of planting plus follow-up control of undesirable competing species for 2 years afterwards. There is no requirement for future maintenance after the establishment period.

None of the sites are highly erodible or in immediate proximity to the channel.

Actual tree planting would take place over a 2-year period. The follow-up competition control would be required for two growing seasons after each tree planting. The reason for extending the tree planting over 2 years is that the hydrologic character of bottomland would make a 1-year planting regime logistically difficult. Mississippi River bottomland sites fluctuate unpredictably between wet and dry periods. Optimum soil conditions during the planting season sometimes occur only during a narrow window of opportunity. Attempting too much site preparation and planting during one planting season could prove logistically infeasible. By spreading the tree establishment process over 2 years, the risk of failure from catastrophic weather events in a given year would be lessened.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** The mast tree component in the floodplain would eventually disappear.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** The Mast Tree Planting project can be implemented quickly, but successful establishment of mast tree species requires a multi-year program to complete three essential phases:

- 1) site preparation;
- 2) planting; and
- 3) control of competing weeds.

**PROJECT: Mississippi River Mast Tree Planting Project, cont.**

Mast trees will not reestablish themselves naturally in areas where the seed source has been removed, as it has in the proposed planting areas. Forest research show that oak and walnut species will not successfully regenerate unless competing species, such as silver maple and elm, are harvested prior to their reintroduction.

Site preparation must be performed prior to planting when the ground is not frozen or too wet for heavy machinery to operate. Planting of acorns or bare root seedling stock must be performed either in the fall or spring as soon as possible following site preparation. Since late year flooding could reduce the survival rate to zero percent, planting is proposed in two stages to increase project success. Competing weeds will be controlled for two growing seasons. The survival rate for acorn plantings is less than five percent without second year weed control. For seedlings, the survival rate in uncontrolled conditions is only 30 percent. These rates rise to 35 percent for acorn plantings and 85 percent for seedling stock with second year control. The tree establishment process will not be completed until the tree seedlings are released from weedy competition.

**NAME OF COST SHARING SPONSOR:** Trees Forever, Global ReLeaf (American Forests).

**VIEWS OF THE SPONSOR:** Trees Forever has expressed a willingness to assume 25 percent of the project costs to plant the mast tree component at Pleasant Creek and Huron Island. Global ReLeaf, an entity of American Forests (formerly the American Forestry Association) expressed a willingness to assume 25 percent of the project costs at Long Island. There is no requirement for future maintenance. American Rivers Transportation Company and Iowa Southern Utilities Company are contributing money for this project through Trees Forever.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** Goals for enhanced wildlife habitat are fully supported by a 1961 Cooperative Agreement between the COE and the USFWS. Restoration supports USFWS initiatives to decrease the number of acres leased for agricultural use. The USFWS has expressed intent to convert some agricultural lease areas at Long Island within the Mark Twain National Wildlife Refuge to habitat more suitable to refuge purposes. The Illinois Department of Conservation strongly endorses the proposed planting. Long Island is listed in the State's Natural Area Inventory. The USFWS concurs with the proposal to establish mast trees at the Pleasant Creek Site within the Upper Mississippi River Fish and Wildlife Refuge. The Iowa Department of Natural Resources concurs with the proposal to establish mast trees on state-managed lands on Huron Island. Restoration of the oak component to the Huron and Pleasant Creek Sites augments regeneration efforts initiated by the Mississippi River Natural Resources Forest Management Program.

**NAME OF CORPS PROJECT MANAGER:** Dorie Bollman

**PROJECT: Mississippi River Mast Tree Planting Project, cont.**

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** The project would restore a mast tree component to 558 acres of lands within the Mississippi River 9-Foot Channel Navigation Project. This proposal appears to represent the most cost efficient means of restoring the historic forest. The establishment of mast producing trees would provide a food source and other habitat benefits to migratory waterfowl, as well as other game and non-game species. Mallards, wood ducks, whitetail deer, squirrels, wild turkey, and blue jays are examples of some of the wildlife species that utilize acorns and other nuts as part of their diet.

The project would increase recreation potential by providing future opportunities for hunting as well as the nonconsumptive recreational enjoyment of wildlife. The project would provide opportunities of interpretive education programs to enhance public awareness of COE's conservation practices to improve wildlife habitat.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Report	\$37,000 Federal
P&S	\$9,000 Federal
Implementation	\$ 232,000 Federal; \$69,500 (American Forests) and \$23,500 (Trees Forever) both Non-federals

**IMPLEMENTATION SCHEDULE:**

Submit Fact Sheet	Oct 92
Approval of Fact Sheet/Initial Work Allowance	May 93
Submit Feasibility Report & Agreements for approval by HQUSACE (Delayed due to flood of '93)	May 94
Report Approval by HQUSACE	Aug 94
Receipt of Sponsor Funds	Dec 94
Approval of Agreements	Dec 94
Complete Plans and Specifications	Dec 94
Contract Advertisement and Award	Mar 95
Begin Implementation	Apr 95
Complete Implementation	Sep 98

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** 3-4 times

**PROJECT: Mississippi River Mast Tree Planting Project, cont.**

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

3

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Interest and cooperation of local sponsor(s),
- Other – successful, competent contractor.

**Using the same attributes above, select the ones most likely in limiting success potential:**

- Other – Limited implementation window. Due to the river’s fluctuating hydraulics, planting needs to be timed for optimal success and done in small increments over a longer window (longer than 3 growing seasons).

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Hunting
- Hiking/Walking
- Educational activities
- Picnicking
- Photography

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes



**BEFORE AND AFTER SHOTS OF THE  
MAST TREE PLANTING  
REFORESTING FLOODPLAIN NUT PRODUCING TREES**



**APPENDIX R**

**PROJECT: McFaddin Ranch Wetlands, Salt Bayou, Texas**

**PROJECT: McFaddin Ranch Wetlands, Salt Bayou, Texas**

**STATE:** Texas

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Galveston

**PROJECT TO BE MODIFIED:** Gulf Intracoastal Waterway

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:**

**LOCATION:** The proposed project is located at about GIWW mile 292.5.

**COUNTY (S):** Jefferson

**USGS TOPOGRAPHIC MAP (S):** Big Hill Bayou

**NEAREST CITY OR TOWN:** Port Arthur, TX

**WATERSHED:** Gulf Intracoastal Waterway (GIWW)

**RESOURCE PROBLEM:** Historically, the project area consisted of fresh to brackish marshlands drained by a long series of bayous and lakes to Sabine Lake. Construction of Federal navigation projects has disrupted natural drainage patterns and introduced salt water to the area directly from the Gulf of Mexico. Increased salinity has contributed to loss of submerged aquatic vegetation, replacement of fresh water by salt tolerant vegetation, conversion of vegetated areas to open water, and reduced wildlife habitat values. Managing water levels and salinity to improve the aquatic plant community for wildlife would accomplish restoration of the area. Management capabilities would be provided by a concrete structure containing five gated culverts equipped with both sluice and flap gates, excavating a new channel through the structure, and damming the existing bayou.

**OBJECTIVE/GOALS:** To reduce saltwater intrusion from the GIWW into a historically fresh to slightly brackish marsh.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes. Part of Chenier Plan Initiative, Gulf Coast Venture of the NAWMP, which has designated this project as CPTX-1.

**PROJECT: McFaddin Ranch Wetlands, Salt Bayou, Texas, cont.**

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** Restoration of the area would be accomplished by replacing an existing nonfunctional structure, which was installed across Salt Bayou when the GIWW was originally dredged. The new water control structure would contain five gated culverts. Each culvert would be equipped with a sluice gate on the marsh side and a flap gate on the GIWW side. The sluice gates would be operated using the portable drive unit. An inlet channel between the existing bayou and new structure and an outlet structure between the new structure and the GIWW would be excavated as part of this project. The existing inoperative structure in Salt Bayou would be backfilled with 5,700 cubic yards of fill material from the excavation for the new structure and channel and from new cut dredged material placed along the south bank of the GIWW when the waterway was originally dredged. The fill would block the existing bayou at the GIWW and force water flow through the new structure and channel between the marsh and GIWW.

A boat roller system would be installed adjacent to the new structure. This facility would provide for portage of small boats between the GIWW and marsh by project managers and fishermen and hunters. Stone riprap would be used to prevent erosion at the structure and along the new channel. Training levees would be constructed on both sides of the new structure and along the GIWW to prevent overtopping of the banks adjacent to the structure during high water flows.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL?** No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** 1) Gradual conversion of marsh vegetation to open water and erosion loss of organic soil; and 2) Fish and Wildlife will continue to decline as habitat diversity is lost.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** Difficult to identify outputs since there are no uniform methods for estimating values of manmade marshes or man-directed restoration of marshes.

**NAME OF COST SHARING SPONSOR:** Texas Parks and Wildlife Department

**VIEWS OF THE SPONSOR:** Conducted 15 public meetings supporting project during and before project planning.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** Ducks Unlimited

**NAME OF CORPS PROJECT MANAGER:** Bob Bass

**PROJECT: McFaddin Ranch Wetlands, Salt Bayou, Texas, cont.**

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** Project is located on Federal and State lands with active management that regularly interacts with project. There is no formal USACE monitoring program.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** 60,000 acres of wetlands can be actively managed.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?** Total estimated first cost of the proposed project is \$1,945,000. The project sponsor, Texas Parks and Wildlife will provide its portion of project costs, TPWD has received approval

**IMPLEMENTATION SCHEDULE:** Project is complete and functioning.

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** No formal monitoring. Project has been visited 3-4 times.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”)**

2

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Availability of information about broad geographical area: Information available from State and Federal habitat managers on site.
- Availability of monitoring information from other projects: Information available as above.
- Availability of suitable work force: Work by contract. No work force problems.
- Site design: Appropriate.
- Application of construction or treatment practices: Adequate and appropriate.
- Follow-up to assure implementation and corrective action when needed: On-site managers maintain structure and assure implementation.
- Interest and cooperation of local sponsor(s): TPWD owned some of the lands to be benefited, so very interested and cooperative.

**Using the same attributes above, select the ones most likely in limiting success potential:** No limiting factors other than bureaucracy of State and Federal agencies and cost of USACE.

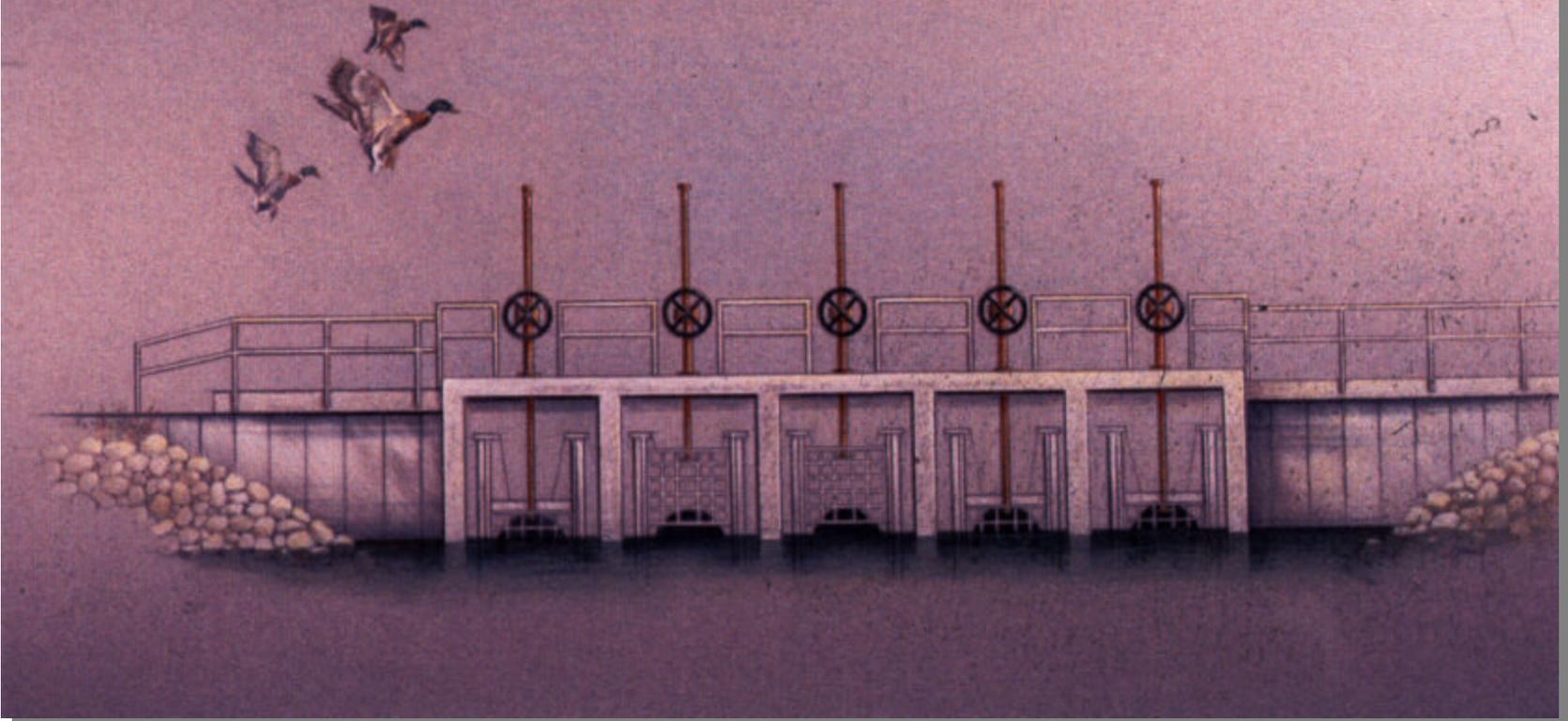
**PROJECT: McFaddin Ranch Wetlands, Salt Bayou, Texas, cont.**

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching - Bird Watching
- Canoeing
- Hunting - Waterfowl
- Fishing
- Photography/Painting, etc. - Wildlife

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes

# SALT BAYOU STRUCTURE



**ARTIST RENDERING OF MCFADDIN RANCH WETLANDS  
SALT BAYOU WATER CONTROL STRUCTURE**



**MCFADDIN RANCH WETLANDS  
SALT BAYOU - BEFORE CONSTRUCTION**



**MCFADDIN RANCH WETLANDS  
SALT BAYOU – BEFORE CONSTRUCTION**



**MCFADDIN RANCH WETLANDS  
SALT BAYOU – UNDER CONSTRUCTION**



**MCFADDIN RANCH WETLANDS  
SALT BAYOU – NEAR COMPLETION**



**MCFADDIN RANCH WETLANDS  
SALT BAYOU – FINAL INSPECTION**

**APPENDIX S**

**PROJECT: Munyon Island Wetland Restoration**

**PROJECT: Munyon Island Wetland Restoration**

**STATE:** Florida

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Jacksonville

**PROJECT TO BE MODIFIED:** Atlantic Intracoastal Waterway from Jacksonville to Miami, construction completed in 1937

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:** FL 22

**LOCATION:** Munyon Island lies within the John D. Macarthur State Park, on the east coast of Florida in the Lake Worth estuary, forming a barrier between North Palm Beach and the Atlantic Ocean.

**COUNTY (S):** Palm Beach

**USGS TOPOGRAPHIC MAP (S):** Riviera Beach, FL

**NEAREST CITY OR TOWN:** North Palm Beach, FL

**WATERSHED:** Lake Worth Lagoon

**RESOURCE PROBLEM:** See Objective/Goals

**OBJECTIVE/GOALS:** The Munyon Island Restoration Project will improve habitat value for fisheries and wildlife by:

- Removal of exotic vegetation, chiefly Australian Pine and Brazilian Pepper,
- Regrading the shoreline to intertidal wetland elevations,
- Revegetating with native wetland vegetation, mangroves, and smooth cordgrass in the wetland,
- Protecting the shoreline and the restored wetland from boat wakes and wind fetch with a limestone boulder wavebreak and protective berm,
- Creating a zone that will buffer/protect the wetland from impact by exotic vegetation,
- Revegetating the upland project areas, including the protective berm and the buffer zone with native coastal strand hammock species,
- Filling of the nearby anoxic dredged hole to bring the bottom depths to within the photic zone, which will dramatically improve water quality and encourage colonization by seagrasses.

**PROJECT: Munyon Island Wetland Restoration, cont.**

Project Objectives:

- Restoration of wetland and upland habitat on Munyon Island will provide:
- Nursery habitat for invertebrates, larval, and juvenile fishes,
- A food source for fisheries and wildlife by providing the basis of primary protection in the food chain (mangrove detrital material),
- Shelter for the fish, birds, and wildlife,
- Water quality improvement by nutrient removal,
- Sediment Stabilization,
- Shoreline protection for wetland plants,
- General and specialized habitat for land and aquatic species,
- An increase in dissolved oxygen and stratum for the recruitment of seagrasses.

**IS THIS A COASTAL AMERICA PROJECT?** Yes

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Additional habitat for nesting and wading birds was created.

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** In accordance with Section 7 of the Endangered Species Act, a biological assessment of potential impacts of the proposed work on threatened and endangered species was prepared and forwarded to the U.S. Fish and Wildlife Service. Federally protected animal species utilizing the wetland restoration project area that have been observed by State Biologists and County Staff include: Wood Stork, Peregrine Falcon, Manatee, Least Turn, Common Snook, Little Blue Heron, Great Blue Heron, Reddish Egret, Snowy Egret, Gopher Tortoise, Brown Pelican, White Ibis, and Osprey.

Two active Gopher tortoise (*Gopherus polyphemus*) burrows have been located in the project area. They will be relocated to an area on the original portion of the island by following the Guidelines for gopher tortoise relocations (dated 8-1-88) under a Florida Game and Freshwater Fish Commission permit.

The state has designated approximately two acres on the north end of Munyon Island as a Least Turn Preserve. The area is posted with signs to prevent pedestrian traffic through the nesting area.

Because of Munyon Island's surrounding seagrass beds, the West Indian Manatee (*Trichechus manatus*) utilizes the island's near shore waters. Manatees have been spotted within the main channel of the wetland restoration project area feeding on the *Spartina* that lines the channel. During project construction, the "Standard Manatee Conditions" will be followed as stated in the project permit issued by the Florida Department of Environmental Protection.

**PROJECT: Munyon Island Wetland Restoration, cont.**

The restored 9.0-acre dredged hole and tidal channels/ ponds within the wetland restoration area have the potential to recruit *Halophila johnsonii*, currently considered as a Federally threatened species.

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The Atlantic Intracoastal Waterway (AIWW) from Jacksonville to Miami navigation project will be modified by restoring approximately 11 acres of mangrove and spartina wetland habitat on Munyon Island and approximately 9 acres of submerged wetland habitat; very little of either remains in the area. Munyon Island was used for dredged material placement during construction and maintenance of the AIWW in 1931, 1933 and 1962. The modification will involve removal of exotic vegetation (Australian pine and Brazilian pepper), grading down the shoreline to intertidal depth by removing dredged material, excavating tidal channels and ponds, and planting the wetland area with native wetland vegetation (red mangroves and smooth cordgrass, 66,000 plants in all). Dredged material removed from the island will be placed in a nearby anoxic hole (1.7 miles away), bringing its bottom depth to within the photic zone and thus encouraging the colonization of seagrass (9 acres). An 800' long riprap wavebreak, 4 acre protective earthen berm and 3.7 acre buffer area will be constructed to provide shoreline stabilization and a vegetative buffer. Project construction cost is now estimated at \$1,452,000. This work will provide restored habitats for fish, crustacean and bird species, which were once native but are now largely missing from this part of Munyon Island. The modification will establish feeding, roosting and nesting areas for a variety of desirable native birds, which shun the exotic vegetation presently growing on the dredged material. The restored submerged wetland at the anoxic dredged hole and the tidal channels/ponds within the island's restored wetland have the potential to recruit *Halophila johnsonii*, a species of seagrass for listing as endangered. Palm Beach County has removed exotic vegetation and previously dredged material from 9.6 acres of Munyon Island, successfully restoring the wetland habitat. The proposed modification will form a contiguous area of 21 acres of functioning wetland.

**WERE THERE SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Exotic species would continue to dominate the island.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** The first Section 1135 project constructed by the Jacksonville District.

**PROJECT: Munyon Island Wetland Restoration, cont.**

**NAME OF COST SHARING SPONSOR:** Palm Beach County

**VIEWS OF THE SPONSOR:** The sponsor has actively been involved in the study process and plan formulation. The sponsor has expressed a strong desire to go forward with the project. The sponsor will provide his share of project funds from revenues generated by hunter license sales. Funds to maintain the project will likewise come from revenues generated from hunting licenses. The sponsor has agreed to sign the draft model PCA and proceed to construction.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** The proposed project modification has received favorable comments from concerned agencies. The State Parks Department supports continued efforts in the restoration of Munyon Island. Palm Beach County has committed to provide pre- and post-monitoring of habitat changes and to publish public awareness articles under the Coastal America program.

**NAME OF CORPS PROJECT MANAGER:** Tim Murphy

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** Palm Beach County has committed to provide pre- and post-monitoring of habitat changes and has published public awareness articles under the Coastal America Program.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** These modifications will have profound and long lasting impacts on the stability and productivity of this valuable ecosystem. The modifications will provide stable dikes and water control, which will result in an increase of target plant species, biomass production by 3,750,000 pounds per year. This increase in biomass plant food will support an increase of 50,000 to 56,000 migratory waterfowl for a total waterfowl population of 196,000. The stabilized dikes and water control system will produce a positive ripple effect for a multitude of coastal species of wildlife inhabiting the area. Bald eagles, wood storks, coots, rails and osprey will maximize use of the stabilized water impoundments and subsequent forage fish. White tail deer, bobcats, opossums, raccoons, foxes, mink, quail, killdeer, and a sundry of songbirds will utilize the impoundment dike and berm system. The selected plan will produce 5,457,700 pounds of biomass plant food per year. This is an increase of 3,750,000 pounds of wildlife food per year over the current conditions. This increase in plant food productive will support an increase of 50,000 to 56,000 migratory waterfowl annually. A multitude of other native terrestrial, avian, and wetland wildlife species will also benefit from the modifications.

**PROJECT: Munyon Island Wetland Restoration, cont.**

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?** Based on the removal of approximately 93,000 cubic yards of material with a barge-based dragline, the cost is \$1,460,000 (PMR, P&S, Construction). The total Federal costs are: Report -\$75,000; P&S - \$153,000; Construction - \$867,000. The total Non-Federal Cost is \$365,000.

**IMPLEMENTATION SCHEDULE:**

Report – 14 months  
P&S – 12 months  
Contract Award – 2 months  
Construction – 16 months

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** 15 visits

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”)**

1

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Availability of monitoring information from other projects: Sponsor had previously restored a part of the island.
- Interest and cooperation of local sponsor(s).

**Using the same attributes above, select the ones most likely in limiting success potential:**

- Availability of suitable work force.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Camping/Hiking/Walking
- Educational activities

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes

**Pre-Construction of Corps project.  
Palm Beach County Department of Environmental Resources Management  
previously restored the Northwest corner of the island.**



**MUNYON ISLAND  
AFTER CONSTRUCTION**



**APPENDIX T**

**PROJECT: Murphy Island, Santee Wildlife Refuge**

**PROJECT: Murphy Island, Santee Wildlife Refuge**

**STATE:** South Carolina

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Charleston District

**PROJECT TO BE MODIFIED:** Atlantic Intracoastal Waterway

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:** SC 1

**LOCATION:** Murphy Island, Santa Coastal Reserve, at junction of Atlantic Intracoastal Waterway (AIWW) and South Santee River, 35 miles north Charleston, South Carolina.

**COUNTY (S):** Charleston

**USGS TOPOGRAPHIC MAP (S):** Minim Island, SC and Cape Romain, SC

**NEAREST CITY OR TOWN:** Charleston, SC

**WATERSHED:** Atlantic Intracoastal Waterway

**RESOURCE PROBLEM:** Construction on the South Carolina portion of the AIWW dates back to 1880. The existing 12x90 navigational channel was completed in 1940. Construction of the AIWW through the Santee Coastal Reserve converted a shallow 30 foot wide tidal creek into a 14 foot deep (project depth plus maintenance overdepth) navigation channel with a top width of 226 feet. Since construction, an additional 100 feet of tidal saltmarsh has disappeared for a total loss of 131 acres. Loss of this saltmarsh has allowed spring high tides, storm surge and boat wakes to attack and erode the wildlife impoundment dikes on Murphy Island. The island is owned entirely by South Carolina Department of Natural Resources, the non-Federal sponsor.

**OBJECTIVE/GOALS:** Objectives and goals for this project:  
Improve plant food sources for wintering waterfowl and prevent the possibility of eat out. Raising the existing dike and construction of set back dikes to prevent saltwater with high concentrations of salt from entering the impoundment at the wrong time. The additional water control structures allows better manipulation of water levels and improve water quality in the impoundments.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**PROJECT: Murphy Island, Santee Wildlife Refuge, cont.**

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?**

Woodstork and Bald Eagle.

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The recommended plan consists of constructing 5,400 feet of setback dikes on Murphy Island adjacent to the AIWW. Relocation of the setback dikes will provide for a saltmarsh buffer between the impoundment dike and the waterway and reduce the erosive impacts of spring high tides, storm surge and boat wakes. An additional 4,500 feet of existing dike will be raised to prevent overtopping by spring high tides. Seven water control structures will be installed to enhance water level management.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?**

The actual constructed project consisted of constructing 3,750 feet of setback dikes, raising 34,250 feet of existing dike between Station 0+00 and 385+00 and installation of seven additional water control structures. South Carolina Department of Natural Resources as “work-in-kind” conducted construction and installation of the water control structures. Both the existing dike and the setback dikes were built to an approximate elevation of 8.0 feet by means of using an amphibious backhoe under an equipment rental contract. The water control structures were placed at Stations 95+00, 176+30, 179+11, 200+00, 301+00, 362+00, and 384+00. The additional dike raising can be attributed to an actual greater production rate than originally estimated.

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Future without project modification would have allowed the dikes in the areas of setback would continue to have been susceptible to erosion from boat wakes resulting in eventual failure.

Sponsor did not have the capability to construct setback dikes in a cost-effective manner, therefore the dikes would have failed in time. Failure of the dikes would then translate into loss of plant food necessary to support the wintering waterfowl and conversion of the wetland impoundment into marginal saltwater marsh.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** None

**NAME OF COST SHARING SPONSOR:** South Carolina Department of Natural Resources

**VIEWS OF THE SPONSOR:** The sponsor has actively been involved in the study process and plan formulation. The sponsor has expressed a strong desire to go forward with the project. The sponsor will provide his share of project funds from revenues

**PROJECT: Murphy Island, Santee Wildlife Refuge, cont.**

generated by hunter license sales. Funds to maintain the project will likewise come from revenues generated from hunting licenses. The sponsor has agreed to sign the draft model PCA and proceed to construction.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** The project is located within the Atlantic Coast Joint Venture (ACJV) of the North American Waterfowl Management Plan (NAWMP). The ACJV has identified the Santee River Delta and the Santee Coastal Reserve as a high priority area. The planning process incorporated correspondence with various Federal, state and local agencies regarding the benefits of the modifications. In accordance with the Endangered Species Act and the Fish and Wildlife Coordination Act, this project has been coordinated with the South Carolina Department of Natural Resources and the U.S. Fish and Wildlife Service. All involved resource agencies and national resource organizations, including Ducks Unlimited, are in support of the recommended modifications. This proposed the Southeast Regional Implementation Team of the Coastal American Partnership supports modification.

**NAME OF CORPS PROJECT MANAGER:** Ted Hauser

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** A post-project vegetation survey will be conducted by SCDNR during the 1998 winter drawdown following project completion. A second and final vegetation survey will be conducted by SCDNR during the 2000 winter drawdown. Winter waterfowl bird counts will also be conducted by SCDNR during the winter prior to the 1998 and 2000 drawdowns. As a condition of project implementation, South Carolina Department of Health and Environmental Control (SCDHEC) placed water sampling requirements on the issued 401 Water Quality Certification. SCDNR will conduct the water quality sampling as required and submit the required reports to SCDHEC. Following each drawdown survey, SCDNR will prepare a written report comparing the current vegetation survey and bird count with previous surveys. In addition to the survey results, the report will discuss operational procedures, water level manipulations, results of water quality sampling, project maintenance/ modifications and any unusual events that occurred since the previous survey and their impact the project and vegetative growth. Monitoring reports are to be submitted to Chief of Planning Branch, Charleston District not later than three months following completion of the vegetation survey or winter draw-down, whichever occurs later. The report is to be furnished to the district around June 1998.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** These modifications will have profound and long lasting impacts on the stability and productivity of this valuable ecosystem. The modifications will provide stable dikes and water control, which will result in an increase of target plant species, biomass production by 3,750,000 pounds per year. This increase

**PROJECT: Murphy Island, Santee Wildlife Refuge, cont.**

in biomass plant food will support an increase of 50,000 to 56,000 migratory waterfowl for a total waterfowl population of 196,000. The stabilized dikes and water control system will produce a positive ripple effect for a multitude of coastal species of wildlife inhabiting the area. Bald eagles, wood storks, coots, rails and osprey will maximize use of the stabilized water impoundments and subsequent forage fish. White tail deer, bobcats, opossums, raccoons, foxes, mink, quail, killdeer, and a sundry of songbirds will utilize the impoundment dike and berm system. The selected plan will produce 5,457,700 pounds of biomass plant food per year. This is an increase of 3,750,000 pounds of wildlife food per year over the current conditions. This increase in plant food productive will support an increase of 50,000 to 56,000 migratory waterfowl annually. A multitude of other native terrestrial, avian, and wetland wildlife species will also benefit from the modifications.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Incremental analysis was used to evaluate 1,200 alternative plans. The totals for Federal are:

Report - \$160,000

P&S - \$50,000

Construction - \$325, 630.21

The total for Non-Federal :

Construction - \$133,905.55

Work-in-Kind - \$100,276.63

Cash - \$33,628.92

**IMPLEMENTATION SCHEDULE:**

Report Approval – 8 Dec 95

Completion of Plans and Specifications – 11 June 96

Construction of Contract Award – 27 Sep 96

Construction Complete – 20 June 97

Project Acceptance – 16 Mar 98

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING? None.**

Monitoring and submittal of monitoring report is the responsibility of the landowner, South Carolina Department of Natural Resources.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”)**

**PROJECT: Murphy Island, Santee Wildlife Refuge, cont.**

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Site Design,
- Application of construction or treatment practices,
- Interest and cooperation of local sponsor(s).

**Using the same attributes above, select the ones most likely in limiting success potential:**

None

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching,
- Hunting – Limited,
- Group Activities,
- Educational activities.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes



**ERODED DIKE TO BE IMPROVED.  
VIEW IS LOOKING SOUTH WITH WILDLIFE IMPOUNDMENT  
ON THE LEFT AND ATLANTIC INTRACOASTAL WATERWAY  
ON THE RIGHT.**



**SECOND COURSE LEVEL OR SETBACK DIKE A.  
BORROW MATERIAL TAKEN FROM IMPOUNDMENT AREA.**



**AMPHIBIOUS BACKHOW WORKING IN BORROW AREA.  
DIKE BEING RAISED IN FOREGROUND.**



**BORROW MATERIAL BEING PLACED ON TOP OF EXISTING  
DIKE BY AMPHIBIOUS BACKHOE.**



**WATER CONTROL STRUCTURES CONSTRUCTED BY SPONSOR,  
SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES.  
DESIGN IS THAT USED BY RICE PLANTATIONS IN THE 1800'S.  
CONTROL STRUCTURE ALLOWS FOR WATER IN BOTH  
DIRECTIONS WITH ABILITY TO RETAIN WATER LEVELS  
INSIDE IMPOUNDMENTS.**



**WATERFOWL ENJOYING BENEFITS OF IMPOUNDED WATER BODIES AND FOOD PLANT GROWTH. TARGET PLANT SPECIES ARE WIDGEONGRASS AND SALTMARSH BULRUSH.**

**APPENDIX U**

**PROJECT: Nimrod Waterfowl Levee**

**PROJECT: Nimrod Waterfowl Levee**

**STATE:** Arkansas

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Little Rock

**PROJECT TO BE MODIFIED:** Nimrod Lake

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood Control and related water resource purposes

**CONGRESSIONAL DISTRICT:** AR 2

**LOCATION:** Nimrod Lake is located about 9 miles southeast of Plainview, Arkansas, on the Fourche LaFave River at River Mile 62.6.

**COUNTY (S):** Yell

**USGS TOPOGRAPHIC MAP (S):** Rover, Plainview, and Nimrod Dam

**NEAREST CITY OR TOWN:** Plainview, Arkansas

**WATERSHED:** Fourche LaFave River

**RESOURCE PROBLEM:** In 1952, the Arkansas Game and Fish Commission (AGFC) constructed the Nimrod Waterfowl Levee, which impounds approximately 2,400 acres of bottomland hardwoods as a greentree reservoir. The construction consisted of a 3,300-foot levee, spillway, and two 12-inch water control structures on Browns Creek, and a 42-inch water control structure on Gilkey Creek. In 1987, AGFC rebuilt portions of the levee by removing two 12-inch gated corrugated metal pipes at Browns Creek and replacing the gated structure at Gilkey Creek with a new stoplog water control structure. These drainage structures do not adequately drain the waterfowl area. Approximately three feet of additional water is trapped in the greentree reservoir, causing the death of hundreds of acres of prime bottomland hardwood. These have since been replaced with brushy aquatic growth, significantly reducing the quality and quantity of wildlife and waterfowl habitat. The Nimrod-Blue Mountain Project Office estimates that wildlife benefits aside, hardwoods in excess of \$100,000 in commercial value have already been lost, because the wet conditions will not permit the harvesting of this resource. The change from bottomland hardwoods to the existing brushy aquatic growth has decreased the food source for bottomland hardwood wildlife species. Although the Nimrod Waterfowl Area is leased to the AGFC for operation and maintenance as a public accessible waterfowl resting area, the Corps retains responsibility for managing the timber resources.

**PROJECT:** Nimrod Waterfowl Levee, cont.

**OBJECTIVE/GOALS:** Restore waterfowl area.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The proposed modification consists of constructing a new 7' x 7' x 13.6' gate well structure including a 36" canal gate with a handwheel and 68 feet of 36" reinforced concrete pipe on the existing levee. This new structure will be located where Brown's Creek intersects the existing levee. The project would restore the proper hydrologic regime necessary for continued bottomland hardwood timber propagation and control any unwanted aquatic growth. The project would allow the area to return to historic level bottomland hardwood trees, and allow the area to return to historic level bottomland hardwood conditions.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?**

No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Currently it is estimated that productivity has decreased 25%, with further acreage destruction inevitable if a no action alternative is selected.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** None

**NAME OF COST SHARING SPONSOR:** Arkansas Game and Fish Commission (AGFC).

**VIEWS OF THE SPONSOR:** The AGFC supports this project modification and they have provided their share of the project cost.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** The U.S. Fish and Wildlife Service and the AGFC along with various local wildlife conservation groups support this project. This project would also be in agreement with the goals of the North American Waterfowl Management Plan.

**PROJECT: Nimrod Waterfowl Levee, cont.**

**NAME OF CORPS PROJECT MANAGER:** Renee Wright

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** The proposed project would restore or prevent the destruction of approximately 2,400 (approximately 600 restored, 1,800 prevented from destruction) acres of greentree reservoir (bottomland hardwoods) and, subsequently, provide food sources for wildlife habitat on Corps own land.

The increase in greentree reservoir acreage will directly improve the habitat quality of all species that utilize greentree reservoirs and bottomland hardwoods in general. The full benefits of restoration will not be realized until the trees reach maturity (approximately 30 years).

Greentree reservoirs are impounded tracts of bottomland hardwood forests, which are managed primarily to attract waterfowl. These areas are shallowly flooded (approximately 18 inches) during the fall and winter to provide food (primarily acorns and benthic organisms) and resting/roosting habitat available for wintering ducks. When properly managed, greentree impoundments are flooded after trees become dormant and are drained before the growing season begins, thus maintaining the integrity of the hardwood forest. When properly managed, greentree forest reservoirs can increase timber growth and prevent hardwood mortality during drought years. Both mallard and wood ducks heavily utilize greentree reservoirs. Black duck, green-winged teal, American wigeons, shovelers, and hooded mergansers also use these flooded timberlands. Other wildlife species extensively feed in such areas, including wild turkey, northern bobwhite quail, eastern gray and fox squirrel, white-tailed deer, and a vast array of songbirds, reptiles, and amphibians. Furbearers such as raccoon, mink, muskrat, and beaver, are also common.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

The estimated cost to implement the project is \$96,300, which includes the feasibility study, engineering and design, and project construction. Operation and maintenance of the proposed project is estimated to cost \$129 per year and would be the responsibility of the Arkansas Game and Fish.

Report - \$41,000 Federal

P&S – \$5,000 Federal

Construction - \$26,200 Federal; \$24,100 Non-Federal

Total - \$96,300.00.

**PROJECT: Nimrod Waterfowl Levee, cont.**

**IMPLEMENTATION SCHEDULE:**

PCA Approval	15 may 1997
Contract Award	15 Aug 1997
Construction	31 Dec 1997 (4 months)

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Several times by Resident Engineer at Nimrod.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

1

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Site design,
- Interest and cooperation of local sponsor(s).

**Using the same attributes above, select the ones most likely in limiting success potential:** None

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Hunting

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** No

**APPENDIX V**

**PROJECT: Orwell Lake**

**PROJECT: Orwell Lake**

**STATE:** Minnesota

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** St. Paul

**PROJECT TO BE MODIFIED:** Orwell Dam/Lake

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood Control

**CONGRESSIONAL DISTRICT:** MN 7

**LOCATION:** Orwell Dam/Lake is in west-central Minnesota about 150 miles northwest of Minneapolis and about 6 miles southwest of Fergus Falls, Minnesota. The dam is on the Ottertail River, 33 miles upstream from where the Ottertail and Bois de Sioux Rivers join to form the Red River of the North.

**COUNTY (S):** Otter Tail

**USGS TOPOGRAPHIC MAP (S):** Orwell Lake, MN

**NEAREST CITY OR TOWN:** Fergus Falls, Minnesota

**WATERSHED:** Ottertail River

**RESOURCE PROBLEM:** Present routine operation of the Orwell Lake maintains a normal full pool elevation of 1,064 +/- 0.5 feet mean sea level (msl) during the summer months. Winter drawdown is permitted to an elevation no lower than 1,048 feet msl. Given the current operating plan for the reservoir, the amount of drawdown (which is determined by assessing flood predictions for coming spring) is kept to a minimum in order to maintain the normal pool elevation as nearly as possible.

At higher pool elevations caused by rainfall events and snowmelt, the reservoir inundates several connected wetland areas and shallow marsh habitat. Some of the wetland/marsh areas retain water in their basins as the reservoir pool elevation drops to normal pool elevation, while others can become dry. These water level fluctuations have decreased aquatic vegetation in littoral areas of the reservoir, which limits the fishery and wildlife potential in the area. This has prevented the full development of perennial emergent vegetation in the wetlands connected to the reservoir, as well as submergent aquatic species. The lack of submergent and emergent vegetation substantially reduces the value of these areas to nesting waterfowl because of the lack of cover and scarcity of aquatic macroinvertebrates necessary for breeding and brood rearing.

Significant shifts in water surface elevations due to rainfall events can cause additional problems during the nesting season. Rising water surface levels can flood over-water and upland waterfowl nests. Falling water levels strand waterfowl nests and their broods, subjecting them to higher predation. Lowered reservoir water levels in the fall and early winter can cause problems to other wildlife. For instance, lower levels can freeze out aquatic furbearers that require stable water levels for access from their lodges to feeding areas under the ice.

**PROJECT: Orwell Lake, cont.**

**OBJECTIVE/GOALS:** 1) To restore wetlands on Orwell Lake project lands, 2) to increase the habitat value of the existing wetlands in the project area, 3) to restore upland nesting habitat for wildlife, and 4) to increase the overall value of Orwell Lake and the surrounding area for fish and wildlife.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The modification consisted of two controlled subimpoundments within the reservoir and plantings in upland areas. See below for info on subimpoundments. The subimpoundments would be filled by runoff from their watersheds. The construction of the control structures allows periodic summer drawdowns to restore the aquatic habitat on each subimpoundment, and also increases the wetland size by holding backwater in the subimpoundments.

Summary Information for Proposed Subimpoundments

<u>Area</u> <u>Location</u>	<u>Subimpoundment</u> <u>Size (acres)</u>	<u>Watershed</u> <u>Size (acres)</u>	<u>Design</u> <u>Pond</u> <u>Elevation</u>
7	15.3	128	1,072
9	51.2	4,703	1,068

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?**

One subimpoundment was not constructed at the request of the local sponsor due to cost increases. This problem could have been avoided in the planning process with more development of the control structure design, which in turn would have allowed for a more accurate cost estimate.

The prairie restoration feature was deleted at the request of the local sponsor. It had been planned that the Section 1135 program would purchase the seed and the local sponsor would prepare the seed area. The local sponsor indicated they did not wish to pursue this feature due to lack of resources to manage a prairie restoration area.

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:**

Without the proposed modifications to the existing project, Orwell Reservoir would remain underutilized by fish and wildlife due to the civil works activities. Since the main purpose of Orwell Reservoir is flood control, water level fluctuations are a normal part of the civil works project. Current water level fluctuations caused by spring runoff or rainfall events at Orwell Reservoir limit peripheral vegetation within the entire reservoir. When plants begin to grow

**PROJECT: Orwell Lake, cont.**

along the moist soil periphery, they may become inundated by a rise in the water level, or they may become stranded and dried out because of lowering water levels. Without stable water levels, aquatic plants never develop fully. This unstable vegetation community provides minimal fish and wildlife benefits.

Although the recent operational plan maintaining normal water surface elevation at 1,064 +/- 0.5 feet msl helps stabilize the vegetation community, some of the peripheral wetlands do not have optimum water levels. There is no cost-effective means to get the desired results with the current reservoir operation plan without the proposed subimpoundment structures in place. Within Orwell Lake there is presently an area separated from the main portion of the reservoir by a road with culvert having a stoplog structure. This does not function with complete success because of the large water level fluctuations that occur during storm events.

In the remainder of the reservoir, no water level manipulations or drawdowns (which stimulate the growth of aquatic vegetation) can occur in the proposed subimpoundment locations without the recommended construction activities. The lack of sufficient water control in the existing subimpoundment, coupled with the absence of water regulatory mechanisms in other areas of the reservoir, prevents the full development of peripheral vegetation along the proposed subimpoundment shorelines, such as reed canary grass, willow, bulrush, and cattails, which would provide valuable cover for a variety of fish and wildlife species. Breeding and nesting waterfowl use of Orwell Reservoir and the surrounding area would continue to be limited due to the reduced amount of aquatic vegetation and invertebrates. High pool elevations in May and June would continue to provide spawning areas for carp in flooded vegetation and allow them access to peripheral wetlands around the reservoir, where they compete with waterfowl for submergent aquatic vegetation and invertebrates. The waterfowl nesting cover would remain marginal due to the monotypic nature of the upland vegetation.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** None, other than the previously discussed change where one subimpoundment was abandoned because of excessive costs, and the prairie restoration was not implemented.

**NAME OF COST SHARING SPONSOR:** Minnesota Department of Natural Resources

**VIEWS OF THE SPONSOR:** Satisfied with the project.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** U.S. Fish and Wildlife Service.

**NAME OF CORPS PROJECT MANAGER:** Gary Palesh

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?**  
No monitoring plan. No report.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Qualitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** Approximately 66 acres of wetland would be directly affected and managed by creation of the subimpoundments.

**PROJECT: Orwell Lake, cont.**

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Feasibility Study	\$25,000
Plans and Specifications	\$80,000
Construction Subimpoundment 7	\$30,000
Subimpoundment 9	\$88,000
Construction Management	<u>\$21,000</u>
<b>Total</b>	<b>\$224,000</b>
Non-Federal (25%)	\$ 56,000
Federal (75%)	\$168,000

**IMPLEMENTATION SCHEDULE:**

Project submitted to HQUSACE for approval:	19 Dec 1991
Project approved	30 Sep 1992
Phase I LCA signed	17 Feb 1993
Phase I construction advertisement	18 May 1993
Phase I construction bid opening	17 Jun 1993
Phase I contract award	30 Jun 1993
Phase I construction completion	31 Jul 1994
Phase I turned over to local sponsor	06 Feb 1995
Phase II LCA signed	20 Jun 1994
Phase II construction advertisement	09 May 1995
Phase II construction bid opening	08 Jun 1995
Phase II contract award	03 Jul 1995
Phase II construction completion	31 May 1996
Phase II turned over to local sponsor	04 Sep 1996

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?**

Never for monitoring. Site is visited occasionally by Corps natural resource management personnel when in the area.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS "VERY CERTAIN" AND 5 IS "VERY DOUBTFUL").**

3

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE "DO'S AND DON'TS" LEARNED FROM THE PROJECT.**

As indicated earlier, the lesson learned was to better develop the project design during the feasibility phase so that a more accurate cost estimate can be provided to the local sponsor.

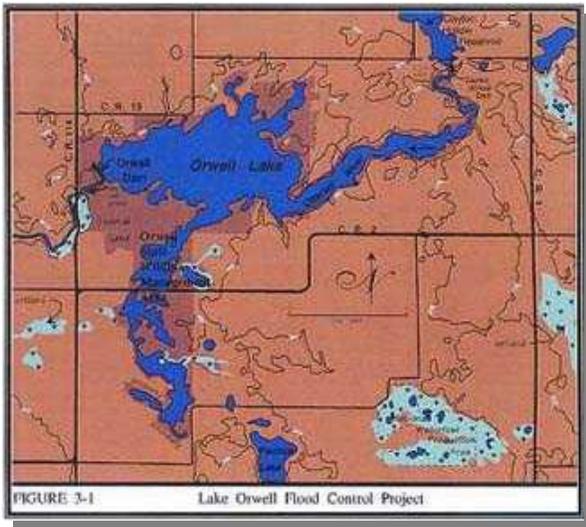
**PROJECT: Orwell Lake, cont.**

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Hunting

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes

**Photo and Map of Orwell Dam and Lake**



**APPENDIX W**

**PROJECT: Sammamish River, Washington**

**PROJECT: Sammamish River, Washington**

**STATE:** Washington

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Seattle

**PROJECT TO BE MODIFIED:** Sammamish River, Washington Channel Improvement Project

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood Control

**CONGRESSIONAL DISTRICT:** WA 7 & WA 8

**LOCATION:** The project is located approximately 5 miles east of Seattle, Washington.

**COUNTY (S):** King

**USGS TOPOGRAPHIC MAP (S):**

**NEAREST CITY OR TOWN:** Seattle

**WATERSHED:** Sammamish River

**RESOURCE PROBLEM:** The last major alteration occurred in association with Sammamish River Channel Improvement Project (The Project) of the Seattle District in the 1960s. The River was deepened and channelized for flood control purposes. This project had several negative fish and wildlife impacts, which included the following:

1. Restricted use of the river by salmonids as a migratory route between Lake Washington and Lake Sammamish. Removal of adjacent vegetation eliminated shading and feeding and resting habitat for fish and permitted greater exposure of fish to predation. Passage to several tributaries was severely restricted or prohibited by the deepening of the channel and lowering of the surface water level, resulting in the loss of available spawning habitat. In addition, higher water temperatures and oxygen reduction resulted, especially in the summer months. Fishery resources were dramatically reduced due to the Project.
2. Wildlife habitat associated with the riparian and adjacent wetland vegetation was virtually destroyed. Like the fishery resource, there were dramatic decreases in the wildlife resources due to the loss of habitat.

**OBJECTIVE/GOALS:**

- 1) Restore the stream channel to provide suitable migratory, reproductive and rearing habitat for salmonid species;

**PROJECT: Sammamish River, Washington, cont.**

- 2) Restore riparian lowland vegetated bench along the west side of the Sammamish River;
- 3) Restore patterns of current direction and velocity within the relatively straight channel that will scour pools in the river bed, lend greater hydraulic diversity to the river, and concentrate current in the bank areas (where hiding fish can feed);
- 4) Restore submerged and closely overhanging cover for fish in the areas on both the east and west banks;
- 5) Restore channel side slopes of varied form above the new riparian bench in order to promote habitat diversity for wildlife;
- 6) Restore diversity of native trees and shrubs along the middle and upper banks to provide food and cover for wildlife and to shade the river.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** No

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?**

Project benefits all fish including Chinook Salmon.

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The proposed modifications consist of a combination of structural (bank excavation, installation of log structures, low flow deflectors, and a footbridge) and nonstructural (revegetation) elements. The total channel length to be modified is approximately 2,400 feet and includes three distinct sites.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Stream would continue to have minimum benefits to fish and wildlife, temperatures would remain high, water quality would remain poor, limited cover would exist.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** None

**NAME OF COST SHARING SPONSOR:** King County, Washington

**PROJECT: Sammamish River, Washington, cont.**

**VIEWS OF THE SPONSOR:** King County has entered into a cost sharing agreement indicating a willingness to provide 25% cost sharing, and to assume responsibility for project O&M.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** USFWS

**NAME OF CORPS PROJECT MANAGER:** Lester E. Soule

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).**

Site 1 represents a single increment because its primary benefit is to restore spawning access to a tributary. Sites 2 and 3 provide essentially identical benefits at very similar costs per site. However, for comparison, Sites 2 and 3 were separated into incremental benefits achieved. The increased numbers of returning adults expected in the with project conditions are:

Site 1: 352 adults (annually)

Site 2: 360 adults (annually)

Site 3: 360 adults (annually)

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

Total project cost = \$413,000

Federal cost - \$309,750

Nonfederal cost - \$103,250

**IMPLEMENTATION SCHEDULE:**

Project Approval	15 Sep 1993
Sign Final LCA	23 Dec 1993
Contract Award	22 Jul 1994
Construction Complete	15 Nov 1994

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Twice a year.

**PROJECT: Sammamish River, Washington, cont.**

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”).**

2

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Availability of suitable work force,
- Site design,
- Application of construction or treatment practices,
- Follow-up to assure implementation and corrective action when needed,
- Interest and cooperation of local sponsor(s).

**Using the same attributes above, select the ones most likely in limiting success potential:**

- Availability of monitoring information from other projects,
- Follow-up to assure implementation and corrective action when needed:

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Canoeing
- Camping/Hiking/Walking

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)? Yes**

**SAMMAMISH RIVER  
VOLUNTEERS FOR VEGETATION PLANTINGS**



**APPENDIX X**

**PROJECT: Savannah Harbor**

**PROJECT: Savannah Harbor**

**STATE:** Georgia

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Savannah

**PROJECT TO BE MODIFIED:** Savannah Harbor

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:** GA 1 and SC 2

**LOCATION:** In the Savannah Harbor, a deep-draft harbor on the south Atlantic coast approximately 75 statute miles south of Charleston Harbor, SC, and 120 statute miles north of Jacksonville Harbor, FL.

**COUNTY (S):** Chatham

**USGS TOPOGRAPHIC MAP (S):** Savannah, GA-SC; Port Wentworth, GA-SC; Limehouse, GA-SC

**NEAREST CITY OR TOWN:** Savannah, GA

**WATERSHED:** Savannah River

**RESOURCE PROBLEM:** Before construction of the tide gate project began, physical model tests were performed by WES to predict the salinity regime of Middle and Back Rivers in the vicinity of the Savannah National Wildlife Refuge. The model studies showed that operation of the tide gate system would increase the salinity levels in the Wildlife Refuge. It was determined that the best means of preventing damage from salt-water intrusion was to construct a fresh water diversion system. This system consisted of a diversion canal from Front River through McCoobs Cut to Middle and Back Rivers and a fresh water control works system located within the Wildlife Refuge. The diversion system was designed to divert 4,000 cubic feet per second of fresh water control works system (Lucknow Canal) would distribute the fresh water throughout the refuge. Due to higher salinity levels than predicted, the fresh water diversion system has been unsuccessful.

The U.S. Fish and Wildlife Service Coordination Act reports that, due to the increased salinity levels, 74 percent of the 5,400 acres of tidal fresh water marsh in the Wildlife Refuge has been converted to saline and brackish marsh. This has significantly lowered the diversity and abundance of fresh water plant species and associated fish and wildlife populations in these areas. Fleshy broad-leafed plants, high in nutrition, have been replaced by grasses with little nutritional value to fish and wildlife. These reports also

**PROJECT: Savannah Harbor, cont.**

state that, after a decade of tide gate and New Cut operation, the density of striped bass eggs spawned in the lower Savannah River has declined by 95 percent.

Since construction of the tide gate/sediment basin and associated features, including New Cut, much controversy has surrounded the adverse environmental impacts which have resulted from the construction and operation of this system. The proposed project modification offers excellent opportunities to restore the area's fish and wildlife resources to a modern historic condition.

New Cut is a man-made channel between Middle and Back Rivers, constructed as part of the Tide Gate system. The purpose of the New Cut is to provide an exit for flood tide waters trapped by closure of the tide gate structure. Velocities through the cut during the ebb tide can exceed 6 feet per second, but normally vary between 2 to 4 feet per second with the Tide Gate in the open position.

The flats located to either side of the cut are primarily marsh. A natural drainage canal located on the East Side of the Cut receives effluent from the weirs located on the backside of Disposal Area 2-A.

**OBJECTIVE/GOALS:** Reduce salinity at the Savannah National Wildlife Refuge, and Reduce velocities to prevent the premature flushing of striped bass eggs from the Back River system.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** No

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No, but benefits one of national importance – Striped Bass.

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The cut would be closed. Using a hydraulic dredge is the chosen plan due to the convenient location of proposed borrow areas and the abundance of suitable borrow material. This alternative also has a secondary benefit, since capacity will be added to the disposal area used as a borrow source. The planned type of construction methodology is well suited for the short construction schedule required for the completion of the closure (1 March 1992).

The selected plan consists of constructing a closure plug across New Cut with a hydraulic pipeline dredge. The closure is approximately 575 feet long, with a crest width of 100 feet and a maximum bottom width of 1,300 feet. The crest elevation of the closure is +8 mlw. The slopes of the closure will be approximately 1V:20H. The slopes of the closure will be stabilized, with one layer of armor stone on each slope with no underlayer. The toe elevation of the armor on each slope will be -3 feet mlw. The armor

**PROJECT: Savannah Harbor, cont.**

stone will be placed to the top of the slope and across the crest of the closure. Approximately 36,000 tons of Georgia Department of Transportation Type I riprap will be used as armor protection. The closure will contain approximately 240,000 cubic yards (cy) of dredged material. The amount of borrow required to fill the neat section of the closure is approximately 450,000 cy. This includes losses due to tidal velocities, the washing of fine-grained material from the borrow material, and settlement due to the weight of the new structure on the relatively soft and unstable canal bottom.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?**

Additional dredged material has been deposited in the plugged channel.

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Over the years, the Savannah Harbor has been the subject of numerous studies and reports that have led to harbor improvements. The original authorizing legislation was the Rivers and Harbors Act of March 2, 1907, House Document 181, 59<sup>th</sup> Congress, 1<sup>st</sup> Session, for the purpose of improvement of the existing deep-draft navigation channel. The most recent amendment was the Water Resources Development Act of 1986, Public Law 99-662. Throughout this time, the project purposes have remained the same, to maintain a deep-draft navigation channel in the Savannah Harbor.

In an effort to provide better maintained navigation channels, a tide gate structure, sediment basin, and drainage canal (New Cut) were constructed in May 1977. This project was authorized by the Rivers and Harbors Act of October 27, 1965, (House Document 263, 89<sup>th</sup> Congress, 1<sup>st</sup> Session). The sediment basin and tide gates are located just downstream of US Highway 17A on Back River. New Cut connects Back and Middle Rivers across Argyle Island. During flood tide, the tide gates are opened to permit the unconsolidated bed load near the bottom of the channel to be carried into Back River. AT high tide, the gates are closed, and the bed load carried in by the flood tide is deposited in the sediment basin. During ebb tide, the portion of Back River above the tide gate drains into the upper part of Front River thorough New Cut. This increases the ebb flow in Front River to the extent that the bed load carried in by the flood tide will be flushed out prior to consolidation. Operation of the tide gate system prevents the development of major shoals in the navigation channel and concentrates the shoal material in the sediment basin located near convenient disposal areas.

Without the proposed modification, the tide gate and New Cut system would continue to operate and the degradation and loss of irreplaceable tidal fresh water marsh and associated fish and wildlife populations would continue. The striped bass population in the lower Savannah River would continue to decline and, eventually, be eliminated.

**PROJECT: Savannah Harbor, cont.**

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).**

None identified.

**NAME OF COST SHARING SPONSOR:** Georgia Ports Authority

**VIEWS OF THE SPONSOR:** Fully Supported

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** U.S. Fish and Wildlife Service, U.S. National Marine Fisheries Service, WES, Georgia Department of Natural Resources, Georgia Department of Transportation, Georgia Office of Planning and Budget, Georgia Ports Authority, and South Carolina Coastal Council.

**NAME OF CORPS PROJECT MANAGER:** Martin V. Cooley

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No, but project has been visited by USFWS.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** With the proposed modification, thousands of acres of tidal fresh water marsh would be restored within and adjacent to the Wildlife Refuge. This would increase the associated fish and wildlife populations significantly. A self-sustaining striped bass sport fishery would be restored in the lower Savannah River. A major pathway for contaminants to enter the Back River would be eliminated, and the reduced dissolved oxygen levels in the Back River sediment basin would be improved.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?** The Federal and Non-Federal costs for the recommended plan are \$2,445,000 and \$815,000, respectively, for a total of \$3,260,000.

**IMPLEMENTATION SCHEDULE:**

Initiate Plans and Specs	15 Aug 91
Complete Plans and Specs	01 Nov 91
Advertise Invitation for Bid	15 Nov 91
Bid Opening	15 Dec 91
Contract Award	15 Jan 92
Complete Construction	15 Mar 92

**PROJECT: Savannah Harbor, cont.**

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?**

Not applicable

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”)**

1 to 2

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Availability of information about broad geographical area,
- Application of construction or treatment practices.

**Using the same attributes above, select the ones most likely in limiting success potential:**

- Availability of monitoring information from other projects,
- Follow-up to assure implementation and corrective action when needed.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Fishing
- Educational activities
- Photography/Painting, etc.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?**

Not at this time.

## **APPENDIX Y**

**PROJECT: Sea Lamprey Trap @ Unit 10 Complex. Sault Ste. Marie**

**PROJECT: Sea Lamprey Trap @ Unit 10 Complex. Sault Ste. Marie**

**STATE:** Michigan

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Detroit

**PROJECT TO BE MODIFIED:** Old U.S. Hydroelectric PowerHouse

**AUTHORIZED PURPOSE/CORPS PROJECT:** Electric Power for the Soo Lock Complex

**CONGRESSIONAL DISTRICT:** MI 1

**LOCATION:** The Soo Lock Complex is located on the St. Marys River, between Lake Superior and Lake Huron, at Sault Ste. Marie, Michigan, and is composed of 4 navigation locks, 2 hydroelectric plants, and the Corps of Engineers Soo Area Office. One additional lock and power plant are operated independently by the Canadian Government. The Soo Lock Complex is located 0.5 mile downstream from the compensating gates used to regulate Lake Superior discharges, and is approximately 20 miles upstream from Lake Huron.

**COUNTY (S):**

**USGS TOPOGRAPHIC MAP (S):**

**NEAREST CITY OR TOWN:** Sault Ste. Marie

**WATERSHED:** St. Mary's River

**RESOURCE PROBLEM:** The Sea Lampreys are adult parasitic that is cylindrical in shape and range in length between 12-24 inches. Native to the Atlantic Ocean, the sea lamprey is a major factor in fish mortality in the Great Lakes. The lamprey uses its sucking mouth to fasten itself to unsuspecting fish. Once attached, it uses its teeth and rough tongue to carve a hole in the side of its prey. An anticoagulant in the lamprey's saliva keeps the wound open until the lamprey is finished drinking blood and body fluids or its victim dies. A lamprey may attack many fish during its parasitic life stage and once attached cannot removed form the fish unless it releases itself.

Adult lampreys spawn in streams, and the offspring spend 3 to 18 months burrowed in the stream bottom. The young lamprey transforms into an adult and migrates down to open waters, where, for the next 18 months, it lives as a parasite capable of killing 40 pounds of fish before it returns upstream to spawn and die. Lampreys entered Lake Ontario through the Erie Canal in the late 1800's. They moved

**PROJECT: Sea Lamprey Trap @ Unit 10 Complex. Sault Ste. Marie, cont.**

into Lake Erie through the Welland Canal in 1921, and by the 1940's, had spread to Lake Superior.

The parasitic sea lamprey so devastated the fish stocks in some of the lakes that commercial and recreational fishing was severely affected. The problem is particularly severe in Lake Huron, which has more parasitic sea lamprey than the other Great Lakes combined. Few Lake Huron trout survive to maturity and parasitic lampreys attached to 1 to 5 Chinook salmon. Based on information provided by the Great Lakes Fishery Commission (GLFC), the St. Marys River is the primary source of parasitic sea lamprey in northern Lake Huron. Most adult sea lamprey spawn in the rapids downstream of the compensating gates or in the tailrace areas of the Great Lakes Power (Canada) and Corps of Engineers hydroelectric generating plants.

**OBJECTIVE/GOALS:** Reduce the number of fish kills annually by sea lamprey. The installation of 6 permanent traps would increase the fish population by about 2% (\$80,000 annually).

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** No

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** No

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The project consists of modifying the old U.S. hydroelectric powerhouse, acquired by the Corps under the River & Harbor Act of 1909. The hydroelectric powerhouse, an integral part of the Soo Lock complex facilities, would be modified by installing six permanent sea lamprey traps on the east face of Unit 10, to help restore the modern historical fisheries in northern Lake Huron. Unit 10 was added as an expansion to the original powerhouse in 1932.

The design consists of installing six expanded metal sea lamprey traps in the tailrace of the existing Unit 10-power house. Each trap would consist of wire mesh baskets measuring 4 feet 9 inches long, 2 feet 9 inches wide, and 4 feet high. The baskets will have a 12-inch square door at the bottom to allow the sea lampreys to be easily emptied into a separate container. The wire mesh baskets would have funnels, which will allow the lamprey to enter the trap, but not allow the lamprey to exit.

The traps would be placed on an existing concrete shelf, which spans the entire Unit 10 tailrace. The traps would also be held in place with steel framing to prevent any movement due to turbulence in the tailrace. A platform/walkway would be constructed to span across the tailrace piers for access and operation of the traps. The attraction water source will be provided by the Unit 10-power house discharge through existing

**PROJECT: Sea Lamprey Trap @ Unit 10 Complex. Sault Ste. Marie, cont.**

manholes. Also included as part of the project is an 8-foot long, 8-foot wide, and 6-inch thick concrete slab to be used as a work area by the U.S. Fish and Wildlife Service.

Since the traps would be installed in the tailrace of the existing Unit 10 powerhouse, disruption of the plant will be necessary during installation of the trap framing and walkway due to turbulent flow conditions. The disruption will be coordinated with the appropriate personnel of the Soo Area Office, prior to the start of construction. In addition, as land access to the Unit 10 site is limited, its use by construction personnel will be coordinated with the Soo Area Office, as well. The tailrace piers have slots for the placement of stoplogs when dewatering is required. It is intended that these stoplogs be used during the installation of the sea lampreys traps. An existing guardrail will serve to limit access to the walkway at the northwest corner of Unit 10. Since this is the only land access and all traps operators are required to wear a personal floatation device, guardrails on the proposed walkway are not required.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Depletion of the fish population in the St. Mary's River.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** None

**NAME OF COST SHARING SPONSOR:** Great Lakes Fishery Commission (GLFC)

**VIEWS OF THE SPONSOR:** The GLFC has originally indicated its willingness to act as the local sponsor, in a letter of intent dated November 14, 1994 (previously provided as an attachment to IAR dated 15 December 1994). The GLFC indicated the project would be in support of its mandate of reducing sea lamprey damage in the Great Lakes. Numerous coordination meetings were held with the project sponsor, GLFC, and the USFWS, throughout the planning and design process. A Biddability, Constructibility, Operability, and Environmental (BCOE) conference was held on 25 April 1996. The project sponsor attended the meeting. Items of the draft PCA were also addressed at the BCOE conference for clarification to the project sponsor. By letter dated 17 May 1996, the project sponsor formally expressed its willingness to proceed with the project and to sign the PCA upon approval of the project for construction. The project cooperation agreement was signed on 14 January 1997.

**PROJECT: Sea Lamprey Trap @ Unit 10 Complex. Sault Ste. Marie, cont.**

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** The Michigan Department of Natural Resources (MDNR), USFWS, and Canada Lamprey Control, have expressed support and recommended construction of the sea lamprey traps. The GLFC, MDNR and the Corps have participated in meetings to develop preliminary plans that provide the basis for this Section 1135 project.

**NAME OF CORPS PROJECT MANAGER:** Jinane L. Karmo

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** The future OMRR&R is estimated at \$5,000 annually. The USFWS will operate the sea lamprey traps at Unit 10. The traps will be visited every day during the duration of the lamprey-spawning season. Due to turbulence created by the plant discharge, the USFWS would access the traps by a concrete walkway, placed across the tailrace piers, which will be installed for that purpose. A manual hoist will be used to empty the mesh baskets.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** Currently, the USFWS utilizes temporary collection traps placed in the tailrace adjacent to the two Corps hydroelectric power plants. Although less efficient than permanent trapping devices, approximately 1,000 adult sea lamprey are collected each year. It has been estimated by the GLFC that with permanent traps, collection of adults would increase to 1,500 and that would translate into a significant reduction in sea lamprey spawning in the St. Marys River.

The 2% reduction in the annual fish killed and the dollar damage associated with this annual fish loss – the 2% reduction in damages equals \$80,000 ( $\$4,000,000 \times .02 = \$80,000$ ). These avoided losses equal the annual benefits for installing the traps.

While these damage estimates are useful in quantifying near-term benefits of control on the St. Marys River, the real long-term benefits will be the establishment of a healthy fish community in Northern Lake Huron. Lake trout, the endemic top predator, cannot survive long enough to reproduce with the current level of mortality due to sea lamprey. Recognizing this, the Lake Huron Committee, the joint fishery management body of Ontario, Michigan, and the Chippewa-Ottawa Treaty Fishery Management Authority, have deferred all lake trout restoration activities in Northern Lake Huron until significant control is reached on the St. Marys.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?** The total estimate cost of the project equals \$243,900. The average annual construction cost is \$13,050 ( $\$166,800 \times .07823$  the capital recovery factor for an annual discount rate of 7 5/8% and a 50-year project life) - \$13,050.

**PROJECT: Sea Lamprey Trap @ Unit 10 Complex. Sault Ste. Marie, cont.**

Comparing the average annual benefits to the average annual project cost results in a benefit-to-cost ratio is greater than one, the project is economically justified.

**IMPLEMENTATION SCHEDULE:** Completed 12 Sep 1997

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Monitoring is done by USFWS. Very often.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”)**

1

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.** None

**Using the same attributes above, select the ones most likely in limiting success potential:** None

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

Fishing  
Group activities  
Educational activities  
Picnicking  
Photography/Painting, etc.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** No

**APPENDIX Z**

**PROJECT: Trestle Bay Restoration**

**PROJECT: Trestle Bay Restoration**

**STATE:** Oregon

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Portland

**PROJECT TO BE MODIFIED:** Columbia River South Jetty

**AUTHORIZED PURPOSE/CORPS PROJECT:** Navigation

**CONGRESSIONAL DISTRICT:**

**LOCATION:** Columbia River at the mouth. South Jetty, 6 miles west of Astoria, Oregon.

**COUNTY (S):** Clatsop

**USGS TOPOGRAPHIC MAP (S):**

**NEAREST CITY OR TOWN:** Astoria, OR

**WATERSHED:** Columbia River

**RESOURCE PROBLEM:** Jetty blocked fish access 603 acres of habitat.

**OBJECTIVE/GOALS:** Develop fish access: egress for fish and detritus.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** No

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** Yes, Bald Eagle, all listed Columbia River fish stocks.

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** Open 500' gap in existing jetty.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**PROJECT:** Trestle Bay Restoration, cont.

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** Jetty remains in place; no fisheries access.

**CONCERNS/ISSUES:** (Such as costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?). Costs.

**NAME OF COST SHARING SPONSOR:** Oregon Parks and Recreation Department

**VIEWS OF THE SPONSOR:** Positive.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** Oregon Department of Fish and Wildlife and City of Warrenton, Oregon

**NAME OF CORPS PROJECT MANAGER:** Laura Hicks

**IS THERE A MONITORING PLAN FOR THIS PROJECT?** Yes

**IS THERE A REPORT?** Yes

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).**

105,000 – 315,000 Chinook Salmon Smolts  
79,000 – 158,000 Dungeness Crabs

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

\$178,000 Federal \*

\$59,750 Non-Federal\*

\* Project not closed out, estimated costs.

**IMPLEMENTATION SCHEDULE:** Complete

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?**

4+

**PROJECT: Trestle Bay Restoration, cont.**

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”)**

1

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Availability of information about broad geographical area,
- Interest and cooperation of local sponsor(s).

**Using the same attributes above, select the ones most likely in limiting success potential:**

- Application of construction or treatment practices.

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

- Wildlife watching
- Hunting
- Photography/Painting, etc.

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes



**Aerial Shot of Trestle Bay Completed Section 1135 Project**



**Aerial Shot of Trestle Bay**

**APPENDIX AA**

**PROJECT: Twentymile Creek Habitat Restoration**

**PROJECT: Twentymile Creek Habitat Restoration**

**STATE:** Mississippi

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** Mobile

**PROJECT TO BE MODIFIED:** Tombigbee River and Tributaries, Mississippi and Alabama, Twentymile Creek

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood Control

**CONGRESSIONAL DISTRICT:** MS 1

**LOCATION:** The Twentymile Creek Watershed lies predominantly within the rural areas of Itawamba, Lee, and Prentiss Counties in northeastern Mississippi. The recommended modification lies within Lee County.

**COUNTY (S):** Itawamba, Lee, and Prentiss Counties in northeastern Mississippi. The recommended modification lies within Lee County.

**USGS TOPOGRAPHIC MAP (S):** Ratliff, MS

**NEAREST CITY OR TOWN:** Tupelo, Mississippi

**WATERSHED:** Twentymile Creek/Tombigbee River

**RESOURCE PROBLEM:** Aquatic and riparian corridor habitat degradation.

**OBJECTIVE/GOALS:** Restoration of aquatic and riparian corridor habitat.

**IS THIS A COASTAL AMERICA PROJECT?** No

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** None

**DESCRIPTION OF PROJECT (PROPOSED MODIFICATION):** The recommended plan consists of constructing weirs and appurtenant structures plus planting willows and bottomland hardwoods along Twentymile Creek between mile 9.1 (Natchez Trace Parkway) and mile 11.7 (Chapel-Pratts Road or Lee County Road 2578). As the result of an interagency-interdisciplinary team field inspection of May 1996, minor modifications of the weir locations and alignments were made during the preparation of

**PROJECT: Twentymile Creek Habitat Restoration, cont.**

the plans and specifications. These modifications were accomplished to reduce adverse impacts to existing habitat.

**Weirs and Appurtenant Structures.** The weirs will be keyed into the bank to prevent flanking of the structures. The top elevation of this hardpoint was set at the two-year flood elevation at each location being protected. The weir will then slope down on a 1V:4H slope to the channel bottom. At an elevation of 3 feet above channel bottom, the weir will be angled upstream and extended out into the channel. This weir section will extend out into the stream with a level top elevation and has a top width of 3 feet. The wide, level crests will promote the formation and maintenance of larger, deeper scour holes. The weirs will be placed on a filter fabric blanket to prevent the rock from settling into the sand and shortening the dikes. Stone was a quarry run gradation with a stone size range of 650 to 1,000 pounds. Stone toe protection was also used at several locations to provide bank protection to reaches that have a stable bottom and would not respond as well to the weirs and to provide additional protection downstream of the last weir. An overbank drainage structure was provided at one location to control streambank erosion due to surface runoff that is entering the stream. Care was taken during construction to protect existing natural features, such as pools, hard clay substrate, and woody debris, so as not to cause any degradation to the habitat that these natural features have produced.

**Willows.** Native black willow (*Salix nigra*), common along Twentymile Creek, was the mainstay for the willow plantings; however, use of dwarf willow species was considered for supplemental plantings among the black willows. Based on habitat restoration work on Harland Creek, located in Northwestern Mississippi, the following guidelines were incorporated into the planting contract: areas currently supporting native woody vegetation will not be included in the planting area; planting sites infested with kudzu will be controlled prior to planting; willow posts must be planted when they are dormant; willows will be kept wet after cutting; the elapsed time between cutting and planting of the native willow material will not exceed 48 hours; the tops of the post will be marked to ensure that the posts would be planted upright; the spacing will be a 3-foot grid; minimum post diameter will be 3 inches at the butt end, however, smaller diameter post within a bunch could be used; minimum willow post length will be of 10 feet; posts will be planted at least 8 feet deep using an 8 inch diameter auger with no more than 4 feet of the post showing above ground; the first row will start at the water's edge (based upon low water elevation) and each row will extend for the entire length of the bend, however, willow post will not be planted in permanently flooded soils or those soils too impermeable to permit significant groundwater movement which will not allow rooting; no willows will be planted above top bank; the planting contractor will be required to excavate material from the channel and dump on top of planted posts to ensure holes are filled and to provide a near-surface medium for root development. If dwarf willow species are utilized to supplement the native black willow planting, the smaller dwarf willow plant materials will be refrigerated for a period of time before planting to form calluses and aid in rooting.

**PROJECT: Twentymile Creek Habitat Restoration, cont.**

**Hardwoods.** Nursery stock, bare root trees were planted in the easement area along the top of bank in the restoration reaches along Twentymile Creek. Species planted will include those, which are native to the bottomland area in this region of northeast Mississippi. Planting of these woody species was accomplished during the winter plant dormancy period. Measures such as plastic guards for tree trunks, netting, mesh, etc., will be incorporated into the plantings to minimize herbivore animals such as beaver and deer. Planting sites infested with kudzu were controlled prior to planting.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?** No

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:** The channel instability problems continue; adverse impacts to aquatic and riparian corridor habitat would also continue.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** The purpose of the project constructed on Twentymile Creek under the authority of the Flood Control Act of 1958 was flood control. The enlarged channel was constructed to contain the 0.33-year flood within banks. Because of the channel instability problems, the channel presently contains the 5-year flood within banks. Construction of the weirs, stone toe protection, and overbank drainage structures along with willows and hardwood plantings would foster the restoration of the aquatic and riparian corridor habitat. This restoration work was designed to avoid impacting the original design level of floodflows and was, therefore, consistent with the project's purpose.

**NAME OF COST SHARING SPONSOR:** Tombigbee River Valley Water Management District

**VIEWS OF THE SPONSOR:** The sponsor was actively involved in the study process and plan formulation. The sponsor expressed a strong desire to go forward throughout the development process of the project. The sponsor included funds in their Fiscal Year 1997 budget (begin July 1996) in order to meet their financial obligations for this project. The sponsor agreed to sign to model PCA, as provided by Mobile District on 19 June 1996 and approved by South Atlantic Division on 9 July 1996, without deviation.

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** Significant coordination occurred with the National Park Service, Natchez Trace Parkway, and a cooperating agency in preparation of the Environmental Assessment. This project was coordinated with the U.S. Fish and Wildlife Service and the Mississippi Department of

**PROJECT: Twentymile Creek Habitat Restoration, cont.**

Wildlife, Fisheries and Parks and is in accordance with the requirements of the Endangered Species Act and the Fish and Wildlife Coordination Act. In addition, appropriate coordination was conducted with the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Natural Resources Conservation Service, Mississippi Department Environmental Quality and Mississippi Department of Wildlife, Fisheries and Parks, regarding compliance with the Clean Water Act, Section 401, Water Quality Certification procedures and coordination of the draft Environmental Assessment. Historic and cultural resources coordination/concurrence was completed with the Mississippi State Historic Preservation Officer. All were fully supportive of the recommended modifications.

**NAME OF CORPS PROJECT MANAGER:** Howard D. Danley, P.E.

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** The willow and hardwood plantings will be inspected at the end of the first growing season to ensure adequate survival. Replanting during the first three years following construction might be necessary in areas experiencing significant plant mortality. This mortality may be from such factors as poor soil conditions; inadequate moisture; herbivore insects, beaver, and deer; inadequate soil aeration; or plant competition from kudzu.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** The stream corridor measures will serve to reestablish a series of riffles-pool on the degraded shallow stream with unstable substrate. Sections of the channelized streams that afford substantial cover, coarse or cohesive substrates, and increased depth can therefore harbor more complex fish faunas due to broader food bases and increased habitat availability. In the case of Twentymile Creek, the excellent opportunity currently exists to install modifications to create depth, velocity, and substrate diversities to form food-producing areas, spawning and rearing areas, and instream and overbank cover to maintain reproductive populations. These modifications will also slow or halt the channel widening, thereby allowing recovery of natural vegetation, which also will offer riparian and riverine habitat benefits. As the stream corridor stabilizes, riparian vegetation will reestablish (accelerated by willow and hardwood plantings), thus improving the riparian wildlife habitat and providing shade for the stream which will improve the aquatic habitat. These types of environmental restoration benefits have been demonstrated on portions of Twentymile Creek that are located upstream of the study area and as part of the Yazoo River Basin Demonstration Erosion Control Project to produce substantial habitat restoration benefits. The rock size and quantities for the weirs (350 to 2,250 cubic yards per reach, yielding about 9,200 total cubic yards) will improve the stability of the aquatic habitat, enhance scour hole formation, provide hard substrate (currently a sparse substrate type in the project area), and provide biologically valuable interstitial spaces between the rocks. The hardwood

**PROJECT: Twentymile Creek Habitat Restoration, cont.**

plantings on the top bank areas will provide long-term benefits to the wildlife community.

Fishery benefits from restoration of channelized streams in northern Mississippi have been substantiated in a number of studies. Studies on stabilized portions of Twentymile Creek compared with unstablized reference channelized streams nearby demonstrated a substantial increase in fish species diversity: 40 species on Twentymile Creek compared with 22 species collected on Mubby-Chiwapa Creeks. Work by WES indicate broad distributions of most fish species throughout the study reach, and correlation between fishes and hydraulic variables which are indicative that the fish community will benefit from the proposed habitat restoration. Quantification of the fishery benefits of the recommended modifications (compared with existing conditions) was performed through use of regression models for the orangefin shiner and brook silverside. These models defined relationships between populations of these 2 native fish species with physical habitat parameters. This habitat based analysis showed that the recommended modifications will significantly increase the stream habitat availability.

The recommended plan will serve to create depth, velocity, and substrate diversities to form food-producing areas, spawning and rearing areas, and instream and overbank cover to maintain reproductive populations. These modifications will also slow or halt the channel widening, thereby allowing recovery of natural vegetation, which also will offer riparian and riverine habitat benefits. As the stream corridor stabilizes, riparian vegetation will reestablish (accelerated by willow and hardwood plantings), thus improving the riparian wildlife habitat and providing shade for the stream which will improve the aquatic habitat. The hardwood plantings on the top bank areas at the weir locations will provide long-term benefits to the wildlife community. Quantification of the fishery benefits of the recommended modifications (compared with existing conditions) was performed through use of regression models for the orangefin shiner and brook silverside. This habitat based analysis showed that the recommended modifications will increase the stream habitat availability.

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?**

	<b>Totals</b>	<b>Non-Federal</b>	<b>Federal</b>
<b>Report</b>	\$165,000	\$0	\$165,000
<b>P&amp;S</b>	\$115,000	\$0	\$115,000
<b>Construction</b>	\$885,000	\$291,250	\$593,750
<b>Totals</b>	<b>\$1,165,000</b>	<b>\$291,250</b>	<b>\$873,750</b>

**IMPLEMENTATION SCHEDULE:**

Report Approval	Apr 1996
Completion of Plans and Specifications	Jun 1996
Construction Contract Award	Sep 1996
Construction Complete	Mar 1997

**PROJECT: Twentymile Creek Habitat Restoration, cont.**

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** Quarterly

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS “VERY CERTAIN” AND 5 IS “VERY DOUBTFUL”)**

2

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE “DO’S AND DON’TS” LEARNED FROM THE PROJECT.**

**Select the attributes most likely contributing to project success:**

- Availability of monitoring information from other projects,
- Site design,
- Application of construction or treatment practices,
- Follow-up to assure implementation and corrective action when needed,
- Interest and cooperation of local sponsor(s).

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:** None

**CAN YOU PROVIDE ANY PICTURES OF PROJECT (before, during, and after construction)?** Yes

**The following pictures are of Twentymile Creek Habitat Restoration in its completed stage.**



## **TWENTYMILE CREEK HABITAT RESTORATION**



**TWENTYMILE CREEK HABITAT RESTORATION**



**TWENTYMILE CREEK HABITAT RESTORATION**



**TWENTYMILE CREEK HABITAT RESTORATION**



## **TWENTYMILE CREEK HABITAT RESTORATION**



**TWENTYMILE CREEK HABITAT RESTORATION**



**TWENTYMILE CREEK HABITAT RESTORATION**



**TWENTYMILE CREEK HABITAT RESTORATION**



## **TWENTYMILE CREEK HABITAT RESTORATION**

**APPENDIX BB**

**PROJECT: CARLYLE LAKE WILDLIFE MANAGEMENT  
AREA**

**PROJECT:** Carlyle Lake Wildlife Management Area

**STATE:** Illinois

**AUTHORITY:** Section 1135

**CORPS DISTRICT:** St. Louis

**PROJECT TO BE MODIFIED:** Carlyle Lake, Kaskaskia River

**AUTHORIZED PURPOSE/CORPS PROJECT:** Flood Control, Water Supply, Recreation, Conservation, Water Quality, and Navigation

**CONGRESSIONAL DISTRICT:** IL 22

**LOCATION:** The Carlyle Lake project is located 50 miles east of St. Louis, Missouri. The Carlyle Lake Wildlife Management Area (CLWMA), managed by the Illinois Department of Natural Resources, is located at the north end of the lake about 15 miles northeast of the town of Carlyle, Illinois.

**COUNTY (S):** Fayette County

**USGS TOPOGRAPHIC MAP (S):** Wildcat Lake Quadrangle, ILL; 7.5-Minute Series

**NEAREST CITY OR TOWN:** Carlyle, Illinois

**WATERSHED:** Kaskaskia River

**RESOURCE PROBLEM:** The CLWMA did not function as originally intended because of poor water transfer capacity between leveed compartments. Low interior levee heights contributed to levee instability during flood overtopping, thus affecting the capability to control water levels.

**OBJECTIVE/GOALS:** The goal of the modification was to help restore the existing wetlands habitat to a modern historic condition by improving water control capability, to, in turn, improve the production and availability of food plants and associated invertebrate food sources for migrating birds especially ducks and geese.

**IS THIS A COASTAL AMERICA PROJECT?** No.

**DOES THIS PROJECT CONTRIBUTE TO THE GOALS OF THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN?** Yes, the wildlife habitat of the CLWMA primarily targets waterfowl (ducks and geese) in support of the NAWMP (Lower Mississippi Valley Joint Venture).

**PROJECT: Carlyle Lake Wildlife Management Area**

**DOES IT BENEFIT ENDANGERED SPECIES? IF SO, WHICH ONES?** Project enhanced conditions for waterfowl provides an indirect benefit to eagles as a winter time alternative food source.

**DESCRIPTION OF PROJECT (MODIFICATION):** The modification includes levee alterations and the placement of culverts to improve water control on 2,565 acres of leveed interior compartments of the CLWMA. The modifications were made to structures constructed by the State on outgranted areas. Levee alterations included 8,000 feet of new levee, 24,000 feet of levee raised to a designated grade, and 18,500 feet of levee raised as a by-product of ditch cleanout. These levee modifications have ensured the establishment of preferred pool elevations and have ensured water separation between pools, and between pools and the site's main ditch.

The capacity for transferring water (filling and draining) between pools was increased by the installation of over 36 new gated-culverts through the interior levees. Certain obsolete culvert structures were removed. A total of 52,000 feet of combined levee borrow ditches and ditch cleanout have also contributed to an improved watering/dewatering system.

**WERE THERE ANY SIGNIFICANT DESIGN CHANGES AFTER PROJECT APPROVAL? IF SO, WHAT WERE THEY AND WHY? WHAT CHANGES, IF ANY, TO THE PLANNING PROCESS MIGHT BE CONSIDERED TO AVOID THE NEED FOR SIGNIFICANT POST APPROVAL CHANGES IN THE FUTURE?**

Originally seventeen interior weirs were planned. The weirs would be placed between pools and between pools and the main ditch, and would allow for flooding of the CLWMA without excessive erosion of the interior levee system. Initially about 6 of the structures were built, but showed considerable damage during a flooding event during the construction period. In retrospect, a larger sized stone could have been used or grouting applied to the smaller stone. As a separate action from the Sec 1135 project, the state elevated lowermost weirs along the site's perimeter levee--making flood overtopping a less frequent occurrence. Largely because of the state's exterior weirs modification, and the belief that water control units could be quickly opened up prior to exterior levee overtopping--the need for the interior weirs was deemed to be less than critical to the performance of the project. No additional weirs were installed.

As a cost-savings measure, elevations input for the placement of pipes relied heavily on some old vintage one foot contour interval maps for the site. This proved to be inadequate. A number of the pipes had to be subsequently lowered to function properly. The number pipes installed was increased from 24 to 36 pipes to achieve the desired water flow characteristics.

The ditch and levee systems work proceeded as originally envisioned.

**PROJECT: Carlyle Lake Wildlife Management Area**

**DISCUSS THE FUTURE WITHOUT PROJECT MODIFICATION:**

During the 25-year operation period prior to the Section 1135 project modification, IDNR experienced hydrological problems that have prevented this area from reaching its originally planned habitat potential. Dependable water manipulation has not been possible due to flooding, and inadequate water removal capability, and erosion of levees during flood overtopping. Improvements implemented by IDNR to correct these specific problems have included raising exterior levee, installing exterior overflow weirs and later further elevating two of the weirs, placing exterior culverts, and increasing pump capacity.

In the absence of a Section 1135 project, unresolved conditions would have included (1) inadequate water transfer capability for the watering and dewatering operations, and (2) sub-optimal pool water depths. A third condition, inadequate flood damage protection of interior levees, has since been resolved by the state's initiative to raise its two lower exterior weirs and by assuming an open gates situation to protect interior levees from significant erosion damage.

The predicted habitat output of the site for target species in the absence of a project is for the mallard 1254 Average Annual Habitat Units (AAHUs) and for the Canada goose it is 621 AAHUs.

**CONCERNS/ISSUES: (Such as: costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?).** The CLWMA has proven to be one of the State's most important waterfowl use areas, and is located along one of the continent's most important migration flyways. There are no outstanding issues. The absence of reliable topographic data did make the installation of the project features difficult. However, adjustments were made and the project installed within the original budget.

**NAME OF COST SHARING SPONSOR:** CLWMA, which is, managed by the Illinois Department of Natural Resources under wildlife license agreements with the Corps of Engineers.

**VIEWS OF THE SPONSOR:** The Department has given strong support to the project as evidenced by its 25% cost-share contribution to construction, and its 100% cost-share to O&M. The sponsor's support is also demonstrated by its expenditure of additional state funds (outside of the Sec 1135 project) for the upgrade of the two lowermost exterior levee weirs, and the surfacing of the site's high use levee roads. The sponsor has expressed an interest in cost-sharing a similar project at nearby wildlife management units 3 & 4.

**PROJECT: Carlyle Lake Wildlife Management Area**

**LIST OTHER CONTRIBUTING/SUPPORTING AGENCIES:** The U.S. Fish and Wildlife Service concurs in the proposed project modification. The Service has emphasized the importance of this area and its contributions to the goals and objectives of the Lower Mississippi Valley Joint Venture (part of the NAWMP).

**NAME OF CORPS PROJECT MANAGER:** Tim Caldwell

**IS THERE A MONITORING PLAN FOR THIS PROJECT? IS THERE A REPORT?** No formal monitoring plan was proposed for this project. No formal report beyond this Post-Construction Evaluation Report is planned. However, a number of initiatives have been taken to help assess the performance of the project. The Corps makes at least two inspections of the project's facilities each year. The state makes its own routine inspections of the area. Up until recently, the state provided the Corps with an annual management plan for the lake site that included the management of units 1 & 2. As a cost-savings initiative, this reporting in the future will take place every 3 years and eventually every 5 years. The management plan includes information such as waterfowl harvest data, success of previous years crop production, and crops to be planted in the future at the site, and also state planned O&M activities. For lake elevation data, IDNR calls down to the Corps' lake management office for the latest information. The state does maintain records on the timing of drawdowns and rewaterings. Staff gages were originally planned for use with each interior pool, but were subsequently deemed not critical to water levels management.

**WHAT ARE THE BENEFITS/OUTPUTS FOR THIS PROJECT? (A Quantitative Number or Significance, such as: Acres of Wetlands, River/Stream Miles, Endangered Species Benefited).** Tangible and intangible benefits of the proposed project modification are judged to exceed the tangible and intangible costs. Improved habitat conditions could indirectly result in an increase in tangible recreation benefits. Intangible benefits to migratory birds were initially anticipated to increase by 37% (from 1875 to 2566 AAHUs or a net change of 691 AAHUs). The state indicates that the vegetation response has exceeded their original expectations, and that a net increase of 50% (i.e. from 1875 to about 2813 AAHUs or a net change of 938 AAHUs) is likely closer to the sites actual performance. The modification will allow water control in 2,565 acres of leveed compartments, and will improve year-round wildlife management capability including: increased habitat diversity, improved food production, food availability, and improved quality of resting areas.

The proposed improvements to the quality of the environment will also affect many other wetlands associated species as well. The Illinois Department of Natural Resources has stated that the future management of the subimpoundment areas will reflect a diversity of strategies to improve habitat and wetland conditions.

**PROJECT: Carlyle Lake Wildlife Management Area**

**WHAT IS THE COST FOR THIS PROJECT? FEDERAL AND NON-FEDERAL SHARE?** The total estimated cost of constructing the proposed modification is \$988,000 including report preparation. The State is responsible for the OMRR&R, estimated to average \$11,000 per year.

	<b>Totals</b>	<b>Non-Fed</b>	<b>Federal</b>
<b>Report</b>	\$ 78,000	\$0	\$ 78,000
<b>Plans and Specs</b>	\$ 112,000	\$0	\$ 112,000
<b>Construction</b>	\$966,000	\$282,000	\$684,000
<b>Totals</b>	<b>\$1,156,000</b>	<b>\$282,000</b>	<b>\$874,000</b>

**IMPLEMENTATION SCHEDULE:** Construction was completed in December 1999.

**HOW OFTEN HAS THE PROJECT SITE BEEN VISITED SINCE CONSTRUCTION HAS BEEN COMPLETED FOR MONITORING?** The site is visited about 12 times per year by Corps lake staff. Weekly communications between state and Corps lake staff occur during the period of annual waterfowl counts. The state makes numerous site visits throughout the year.

**LEVEL OF CERTAINTY THAT PROJECT IS TRENDING TOWARD DESIRED GOALS: (RATE 1 TO 5, WHERE 1 IS "VERY CERTAIN" AND 5 IS "VERY DOUBTFUL")** IDNR's District biologist indicates a rating of "1". It is very certain that the project is trending toward the desired management goals.

**WHAT WERE THE LESSONS LEARNED AND ASSISTANCE DESIRED FOR THIS PROJECT? THIS INCLUDES THE "DO'S AND DON'TS" LEARNED FROM THE PROJECT.**

**Attributes most likely contributing to project success:**

**Availability of monitoring information from other projects:** Daily water stage readings collected by the Corps at the Carlyle Lake Dam have provide a useful tool for operating and monitoring the needs of the units 1 & 2 interior pools. The existing Annual Management Plan furnished by the state to the Corps serves as a convenient means of documenting the success of prior management activities and the need for future management activities at the site.

**Availability of suitable work force:** The state has been able to accomplish the site's O&M without adding additional employees to its work force. This has allowed the state to work within its existing O&M budget for units 1 & 2. Considerable biological expertise was available between the agencies, and was brought to bear upon this project.

**Site design:** The final product is performing very well. Site dewatering now takes place 1-2 weeks quicker.

## **PROJECT: Carlyle Lake Wildlife Management Area**

### **Follow-up to assure implementation and corrective action when needed:**

Corps and state staff closely followed the performance of installed features during the project's construction phase. Effective corrective actions were made that ultimately kept the Sec 1135 project within budget. Actions by IDNR and the state legislature resulted in actions independent of the Sec 1135 project (e.g. road topping, exterior weirs upgrade) that also greatly enhanced the overall performance of CLWMA Units 1 & 2.

**Interest and cooperation of local sponsor(s):** A very high level of interest and cooperation was demonstrated by the sponsor during all phases of this project.

### **Attributes most likely limiting project success potential:**

**Site design:** Site design would have greatly benefited from updated 2-foot contour mapping for the site. The lesson here is that good contour mapping is needed for wetlands projects even during the feasibility-planning phase of the project.

Levee roads frequently traveled at wetland project sites should always be topped with crushed stone to prevent levee damage.

**Interest and cooperation of local sponsor(s):** More representation from the engineering component of IDNR during the early phase of planning would have benefited the concept plan. Also, more active participation from the people ultimately responsible for the post-project O&M would have been a benefit during the feasibility stage. For example, the issues relating to weir design could have been better flushed out early on.

**Other:** Flooding problems, environmental work restrictions (e.g. no work during certain periods of the year to protect endangered species), and sponsor imposed constraints (e.g. no construction work during waterfowl hunting season) have greatly prolonged the project's construction phase. The lesson here is that wetlands projects by their nature place us in areas of marginal work conditions with limited windows of opportunity for actual work, and a doubling of the time normally assessed for the implementation of a project this size would not be unrealistic.

In retrospect, more could have been done on this project from a public relations standpoint. Waterfowl interest groups were fairly well read into the project, but more in response to their initiative rather than that of the state or the Corps. To date, there has not been a dedication ceremony for this project. Such a dedication would make the public better aware of the project's existence and of the contributions made to the project by their Congressmen. While the newspapers did a spread on the project, the Corps could have been more proactive in advertising the project. It would be beneficial to place a sign at the project area given some background to this interior levees joint partnership effort.

**PROJECT: Carlyle Lake Wildlife Management Area**

**INDICATE THE RECREATION USES WITHIN THE RESTORED AREA:**

Recreational uses at the site include: wildlife watching, wildlife photography and hunting. All of these recreational uses have improved as a secondary by-product of the Sec 1135 habitat restoration project.

**PICTURES OF PROJECT:**



**Typical Levee Modification**



**Typical Ditch Cleanout**



**Typical Culvert Pipes Installation**



**De-watered Condition**

**PROJECT: Carlyle Lake Wildlife Management Area**



**Agricultural Crops & Wetland Plants**



**Watering Phase--Filled Ditch**



**Water Transfer Through New Culverts**



**Watered Management Unit**

## **APPENDIX CC**

## **REFERENCES**

## APPENDIX CC

### REFERENCES

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**APPENDIX DD  
PROJECT SURVEY SHEET**

**Project Name:**

**State:**

**Authority:**

**Corps District:**

**Congressional District:**

**Project to be modified:**

**Authorized Purpose/Corps Project:**

**Location:**

**County(s):**

**USGS Topographic Map(s):**

**Nearest City or Town:**

**Watershed:**

**Resource Problem:**

**Objective/Goals:**

**Description of Project (Proposed Modification):**

**Were there any significant design changes after project approval? If so, what were they and why? What changes, if any, to the planning process might be considered to avoid the need for significant post approval changes in the future?**

**Concern/Issues (Such as costs, identification of outputs, conflicting planning objectives, recreation vs. ecosystem restoration, flood control vs. ecosystem restoration, others?)**

**Is this a Coastal America Project?**

**Does this project contribute to the Goals of the North American Waterfowl Management Plan?**

**Does it benefit endangered species? If so, which ones?**

**Name of Cost Sharing Sponsor:**

**Views of the Sponsor:**

**List other contributing/supporting agencies:**

**Name of Corps Project Manager:**

**Is there a monitoring plan for this project? Is there a report?**

**What are the benefits/ outputs for this project? (A Quantitative Number and Significance such as: Acres of Wetlands; River/Stream Miles; Endangered Species Benefited).**

**What is the Cost for this project? Federal and Non-Federal share?**

**Implementation Schedule:**

**How often has the project site been visited since construction has been completed for monitoring?**

**Level of Certainty that project is trending toward desired goals: (Rate 1 to 5, where 1 is “very certain” and 5 is “very doubtful”).**

**What were the Lessons Learned and Assistance Desired for this project? This includes the “Do’s and Don’ts” learned from the project.**

**Indicate the recreation uses within the restored area:**

**Can you provide any pictures or project (before, during, and after construction)?**