DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF:
Planning, Programs, and
Project Management Division
Environmental Planning
and Compliance Branch

**FINDING OF NO SIGNIFICANT IMPACT**
**(FONSI)**

South White Lake Shoreline Protection Project
Vermilion Parish, Louisiana
EA # 390

Description of Proposed Action. The construction design consists of building approximately 61,500 linear feet (~ 11.6 miles) of stone breakwater stretching from Will's Point to the western edge of Bear Lake along the southern shoreline of White Lake. The breakwater would be situated along the -1.5 foot North American Vertical Datum 1988 contour in approximately 2.0 to 3.0 feet of water. The dike crown would be 4.0 feet wide and would be set at an elevation of +3.5 feet with a +/-0.50-foot tolerance. The breakwater would have front and back side-slopes of 1.0-foot vertical on 1.5-foot horizontal. Gaps for fish access would be built at approximately 1,000-foot intervals, with a top width of 50 feet, an approximate 35-foot bottom width, and would be lined completely with a single layer of rock. The total length of the dike, including lining of gaps, would require approximately 266,000 tons of 15-24 inch stone. The stones would be placed on a geotextile fabric base. A flotation channel would be dredged parallel to, and lake-ward of the rock dike. At no time would the contractor excavate closer than 50-feet from the centerline of the dike. Maximum allowable dredging depth for the flotation channel would be 6 feet. Material dredged from the flotation channel would be placed or cast landward of the rock dike where practicable. Placement of all dredged material would be held a minimum of 10 feet from the landside toe of the rock dike and a minimum of 50 feet from the top of bank. Additional off-site access dredging is not anticipated but may become necessary in localized areas in order to facilitate rock transport through the Gulf Intracoastal Waterway (GIWW), Schooner Bayou Canal and White Lake. Should this access dredging become necessary, controlling dredge depth would be 6 feet. This material would be placed to provide beneficial use wherever possible, and in such a way as to avoid stacking and the creation of a hazard to navigation. During the construction phase, approximately 247 acres (breakwater construction footprint of 61,500 feet long by 175 feet wide) of non-vegetated mud bottom would be disturbed. Approximately 42 acres of non-vegetated water bottom would be lost under the footprint of the actual breakwater (61,500 feet long by 30 feet wide). Approximately 157 acres of emergent marsh would be created between the breakwater and existing shoreline through the beneficial used of dredged material. Shoreline loss would be prevented and marsh would be created south of the breakwater. Stabilizing the shoreline and creating marsh, would protect and/or create approximately 844 acres of marsh over the 20-year project life (687 acres protected + 157 acres from the beneficial use of dredged materials).

Factors Considered in Determination. This office has assessed the impacts of the proposed action on significant resources, including White Lake, wetlands, fisheries, wildlife, essential fish habitat, threatened and endangered species, cultural, recreation, aesthetics, and air quality. No significant adverse impacts were identified for any of the significant resources. The risk of encountering HTRW is low. By a letter dated May 11, 2004, the U.S. Fish and Wildlife Service confirmed that the proposed action is not likely to adversely affect any endangered or threatened species. In a letter, dated September 3, 2004 the Louisiana Department of Natural Resources concurred with the determination that the proposed action is consistent, to the maximum extent practicable, with the Louisiana Coastal Resources Program. A Water Quality Certificate (TR 040726-01 / AI 101235 CER 40008), dated September 2, 2004 was received from the Louisiana Department of Environmental Quality. Review of the Section 404(b)(1) Public Notice was completed on August 19, 2004. The Section 404(b)(1) Evaluation was signed on August 25, 2004. In a letter dated August 16, 2004, the Louisiana State Historic Preservation Officer concurred with a recommendation of no effect on historic properties. This office has concurred with, or resolved, all Fish and Wildlife Coordination Act recommendations contained in a letter from the U.S. Fish and Wildlife Service, dated August 16, 2004. This office has concurred with, or resolved, all comments on the air quality impact analysis documented in the EA, in a letter from Louisiana Department of Environmental Quality, dated July 29, 2004. This office has concurred with, or resolved, all Essential Fish Habitat recommendations contained in a letter from National Marine Fisheries Service, dated July 22, 2004. In a letter dated July 21, 2004, the Louisiana Department of Wildlife and Fisheries stated they have no objections to the proposed action.

Environmental Design Commitments. The following commitments are an integral part of the proposed action:

1.) If the proposed action is changed significantly or is not implemented within one year, CEMVN will reinitiate coordination with the USFWS to ensure that the proposed action would not adversely affect any Federally listed threatened or endangered species, or their habitat. (CAR letter dated August 16, 2004)

2.) If any unrecorded cultural resources are determined to exist within the proposed project boundaries, then no work will proceed in the area containing these cultural resources until a CEMVN-PM-RN archeologist has been notified and final coordination with the SHPO and THPO has been completed.

3.) No impacts have been identified that would require compensatory mitigation.

Public Involvement. The proposed action has been coordinated with appropriate Federal, state, and local agencies and businesses, organizations, and individuals through distribution of Environmental Assessment # 390 (EA #390) for their review and comment.

Conclusion. This office has assessed the potential environmental impacts of the proposed action. Based on this assessment, and a review of the public comments made on EA #390 a determination has been made that the proposed action would have no significant impact on the human environment. Therefore, an Environmental Impact Statement will not be prepared.

13 SEP 04
Date

Peter J. Rowan
Colonel, U.S. Army
District Engineer

# ENVIRONMENTAL ASSESSMENT

# SOUTH WHITE LAKE SHORELINE PROTECTION PROJECT
# (ME-22, PPL 12)
# VERMILION PARISH, LOUISIANA

## EA #390

## INTRODUCTION

The U.S. Army Corps of Engineers (USACE), New Orleans District (CEMVN), has prepared this Environmental Assessment #390 (EA #390) to evaluate a proposal for shoreline protection along the southern shore of White and Bear Lakes for approximately 61,500 feet. The study area is located approximately 35 miles southwest of Abbeville, and just north of Pecan Island, Vermilion Parish, Louisiana (see figure 1). EA #390 has been prepared in accordance with the National Environmental Policy Act of 1969 and the Council on Environmental Quality's Regulations (40 CFR 1500-1508), as reflected in the USACE Engineering Regulation, ER 200-2-2.

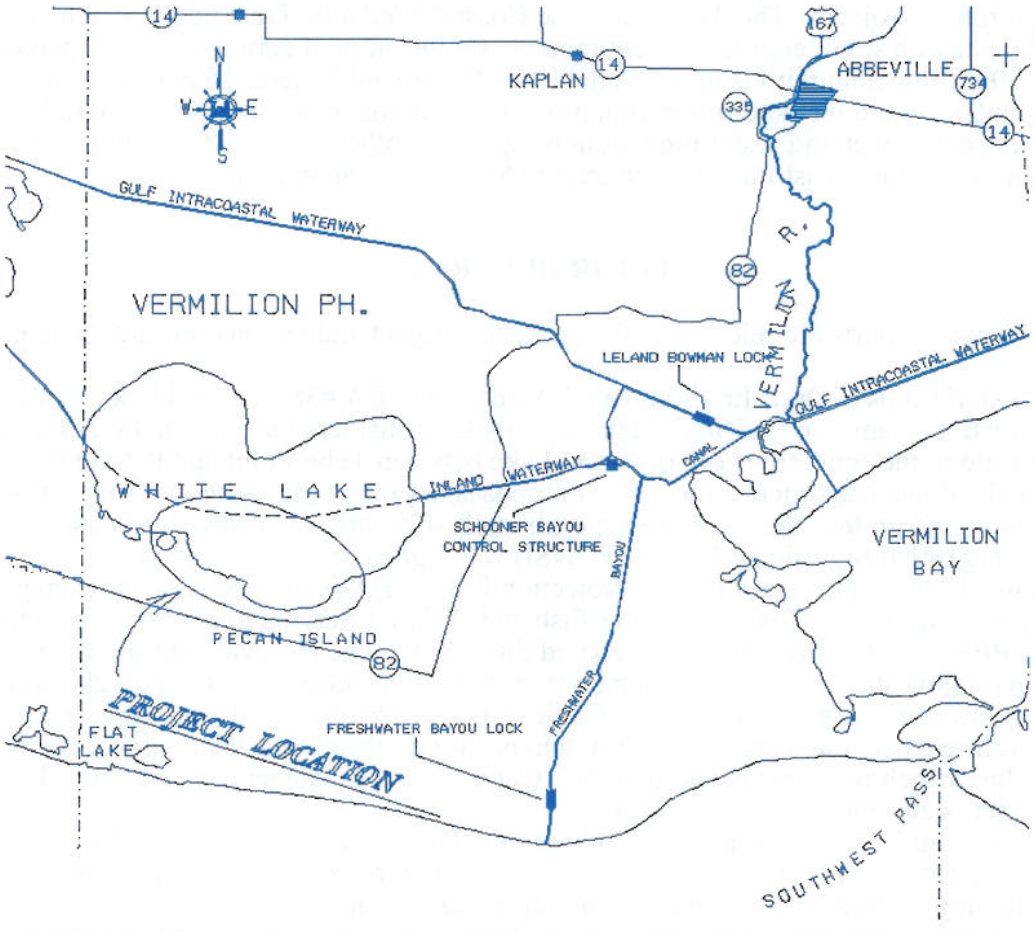


**Figure 1. South White Lake project location, Vermilion Parish, Louisiana.**

## PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action would be to stop shoreline erosion and promote the creation of fresh marsh along an approximately 61,500-foot length (approximately 11.6 miles) of the southern shoreline of White Lake. The need for the proposed action is the result of ongoing wind-induced wave erosion along the shoreline at the rate of about 15 feet per year. At this rate of erosion, it is likely that nearby low marsh management levees would be further breached, increasing interior marsh loss.

## AUTHORITY FOR THE PROPOSED ACTION

The proposed action was authorized by the Coastal Wetlands Planning Protection and Restoration Act of 1990 (also known as the Breaux Act, Public Law 101-646). The Act directed USACE to establish a Task Force composed of representatives of five Federal agencies (USACE, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Department of Agriculture - Natural Resource Conservation Service, and National Oceanic and Atmospheric Administration - National Marine Fisheries Service) and the State of Louisiana to develop a comprehensive approach to preventing the loss of and restoring coastal wetlands in Louisiana. The Task Force was required to prepare a comprehensive Coastal Restoration Plan for Louisiana by the end of 1993, which provides the basis for selecting priority projects for implementation. This Task Force must annually prepare and transmit to Congress a priority list of Louisiana wetland restoration projects. The Act created the Coastal Wetlands Trust Fund, which is supported by a tax on small engines and equipment. Of the amount appropriated, 70 percent (not to exceed $70 million annually) is to be available (as 85 percent Federal/15 percent State matching grants) to fund wetland restoration projects and associated activities in coastal Louisiana. A coastal wetland restoration grant program for other States is funded by 15 percent of the Coastal Wetlands Trust Fund (not to exceed $15 million annually).

## PRIOR REPORTS

The following reports are relevant to the proposed project and are incorporated herein by reference:

- USACE (2004). Draft Environmental Assessment, EA #380: Grand Lake Shoreline Protection, Cameron Parish, Louisiana. This EA considers the construction of a rock dike along the southern shore of Grand Lake between Tebo Point and the Superior Canal. When constructed, the project proposes to protect the shoreline from further erosion and protect and/or create approximately 495 acres of freshwater marsh. A Finding of No Significant Impact (FONSI) was signed on 20 April 2004.
- Grand-White Lakes Land Bridge Protection Project EA (PME-18/ME-19), Cameron Parish, Louisiana (1/2003). The US Fish and Wildlife Service in coordination with the CWPPRA Task Force agencies prepared this report. The EA evaluates alternatives to stop or slow shoreline erosion along the southeastern shoreline of Grand Lake and the northern and western shorelines of Collicon Lake. The preferred alternative would halt shoreline erosion and create marsh in that portion of the Grand-White Lakes Land Bridge, which is currently less than 500 feet wide and in danger of breeching. This project is currently under construction.
- Mermentau River Disposal Area Containment Dikes and Flotation Canal Lower Mud Lake EA #311. This CEMVN report evaluates impacts attributed to the construction of containment dikes and associated flotation canals in conjunction with routine maintenance dredging of the Mermentau River downstream of Grand Lake and the Catfish Point Control Structure. The FONSI was signed on 27 April 2000.

- Grand and White Lakes Flood Control Project, Technical Report #HL-93-11 (CEMVN, 8/1993). The Mermentau River is the primary tributary to the Grand and White Lakes area of southwest Louisiana, which provides fresh water for local agriculture, livestock, and wildlife productivity. Hydraulic control structures within the system prevent higher salinities from intruding into sensitive areas. These features also restrict the passage of flood flows from the lower Mermentau River basin to the Gulf of Mexico.
- Grand and White Lakes Water Management Study (CEMVN, 9/1983). This report presents the results of an initial evaluation of water resources related problems in the Grand and White Lakes area in western coastal Louisiana. The study was intensively surveyed to obtain agricultural data and information on water resources problems being experienced by local residents. Four major problems were identified: restricted lake access to juvenile marine and estuarine organisms, increasing severity of flooding, saltwater intrusion in irrigation water supplies, and wildlife productivity. Eleven alternative plans were developed, and in the final analysis, some of the plans were combined to form a comprehensive plan of improvement addressing all the problems.
- Mermentau River Basin, Final Environmental Impact Statement (EIS) Operation and Maintenance of Four Projects. Filed with the U.S. Environmental Protection Agency (EPA) on 26 March 1982.
- Mermentau River-Gulf of Mexico Navigation Channel, Louisiana. Final EIS filed with the EPA on 10 October 1978.

## PUBLIC CONCERNS

There is considerable local, regional, and national concern about the loss of shoreline, and associated wetlands, along Louisiana's coastlines and lakes. Louisiana has approximately 40 percent of the nation's coastal wetlands. These wetlands directly support 28 percent of the national fisheries harvest, a majority of the marine recreational fishing landings, and an extensive variety of wildlife (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority [LCWCRTF and WCRA], 1998). Additionally, significant oil industry infrastructure supporting offshore oil production operations in the Gulf of Mexico are located along much of this coastline. This loss of shoreline is adversely impacting the livelihood and recreational pursuits of local residents, commercial fisheries, the oil industry and the natural resources in these shoreline areas. Additionally, the loss of shoreline increases the risk of flooding to communities located adjacent to, and inland of, these shoreline areas. Therefore, the public is very supportive of projects that stop this loss and promote rebuilding or restoring of former wetland areas. The seriousness of this public concern has promoted Congress to appropriate considerable long-term funding for projects that stop shoreline erosion and promote the creation of new shoreline (wetland creation and barrier island protection/creation) along the Louisiana coast.

While the public is supportive of these types of programs, they do have project-specific concerns about the location of the breakwater, the configuration and design of the breakwater, its effectiveness in capturing sediments and promoting accretion, the cost of the project, and the use of the sediments from the dredged flotation channel.

## DESCRIPTION OF THE PROPOSED ACTION

The construction design consists of building approximately 61,500 linear feet (~ 11.6 miles) of stone breakwater stretching from Will's Point to the western edge of Bear Lake along the southern shoreline of White Lake (figure 2). The breakwater would be situated along the -1.5

foot North American Vertical Datum 1988[1] contour in approximately 2.0 to 3.0 feet of water. The dike crown would be 4.0 feet wide and would be set at an elevation of +3.5 feet with a +/- 0.50-foot tolerance. The breakwater would have front and back side-slopes of 1.0-foot vertical on 1.5-foot horizontal. Gaps for fish access would be built at approximately 1,000-foot intervals, with a top width of 50 feet, an approximate 35-foot bottom width, and would be lined completely with a single layer of rock. The total length of the dike, including lining of gaps, would require approximately 266,000 tons of 15-24 inch stone. The stones would be placed on a geotextile fabric base. A flotation channel would be dredged parallel to, and lake-ward of the rock dike. At no time would the contractor excavate closer than 50-feet from the centerline of the dike. Maximum allowable dredging depth for the flotation channel would be 6 feet. Material dredged from the floatation channel would be placed or cast landward of the rock dike where practicable.

Placement of all dredged material would be held a minimum of ten feet from the landside toe of the rock dike and a minimum of 50 feet from the top of bank. Additional off-site access dredging is not anticipated but may become necessary in localized areas in order to facilitate rock transport through the Gulf Intracoastal Waterway (GIWW), Schooner Bayou Canal and White Lake. Should this access dredging become necessary, controlling dredge depth would be 6 feet. This material may be placed adjacent to the required dredge location in such a way as to avoid stacking and the creation of a hazard to navigation. During construction phase, approximately 247 acres (breakwater construction footprint of 61,500 feet long by 175 feet wide) of non-vegetated mud bottom would be disturbed. Approximately 42 acres of non-vegetated water bottom would be lost under the footprint of the actual breakwater (61,500 feet long by 30 feet wide). Approximately 157 acres of emergent marsh would be created between the breakwater and existing shoreline through the beneficial use of dredged material. Shoreline loss would be prevented and marsh would be created south of the breakwater. Stabilizing the shoreline and creating marsh, would protect and/or create approximately 844 acres of marsh over the 20-year project life.


**Figure 2. Location of breakwater on White and Bear Lakes.**

1 All elevations refer to feet NAVD 88 unless otherwise specified.

## ALTERNATIVES TO THE PROPOSED ACTION

Six alternatives to the proposed action were considered. These alternatives were:

1. No-action. Under the no-action alternative, the current conditions would remain in effect. The shoreline along the southern part of White Lake would continue to erode at the rate of approximately 15 feet per year. Nearby low maintenance levees would either be breached or existing breaches would widen. This would result in further loss of fresh marsh interior to these levees. For comparison purposes this alternative will be further discussed in this document.
2. A rock dike (breakwater) along the southern shoreline of White Lake, between Will's Point and the west shoreline of Bear Lake, with disposal of dredge material on the landside of the dike in open water with no connection to land.
3. A rock dike along the southern shoreline of White Lake, from Will's Point, across the opening of Bear Lake, to the western edge of Bear Lake, with earthen dikes along the shoreline of Bear Lake. To maintain benefits for the 20-year project life, the earthen dikes would need to receive maintenance on a 3-5 year cycle, with the last maintenance at year 19.
4. A rock dike along the southern shoreline of White Lake, between Will's Point and the west shoreline of Bear Lake, with disposal of dredge material in some inland areas to restore and/or enhance wetlands.
5. A rock dike along the southern shoreline of White Lake, from Will's Point, across the opening of Bear Lake, to the western edge of Bear Lake, with terraces on the interior of Bear Lake.
6. A rock dike along the southern shoreline of White Lake, from Will's Point, across the opening of Bear Lake, to the western edge of Bear Lake, and patching the existing interior and exterior levee breeches adjacent to Bear Lake.

Three of the alternatives were eliminated from further consideration after initial evaluation:

BREAKWATER CONSTRUCTION AND DISPOSAL OF DREDGE MATERIAL IN SOME INLAND AREAS TO RESTORE AND/OR ENHANCE WETLANDS (No 4.)

Under this alternative, in addition to building the breakwater along the southern shore of White Lake, some of the dredge material from the flotation channel would be disposed of onshore in open water areas with the intent to elevate subsided and impounded marsh approximately 4-12 inches over delineated areas. This would nourish and help sustain impounded and managed marsh that is subject to increased subsidence due to long term periodic dewatering. Several areas were initially identified for potential disposal of this material and it was estimated that an additional 724 acres of marsh could be nourished during project construction. Upon further evaluation of landowner issues (numerous land owners with varying interests), conservation servitude limitations, potential high cost for compensable interests, problems with plugging/clogging existing trenasses[2], and the much higher costs of the hydraulic dredging and onshore disposal, this alternative was determined to be impracticable and was not considered further.

BREAKWATER CONSTRUCTION ALONG THE SOUTHERN SHORE OF WHITE LAKE AND ACROSS THE OPENING OF BEAR LAKE, WITH TERRACES ON THE INTERIOR OF BEAR LAKE (No 5.)

The breakwater in the proposed action would be constructed along the southern shore of White Lake and across the mouth of Bear Lake, with an opening to permit boat access to the lake. Several rows of overlapping terraces would be constructed around the rim of Bear Lake to protect the shoreline. Since Bear Lake was formerly a land-locked lake, the rock dike would partially restore the eroded lake rim. It was determined that the expense to construct the dike across the opening was slightly more than the expense around the existing shoreline. The

[2] Trenasse – a natural or man-made shallow and narrow (3-7 feet wide) channel cut through marsh.

historic lake rim is no longer present, and with current water depths (approximately 4 feet deep), a great deal of rock would be required to construct a dike across the opening. Furthermore, to reach design heights of an average elevation of +3.5 feet (with a 4-foot crown width), the footprint at the bottom would need to be fairly large.

To stabilize the shoreline within Bear Lake, construction of terraces was proposed. However, geotechnical surveys indicated that the sediments were not conducive to stacking. The sediments in Bear Lake are very fluid making it difficult to stack and stabilize the dredge material to a suitable level for effective shoreline protection. Furthermore, since Bear Lake was a historic lake as opposed to historic marsh converted to shallow open water, filling the lake bottom with terraces is not appropriate under restoration principles. Therefore, this alternative was determined to be impracticable and was not considered further.

BREAKWATER CONSTRUCTION ALONG THE SHORELINE OF WHITE LAKE AND ACROSS THE OPENING OF BEAR LAKE, AND PATCHING THE EXISTING INTERIOR AND EXTERIOR LEVEE BREECHES ADJACENT TO BEAR LAKE (No 6.)

As in the previous alternative, this alternative would partially restore the historic lake rim of Bear Lake as well as protect the shoreline of White Lake. The expense to construct the dike across the opening of Bear Lake is slightly more than the expense to construct a dike around the existing shoreline, as previously discussed. Patching the existing interior and exterior levee breaches adjacent to Bear Lake would not provide any protection to the existing shoreline. Bear Lake is large enough that wind driven waves would be able to build up fetch[3] and would continue to erode the existing shoreline. Patching the existing interior and exterior levees would provide some short term benefits, however in the long term, these levees would give way thus exposing existing marsh that has subsided. With the consideration that in the long term, land would not be protected and landowner issues (numerous land owners with varying interests), this alternative was determined to be impracticable and was no longer considered.

## ENVIRONMENTAL SETTING

### GENERAL

The project is located on the south shore of White Lake, which is in the southeast portion of the Mermentau River Basin, Vermilion Parish, Louisiana. The lake is approximately 54,500 surface acres (~85 square miles) and about 14 miles (east to west) by nine miles (north to south) in dimension. Due to the shallowness of the lake (average of about seven feet), wind driven waves easily form. During the winter months, strong northern winds cause large waves, which continue to cause erosion on the southern shore. Coastal marsh bisected by canals completely surrounds the lake, and access to the lake is by boat from one of these canals. The coastal marshes provide important winter habitat in the southern end of the Mississippi Flyway for migratory birds. Vegetation types occurring on the shores of the lake are primarily water tolerant grasses, sedges, and shrubs.

The old White Lake rim has eroded away exposing fragile interior marshes, which erode more rapidly as evidenced by the severely scalloped shoreline in the area. Erosion rates were calculated by comparing 1978-79 aerial photography with 1997-98 aerial photographs showed rates averaging 15 feet per year. The shoreline protection feature of the project addresses the erosion problem. Further interior marsh loss may occur if interior levees breach as a result of the eroding shoreline. Several large areas of this marsh have subsided due to several years of gravity drainage and portions are below the White Lake water level.

[3] The distance traversed by waves, usually wind driven, without obstruction.

## CLIMATE

Vermilion Parish is located within a subtropical latitude. The climate is influenced by the many water surfaces of the nearby lakes, streams, and the Gulf of Mexico. Throughout the year, these water areas modify the relative humidity and temperature conditions, decreasing the range between the extremes. Summers are long and hot with high average humidity, average daily temperatures of 81°Fahrenheit, and the average daily maximum of 90°F. Winters are influenced by cold, dry polar air masses moving southward from Canada, with the average daily temperature of 53°F, and the average daily minimum of 43°F. The cold-front passage events that are experienced along the Louisiana coastline from October through April have major impacts on circulation, sediment resuspension, sediment transport, water level and salinity changes. Prevailing southerly winds create a strong maritime character. Annual precipitation averages 62.5 inches based over the period 1961-1990. The wettest month is July with an average monthly normal of 7.4 inches. October is the driest month averaging 3.7 inches.

The Coastal and Hydraulics Laboratory in Vicksburg, Mississippi reconstructed wind records from 1990-1999 for various stations along the Gulf Coast. Station 106 (29.50N 92.92W, approximately 26 miles south of White Lake) shows that winds near White Lake are generally southeasterly at 11-22 miles per hour. Less frequent but stronger winds blow from the north and northwest and are frequently in the mid teens. Hurricanes in the summer and fall months and the sequential frontal passages in the winter and spring months increase water levels along the coast and provide a powerful pumping mechanism for the mobilization and transport of suspended sediments in the coastal wetland system. The storm surge associated with hurricanes can elevate sediment levels in the water column through resuspension, and transport these sediments inland several miles. Hurricane Lili (October 2003) made landfall as a category two hurricane, after being downgraded overnight from a category four, just to the east of White Lake on the western side of Vermilion Bay, with highest wind gusts reported for Intracoastal City, Louisiana at 120 mph. Other hurricanes to make landfall near White Lake were Edith (1971) and Danny (1985) both coming on shore near Pecan Island.

## GEOLOGY

White Lake and the Mermentau River Basin lie in the Chenier Plain, a series of ancient natural beaches consisting of coarse sand and crushed shells, which through the activities of nature have become isolated from the sea by strips of marshes. Sediments from the Mississippi River were deposited along the coast and periodically eroded as the river shifted its mouth during the past 3,000 years. Eroded deposits are evident as intermittent sand ridges, called *cheniers* by early French explorers and settlers because of the live oaks that grow on them (Boesch *et al*, 1994).

Soils in the project area consist of Larose and Allemands types. Both are described as very poorly drained, ponded most of the time, and are frequently flooded. Larose soils are further described as very slowly permeable, very fluid, mineral soils that formed in herbaceous plant remains. The Allemands soil type is more organic than Larose, and formed in moderately thick accumulations of decomposed herbaceous material. Both soil types are also well suited for wetland wildlife, and used for hunting, fishing, and other outdoor activities. Controlling the level of water and preventing wildfires and saltwater intrusions are the main concerns in managing the soils for wildlife habitat (Midkiff *et al*, 1995).

The soil type along the White Lake shoreline between Bear Lake and Will's Point is mainly Larose muck. The subsidence rate in this area is low (from 0 to 1 foot per century). The bottom of White lake in the vicinity is quite silty.

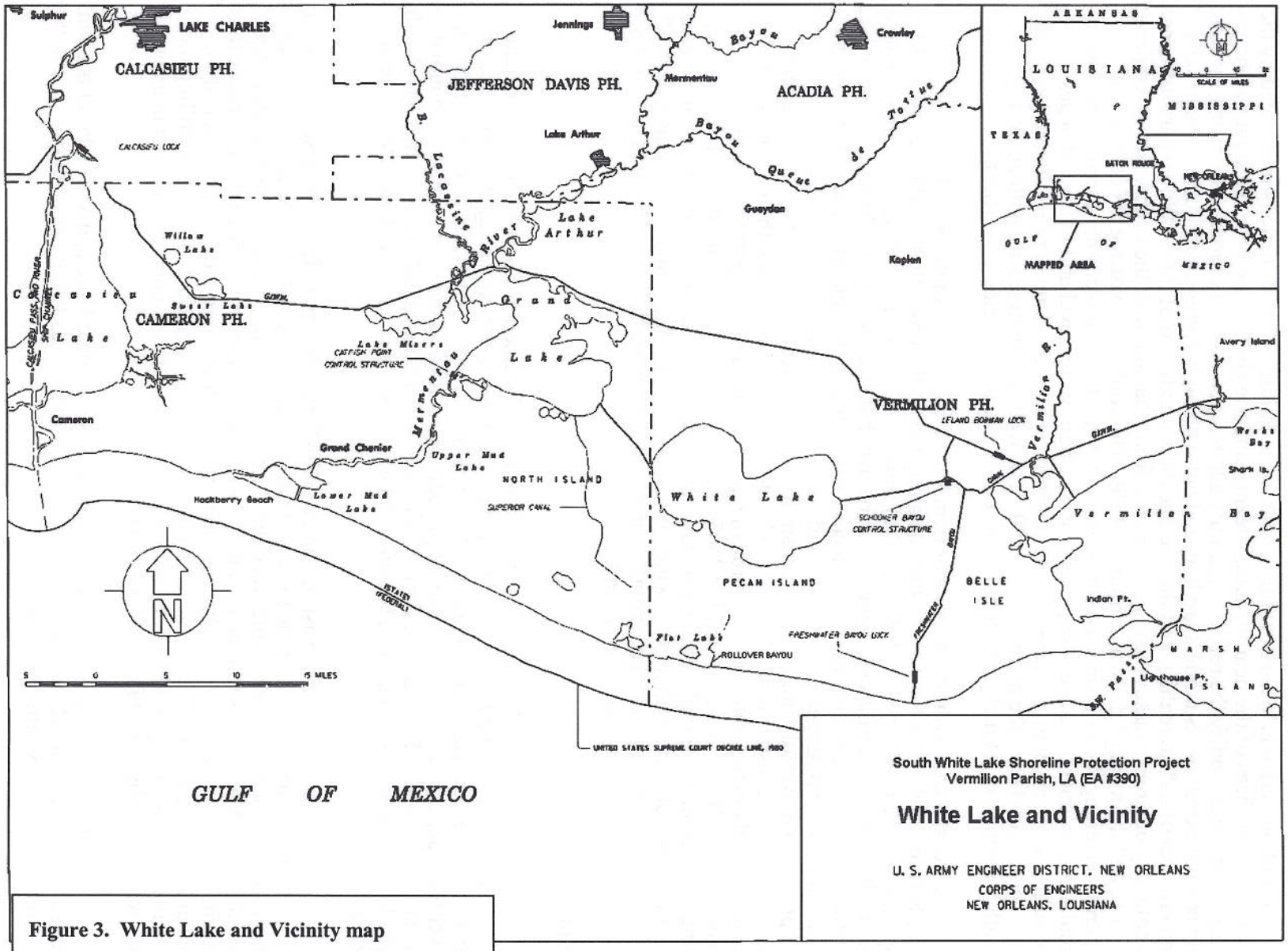


**Figure 3. White Lake and Vicinity map**

HYDROLOGY

Before navigation channels altered hydrology in the early 1900s, drainage in the Mermentau Basin was predominantly in a north-south direction through the Mermentau River, Freshwater Bayou, Bayou Lacassine, and Rollover Bayou (figure 3). The eastern portion of the basin, however, drained in an easterly direction through Belle Isle and Schooner Bayous. Sheet flow over the marsh occurred between Grand Chenier and Pecan Island ridges, as well as westerly into the Calcasieu/Sabine Basin. Navigation, flood control, agriculture, and oil and gas exploration activities have dramatically altered the hydrology of the Mermentau Basin. The net effect of those alterations is that the Lakes Sub-basin is now, for the most part, hydrologically isolated from the Chenier Sub-basin. The Lakes Sub-basin now functions more as a freshwater reservoir and less as the low-salinity estuary it once was (Gunter and Shell 1958; Morton 1973).

The most important factors influencing hydrology in the Lakes Sub-basin are the amount of Mermentau River runoff, and the water control structures operated by CEMVN. Four of the structures (i.e., Catfish Point and Schooner Bayou Control Structures and the Calcasieu and Leland-Bowman Locks) regulate water levels and prevent saltwater intrusion into the Lakes Sub-basin. The Freshwater Bayou Canal Lock is more removed from the Lakes Sub-basin, and is operated to prevent saltwater intrusion from the Gulf of Mexico. The CEMVN-operated structures maintain higher-than-normal water levels. The average water levels in the Lakes Sub-basin have increased from 1.7 feet Mean Low Gulf (MLG) in 1945, to over 2.6 feet MLG by 1999 (LDNR 2000). The structures are operated to maintain water levels near or above 2.0 feet MLG for navigation and to provide sufficient fresh water for rice irrigation.

As part of its surface water quality monitoring program, the Louisiana Department of Environmental Quality (LDEQ) routinely monitors several parameters on a monthly basis at numerous sites. Although there are several long-term sites on larger water bodies throughout the state, sites are currently monitored intensively for 1 year and again on a 5-year cycle (LDEQ 2000). Based upon those data and the use of less-continuous information (e.g., fish tissue contaminants data, complaint investigations, and spill reports), LDEQ has assessed water quality fitness for the following uses: agriculture, primary contact recreation (swimming), secondary contact recreation (boating and fishing), fish and wildlife propagation, and drinking water supply (LDEQ 2000). Based on existing data and more subjective information, water quality is determined to either fully, partially, or not support those uses. Water quality in White Lake is considered by the LDEQ to fully support primary and secondary contact recreation and agricultural use, but does not support fish and wildlife propagation.

Salinity is an important factor in the Lakes Sub-basin because farmers within the area utilize the fresh water to grow rice and crawfish. Salinities in the project area are generally fresh; however, some saltwater intrusion may occur in times of drought, when locking operations allow spikes of salt water into the sub-basin and insufficient head differential exists to flush the salt water out. When water levels are low in the sub-basin, some salt water from the Gulf of Mexico and brackish water from Vermilion Bay flows into the sub-basin through the Leland-Bowman Lock and the Schooner Bayou Control Structure (figure 1) when the gates are opened for navigational purposes.

## SIGNIFICANT RESOURCES

This section contains a description of significant resources and the impacts of the proposed action on these resources. The significant resources described in this section are those recognized by: laws, executive orders, regulations, and other standards of national, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public.

WETLANDS

This resource is institutionally significant because of: the Clean Water Act of 1977, as amended; Executive Order 11990 of 1977, Protection of Wetlands; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968. Wetlands are technically significant because: they provide necessary habitat for various species of plants, fish, and wildlife; they serve as ground water recharge areas; they provide storage areas for storm and flood waters; they serve as natural water filtration areas; they provide protection from wave action, erosion, and storm damage; and they provide various consumptive and non-consumptive recreational opportunities. Wetlands are publicly significant because of the high value the public places on the functions and values that wetlands provide.

Existing Conditions

O'Neil classified this area as sawgrass marsh (intermediate marsh) in 1949 with the dominant vegetation of Jamaican sawgrass. Other species appearing in this marsh were cattail, bulrush, roseau cane, bulltongue, hogcane, and spike rush with yellow cutgrass near the ridges. This was considered deep marsh, with water levels ranging from 4 to 15 inches. However, by 1968 Chabreck found the species composition had changed to more fresh water with vegetation consisting of mainly Roseau cane, giant cutgrass, California bulrush, and coastal arrowhead (Chabreck *et al.,* 1968; and Chabreck and Condrey, 1979). Much of the area south of White Lake was mapped as no longer being predominately marsh in 1968 and 1978 by Chabreck *et al.* Low levees were built, and the area was drained for pasture. These levees have since been breached, and the land has converted to flooded pasture. Woody tree species have grown on the old levees, consisting mainly of willows, Chinese tallow, and some red maples.

In order to further describe wetland resources in the project area, the project area was broken down into four sub-areas – A thru D (see figure 4). Sub-area A encompasses an inshore (300 feet in from the shoreline) marsh area of about 4,725 acres and extends from Bear Lake eastward to where the channel running parallel to the shoreline turns due south all the way to Louisiana Route 82. Sub-area B is the inshore marsh area just to the east of sub-area A, and contains about 685 acres of land and open water. Sub-area C is located just west of sub-area B and is predominantly an open water area of about 119 acres. Sub-area D includes the entire project shoreline from Bear Lake on the west to Wills point on the east, between the proposed near shore edge of the new breakwater and extending 300 feet inshore of the existing shoreline, and contains 756 acres.

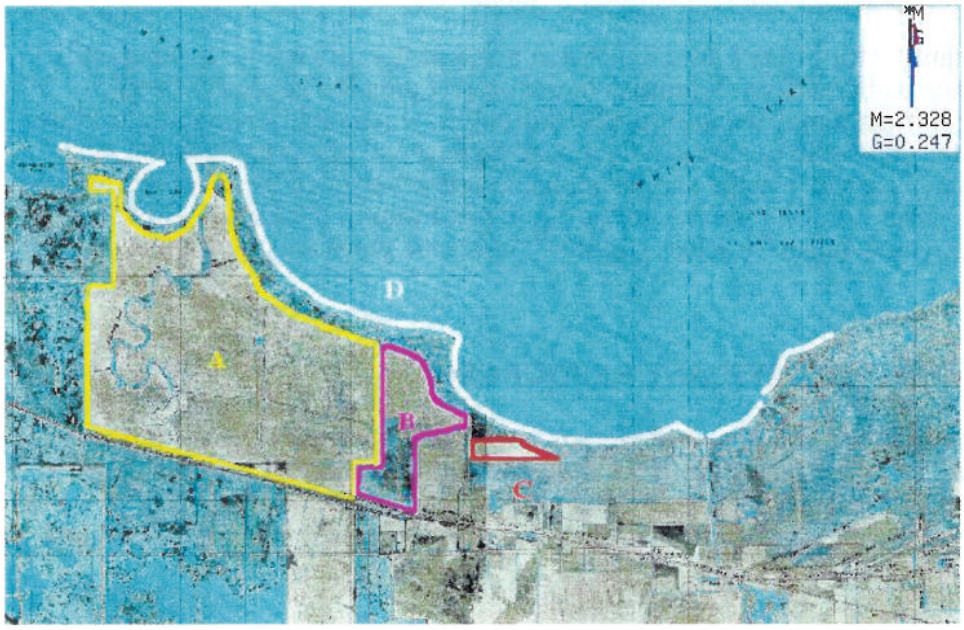


**Figure 4. Southern shore of White Lake, areas considered under the Wetland Value Assessment.**

Based on USACE, LDNR and US Geological Survey data from satellite imagery and color infra-red aerial photographs, portions of this area have opened significantly since 1990. The rate of land loss has increased markedly since 1978. Prior to that the rate of land loss was less than three acres per year. From 1978 to 1990 the rate of loss jumped to an average of about 83 acres per year representing a total loss of about 17 percent of the land present in 1978. During the next 10 years the rate of land loss decreased to about 30 acres per year for a total loss of about six percent of the land available in 1990. Based on field visits in April 2003 to sub-area A it is clear that the rate of land loss will increase, due to ongoing shoreline erosion, a 2-3 foot wide breach in the outer management levee on the southwest shoreline of bear lake, and the low elevation of the interior management levees in some locations (12- 18 inches above interior water levels).

Conversations with the representatives of the owners (Miller estate) of the property in sub-area A, indicate that it is unlikely that the observed breach will be repaired in the near future. Therefore, it is likely that this small breach will expand rapidly as a result of wave action. As this breach expands, the likelihood of breaching and overtopping of the inner management levees increases. The inner management levee, in the area of the breach, varies from about 12 inches to 36 inches in elevation above interior water levels. Breaching of this inner management level will result in extensive flooding of the interior marsh, which is currently below normal White Lake water elevation. Therefore, under the future without project scenario it is possible that much of the wetlands located on the land-side of the interior management levees would be lost within the next few years.

*Sub-Area A*

As indicated in Table 1, about 18 percent of the former land area in this sub-area was open water in 2000. This represents a loss of about 795 acres of land since 1956, most (581 acres) of which occurred between 1978 and 1990. Using the average rate of land loss between 1990 and 2000, it is estimated that an additional 50 acres of land have been lost between 2000 and 2003 for a total loss of 845 acres of land.

With the exception of the 1956-1978 period, when most of the land was converted to agricultural use, emergent wetlands comprised about 95 percent of the land in this sub-area. The amount of emergent wetlands present as of 2003 is estimated at 3,630 acres.

The project will benefit this area since the shoreline protection will prevent further breaching of interior levees and this sub-area was included in the Wetland Value Assessment (WVA) carried out by the CWPPRA Environmental Work Group.

*Sub-Area B*

This sub-area has also experienced a significant loss of land particularly since 1978. Prior to 1978 there was no apparent loss of land. However, between 1978 and 1990 over 315 acres or about 46 percent of the land was converted to open water. Between 1990 and 2000 another 41 percent of the remaining land was converted to open water. Given these estimated land losses, about 63 percent of the land in this sub-area has been converted to water since 1978. Based on the average rate of land loss from 1990 to 2000, it is estimated that an additional 36 acres of land has been lost from 2000 to 2003. The total estimated loss of land in this sub-area from 1956 to 2003 is 466 acres.

Emergent wetlands comprised about 98 percent of the land area during the period from 1956-1990. Since about 68 percent of this sub-area is already water, benefits accrued as a result of the proposed project are expected to be minimal and it was not included in the WVA completed by the CWPPRA Environmental Work Group.

| Table 1. Estimated Land Losses (in acres) in the Sub Areas of the South White Lake Project Ares, 1956-2003 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time Period | Sub-Area A | | | Sub-Area B | | | Sub-Area C | | | Sub-Area D[b] | | | Totals | | |
| | Acres | % Loss | % Loss/year | Acres | % Loss | % Loss/year | Acres | % Loss | % Loss/year | Acres | % Loss | % Loss/year | Acres | % Loss | % Loss/year |
| 1956 | 4,669 | | | 680 | | | 119 | | | 1,212 | | | 6,680 | | |
| 1978 | 4,624 | 1.0 | 0.05 | 684 | 0.0 | 0.00 | 119 | 0.0 | 0.00 | 795 | 34.4 | 1.56 | 6,222 | 6.9 | 0.31 |
| 1990 | 4,043 | 12.6 | 1.05 | 366 | 46.5 | 3.88 | 5 | 95.8 | 7.98 | 568 | 28.6 | 2.38 | 4,982 | 19.9 | 1.66 |
| 1993 | 4,010 | 0.8 | 0.27 | 421 | 0.0 | 0.00 | 11 | 0.0 | 0.00 | 511 | 10.0 | 3.33 | 4,953 | 0.6 | 0.20 |
| 2000 | 3,874 | 3.4 | 0.49 | 250 | 40.6 | 5.80 | 10 | 9.1 | 1.30 | 379 | 25.8 | 3.69 | 4,513 | 8.9 | 1.27 |
| 2003[c] | 3,823 | 1.3 | 0.44 | 214 | 14.4 | 4.80 | 10 | 0.0 | 0.00 | 322 | 15.0 | 5.00 | 4,369 | 3.2 | 1.07 |
| Loss Rates | | | Weighted % | | | Weighted % | | | Weighted % | | | Weighted % | | | Weighted % |
| 1956 – 1990 | 626 | 13.4 | 0.40 | 314 | 46.2 | 1.37 | 114 | 95.8 | 2.82 | 2 | 0.5 | 0.12 | 1,698 | 25.4 | 0.79 |
| 1978 – 1990 | 581 | 12.6 | 1.05 | 318 | 46.5 | 3.88 | 114 | 95.8 | 7.98 | 0 | 0.0 | 0.00 | 1,240 | 19.9 | 1.66 |
| 1990 – 1993 | 33 | 0.8 | 0.27 | 0 | 0.0 | 0.00 | 0 | 0.0 | 0.00 | 27 | 6.3 | 2.10 | 29 | 0.6 | 0.20 |
| 1956 – 2000 | 795 | 17.0 | 0.40 | 430 | 63.2 | 1.98 | 109 | 91.6 | 2.38 | 21 | 4.8 | 0.24 | 2,167 | 32.4 | 0.83 |
| 1978 – 2000 | 750 | 16.2 | 0.76 | 434 | 63.5 | 3.96 | 109 | 91.6 | 0.76 | 3 | 0.7 | 0.29 | 1,709 | 27.5 | 1.34 |

[a] Landlosses based on aerial photography analysis by the Corps of Engineers, Louisiana Department of Natural Resources, and US Geological Services
[b] Extrapolated using estimated average shoreline erosion rate of 15 feet/year for the 1978 to 1998 period.
[c] Extrapolated using loss rate from 1990 to 2000.

*Sub-Area C*

This 119-acre area was converted to open water sometime between 1978 and 1988. Prior to 1978 this area was primarily fresh marsh. Since 1988 only about 5 acres of land (a loss of about 97 percent) remains in this area, most of which is fresh marsh. No benefits will accrue to this sub-area and it was not included in the WVA for this project.

*Sub-Area D*

This sub-area is a 550-foot wide strip that extends from the near shore edge of the new breakwater to 300 feet inshore (determined by 15 feet of shoreline erosion × 20 year project life) along the entire 61,500 feet of the project study area, and includes approximately 424 acres of fresh marsh. Comparisons of 1978-1979 and 1997-1998 aerials photographs indicated that the shoreline in the project area has eroded at an average rate of 15 feet per year. Based on the shoreline erosion rate of 15 feet/year, it is estimated that the shoreline was about 660 feet (15 feet/year x 44 years) further offshore than in the year 2000. Using these assumptions the amount of land lost between 1956 and 2000 was about 932 acres, most of which was fresh marsh. Given this estimated erosion rate of 15 feet/year, another 63 acres will have been lost during the 2000-2003 period, for a total loss of 995 acres from 1956 to 2003.

Future Conditions with No Action

When the average erosion rate of 15 feet per year was applied to the approximate 61,500 feet of shoreline over 20 years, a total of about 424 acres[4] of wetland would be lost. This averages to about 21 acres per year[5]. In addition to this loss of shoreline, current management practices and periodic flooding of the interior marsh as a result of high water events is expected to contribute to land loss. The rate of interior marsh loss was estimated at about 1.1 percent (weighted average) per year from 1978 to 2000 for all sub-areas. The combination of the shoreline loss and interior fresh marsh loss is estimated at 1.35% for Project Years (PY) 1-11. The interior management levee is expected to have large-scale breaching in PY12 resulting in an instantaneous loss of 20 percent of the existing fresh marsh. From PY12 to the end of the project (PY20) it is estimated that the average land loss rate will increase to about 2.7 percent per year.

*Sub-Area A*

Under the no action alternative, the wetland losses due to shoreline erosion and interior marsh losses, are expected to average about 1.37 percent during PY1-11 and 2.74 percent during PY12-20. Based on the 2000 aerial photographs and adjustments for additional losses from 2000 to 2003 using average land loss rate from 1990 to 2000, about 3,630 acres of emergent wetland occur in this sub-area. Assuming that the project will be constructed in 2004, projected losses from PY0 (2004) to PY20 are shown in Table 2.

| Project Year | Acres of Wetland | Acres Lost/year | Annual Rate of Loss in percent |
|---|---|---|---|
| 0 | 3,630 | Baseline | Baseline |
| 1 | 3,580 | 50 | 1.35 |
| 11 | 3,125 | 46 | 1.35 |
| 12 | 2,500 | 625 | 20.0 |
| 20 | 2,008 | 62 | 2.70 |
| | | | |
| Average Loss | | 81 | 2.23 |
| **Total Loss** | **1,622** | | |

**Table 2. Projected Future Emergent Marsh Losses without Construction of the Project for Sub-area A.**

[4] (15 feet per year)(20 years)(61,500 feet)=18,450,000ft$^2$ = 424 acres

[5] (15 feet per year)(1 year)(61,500 feet)=922,500 ft$^2$ = 21.2 acres

Under the Future Without Project conditions, approximately 45 percent of the fresh marsh could be lost during the 20-year project lifetime. This estimated loss of wetlands appears to be conservative since it assumes a breach in the levee system in PY12. As pointed out previously, a small breach already exists in the outer management levees at Bear Lake. It is likely that the instantaneous loss of 20 percent of wetland and followed by the doubling of the rate of loss is likely to occur much sooner than PY20. Therefore, the loss of wetlands in this sub-area is likely to be higher than estimated in Table 3.

*Sub-Area D*

Under the no action alternative, the rate of wetland loss in this sub-area will be a function of the estimated rate of shoreline erosion, 15 feet/year. In addition to the estimated 932 acres of fresh marsh that has been lost from 1956 to 2003, an additional 424 acres of fresh marsh would be lost over a 20-year period. An increase in the land loss rate after PY12 is not assumed for this sub-area, since erosion is the primary cause of the loss of wetlands.

Future with construction of a rock dike along the shoreline of White and Bear Lakes (Proposed Action).

With implementation of the proposed action, there would be a temporary disturbance during construction, but once completed, the southern lake edge would stabilize allowing sediment to settle out. The proposed action is assumed to prevent the loss of 424 acres (61,500 feet x 300 feet) of marsh by preventing further shoreline erosion. Material dredged for the flotation channel, which will be deposited on the landward side of the breakwater, would result in the creation of 157 acres of marsh. The breakwater would prevent further loss of shoreline and protect a total of about 5473 acres, which includes 2,359 acres of marsh, south of the lake, and was included in the WVA for this project. Total benefits in AAHU's are given in Table 3.

**Table 3. Total Benefits in AAHUs Due to Project Wetland Value Assessment**

| | ***Sub-area A*** | ***Sub-area D*** |
|---|---|---|
| A. Emergent Marsh Habitat Net AAHU's | 69.94 | 319.40 |
| B. Open Water Habitat Net AAHU's | -12.21 | -21.62 |
| Net Benefits =(2.1 x EMAAHUs + OWAAHUs)/3.1 | 43.44 | 209.4 |
| **Total Benefits = Sub-area A + B** | **252.84 AAHUs** | |

Future with construction of a rock dike along the existing southern shoreline of White Lake and across the opening of Bear Lake with earthen dikes along the shoreline of Bear Lake.

With scheduled maintenance of the earthen dikes along the shoreline of Bear Lake, the future with this proposal is the same as the preferred plan. Some emergent marsh would be created by the earthen dikes; however, since they would need to be maintained, this marsh would not be able to reach maturity. Without maintenance, the dikes would eventually give way, allowing shoreline erosion from storm driven wave action to once again commence thus threatening the marshes south of Bear Lake.

## FISHERIES

Existing Conditions

This resource is institutionally significant because of the Fish and Wildlife Coordination Act of 1958, as amended. Fisheries resources are technically significant because: they are a critical element of many valuable freshwater and marine habitats; they are an indicator of the health of various freshwater and marine habitats; and many species are important commercial resources.

Fisheries resources are publicly significant because of the high priority that the public places on their esthetic, recreational, and commercial value.

The fresh marshes adjacent to White Lake supports recreationally and commercially important freshwater fish including largemouth bass; bluegill; warmouth; crappie; gars; bowfin; blue, channel, and flathead catfish; and freshwater drum. Those marshes and associated shallow waters may also provide limited-value nursery habitat for some estuarine-dependent species tolerant of near-freshwater conditions, such as Gulf menhaden, Atlantic croaker, striped mullet, white shrimp, and blue crab. Other estuarine-dependent fish species found in the area, but which are less abundant, could include red drum, black drum, southern flounder, and brown shrimp.

Future Conditions with No Action

Without implementation of the proposed action, nursery habitat for freshwater and estuarine species would continue to be lost as the lake continues to encroach into the surrounding marsh and wetlands. Approximately 441 acres of fresh marsh would be converted to shallow, turbid open water areas, which would have little to no submergent or emergent vegetation. Although shallow unvegetated open water areas can function as nursery habitat for freshwater and estuarine-dependent fish species, the productivity of those waters is substantially less than marsh ponds or marsh that is subject to periodic prolonged inundation.

Future with construction of a rock dike along the shoreline of White and Bear Lakes (Proposed Action).

With implementation of the proposed action, the lake shoreline would be protected, thus protecting the marsh edge and saving valuable habitat for larval fish and shellfish.

Future with construction of a rock dike along the existing southern shoreline of White Lake and across the opening of Bear Lake with earthen dikes along the shoreline of Bear Lake.

The future with this proposal is expected to be the same as the future with the Proposed Action.

## WILDLIFE

Existing Conditions

This resource is institutionally significant because of the Fish and Wildlife Coordination Act of 1958, as amended and the Migratory Bird Treaty Act of 1918. Wildlife are technically significant because: they are a critical element of many valuable aquatic and terrestrial habitats; they are an indicator of the health of various aquatic and terrestrial habitats; and many species are important commercial resources. Wildlife are publicly significant because of the high priority that the public places on their esthetic, recreational, and commercial value.

Reptiles and amphibian species are diverse and abundant in fresh marsh habitats. Common species the project area include American alligator; western cottonmouth; red-eared, common snapping, and soft-shell turtles; bronze, bull, tree, and pig frogs.

The project-area wetlands provide habitat for numerous species of puddle ducks and diving ducks. Puddle ducks such as mallard, gadwall, American widgeon, pintail, northern shoveler, green-winged teal, and blue-winged teal utilize fresh marsh habitat within that area. Diving ducks such as lesser scaup, ring-necked duck, and several species of mergansers utilize large ponds and open water areas. The project area also provides feeding habitat for wading birds such as rosette spoonbills, black-necked stilts, American coots, rails, gallinules, bitterns, several species of herons, great and snowy egrets, white-faced and white ibises. Other non-game birds such as the boat-tailed grackle, red-winged blackbird, cormorants, anhinga, northern harrier,

belted kingfisher and white pelican also use fresh marshes within the project area. The surrounding marshes and chenier ridges provide important resting and over wintering habitat for migratory birds on the Mississippi flyway. Mammals that utilize the area include nutria, muskrat, raccoon, river otter, swamp rabbit, and white-tailed deer.

Future Conditions with No Action

The continued loss of marsh and submerged aquatic vegetation to shoreline erosion would reduce habitat values for a variety of wildlife species. The many ducks and other wetland-associated birds that utilize the marsh and submerged aquatic vegetation for food and cover would be negatively impacted, as would game mammals, fur animals, reptiles and amphibians. This loss is viewed as especially significant from the standpoint of waterfowl wintering habitat, in light of the major importance of the Mermentau Basin marshes to puddle ducks.

Future with construction of a rock dike along the shoreline of White and Bear Lakes (Proposed Action).

With implementation of the proposed action, future conditions would be expected to remain similar to existing conditions. As the shoreline becomes stabilized and marsh begins to fill in behind the breakwater, additional marsh habitat is expected to be created, thus providing more habitat for resident as well as migratory wildlife.

Future with construction of a rock dike along the existing southern shoreline of White Lake and across the opening of Bear Lake with earthen dikes along the shoreline of Bear Lake.

The future with this proposal is expected to be the same as the future with the Proposed Action.

## ESSENTIAL FISH HABITAT

Existing Conditions

This resource is institutionally significant because of the Magnuson-Stevens Fishery Conservation and Management Act. Essential Fish Habitat (EFH) is technically significant because, as the Act states, EFH is "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity."EFH is publicly significant because of the high value that the public places on the seafood and the recreational and commercial opportunities EFH provides.

Specific categories of EFH include all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities), including the sub-tidal vegetation (seagrasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves). The Gulf of Mexico Fishery Management Council, through the generic amendment of the Fishery Management Plans for the Gulf of Mexico, lists the following Federally managed species or species groups as being potentially found in coastal Louisiana: brown shrimp, white shrimp, red drum, gray snapper, and Spanish mackerel. In addition, coastal wetlands provide nursery and foraging habitat that supports economically important marine fishery species such as spotted seatrout, southern flounder, Atlantic croaker, gulf menhaden, striped mullet, and blue crab. These species serve as prey for Federally managed fish species such as mackerels, snappers, groupers, billfishes and sharks.

The proposed project is located in an area that has been identified as EFH for postlarval, juvenile, and sub-adult life stages of white shrimp, brown shrimp, and juvenile red drum. EFH requirements vary depending upon species and life stage (Table 4). Categories of EFH in the project area include estuarine emergent wetlands, estuarine water column, submerged aquatic vegetation, and estuarine water bottoms. Detailed information on Federally managed fisheries and their EFH is provided in the 1998 generic amendment of the Fishery Management Plans for

the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council. The generic amendment was prepared as required by the Magnuson-Stevens Fishery Conservation and Management Act.

In addition to being designated as EFH for white shrimp, brown shrimp, and red drum, aquatic habitats to be affected provide limited-value nursery and foraging habitats for economically important fishery species including Atlantic croaker, striped mullet, gulf menhaden, and blue crab. Those estuarine-dependent species serve as prey for other species managed under the Magnuson-Stevens Fishery Conservation and Management Act by the Gulf of Mexico Fishery Management Council (e.g., red drum, mackerels, snappers and groupers) and highly migratory species (e.g., billfishes and sharks) managed by the National Marine Fisheries Service (NMFS). Affected habitats are currently of limited-value to estuarine fisheries organisms because the CEMVN operated Catfish Point and Schooner Bayou control structures limit estuarine fisheries access into Grand Lake and White Lake.

| Species | Life Stage | Habitat |
|---|---|---|
| brown shrimp | post larval/juvenile | Marsh edge, submerged aquatic vegetation, tidal creeks, inner marsh, shallow open water, nonvegetated bottom, and muddy substrates |
| white shrimp | post larval/juvenile and subadult | Marsh edge and ponds, submerged aquatic vegetation, inner marsh |
| red drum | post larval/juvenile | Submerged aquatic vegetation, estuarine mud bottoms, marsh/water interface |
| (Source: Gulf States Marine Fish Commission (http://www.gsmfc.org), habitat association tables for the 1998 Generic Amendment for Addressing EFH Requirements). | | |

**Table 1. Essential Fish Habitat for Federally Managed Species in the White Lake Project Area.**

Future Conditions with No Action

Fresh marsh and submerged aquatic vegetation is considered by the NMFS to be essential fish habitat for several estuarine-dependent species. The loss of 441 acres of fresh marsh and conversion to shallow, turbid open water areas could contribute to decreased fish stocks in the project area.

Future with construction of a rock dike along the shoreline of White and Bear Lakes (Proposed Action).

During construction phase, approximately 247 acres (breakwater construction footprint of 61,500 feet long x 175 feet wide) of non-vegetated muddy bottom would be disturbed. Approximately 42 acres of non-vegetated muddy bottom would be lost under the footprint of the actual breakwater (30 feet wide x 61,500 feet long). With the breakwater, further shoreline loss would be prevented and marsh would be created between the breakwater and the existing shoreline. Stabilizing the shoreline would protect approximately 687 acres of marsh over the 20-year project life. In addition, through beneficial use of flotation canal dredge material approximately 157 acres of emergent marsh would be created between the breakwater and existing shoreline. This additional marsh, as well as protecting existing marsh would provide important nursery habit for fisheries.

Future with construction of a rock dike along the existing southern shoreline of White Lake and across the opening of Bear Lake with earthen dikes along the shoreline of Bear Lake.

The future with this proposal is expected to be the same as the future with the Proposed Action.

ENDANGERED AND THREATENED SPECIES

Existing Conditions

This resource is institutionally significant because of: the Endangered Species Act of 1973, as amended; the Marine Mammal Protection Act of 1972; and the Bald Eagle Protection Act of 1940. Endangered (E) or threatened (T) species are technically significant because the status of such species provides an indication of the overall health of an ecosystem. These species are publicly significant because of the desire of the public to protect them and their habitats.

Of the 29 listed Threatened or Endangered species listed in Louisiana[6], eight are listed in Vermilion Parish, with others listed as "occasional visitors." Possible listed species in the project area include the brown pelican (E); piping plover (T); Gulf sturgeon (T); leatherback, hawksbill, and Kemp's Ridley sea turtles (all E); green and loggerhead sea turtles (both T). No bald eagle nests are known to occur in the White Lake area. Brown pelicans may rest or feed in the project area, but are not known to be resident. The piping plover is not likely to inhabit the project area due to its preferred habitat of higher salinity intertidal beaches, mudflats, sandflats, algal flats, and wash-over passes with no (or very sparse) emergent vegetation. Of the listed marine species, the five sea turtles are predominately salt or brackish zone species and as White Lake is a fresh water lake, these animals would not be expected to occur in White Lake.

Future conditions with No Action

Without implementation of the proposed action, no threatened or endangered species would be affected. However, as the south White Lake shoreline habitat continues to erode, threatened or endangered species in adjacent areas could be negatively affected do to reduced prey species habitat.

Future with construction of a rock dike along the shoreline of White and Bear Lakes (Proposed Action).

With implementation of the proposed action, there would be no direct or indirect affects on threatened or endangered species. Bald eagles and brown pelicans may be occasional visitors in the project area, but the south shore of White Lake is not a known nesting or major feeding ground. Protected marine mammals, fish or turtles could conceivably swim to White Lake through the several canals interlacing the area. However, since the lake is within the upper limits of the tidal system and freshwater, these animals are not likely to be in the lake or project area. In a letter dated 11 May 2004, the U.S. Fish and Wildlife Service concurred with CEMVN's determination that the proposed action is not likely to adversely affect any Federally listed threatened or endangered species.

Future with construction of a rock dike along the existing southern shoreline of White Lake and across the opening of Bear Lake with earthen dikes along the shoreline of Bear Lake.

The future with this proposal is expected to be the same as the future with the Proposed Action.

[6] U.S. Fish and Wildlife Service web page, http://ecos.fws.gov/servlet/TESSwebpage

## CULTURAL/HISTORIC RESOURCES

Existing Conditions

This resource is institutionally significant because of: the National Historic Preservation Act of 1966, as amended; the Native American Graves Protection and Repatriation Act of 1990; and the Archeological Resources Protection Act of 1979; as well as other statutes. Cultural resources are technically significant because of: their association or linkage to past events, to historically important persons, and to design and/or construction values; and for their ability to yield important information about prehistory and history. Cultural resources are publicly significant because preservation groups and private individuals support their protection, restoration, enhancement, or recovery. Various cultural resources including both prehistoric and historic sites occur throughout the Louisiana coastal zone. The Louisiana Department of Culture, Recreation and Tourism maintains catalogues of numerous cultural resource sites, but many areas remain unsurveyed. No sites have been identified within the project area.

Existing Conditions

Although no formal archaeological surveys have been conducted in the project vicinity, several prehistoric and historic sites have been recorded in the Pecan Island region of Vermilion Parish south of White Lake. These sites include both historic as well as prehistoric archaeological components. Each of these sites is located on stranded beach ridges representing the only significant topographic relief in southern Vermilion Parish. Most notable of the recorded sites is 16VM9, also known as the Morgan site. The Morgan site originally consisted of four mounds constructed during the Coles Creek period (ca. a. d. 700 – 1100). None of the recorded sites in the vicinity, however, are located directly within the project area.

Future Conditions with No Action

There will be no immediate impact on any cultural resources. However, if erosion rates in the vicinity of south White Lake remain constant, these processes may eventually impact archaeological sites located to the south.

Future with construction of a rock dike along the shoreline of White and Bear Lakes (Proposed Action).

A review of state site records indicates that there are currently no recorded prehistoric or historic archaeological resources within the proposed project area. In addition, no previous cultural resource surveys have been undertaken in the project area. An examination of the distribution of sites in the project vicinity indicates that all recognized sites occur on the relatively higher natural ridges located to the south of the project area. Given this trend it is unlikely that any intact cultural remains will be found immediately within the project area. Examination of historic maps indicates that erosion along the south shore of White Lake has eroded at a high rate since at least the 1930s. Some portions of the project area appear to have undergone as much as 10-15 feet of shoreline erosion per year during the past several decades. Other portions of the project area, however, have been less dramatically affected by this process. As a result, it is unlikely that any unrecorded shipwrecks will be encountered within the project area (i.e., within 500 feet of the shoreline). In addition to the literature examination, C. Baxter Mann (CEMVN), conducted a field visit on 15 July 2004, and no cultural resources were observed.

Based on the literature review and field visit by CEMVN archaeologist, the proposed action will not affect any significant cultural resources. No additional cultural resources investigations will be conducted. In the event that significant cultural resources are encountered during the project, work in the location of the site will be halted. Coordination will be conducted with the Louisiana State Historic Preservation Office (SHPO).

Future with construction of a rock dike along the existing southern shoreline of White Lake and across the opening of Bear Lake with earthen dikes along the shoreline of Bear Lake.

The future with this proposal is expected to be the same as the future with the Proposed Action.

## RECREATIONAL RESOURCES

The natural and recreational resources of the project area provide wide and varied opportunities for outdoor enjoyment. Recreational activities taking place in White Lake include motorized and non-motorized boating, environmental study, hunting, fishing, and wildlife viewing, including nature photography. Recreational fishing is by far the most popular activity in the area due to the presence of the Gulf of Mexico, numerous other water bodies and access into adjacent bayous and marshes. Small game hunting in the adjacent marshes is also popular due to the abundance of habitat and a wide range of species available to the hunter.

### Existing Conditions

The White Lake/Vermilion Parish area is bountiful in recreational opportunities. Within the proposed project vicinity is a population of approximately 53,661 residents. Many of that number engage in multiple recreational uses. On any given day during the year, families can be seen fishing, boating, bird watching, sightseeing and hunting in the vicinity of the project. Included within the proposed project's market area are: 5,648 registered boats, 10,064 resident fishing licenses, and 4,034 resident hunting licenses[7].

### Future Conditions with No Action

Without implementation of the proposed action, White Lake would continue to be impacted by increasing amounts of sediment and nutrients being introduced into it as well as shoreline erosion along the southern shoreline. Recreational use within the project area would continue as it is at present. Erosion is expected to continue along the shoreline impacted by wind and wave erosion. While natural population growth would bring more visitors to the area over time, their experience would be diminished by the negative impacts of no action.

Future with construction of a rock dike along the shoreline of White and Bear Lakes (Proposed Action).

The recreational environment in and around the project would experience limited short-term disruption imposed by the physical size and working activities of the floating bucket dredge and associated equipment. Construction of the breakwaters would increase turbidity in the vicinity of work, temporarily disrupting fishing activities. This turbidity would temporarily displace any water-oriented recreational activity taking place during construction to other areas in lake.

The fish and wildlife community thru the construction of the breakwater would realize positive long-term benefits. The breakwaters would provide a new area for fisheries to breed, colonize and forage. Larger sport fish would be attracted by the presence of smaller baitfish and shrimp using the rocks for protection. The exposed rocks would provide areas for birds to loaf and forage.

Future with construction of a rock dike along the existing southern shoreline of White Lake and across the opening of Bear Lake with earthen dikes along the shoreline of Bear Lake.

The future with this proposal is expected to be the same as the future with the Proposed Action.

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[7] Louisiana Department of Wildlife and Fisheries 2003 statistics

## AESTHETICS

This resource's institutional significance is derived from laws and policies that affect visual resources, most notably the 1969 National Environmental Policy Act, (NEPA). The 1988 U.S. Army Corps of Engineers Visual Resources Assessment Procedure (VRAP) provides a technical basis for identifying the project's significant impacts. Public significance is based on expressed public perceptions and professional analysis of the projects visual impacts.

Existing Conditions

Primary viewpoints into the proposed project area emanate from recreational and commercial boats as they enter White Lake from Schooner Bayou or smaller canals. Viewpoints that may provide some visual interest are based on the interplay of forms and textures occurring when manmade elements are contrasted by water, vegetation and changes in elevation from the water's edge to dry land.

Future Conditions with No Action

Without implementation of the proposed action, visual resources would evolve from Existing Conditions as dictated by White Lake's wave action causing land erosion and resulting in the loss of shoreline vegetation.

Future with construction of a rock dike along the shoreline of White and Bear Lakes (Proposed Action).

The creation of marsh by beneficial use of dredge materials behind the proposed breakwater would benefit existing visual resources by providing depth to an otherwise narrow viewed stretch of vegetation. The created marsh would also provide additional contrast in form and texture to the existing background as defined by the existing vegetated shoreline. There may be some perceived visual disturbances as an unnatural breakwater structure is placed in front of somewhat naturally evolved shoreline but the visual benefits surrounding the possible creation of marsh far outweigh any perceived visual disturbances.

During construction activity, loud sounds and visual noise from dredging and disposal activities would temporarily affect aesthetic resources in an otherwise quiet remote area. These minor impacts would be of short duration and the project area should stabilize quickly.

Future with construction of a rock dike along the existing southern shoreline of White Lake and across the opening of Bear Lake with earthen dikes along the shoreline of Bear Lake.

The future with this proposal is expected to be the same as the future with the Proposed Action.

## AIR QUALITY

This resource is considered institutionally significant because of the Louisiana Environmental Quality Act of 1983, as amended, and the Clean Air Act of 1963, as amended. Air Quality is technically significant because of the status of regional ambient air quality in relation to the National Ambient Air Quality Standards (NAAQS). It is publicly significant because of the desire for clean air expressed by virtually all citizens.

Vermilion Parish is currently classified in attainment of all NAAQS. This classification is the result of area-wide air quality modeling studies. The total volatile organic compound emissions for this project during construction is anticipated to be well below the *de minimis* level of 100 tons per year. Therefore, this action conforms to the Louisiana State Implementation Plan.

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

The CEMVN is obligated under Engineer Regulation 1165-2-132 to assume responsibility for the reasonable identification and evaluation of all Hazardous, Toxic, and Radioactive Waste (HTRW) contamination within the vicinity of the proposed action. A HTRW Land Use History and a Phase I HTRW Initial Site Assessment (ISA #234) have been completed for the proposed action and are on file in the CEMVN. The proposed work site is shallow open water, some of which was formerly marsh in recent times. The land use history of the area did not reveal any evidence suggesting the possible presence of HTRW. The site has never been developed or had any buildings on it. Neither EPA records nor aerial photographs suggested the possible presence of HTRW. A field trip on 15 July 2003 to the work site revealed several small oil or gas platforms in the lake. There was no evidence of HTRW, such as oily sheens on the water, chemical odors, discolored water or soil, or dead or dying animals or vegetation. There are several oil and gas pipelines through the area, the location of which has been recorded by the USACE-MVN Relocations Section. Provided that sufficient care is used to prevent damage to these pipelines, the risk of HTRW is low, and the work should proceed as scheduled. No further HTRW investigation is warranted.

## CUMULATIVE IMPACTS

Erosion due to artificially elevated water levels is thought to be the leading cause of shoreline loss in White Lake. High water levels were maintained in the Lakes Subbasin beginning in 1951, with the installation of the Catfish Point Control Structure, through the mid 1970s. Since then, the water level has been affected by Catfish Point Control Structure, Schooner Bayou Control Structure, Leland-Bowman Lock (formerly Vermilion Lock), Calcasieu Lock, and tidal influence. Dunbar, *et al.* (1992) states that the greatest land loss in the Lake Subbasin occurred between 1956 and 1974. CEMVN has managed water at a lower level since the early 1990s, but the lake rims were badly eroded by this time. Consequently, the historical buffer from wave energy was also gone.

The proposed project serves as a barrier to prevent further erosion of the southern shoreline of White Lake. Impacts associated with construction would be limited to the footprint of the breakwater and the flotation canal. Material from the flotation canal would be cast inside the breakwater where feasible. Shoreline loss would be prevented and some marsh would accrete on the land side (southern side) of the breakwater. At the end of 20 years, 844 acres of fresh marsh would be protected and/or created (687 acres wetlands/marsh plus 157 acres beneficial used of dredge material). At current erosion rate of about 15 feet per year, approximately 424 acres of valuable wetland habitat could potentially be converted to shallow open water over a 20-year period.

## COORDINATION

Preparation of this EA and a draft Finding of No Significant Impact (FONSI) has been coordinated with appropriate Congressional, Federal, state, and local interests, as well as environmental groups and other interested parties. The following agencies, as well as other interested parties, are receiving copies of this EA and draft FONSI:

U.S. Department of the Interior, Fish and Wildlife Service
U.S. Environmental Protection Agency, Region VI
U.S. Department of Commerce, National Marine Fisheries Service
U.S. Natural Resources Conservation Service, State Conservationist
Advisory Council on Historic Preservation
Governor's Executive Assistant for Coastal Activities

Louisiana Department of Wildlife and Fisheries
Louisiana Department of Natural Resources, Coastal Management Division
Louisiana Department of Natural Resources, Coastal Restoration Division
Louisiana Department of Environmental Quality, PER-REGC
Louisiana Department of Environmental Quality, EP-SIP
Louisiana State Historic Preservation Officer

## MITIGATION

The proposed action would only create minimal and insignificant impacts to benthic habitat as a result of the dredging of the flotation channel, deposition of the dredge material on the inshore side of the dike, and the construction of the dike. These impacts would be related to the temporary loss of aquatic habitat and any associated flora and fauna due to these activities. The impacted areas are shallow and subject to sedimentation and turbidity as a result of wave action, and are not conducive to supporting significant flora and fauna. Benthic flora and fauna that may be displaced or destroyed are expected to rapidly re-colonize the impacted areas, except for the dike footprint, once construction has been completed. It is also important to point out that much of this shallow water habitat, where construction activities will occur, was previously fresh marsh and the associated benthic habitat in these areas is the result of long-term shoreline erosion activities. Therefore, any impacts should be temporary significant. Additionally, the proposed action is expected to create about 157 acres of wetlands on the inshore side of the dike. The benefits from this additional 157 acres of fresh marsh over the life of the project should far exceed any minor impacts created by the dike and associated dredging activities. Therefore, no mitigation is required for this project.

## COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Environmental compliance for the proposed action would be achieved upon: coordination of this EA and draft Finding of No Significant Impact (FONSI) with appropriate agencies, organizations, and individuals for their review and comments; U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) confirmation that the proposed action would not be likely to adversely affect any endangered or threatened species; Louisiana Department of Natural Resources concurrence with the determination that the proposed action is consistent, to the maximum extent practicable, with the Louisiana Coastal Resources Program; receipt of a Water Quality Certificate from the State of Louisiana; public review of the Section 404(b)(1) Public Notice; signature of the Section 404(b)(1) Evaluation; receipt of the Louisiana State Historic Preservation Officer Determination of No Affect on cultural resources; receipt and acceptance or resolution of all USFWS Fish and Wildlife Coordination Act recommendations; receipt and acceptance or resolution of all Louisiana Department of Environmental Quality comments on the air quality impact analysis documented in the EA; and receipt and acceptance or resolution of all NMFS Essential Fish Habitat recommendations. The draft FONSI will not be signed until the proposed action achieves environmental compliance with applicable laws and regulations, as described above.

## CONCLUSION

The proposed action consists of building approximately 61,500 linear feet (~ 11.6 miles) of stone breakwater stretching from Will's Point to the western edge of Bear Lake along the southern shoreline of White Lake. This office has assessed the environmental impacts of the proposed action and has determined that the proposed action would have no significant impact on fisheries, wildlife, threatened or endangered species, cultural resources, recreation, aesthetics,

and air quality. Risk of encountering HTRW on this project is low. Approximately 42 acres of muddy and non-vegetated bottom, would be lost under the footprint of the breakwater; however, the stabilization and creation of approximately 687 acres of more desirable freshwater marsh which provides important nursery habitat (essential fish habitat) would make up for this loss. Through the beneficial use of dredge materials, an additional 157 acres of marsh would be created between the breakwater and the existing shoreline. This project is anticipated to benefit 2,359 acres of fresh marsh and 3,114 acres of open water for a total 5,473 acres. Shoreline loss would be prevented and some marsh would accrete south of the breakwater so at the end of 20 years, 844 acres (253 AAHUs) of marsh would be protected and/or created.

## PREPARED BY

EA #390 and the associated draft FONSI were prepared by Elizabeth L. McCasland and W. Kenneth Derickson, Biologists, with relevant sections prepared by: J. Christopher Brown – HTRW; C. Baxter Mann - Cultural Resources; Jay V. Gamble – Recreation; and Melanie Goodman – Project Manager. The address of the preparers is: U.S. Army Corps of Engineers, New Orleans District; Planning, Programs, and Project Management Division, CEMVN-PM; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

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## Appendix A

## Wetland Value Assessment

# Project Information Sheet for Wetland Value Assessment
# South White Lake, Vermilion Parish, LA

**Project Name:** South White Lake Shoreline Protection (ME-22)

**Sponsoring Agency:** U.S. Army Corps of Engineers
Environmental Work Group Contact: Sean Mickal, (504) 862-2319
Engineering Work Group Contact: Chris Monnerjhan, (504) 862-2415
Corps Project Manager Point of Contact: Melanie Goodman, (504) 862-1940
DNR Project Manager Point of Contact: Ken Duffy, (225) 342-4106

**Project Area:** The project is located in Vermilion Parish, along the south shoreline of White Lake, between Will's Point and the western shore of Bear Lake.

Sub Area A (The Kaplan Tract)
These acres come from USGS 1998 DOQQs. The acreage has been brought forward to 2002 using a loss rate of 1.37%. The reason for using this loss rate is explained later.

Total acres 4,717 acres
Fresh Marsh 1,935 acres
Open water 2,782 acres

There is no change in these acres from the last WVA prepared during Phase 0, dated 18 September 2002.

Sub Area D (The Shoreline)
Protection is based on a 15-foot per year loss rate over 20 years; a shoreline length of 61,500 feet; and the dike placed 250 feet offshore at the -1.5 foot (NAVD 88) contour in approximately 2-3 feet of water, stage dependent. Toe of dike is approximately 235 feet off shore (235 x 61,500) = 14,452,500 = 332 acres

Total acres 756 acres
Fresh Marsh 424 acres
Open water 332 acres

Total Project Acreages: *Areas A and D only*
Total acres 5,473 acres
Fresh Marsh 2,359 acres
Open water 3,114 acres

Net Areas Preserved

| Net Areas Preserved | | |
|---|---|---|
| | Sub Area A | Sub Area D |
| FWOP TY20 | 1,150 | 0 |
| FWP TY20 | 1,413 | 424 |
| **Net Preserved** | **263** | **424** |

Total Net Preserved (Sub Area A + Sub Area D) = 687 acres
Total Net Acres Created Sub Area D = 157
Total Net Gain FWP TY20 = 844

**Problem:**
Sub Area A: This sub area is expected to experience accelerated marsh loss when interior levees are breached as a result of a shoreline levee breach sometime around TY12. The area has subsided due to several years of gravity drainage and portions are below the level of White Lake. This area has been enlarged over the PPL 11 project to take into account the area is hydrologically connected and drained by a single pump in the southeast corner of the boundary area.

Sub Area D: Erosion is believed to be the cause of marsh loss in this Sub Area. USACE land loss maps indicate it is the only cause of loss in a strip about a mile wide along the south shore of White Lake. The old lake rim has eroded away and the more fragile marshes erode more rapidly as evidenced by the severely scalloped shoreline in the Sub Area. The breakwater addresses the erosion problem in Sub Area D. Approximately 157 acres of marsh would be created from beneficial use of material dredged for floatation channel.

**Goals:**
The project goal is to stop erosion along the South White Lake shoreline between Will's Point and west of Bear Lake, and to build marsh substrate behind the rock breakwaters using dredge material from the project construction floatation channel. A secondary goal is to prevent a breach from occurring between White Lake and the management unit known as the Kaplan Tract.

**Project Features:**
A segmented breakwater would be constructed at the -1.5-foot NAVD 88 contour in two to three feet of water, stage dependent. The breakwater would be constructed along approximately 61,500 linear feet of shoreline between Will's Point and past the western side of Bear Lake. The breakwater would follow along the shoreline of Bear Lake. The breakwater would have a crown elevation of +3.5 feet NAVD 88, with a 4-foot wide crown and 1V on 1.5H side slopes. The stone section would be placed on geotextile reinforcing fabric. There would be 50-foot wide, rock lined gaps in the breakwater at 1,000-foot intervals. A flotation channel would be necessary to construct the dike. Dredge material removed to construct the floatation channel would be beneficially used to create 157 acres of marsh substrate between the breakwater and the shoreline. The original WVA attributed 60 acres of benefits due to accretion over the 20-year project life. The breakwater design has been revised and is higher than the conceptual plan. Since overtopping of the breakwater is not expected to occur as frequently as the conceptual plan, and the area between the breakwater and the shoreline would be filled with dredge material to create marsh substrate, incremental benefits are no longer being attributed to accretion. However, it is believed that the breakwater would be overtopped periodically, and sufficient accretion would occur over the life of the project to help nourish and sustain the elevation and health of the created marsh.

**Monitoring Information:**

Cameron Prairie Refuge Protection
A 13,200-foot long rock breakwater was placed on the north bank of the GIWW in January 1994. It was 0-50 feet offshore in 3-4 feet of water. The rocks stopped erosion in the project area and allowed 4.6 feet of horizontal accretion in the first year. This fresh marsh area accreted 1.4 acres per year over 13,200 feet and now completed covers the area between the dike and the shoreline. In the reference area, erosion continued at 4 feet per year.

Freshwater Bayou Wetlands (ME-04) Phase I
A 28,000-foot long rock dike was completed along the western bank of Freshwater Bayou in January 1995. Over the next year 2.3 feet of land accreted behind the rocks while the reference area eroded 6.5 feet.

Boston Canal/Vermilion Bay Sub Area D Protection
Breakwaters were built to a +4 foot elevation in 4-6 feet of water at the mouth of Boston Canal in December 1994. Sediment fences were placed behind the breakwaters. Within less than a year, there was between 1.5 and 4.5 feet of vertical accretion behind the breakwaters.

Blind Lake Shore Protection
In a state only project, a 2,340-foot rock breakwater was built across the mouth of Blind Lake on the south bank of the GIWW in 1989. Giant cutgrass was planted 70 feet from shore. Containerized had 99 % survival at 2.5 months, fresh dug had 82 % survival. In 2.5 years, vertical accretion was .3 feet. By the mid-90s, this entire fresh marsh area had filled and was colonized with giant cutgrass, elephant ear and willow.

Tuttle Cove Gabions
In a state-only project, 1,642 feet of rock –filled gabions were built across the mouth of the Prairie on the western shore of Lake Pontchartrain in 1994. They were 300 feet offshore and 3 feet above mean high water. This intermediate to brackish area prograded an average of 3.5 feet per year while the reference area eroded 6.3 feet per year. There was a 6-foot gap near the south end of the gabions and accretion was greater near this gap. By 1999 the gabions were starting to deteriorate.

## V1 Emergent Vegetation

Baseline
Emergent Vegetation - This area has been classified as fresh marsh since O'Neil mapped it. The dominant vegetation has changed from the sawgrass found by O'Neil to mainly *Phragmites communis, Zizaniopsis miliacea, Scirpus californicus,* and *Sagittaria falcata* as noted by Chabreck in 1997. Numerous other fresh marsh species, such as elephant ear, *Sesbania*, and willow were noted.

Soils and Subsidence - The soil type along the White Lake Sub Area D between Bear Lake and Will's Point is mainly Larose muck. Larose Muck is classified as very poorly drained and very slowly permeable, semi-fluid mineral soils. The subsidence rate in this area is low (from 0 to 1

foot per century)[1]. Lake bottom in the project area was former shoreline and consists of very soft to soft fat clay with lenses and layers of lean clay, silt, and peat with relatively high moisture contents and wood. Approximately 4 to 10 feet of lacustrine deposits are found with the marsh/swamp. Lacustrine deposits consist of very soft to soft fat and lean clays with shell fragments. Pleistocene age deposits underlie marsh/swamp and lacustrine deposits and are found 7-25 feet deep, with the much deeper deposits on the western end of the project site. These Pleistocene deposits consist of stiff to very stiff clays, silts, silty sand, and sands with low water content.[2]

Sub Area A

The southwestern portion of this area has opened significantly since the late 1980s when land management strategies in this area changed. The USACE data ends at 1990 therefore, 1998 DOQQs from LDNR were coupled with the USACE data to calculate a loss rate from 1990 to 1998. The DNR acreages were adjusted accordingly to calculate the loss rate. Erosion rates calculated by comparing 1978-79 aerial photography with 1997-98 aerial photographs showed erosion rates averaging 47.62 acres per year or roughly 0.91% per year. A comparison was then done using the 1998 DOQQ compared to the 1993 Land/Water classification. This later comparison showed an erosion rate during this 5 year time period of 8.30% per year. This erosion rate exemplifies the land loss potential when agricultural land is abandoned and allowed to convert back to fresh water marsh after decades of active farming. A weighted average using USGS data from 1956 to 1998 showed an average loss per year of 1.37%. This average was used as the base loss rate. It was determined that a levee breach would occur in TY12. A 25% increase in erosion rate was factored into the PPL 11 candidate project. However, given the calculated land loss from 1993 to 1998 and recent survey data, which suggests that much of Sub Area A is below mean Catfish Lake level, the potential for inundation could be even more severe. As a result, a 50% increase in loss rate (to 2.06%) was applied after year 12.

| | Sub Area A |
|---|---|
| COE % Loss 55-74 per year | 0.02 |
| COE % Loss 74-90 per year | 0.71 |
| COE % Loss 83-90 per year | 1.57 |
| | |
| USGS % Loss 56-78 per year | 0.05 |
| USGS % Loss 78-98 per year | 0.91 |
| | |
| USGS Apparent % Loss 93-98 per year | 8.30 |
| | |
| **Weighted Averages** | |
| COE % Loss 55-90 per year | 0.34 |
| USGS % Loss 56-90 per year | 0.35 |
| USGS % Loss 56-98 per year | 1.37 |

[1] USDA Natural Resources Conservation Service. 1996. Soil Survey of Vermilion Parish, Louisiana
[2] CEMVN. 2004. CWPPRA South White Lake Shoreline Protection Project (#ME-22), Vermilion Parish, LA, Preliminary Design Report.

| Sub Area A | Land | % | Water | % | Total | % |
|---|---|---|---|---|---|---|
| 1993 | 4072.92 | 85.02166 | 717.53 | 14.97834 | 4790.45 | 100 |
| 1998 | 2058.54 | 43.53603 | 2669.82 | 56.46397 | 4728.36 | 100 |
| 1998 rec | 2085.572 | 43.53603 | 2704.878 | 56.46397 | 4790.45 | 100 |

| | | |
|---|---|---|
| Loss/Gain 1993-1998 | 1987.348 | acres |
| % Loss 1993-1998 | 41.48563 | |
| Acres Lost Per Year | 397.4697 | |
| % Lost Per Year | 8.297126 | |
| Erosion Rate 93-98 | 8.30% | |

Sub Area D

This area uses the estimated Sub Area D erosion rate instead of land loss from Britsch's maps. Erosion rates were calculated by comparing 1978-79 color IRs and the 1997-98 infragreens. Sub Area D erosion rates averaged approximately 15 feet per year.

Future without project

Sub Area A

With an erosion rate of 15 feet per year on the south shore of White Lake, it was estimated that after TY12 the levee would break in several places bordering Sub Area A. For the first 11 years a loss rate of 1.37% was used. It is doubtful that the landowner would repair the levee. Since a large portion of the leveed area is below the water level in White Lake, a portion of the area would be flooded. It is projected that a rapid loss of marsh would occur following inundation from White Lake. This loss of marsh is expected to occur in TY12 as a 20% loss of the TY11 marsh acreage. Following this instantaneous marsh loss, the land loss rate would be 50% higher than the rate used for TY1 – TY11. A 50% increase in the 1.37% rate is 2.06% per year.

Future with project

The project protects the shoreline and so no breach occurs, therefore the loss rate of 1.37% per year remains constant through TY20.

| Future without project | | | Future with project | | |
|---|---|---|---|---|---|
| TY0 | 41% | 1,935/4,717 | TY0 | 41% | 1,935/4,717 |
| TY1 | 40% | 1,909/4,717 | TY1 | 40% | 1,909/4,717 |
| TY11 | 35% | 1,663/4,717 | | | |
| TY12 | 28% | 1,330/4,717* | | | |
| TY20 | 24% | 1,150/4,717** | TY20 | 30% | 1,413/4,717 |

*Levee breach occurs causing a 20% loss of TY11 acreage

**Loss rate of 2.06% is applied to TY12 acreage

Sub Area D

Future without project

When the average erosion rate of 15 feet per year was applied to the 61,500 feet of Sub Area D over 20 years, a total of 424 acres would be lost without the project. This averages to 21 acres per year.

Future with project
The breakwater is assumed to stop erosion along the Sub Area D. The dredged material from the flotation canal would be beneficially used to create approximately 157 acres of marsh.

| Future without project | | | Future with project * | | |
|---|---|---|---|---|---|
| TY0 | 56% | 424 acres | TY0 | 56% | 424 acres/756 |
| TY1 | 52% | 403 acres | TY1 | 58% | 440 acres (424 + 16 created)/756 |
| | | | TY5 | 77% | 581 acres (424 + 157 created)/756 |
| TY20 | 0% | 0 acres | TY20 | 77% | 581 acres (424 + 157 created)/756 |

*For future with project, 157 acres of marsh substrate created by beneficial disposal of material dredged for floatation channel would produce 10% or 16 acres of emergent vegetation in TY1 and 100% or 157 acres of emergent vegetation at TY5.

## V2 Submerged Aquatic Vegetation

Sub Area A
Baseline
TY0 20% - DNR habitat data

| Future without project | | Future with project |
|---|---|---|
| TY1 | 20% | TY1 – 20% |
| TY11 | 20% | |
| TY12 | 17%* | |
| TY20 | 15% | TY20 – 20%** |

*After the levee breaks through, the SAV coverage would likely decrease. The group decided not to decrease the coverage very much since SAV does occur n Bear Lake, demonstrating that the turbid water from White Lake would not eliminate SAV.
**The SAV would remain at 20% since the breakwater would prevent the levee break.

Sub Area D
Baseline
TY0 1% Almost no SAV exists along the shoreline of White Lake, except along the edge of Bear Lake.

| Future without project | | Future with project | |
|---|---|---|---|
| TY1 | 1% | TY1 | 5% |
| | | TY5 | 60%** |
| TY20 | 1%* | TY20 | 60% |

*As erosion continues, the SAV coverage would likely remain at 1% as the area continues to erode and deepen.
**The breakwater and created marsh would protect the approximately 50-foot wide area of open water remaining between the shoreline. The entire open water area is expected to become shallow (less than 1.5 feet deep) and SAV coverage would substantially increase.

## V3 Marsh Edge/Interspersion

Sub Area A

Baseline

TY0 Class 1 - 10%
Class 2 - 40%
Class 3 - 20%
Class 4 - 30%

| Future without project | | Future with project |
|---|---|---|
| TY1 | Same as existing | Same as existing |
| TY11 | Class 1 - 5%<br>Class 2 - 40%<br>Class 3 - 20%<br>Class 4 - 35% | N/A |
| TY12 | Class 2 - 15%<br>Class 3 - 30%<br>Class 4 - 55% | N/A |
| TY20 | Class 2 - 10%<br>Class 3 - 30%<br>Class 4 - 60% | Class 2 - 40%<br>Class 3 - 20%<br>Class 4 - 40% |

Sub Area D

Baseline

The marsh is solid, but its proximity to open water makes about 50% a Class 4.

TY0 Class 1 - 50%
Class 4 - 50%

| Future without project | | Future with project | |
|---|---|---|---|
| TY1 | Class 1 - 50%<br>Class 4 - 50% | TY1 | Class 1 - 100%* |
| | | TY5 | Class 1 - 100% |
| TY20 | Class 5 - 100% | TY20 | Class 1 - 100% |

*The created marsh would increase the actual acreage and percent of Class 1, comparing FW to FWO.

## V4 Shallow Open Water

Sub Area A

Baseline

TY0 80% 2,226/2,782 acres - According to Mr. Randy Moertle

| Future without project | Future with project |
|---|---|
| TY1 80% | TY1 80% |
| TY11 81% | |
| TY12 75% | |
| TY20 75% | TY20 83% |

Assume all marsh lost becomes SOW

Sub Area D

Baseline

According to transect data furnished by NRCS, shallow water ≤1.5-feet deep extends to about 30 feet offshore in this area of White Lake. Thus, about 42 acres of the 332 acres of open water are shallow.

TY0 13% 42/332

Future without project

Sub Area D erosion would continue and the percentage of water in the project area would increase. The strip of shallow water would stay the same size.

TY1 12% 42/353

TY20 6% 42/756

Future with project

Sub Area D erosion would be stopped and marsh would be created in 157 acres of the open water area leaving 175 acres of open water. Most of the remaining 50-foot wide, open water area between the created marsh and the existing shoreline would remain or become shallow ( ≤.5 feet). The water depth in and near the areas that would be occupied by the fish gaps is expected to remain > 1.5 feet (approximately 12 acres [41.9 ft x 200 ft (area of water bottom between gap and created marsh) x 61 (number of gaps)]).

TY1 24% 42/175

TY5 93% 163/175

TY20 93% 163/175

By TY3 all remaining open water between the existing shoreline and the newly created marsh, which would average approximately 50 feet wide, would be shallow.

## V5 Salinity

Sub Area A

Baseline

TY0 0 ppt

| Future without project | Future with project |
|---|---|
| TY1 0 ppt | TY1 0 ppt |

TY11 0 ppt
TY12 1 ppt *
TY20 1 ppt TY20 0 ppt
* Levee break increases salinity to 1 ppt, same as Catfish Lake.

Sub Area D
Average high salinity at Catfish Point north was about 3.5 ppt during the growing seasons from 1995-98 (HICP, July 2000 draft). As the Mermentau River water moves into Grand Lake, salinity would become diluted. The mean high salinity in White Lake would probably be about 1 ppt. The project would do nothing to change salinity.

Baseline
TY0 1 ppt

| Future without project | | Future with project | |
|---|---|---|---|
| All TYs | 1 ppt | All TYs | 1 ppt |

## V6 Fish Access

Sub Area A
Baseline
TY0 0.0001 The value for fresh marsh without fish access.

| Future without project | | Future with project | |
|---|---|---|---|
| TY1 | 0.0001 | TY1 | 0.0001 |
| TY11 | 0.0001 | | |
| TY12 | 0.1* | | |
| TY20 | 0.1 | TY20 | 0.0001 |

*Levee breaks increasing to 0.1, the same as White Lake.

Sub Area D
Baseline
TY0 0.1 The rating for the Catfish Point Control Structure.

| Future without project | | Future with project | | |
|---|---|---|---|---|
| TY1 | 0.1 | TY1 | 0.1 | Access would remain 0.1 due to the fish dips. |
| | | TY3 | 0.1 | |
| | | TY5 | 0.1 | |
| TY20 | 0.1 | TY20 | 0.1 | |

# WETLAND VALUE ASSESSMENT COMMUNITY MODEL
## Fresh/Intermediate Marsh

Project: South White Lake Shoreline Protection
Area A - Kaplan Tract
Condition: Future Without Project

Project Area:
Fresh..... 4,717
Intermediate..

| Variable | | TY 0 | | TY 1 | | TY 11 | |
|---|---|---|---|---|---|---|---|
| | | Value | SI | Value | SI | Value | SI |
| V1 | % Emergent | 41 | 0.47 | 40 | 0.46 | 35 | 0.42 |
| V2 | % Aquatic | 20 | 0.28 | 20 | 0.28 | 20 | 0.28 |
| V3 | Interspersion | % | | % | | % | |
| | Class 1 | 10 | 0.48 | 10 | 0.48 | 5 | 0.44 |
| | Class 2 | 40 | | 40 | | 40 | |
| | Class 3 | 20 | | 20 | | 20 | |
| | Class 4 | 30 | | 30 | | 35 | |
| | Class 5 | | | | | | |
| V4 | %OW <= 1.5ft | 80 | 1.00 | 80 | 1.00 | 81 | 1.00 |
| V5 | Salinity (ppt) | | | | | | |
| | fresh | 0 | 1.00 | 0 | 1.00 | 0 | 1.00 |
| | intermediate | | | | | | |
| V6 | Access Value | | | | | | |
| | fresh | 0.0001 | 0.30 | 0.0001 | 0.30 | 0.0001 | 0.30 |
| | intermediate | | | | | | |
| | **Emergent Marsh HSI =** | | **0.50** | **EM HSI =** | **0.50** | **EM HSI =** | **0.47** |
| | **Open Water HSI =** | | **0.41** | **OW HSI =** | **0.41** | **OW HSI =** | **0.40** |

**Future Without Project, continued**

| Variable | | TY 12 | | TY 20 | | | |
|---|---|---|---|---|---|---|---|
| | | Value | SI | Value | SI | Value | SI |
| V1 | % Emergent | 28 | 0.35 | 24 | 0.32 | | |
| V2 | % Aquatic | 17 | 0.25 | 15 | 0.24 | | |
| V3 | Interspersion | % | | % | | % | |
| | Class 1 | | 0.00 | | 0.00 | | |
| | Class 2 | 15 | | 10 | | | |
| | Class 3 | 30 | | 30 | | | |
| | Class 4 | 55 | | 60 | | | |
| | Class 5 | | | | | | |
| V4 | %OW <= 1.5ft | 75 | 0.94 | 75 | 0.94 | | |
| V5 | Salinity (ppt) | | | | | | |
| | fresh | 1 | 0.00 | 1 | 0.00 | | |
| | intermediate | | | | | | |
| V6 | Access Value | | | | | | |
| | fresh | 0.10 | 0.00 | 0.10 | 0.00 | | |
| | intermediate | | | | | | |
| | **EM HSI =** | | **0.00** | **EM HSI =** | **0.00** | **EM HSI =** | |
| | **OW HSI =** | | **0.07** | **OW HSI =** | **0.07** | **OW HSI =** | |

# WETLAND VALUE ASSESSMENT COMMUNITY MODEL
## Fresh/Intermediate Marsh

Project: South White Lake Shoreline Protection
Area A - Kaplan Tract
Condition: Future With Project

Project Area:
Fresh..... 4,717
Intermediate....

| Variable | | TY 0 | | TY 1 | | TY 20 | |
|---|---|---|---|---|---|---|---|
| | | Value | SI | Value | SI | Value | SI |
| V1 | % Emergent | 41 | 0.47 | 40 | 0.46 | 30 | 0.37 |
| V2 | % Aquatic | 20 | 0.28 | 20 | 0.28 | 20 | 0.28 |
| V3 | Interspersion | % | | % | | % | |
| | Class 1 | 10 | 0.48 | 10 | 0.48 | | 0.40 |
| | Class 2 | 40 | | 40 | | 40 | |
| | Class 3 | 20 | | 20 | | 20 | |
| | Class 4 | 30 | | 30 | | 40 | |
| | Class 5 | | | | | | |
| V4 | %OW <= 1.5ft | 80 | 1.00 | 80 | 1.00 | 83 | 1.00 |
| V5 | Salinity (ppt) fresh intermediate | 0 | 1.00 | 0 | 1.00 | 0 | 1.00 |
| V6 | Access Value fresh intermediate | 0.0001 | 0.30 | 0.0001 | 0.30 | 0.0001 | 0.30 |
| | **Emergent Marsh HSI =** | | **0.50** | **EM HSI =** | **0.50** | **EM HSI =** | **0.43** |
| | **Open Water HSI =** | | **0.41** | **OW HSI =** | **0.41** | **OW HSI =** | **0.40** |

**AAHU CALCULATION - EMERGENT MARSH**

**Project:** South White Lake Shoreline Protection
Area A - Kaplan Tract

| Future Without Project | | | Total | Cummulative |
|---|---|---|---|---|
| TY | Marsh Acres | x HSI | HUs | HUs |
| 0 | 1935 | 0.50 | 973.42 | |
| 1 | 1909 | 0.50 | 949.98 | 961.68 |
| 11 | 1663 | 0.47 | 774.62 | 8609.96 |
| 12 | 1330 | 0.42 | 562.23 | 666.03 |
| 20 | 1150 | 0.40 | 456.29 | 4067.83 |
| | | | **AAHUs =** | **715.28** |

| Future With Project | | | Total | Cummulative |
|---|---|---|---|---|
| TY | Marsh Acres | x HSI | HUs | HUs |
| 0 | 1935 | 0.50 | 973.42 | |
| 1 | 1909 | 0.50 | 949.98 | 961.68 |
| 20 | 1413 | 0.43 | 612.48 | 14742.57 |
| | | | **AAHUs** | **785.21** |

# WETLAND VALUE ASSESSMENT COMMUNITY MODEL
## Fresh/Intermediate Marsh

| NET CHANGE IN AAHUs DUE TO PROJECT | | |
|---|---|---|
| A. Future With Project Emergent Marsh AAHUs | = | 785.21 |
| B. Future Without Project Emergent Marsh AAHUs | = | 715.28 |
| Net Change (FWP - FWOP) = | | **69.94** |

**AAHU CALCULATION - OPEN WATER**

**Project:** South White Lake Shoreline Protection
Area A - Kaplan Tract

| Future Without Project | | | Total | Cummulative |
|---|---|---|---|---|
| TY | Water Acres | x HSI | HUs | HUs |
| 0 | 2782 | 0.41 | 1127.50 | |
| 1 | 2808 | 0.41 | 1138.04 | 1132.77 |
| 11 | 3054 | 0.40 | 1228.69 | 11834.82 |
| 12 | 3387 | 0.38 | 1300.88 | 1265.79 |
| 20 | 3567 | 0.37 | 1323.16 | 10499.32 |
| | | | **AAHUs =** | **1236.64** |

| Future With Project | | | Total | Cummulative |
|---|---|---|---|---|
| TY | Water Acres | x HSI | HUs | HUs |
| 0 | 2782 | 0.41 | 1127.50 | |
| 1 | 2808 | 0.41 | 1138.04 | 1132.77 |
| 20 | 3304 | 0.40 | 1319.48 | 23355.67 |
| | | | **AAHUs** | **1224.42** |

| NET CHANGE IN AAHUs DUE TO PROJECT | | |
|---|---|---|
| A. Future With Project Open Water AAHUs | = | 1224.42 |
| B. Future Without Project Open Water AAHUs | = | 1236.64 |
| Net Change (FWP - FWOP) = | | **-12.21** |

| TOTAL BENEFITS IN AAHUs DUE TO PROJECT | | |
|---|---|---|
| A. Emergent Marsh Habitat Net AAHUs | = | 69.94 |
| B. Open Water Habitat Net AAHUs | = | -12.21 |
| Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1 | | **43.44** |

# WETLAND VALUE ASSESSMENT COMMUNITY MODEL
## Fresh/Intermediate Marsh

Project: S White Lake, Area D

Project Area:
Fresh..... 756
Intermediate..

Condition: Future Without Project

| Variable | | TY 0 | | TY 1 | | TY 20 | |
|---|---|---|---|---|---|---|---|
| | | Value | SI | Value | SI | Value | SI |
| V1 | % Emergent | 55 | 0.60 | 51 | 0.56 | 0 | 0.10 |
| V2 | % Aquatic | 1 | 0.11 | 1 | 0.11 | 1 | 0.11 |
| V3 | Interspersion<br>Class 1<br>Class 2<br>Class 3<br>Class 4<br>Class 5 | %<br>50<br><br><br>50<br> | 0.60 | %<br>50<br><br><br>50<br> | 0.60 | %<br><br><br><br><br>100 | 0.10 |
| V4 | %OW <= 1.5ft | 13 | 0.25 | 12 | 0.24 | 6 | 0.17 |
| V5 | Salinity (ppt)<br>fresh<br>intermediate | 1 | 1.00 | 1 | 1.00 | 1 | 1.00 |
| V6 | Access Value<br>fresh<br>intermediate | 0.10 | 0.37 | 0.10 | 0.37 | 0.10 | 0.37 |
| | **Emergent Marsh HSI =** | | **0.61** | **EM HSI =** | **0.58** | **EM HSI =** | **0.22** |
| | **Open Water HSI =** | | **0.25** | **OW HSI =** | **0.25** | **OW HSI =** | **0.21** |

Project: S White Lake, Area D

Project Area:
Fresh..... 756
Intermediate.

Condition: Future With Project

| Variable | | TY 0 | | TY 1 | | TY 3 | |
|---|---|---|---|---|---|---|---|
| | | Value | SI | Value | SI | Value | SI |
| V1 | % Emergent | 55 | 0.60 | 58 | 0.62 | 67 | 0.70 |
| V2 | % Aquatic | 1 | 0.11 | 5 | 0.15 | 35 | 0.42 |
| V3 | Interspersion<br>Class 1<br>Class 2<br>Class 3<br>Class 4<br>Class 5 | %<br>50<br><br><br>50<br> | 0.60 | %<br>100<br><br><br><br> | 1.00 | %<br>100<br><br><br><br> | 1.00 |
| V4 | %OW <= 1.5ft | 13 | 0.25 | 24 | 0.37 | 41 | 0.56 |
| V5 | Salinity (ppt)<br>fresh<br>intermediate | 1 | 1.00 | 1 | 1.00 | 1 | 1.00 |
| V6 | Access Value<br>fresh<br>intermediate | 0.10 | 0.37 | 0.10 | 0.37 | 0.10 | 0.37 |
| | **Emergent Marsh HSI =** | | **0.61** | **EM HSI =** | **0.67** | **EM HSI =** | **0.71** |
| | **Open Water HSI =** | | **0.25** | **OW HSI =** | **0.32** | **OW HSI =** | **0.50** |

# WETLAND VALUE ASSESSMENT COMMUNITY MODEL
## Fresh/Intermediate Marsh

Project: S White Lake, Area D

**FWP**

| Variable | | TY5 Value | TY5 SI | TY20 Value | TY20 SI | | |
|---|---|---|---|---|---|---|---|
| V1 | % Emergent | 77 | 0.79 | 77 | 0.79 | | |
| V2 | % Aquatic | 60 | 0.64 | 60 | 0.64 | | |
| V3 | Interspersion<br>Class 1<br>Class 2<br>Class 3<br>Class 4<br>Class 5 | %<br>100 | 1.00 | %<br>100 | 1.00 | % | |
| V4 | %OW <= 1.5ft | 41 | 0.56 | 41 | 0.56 | | |
| V5 | Salinity (ppt)<br>fresh<br>intermediate | 1 | 1.00 | 1 | 1.00 | | |
| V6 | Access Value<br>fresh<br>intermediate | 0.10 | 0.37 | 0.10 | 0.37 | | |
| | | **EM HSI =** | **0.77** | **EM HSI =** | **0.77** | **EM HSI =** | |
| | | **OW HSI =** | **0.62** | **OW HSI =** | **0.62** | **OW HSI =** | |

## AAHU CALCULATION - EMERGENT MARSH

**Project:** S White Lake, Area D

| Future Without Project | | | Total | Cummulative |
|---|---|---|---|---|
| TY | Marsh Acres | x HSI | HUs | HUs |
| 0 | 424 | 0.61 | 256.66 | |
| 1 | 402 | 0.58 | 234.63 | 245.57 |
| 20 | 0 | 0.22 | 0.00 | 1764.72 |
| | | | **AAHUs =** | **100.51** |

| Future With Project | | | Total | Cummulative |
|---|---|---|---|---|
| TY | Marsh Acres | x HSI | HUs | HUs |
| 0 | 424 | 0.61 | 256.66 | |
| 1 | 440 | 0.67 | 292.99 | 274.66 |
| 3 | 503 | 0.71 | 358.90 | 650.89 |
| 5 | 581 | 0.77 | 444.70 | 802.26 |
| 20 | 581 | 0.77 | 444.70 | 6670.55 |
| | | | **AAHUs** | **419.92** |

| NET CHANGE IN AAHUs DUE TO PROJECT | |
|---|---|
| A. Future With Project Emergent Marsh AAHUs = | 419.92 |
| B. Future Without Project Emergent Marsh AAHUs = | 100.51 |
| Net Change (FWP - FWOP) = | **319.40** |

## AAHU CALCULATION - OPEN WATER

**Project:** S White Lake, Area D

| Future Without Project | | | Total | Cummulative |
|---|---|---|---|---|
| TY | Water Acres | x HSI | HUs | HUs |
| 0 | 332 | 0.25 | 83.61 | |
| 1 | 353 | 0.25 | 88.60 | 86.11 |
| 20 | 756 | 0.21 | 157.98 | 2396.14 |
| | | | AAHUs = | 124.11 |

| Future With Project | | | Total | Cummulative |
|---|---|---|---|---|
| TY | Water Acres | x HSI | HUs | HUs |
| 0 | 332 | 0.25 | 83.61 | |
| 1 | 175 | 0.32 | 55.67 | 71.37 |
| 3 | 175 | 0.50 | 88.09 | 143.76 |
| 5 | 175 | 0.62 | 109.16 | 197.25 |
| 20 | 175 | 0.62 | 109.16 | 1637.41 |
| | | | AAHUs | 102.49 |

| NET CHANGE IN AAHUs DUE TO PROJECT | |
|---|---|
| A. Future With Project Open Water AAHUs = | 102.49 |
| B. Future Without Project Open Water AAHUs = | 124.11 |
| Net Change (FWP - FWOP) = | **-21.62** |

| TOTAL BENEFITS IN AAHUs DUE TO PROJECT | |
|---|---|
| A. Emergent Marsh Habitat Net AAHUs = | 319.40 |
| B. Open Water Habitat Net AAHUs = | -21.62 |
| Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1 | **209.40** |