E C O L O G I C A L R E V I E W

Grand-White Lake Land Bridge Protection
CWPPRA Priority Project List 10
State No. ME-19
Federal No. PME-18

March 11, 2003

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This document reflects the project design as of the 95% Design Review meeting, incorporates all comments and recommendations received following the meeting, and is current as of March 11, 2003.

ECOLOGICAL REVIEW
Grand-White Lake Land Bridge Protection

In October 2000, the Louisiana Department of Natural Resources initiated the Ecological Review to improve the likelihood of restoration project success. This is a process whereby each restoration project's biotic benefits, goals, and strategies are evaluated prior to granting construction authorization. This evaluation utilizes monitoring and engineering information, as well as applicable scientific literature, to assess whether or not, and to what degree, the proposed project features will cause the desired ecological response.

I. Introduction

The Grand-White Lake Land Bridge Protection project is located in the Mermentau Basin, in Cameron Parish, Louisiana. The project area encompasses the southeastern shoreline of Grand Lake, from the old Gulf Intracoastal Waterway to the level of the northern edge of Round Lake, and eastward to the eastern shore of Collicon Lake (Figure 1). The total project area is 1,530 acres, consisting of open water (71%), fresh marsh (29%), and bottomland shrub/scrub (less than 1%) (Clark 1999).

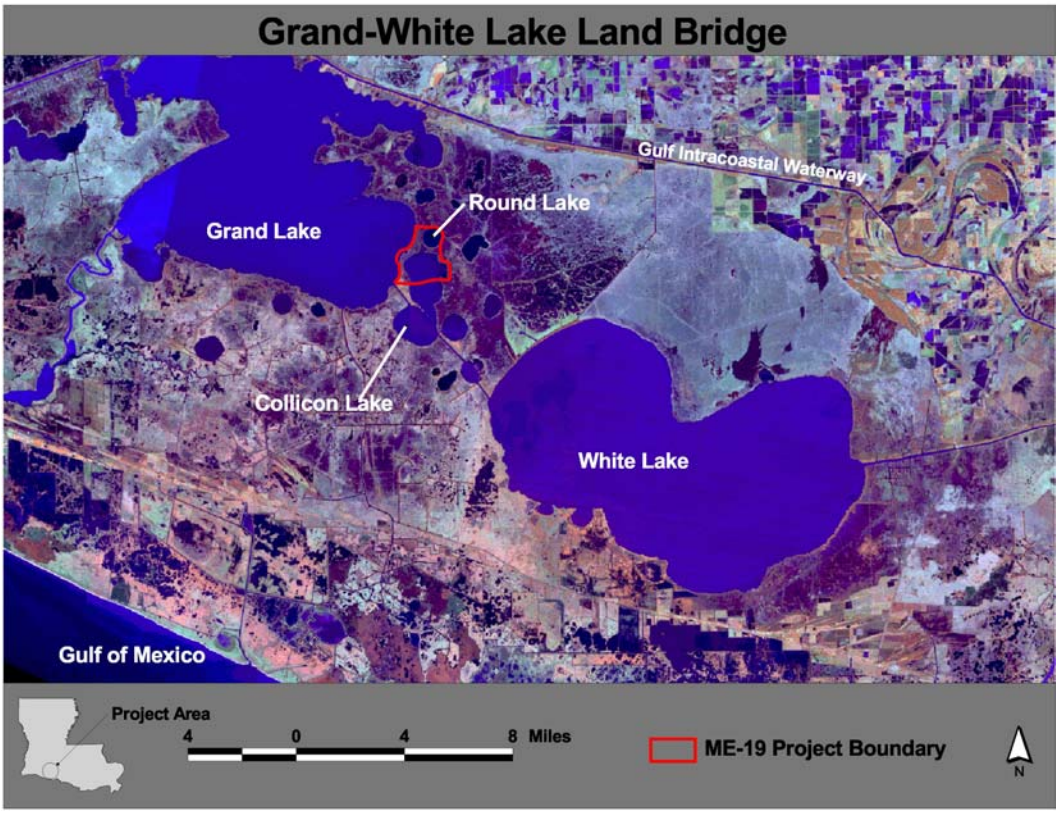

Figure 1. Grand-White Lake Land Bridge.

The land bridge separating Grand Lake from Collicon Lake is experiencing wind driven wave erosion along the southeastern shoreline of Grand Lake. Along this section of shoreline the land bridge is less than 500 feet in width. Shoreline erosion rates, calculated from a comparison of

1978 aerial photography and 1994 satellite spot imagery, indicate that the land bridge is eroding at a rate of 26.9 feet/year (Clark 1999). At this rate, the land bridge is projected to be breached by 2014. Should the land bridge be breached, it would increase the size of Grand Lake by 4,800 acres, and increase the 15-mile northwest fetch of Grand Lake to 17 miles, thereby increasing wave-induced erosion rates along the northern and eastern shorelines of Collicon Lake. This would endanger the 8,935 acres of freshwater marsh in the Grand-White Lake land bridge area.

The Coast 2050 report identified wave erosion along the Grand and White lakes's shorelines as a leading cause of future land loss in the project vicinity [Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority (LCWCRTF&WCRA) 1999]. Stabilizing the Grand Lake shoreline and preventing the coalescence of Grand Lake and White Lake was recommended by Coast 2050 as a regional ecosystem strategy which would reduce wave-induced erosion of interior marshes, and preserve much of the existing marsh in the area (LCWCRTF&WCRA 1998).

II. Goal Statement

The goal of this project is to prevent the coalescence of Grand and Collicon lakes by:

a. Stopping erosion along the southeastern shoreline of Grand Lake and north and western shorelines of Collicon Lake over the 20 year project life
b. Creating a total of 17 acres of emergent marsh along the southeastern shoreline of Grand Lake and 10 acres of emergent marsh along the north and western shorelines of Collicon Lake over the 20 year project life
c. Reducing erosion along the southern shoreline of Round Lake by 50% over the 20 year project life.

III. Strategy Statement

The project goal will be achieved through the implementation of the following strategies/project features:

1. Construction of approximately 12,000 feet of shoreline protection along the southeastern shore of Grand Lake.
2. Construction of earthen terraces in the northwestern portion of Collicon Lake.
3. Planting of vegetation along 4,000 feet of the southern shoreline of Round Lake.

IV. Strategy-Goal Relationship

The construction of a foreshore rock dike will stop erosion along the southeastern Grand Lake shoreline by damping wind-induced waves. The rock dike will be constructed to a final elevation of 1 foot above mean water level (2.5 feet NAVD-88) to allow for periodic wave overwash. Spoil material from dredging of the access channel will be used beneficially to create marsh between the foreshore dike and the Grand Lake shoreline.

The construction of terraces will not only result in the direct creation of marsh habitat, but will also facilitate marsh building by trapping suspended sediments in shallow open water areas in the northwestern portion of Collicon Lake. The terraces will also reduce wave energy, protecting the interior fringing fresh marsh. Vegetation plantings on the crown and slope of the terraces will

aid in stabilizing and consolidating the deposited spoil material.

The planting of *Zizaniopsis miliacea* (giant cutgrass) or other vegetation will reduce erosion along the southern shoreline of Round Lake by stabilizing soils and damping wind induced waves.

V. Project Feature Evaluation

A 12,000-foot foreshore dike will be constructed along the southeastern shoreline of Grand Lake, 50 to 200 feet lakeward of the shoreline, along the -1 to -2 foot contour line (Figure 2). The limestone rock will be placed on geotextile fabric and built to an elevation, of 2.5 feet NAVD-88, after settlement. This structure was designed so that at mean water level of 1.55 feet NAVD-88 (calculated using hourly water level readings from inside the Catfish Point water control structure from January 1990 to April 2000), 1 foot of the dike would remain sub-aerial. The height of the rock dike will periodically enable water and sediment to flow over the dike to the marsh creation area, mimicking the hydrology of a semi-tidal marsh. Analysis of the hourly water level readings from inside the Catfish Point water control structure from January 1990 to April 2000, indicates that water levels in the lake will exceed the height of the dike 7.4% of the time.

The rock dike will have a 3 foot crown, a 3:1 side slope, and include 25 foot gaps every 700 to 1000 feet to allow water and sediment exchange and organism access. Dredged spoil material from the construction of the access channel will be placed behind the rock structure to a height of 2.5 feet NAVD-88, to create approximately 17 acres of marsh. The created mash platform will be seeded with *Echinochloa esculenta* (Japanese millet) or other suitable fresh marsh vegetation to enhance marsh creation.

Two linear rows of terraces will be constructed in Collicon Lake to protect 14,130 feet of shoreline. The terrace rows will follow the shoreline contours with the first row approximately 40 feet from shore, and the second row of terraces 100 feet lakeward of the first row. The terrace rows will be comprised of successive 200 foot long terraces with a top width of 10 feet and spaced 50 feet apart (Figure 1). The 50 foot gaps will allow water, fish and sediment access to the shoreline. Each terrace row will consist of 56 segments, for a total length of 14,130 feet. The terraces will be constructed to a final elevation of 3.0 feet NAVD-88 (approximately 1.5 feet above mean water level). The terrace tops will be planted with *Paspalum vaginatum* (seashore paspalum) and seeded with Japanese millet or other suitable wetland vegetation. The side slopes will be vegetated with either *Zizaniopsis miliacea* (giant cutgrass) or *Schoenoplectus californicus* (California bulrush).

A total of 4,000 feet of *Z. miliacea* or other suitable vegetation, will be planted along the southern shoreline of Round Lake to protect the shoreline. The vegetation will be planted in one or two rows of gallon containers on 5-foot centers.

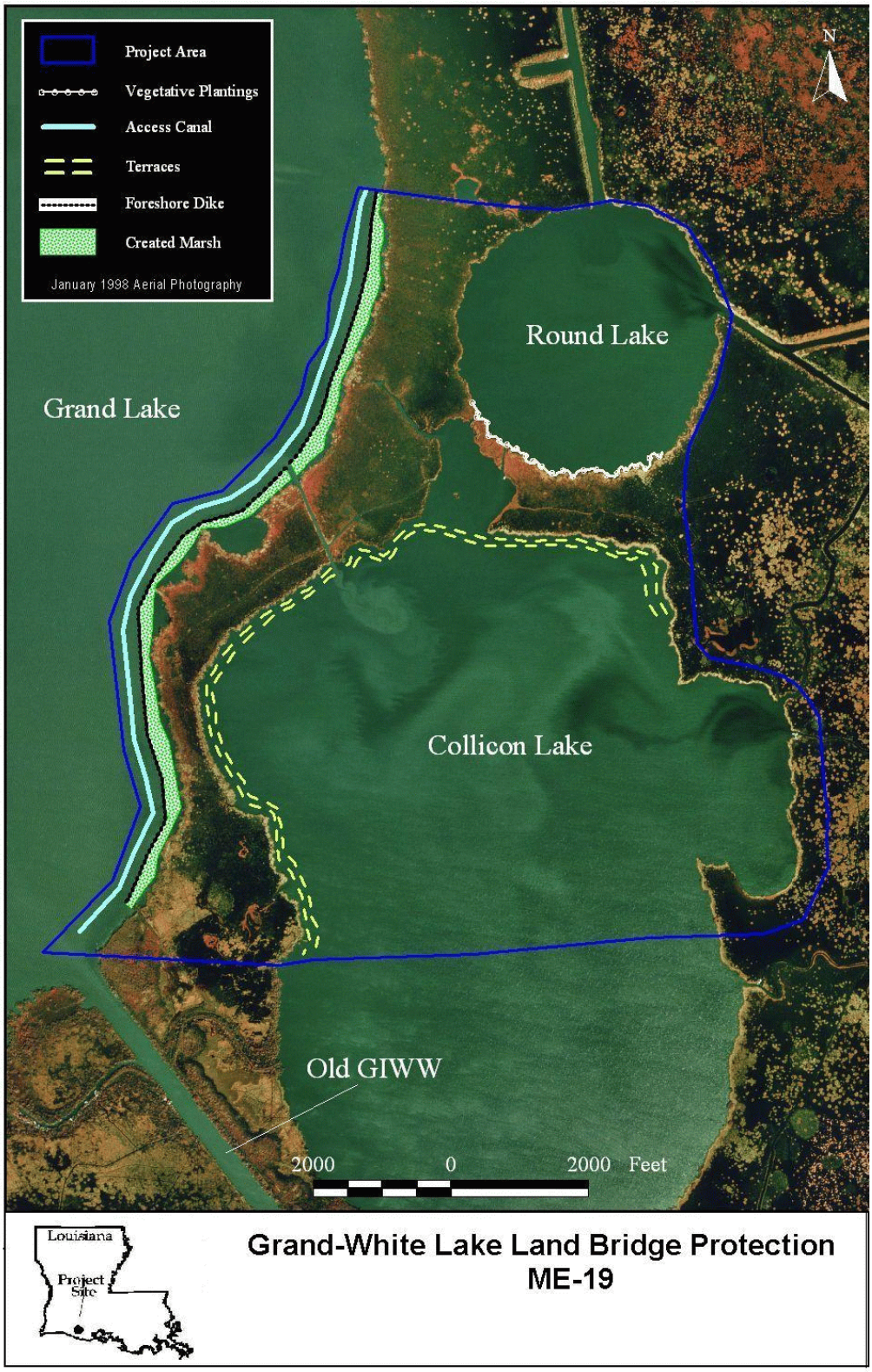

Figure 2. Grand-White Lake Land Bridge Protection (State No. ME-19, Federal No. PME-18)

VI. Assessment of Goal Attainability

Foreshore Dike

Several projects using hard shoreline stabilization materials have been implemented in the Louisiana coastal zone to stabilize lake and bay shorelines and navigation canal banks. Results from restoration projects indicate that shoreline protection measures have been effective in protecting lake shorelines from erosion.

- The Boston Canal/Vermillion Bay shoreline Protection (TV-09) project was designed to reduce wind-driven wave erosion along Vermillion Bay and at the mouth of Boston Canal. Rock breakwaters and vegetation plantings were constructed in 1995 to accomplish that goal. Initial post-construction data indicate that 1.4 to 4.5 feet of sediment was deposited between the breakwater and the shoreline in less than one year. The rock breakwater at the mouth of Boston Canal was successful in stabilizing the shoreline (LDNR 1998).

- The Turtle Cove Shoreline Protection (PO-10) project was implemented in 1993 to protect a narrow strip of land in the Manchac Wildlife Management Area which separates Lake Pontchartrain from an area known as "The Prairie." Wind-driven high energy waves caused a shoreline erosion rate of approximately 12.5 feet per year. The purpose of the project was to protect the lake shoreline with a rock-filled gabion and to promote sediment deposition into the area behind the structure. Following construction of a 1,642 foot rock-filled gabion 300 feet from shore and at an elevation of 3 feet above mean high water level, the shoreline prograded at a rate of 3.47 feet per year in the project area, and sediment elevation behind the structure increased 0.26 feet per year from October 1994 to December 1997. Five years post construction, the structure had numerous breaches and required maintenance (LDNR 1999).

- The Lake Salvador Shoreline Protection Demonstration (BA-15) project evaluated a series of shoreline protection measures at Lake Salvador, St. Charles Parish, Louisiana. Phase two of this project was conducted in 1998 and evaluated the effectiveness of a rock berm to protect the lake shoreline from higher energy wave erosion. Shoreline surveys conducted behind the berm five months after construction indicated that the shoreline was still eroding. Subsequent surveys were not conducted due to poor weather conditions (LDNR 2000). The rock structure itself appears to be holding up well, showing little sign of deterioration and subsidence. The structure was designed to be constructed with a crest elevation of 4.0 feet NAVD-88, however the structure average height in 2002 was 2.51 feet NAVD-88. The average settlement of the structure, as measured from 1998 to 2002, was 0.26 feet, which indicates that the settlement may have only been built to an elevation of 2.75 feet NAVD-88 (Darin Lee, Personal Communication 2002).

Terraces

The purposes of bay bottom terracing are to increase the length of marsh-water interface, re-establish emergent marsh vegetation, reduce marsh fringe retreat by reducing fetch, increase overall primary productivity, promote deposition and retention of suspended sediments, and reduce turbidity. Though terracing is a relatively recent habitat creation technique, data currently exist from several projects in Louisiana and Texas.

- The Sabine Terracing Project, located one mile east of Sabine National Wildlife Refuge headquarters in Cameron Parish, Louisiana, was completed in 1991. The project consisted of 128 terraces arranged in a checkerboard pattern. The terraces were planted with *Spartina alterniflora* (smooth cordgrass). The project increased marsh water interface by 52,500 feet, and the *S. alterniflora* plantings completely covered the terraces by fall 1992 and established emergent marsh over an estimated 16.8 acres. Shoreline erosion was also decreased and wave height was substantially reduced (LDNR 1993). A study conducted by National Marine Fisheries Service (NMFS), Galveston Fishery Ecology Branch, at the Sabine terraces indicated that terrace fields support higher standing crops of most fishery species when compared with shallow marsh ponds of similar size (Rozas and Minello 2001).

- In Pierce Marsh, Galveston Bay Texas, 153 terraces were built in 1999 and planted with *S. alterniflora.* Approximately 9 linear miles of fringing marsh were created. One year after planting, *S. alterniflora* was well established (Shead and Goldberg 2001). Though the project was successful, the sacrificial outer terraces exposed to the long fetch of Galveston Bay were rapidly eroding.

- The Little Vermillion Bay Sediment Trapping (TV-12) terraces were constructed in August of 1999 and planted with *Spartina alterniflora*. The terraces have shown extensive growth of vegetation and appear to be holding up well in the high-energy environment of Little Vermillion Bay. Most of the terraces are almost completely covered with vegetation, dominated by the spread of the *S. alterniflora* plantings (D. Castellanos, personal communication August 2001).

- Based on observations of the 1996 Shell Mitigation Project, terraces constructed from the dredged spoil of Little Vermilion Bay eroded at a rate of 4 feet per year (NMFS 1999).

Because of the shorter fetch in Collicon Lake, compared to Vermillion and Galveston Bays, the terraces constructed in Collicon Lake will not be subjected to the same severity of wind-induced wave erosion. Nevertheless, the terraces will be planted to aid the stabilization of the newly deposited spoil material.

Vegetation Planting

Several vegetation planting projects utilizing *Schoenoplectus californicus* have been implemented in the vicinity of the Grand-White Lake land bridge, and are summarized in Table 1.

All of these projects were funded under the Louisiana Department of Natural Resources/Natural Resources Conservation Service/Soil and Water Conservation Committee (LDNR/NRCS/SWCC) Vegetation Planting Program. The five projects were successful, the plantings in the projects exhibited 75 to 98 percent survival, and all plantings had good lateral spread.

The proposed *Zizaniopsis miliacea* plantings will protect the remainder of the southern shoreline of Round Lake with very little overlap with the previous *S. californicus* plantings from 1997.

VII. Summary of Findings

Based on the investigation of similar restoration projects and a review of engineering principles, the proposed strategies of the Grand-White Lake Land Bridge Protection project will likely achieve the desired ecological goals. At this time, the Louisiana Department of Natural Resources, Coastal Restoration Division recommends that the Grand-White Lake Land Bridge Protection project be approved for CWPPRA Phase 2.

Table 1: Previous plantings of *Schoenoplectus californicus* in the vicinity of the Grand White Lake Land Bridge.

Location	Date planted	Date monitored	Length of plantings (feet)	# Plants	Technique	Water Depth	% Survival	Lateral Spread (feet)	Comment
Grand Lake/ Tebo Point	6/13/95	10/30/96	4,920	820	Anchored Gallon 72" spacing	24"	88	6-7	Water Hyacinth
Grand Lake/ Tebo Point	6/25/97	1997	5,500	1,100	Gallon 60" spacing	24"	90		Water Hyacinth
Umbrella Bay/Grand Lake	6/15/95	10/30/96	3,996	666	Anchored Gallon 72" spacing	18"	98	5-10	
Umbrella Bay/Grand Lake	7/6/98	9/2/98	12,000	2,400	Anchored Gallon 60" spacing	12-16"	90	1-12	Water Hyacinth
Grand, Collicon and Round Lake	7/24/97	10/27/98	21,450	4,290	Anchored Gallon 60" spacing	18"	75	2-8	

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