PROJECT PLAN
AND
ENVIRONMENTAL ASSESSMENT
FOR
FLOATING MARSH CREATION DEMONSTRATION PROJECT
(LA-05)
LOUISIANA

Prepared by:
Dr. Jenneke M. Visser
and
Dr. Charles E. Sasser
Louisiana State University

For:

LOUISIANA DEPARTMENT OF NATURAL RESOURCES

and

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

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Abstract

The objective of this demonstration is to develop methods for restoration of open areas within thin and deteriorated mats that once supported thick-mat maidencane marsh and other freshwater areas where establishment of maidencane marsh is desired. This document describes the development of artificial floating-marsh systems (AFS). The recommended plan consists of two phases. Phase 1 is the development of artificial floating-marsh systems (AFS) and has two components. The first component is development of a floating system which provides the structure that keeps the substrate in place and provides the buoyancy during the period in which *Panicum hemitomon* plants establish. The second component consists of understanding the plant response to environmental effects in order to maximize the establishment and growth of *P. hemitomon* in an AFS. Based on the information from Phase 1, three designs will be selected. Phase 2 consists of testing these three designs under sheltered and exposed hydrologic conditions. This evaluation will be located on Mandalay National Wildlife Refuge, Terrebonne Parish, Louisiana. The methods used are unproven and need to be tested on a small scale. However, if the designs are successful, recommendations will be made on how to expand the application to benefit 33,000 ha (82,000 acres) of existing shallow fresh waters in coastal Louisiana. No negative environmental impacts are anticipated as a result of project implementation. The Louisiana Department of Natural Resources will provide the non-federal share of the total cost of the project. This document is intended to fulfill the requirements of the National Environmental Policy Act and is funded under the authorization of Public Law 101-646, Project Priority List 12.

Prepared under the authority of the Coastal Wetlands Planning, Protection, and Restoration Act of November 1990, House Document 646, 101st Congress.

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SUMMARY OF PROJECT PLAN/EA

Project Name:	Floating Marsh Creation Demonstration Project (La-05)
Parishes:	Terrebonne
State:	Louisiana
Federal Sponsor:	U.S.D.A. Natural Resources Conservation Service
Non-federal Sponsor:	Louisiana Department of Natural Resources

Description of Recommended Plan:

The recommended plan will consist of two phases. Phase 1 of this plan is the development of artificial floating-marsh systems (AFS) and has two components. The first component is development of a floating system which provides the physical structure that keeps the substrate in place and provides the buoyancy during the period in which *Panicum hemitomon* plants establish. For this component eight structure designs using a variety of mat materials and support structures will be evaluated. The second component consists of efforts to understand the plant response to environmental effects in order to develop methods to maximize the establishment and growth of *P. hemitomon* in an AFS. Based on this information, three designs will be selected for further testing based on maintenance of structural integrity and buoyancy as well as the potential for maximizing *P. hemitomon* growth. Phase 2 consists of field testing the three selected designs under sheltered and exposed hydrologic conditions. These tests will be located on Mandalay National Wildlife Refuge, Terrebonne Parish, Louisiana.

Resource Information:

Size of Project:	4 acres
Land Ownership:	100% federal
Habitat Types:	100% fresh marsh.
Threatened and Endangered Species:	
Bald eagle	*Haliaeetus leucocephalus*

Cultural Resources:

There are no known cultural resource sites within the project area.

Problem Identification:

Potential causes of the land/floating marsh loss in the area include:

- grazing by nutria
- increased water levels
- hydrologic modifications

Alternative Plans Considered:

- No Action
- Demonstration Project

Project Objectives:

The objective of this demonstration is to develop methods for restoration of open areas within thin and deteriorated mats that once supported thick-mat maidencane marsh and other freshwater areas where establishment of maidencane marsh is desired.

Principal Project Measures

A minimum of three designs that create a floating substrate that supports the growth of *P. hemitomon* will be tested in shallow freshwater areas. Each design will include nutria exclusion measures that protect plants during the establishment phase.

Project Benefits

This project is designed to impact a very small area (1.2 ha or 3 acres). The methods used are unproven and will be tested on a small scale. However if certain designs are successful, recommendations will be made on how to translate the application of those restoration methods to approximately 33,000 ha (82,000 acres) of shallow freshwater areas.

Potential Adverse Impacts

No long-term or cumulative adverse impacts are anticipated. Any short-term negative impacts of the proposed unproven methods will be limited to a very small area (1.2 ha or 3 acres).

INTRODUCTION

The Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) of 28 November, 1990, House Document 646, 101st Congress, provides for the use of federal funds for planning and implementing projects that create, protect, restore, and enhance coastal wetlands of the United States, including Louisiana. The CWPPRA Task Force is comprised of five federal agencies and the State of Louisiana. The federal agencies involved are the Army (Corps of Engineers, COE), the United States Departments of Agriculture (Natural Resources Conservation Service, NRCS), Commerce (National Marine Fisheries Service, NMFS), the Interior (US Fish and Wildlife Service, USFWS), and the Environmental Protection Agency (EPA). The Governor represents the State of Louisiana. The Louisiana Department of Natural Resources (LDNR) typically serves as the non-federal cost share partner for CWPPRA projects.

Floating Marsh Creation Demonstration Project (LA-05) has been approved for funding and was included on the Twelfth Priority Project List which was transmitted to Congress in December 2003. Field construction is authorized to begin as soon as compliance with appropriate environmental laws and regulations are achieved and the project plans and specifications are completed. The CWPPRA specifies that projects be cost-shared with the State of Louisiana. Pursuant to the Louisiana Coastal Wetlands Conservation Plan, the federal government provides 85% of the project cost and the State of Louisiana provides the remaining 15%. The United States Department of Agriculture through NRCS acts as the federal sponsoring agency for this project. The State has indicated its willingness to cost share on the proposed action.

This Project Plan and Environmental Assessment has been prepared to describe the recommended plan of action and to evaluate the potential impacts associated with the Floating Marsh Creation Demonstration Project. This document is being prepared in accordance with National Environmental Policy Act of 1969. The following sections include a discussion of the problems affecting the area, alternative actions, the recommended alternative and its impacts, significant resources, and coordination and public participation.

Project Components

This demonstration will consist of two phases. Phase 1 is the development of artificial floating-marsh systems (AFS) and has two components. The first component is development of a floating system which provides the structure that keeps the substrate in place and provides the buoyancy during the period in which *Panicum hemitomon* (maidencane) plants establish. For this component eight structure designs using a variety of mat materials and support structures will be evaluated. The second component consists of efforts to understand the plant response to environmental effects in order to develop methods to maximize the establishment and growth of *P. hemitomon* in an AFS. Based on this information, three designs will be selected based on their efficacy in the maintenance of structural integrity and buoyancy as well as the potential for maximizing *P. hemitomon* growth. Phase 2 consists of testing the three selected designs under sheltered and exposed hydrologic conditions. These tests will be located on Mandalay National Wildlife Refuge, Terrebonne Parish, Louisiana.

Project Objectives

The objective of this demonstration is to develop methods for restoration of open areas within thin and deteriorated mats that once supported thick-mat maidencane marsh and other fresh water areas where establishment of maidencane marsh is desired. This will be accomplished in two phases. The first phase is a development phase consisting of two components. The first development component is the development of structures that provide a floating substrate in which *Panicum hemitomon* can establish. The second development component is optimizing plant responses to accelerate the development of floating marsh. The information from this first phase will be used to design three artificial floating systems for field testing.

Specific Goals

1. *Phase 1, Component 1*: Development of structures
   a. Determine which AFS designs provide structural integrity (including structure and the artificial mat) of sufficient duration to allow the establishment of a floating marsh mat.
   b. Determine which AFS designs provide buoyancy of sufficient duration to allow the establishment of a floating marsh mat.
2. *Phase 1, Component 2:* Optimizing plant responses
   a. Determine the combination of flooding, nitrogen level, and phosphorus level that optimizes the above and belowground production of *P. hemitomon* biomass.
   b. Determine which substrate material optimizes the above and belowground production of *P. hemitomon* biomass.
   c. Determine which containment (mat) material optimizes the above and belowground production of *P. hemitomon* biomass.
   d. Determine which of four edge expansion species provides for the maximum lateral expansion of *P. hemitomon*.
   e. Provide a preliminary assessment of the possibility for establishing *P. hemitomon* from seed.
3. *Phase 2:* Field deployment
   a. Determine which of the three tested AFS designs provides the best establishment of *P. hemitomon* under exposed and under sheltered field conditions.
   b. Determine which of the three tested AFS designs provides the most cost effective method for floating marsh creation under exposed and under sheltered field conditions.

PROJECT SETTING

Project Location

The field component of this project will be located on Mandalay National Wildlife Refuge (Figure 1). The refuge is located 5 miles southwest of Houma, LA. The refuge is only accessible by boat. The headquarters is located five miles west of Houma, LA on LA Highway 182. Mandalay Refuge personnel manage 1,705 ha (4,212 acres) of mostly fresh marsh and open water in Terrebonne Parish. Within the northern part of the refuge, six 0.2 ha (0.5 acre) sites will be chosen in shallow open water areas. Three of the sites will be exposed to >200m (656 ft) of wave fetch from at least one direction, while the other three will be sheltered (i.e. <200 m fetch in all directions).

Climate

The climate for the project area is subtropical. Summers are typically hot and humid with coastal areas frequently cooled by sea breezes. The prevailing winds are from the south and southeast. Winters are mild with occasional passages of cool air from the north. The average summer temperature is 27°C (81°F), with an average daily maximum of 33°C (91°F). The average winter temperature is 14°C (57°F) with an average daily minimum of 7°C (44°F).

Rain occurs throughout the year and precipitation is adequate for crops grown in Terrebonne Parish. The average annual precipitation is approximately 170 cm (67 inches). Rainfall is heaviest during the summer, averaging approximately 56 cm (22 inches) for the season. Throughout the remainder of the year precipitation is fairly evenly distributed, typically averaging 38 cm (15 inches) in each of the spring, fall, and winter seasons. Occasionally, 7.5 cm (3 inches) or more falls within a 24-hour period, generally during tropical storms.

Geology

The study area is located in the Mississippi River Delta Plain (MRDP). The MRDP developed as a series of overlapping delta lobes, each with a well-described cycle of river-dominated growth and marine-dominated abandonment. Each part of this delta cycle is characterized by different forces and the development of different habitats (Gagliano and Van Beek 1970). The time period of an entire cycle lasts from approximately two to four thousand years for a major complex. Three major Holocene delta lobes (Maringouin, Teche, and Lafourche) built the study area, of which the Lafourche lobe is the most recent (Kolb and Van Lopik 1958).

A delta lobe is built by deposition of river sediments at the mouth of the river. As the delta lobe grows, vegetation invades the exposed mudflats, developing into increasingly larger vegetated fresh-water wetlands. As a delta matures and nears its maximum development, the river bypasses the fresh marshes in the portion of the delta lobe farthest removed from the Gulf of Mexico and organic peat begins to accumulate. When the distributary course is no longer hydraulically efficient, the main channel of the river changes to a more efficient route and the

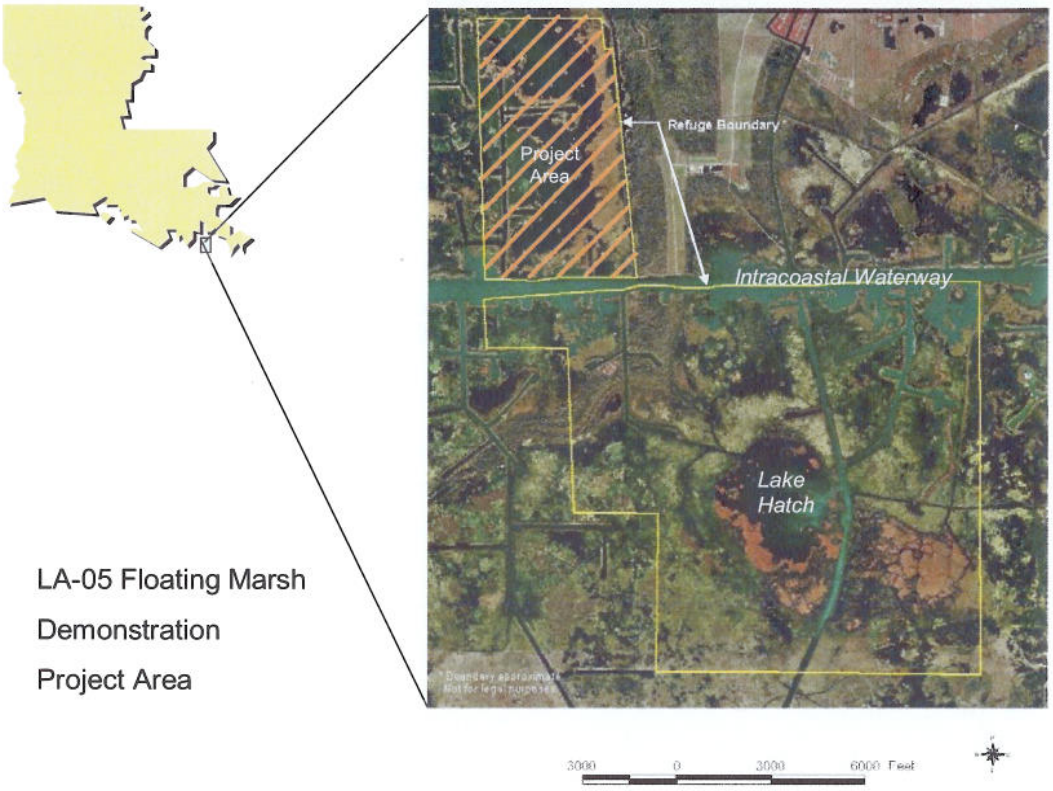

Figure 1. Location of the project area.

newly built delta lobe is slowly abandoned (Frazier 1967). Expansive freshwater marshes thrive in the abandoned upper delta lobe. Vegetative production and decomposition in these marshes accumulate deep layers of organic peat, which replace mineral sediment as the primary depositional material. It is during this stage in the delta cycle that formation of floating marshes is most likely to occur, as a result of submergence of natural attached organic marshes (O'Neil 1949). With increased submergence, a buoyant organic mat is subjected to increasing upward tension until it breaks free from its mineral substrate and floats. Other theories of floating marsh formation state that floating mats form by encroachment into lakes from attached marshes (Russell 1942), establishment of a mat on concentrated free floating aquatics (Russell 1942), and/or the invasion of unvegetated organic mats that pop up from lake bottoms (Rich 1984).

Vegetation

The marshes in the project area have remained fresh since they were first mapped by O'Neil (1949). However, vegetation associations have changed in large parts of the project area from thick-mat maidencane (*P. hemitomon*) dominated marsh to thin-mat spikerush (*Eleocharis baldwinii*) dominated marsh (Visser et al. 1999) and open water. Floating maidencane marshes

consist of a thick (~50 cm) mat of tightly woven roots in a mostly organic matrix that floats continuously on a layer of usually clear water (Sasser et al. 1995, 1996). In contrast, spikerush marshes grow on thin (<25 cm), seasonally floating mats that would not support the weight of a person during most of the growing season (Sasser et al. 1995, 1996). Both the thick-mat maidencane and the thin-mat spikerush marshes are supported by substrates that contain very low mineral densities (<0.015 g/cc in the active root zone) and high (>78%) organic matter content (Sasser et al. 1996). Sasser et al. (1995) also showed that end-of-season biomass of thin-mat spikerush marsh (129 g/m^2) is significantly lower than the end-of-season biomass of thick-mat maidencane marshes (524 g/m^2). A complete species list of species found in thin-mat spikerush and thick-mat maidencane floating marshes is provided in Table 1.

Soils

The soils of thick-mat maidencane floating marshes are classified as Carlin Series (Appendix A). The Carlin Series is classified as a Hydric Haplohemist. These soils consist of very deep, very poorly drained, rapidly permeable organic soils floating over a water layer which may contain an organic ooze. The thickness of the water layer fluctuates with the water level in adjacent waterbodies and results in a fluctuating surface elevation. Although permeability is rapid, there is very little movement of air due to the high water table. Therefore, the mat experiences reduced soil conditions.

The soils of the thin-mat spikerush marsh could be considered a transition between a Carlin Series and a Kenner Muck (Appendix B). Kenner Muck is classified as a Fluvaquentic Haplosaprist. These soils consist of very poorly drained, organic soils that have more than 1.3 m (51 inches) of very dark gray to black, well-decomposed organic material stratified with thin semifluid gray clay layers. The water table ranges from 15 cm (0.5 ft) below to 30 cm (1 ft) above the soil surface. If disturbed these soils tend to liquefy.

Wildlife Resources

The emergent wetlands and open water in the project area provide important habitat for a large number of wildlife species. Many economically important species such as deer, waterfowl, furbearers, and alligators are afforded food, cover, nesting, and resting habitat by the wetlands in the project area. In addition to the many economically important species (see economic resources section), many species of reptiles, amphibians, birds, and other wildlife also use the project area. Mandalay Refuge provides important habitat for wintering waterfowl of the Mississippi flyway. Teal (*Anas discors* and *Anas crecca*), widgeon (*Anas americana*), and ring-necked ducks (*Aythya collaris*) are the most prevalent species during the winter months, however lesser scaup (*Aythya affinis*), mallard (*Anas platyrhynchos*), and gadwall (*Anas strepera*) are also quite common. The refuge is home to nesting rookeries of herons and egrets and supports nesting bald eagles (*Haliaeetus leucocephalus).*

Table 1. Plant species found in thin-mat spikerush and thick-mat maidencane marshes within the project area. Based on Sasser et al. (1994, 1995) and Visser et al. (1999).

Scientific Name	Common Name	Marsh*
Aeschynomene indica L.	Sensitive Joint Vetch	S
Althernanthera philoxeroides (Mart.) Griseb.	Alligatorweed	M,S
Amaranthus australis (Gray) Sauer	Southern Waterhemp	M
Andropogon glomeratus (Walter) B.S.P.	Broomsedge	M,S
Bacopa monnieri (L.) Wettst.	Coastal Waterhyssop	M,S
Bidens laevis (L.) B.S.P.	Smooth Beggar-tick, Fouchet	S
Boehmeria cylindrica (L.) Sw.	False Nettle	M
Cephalanthus occidentalis L.	Buttonbush	M,S
Colocasia antiquorum (L.) Schot	Elephant-ear	M,S
Conoclinium coelestinum (L.) DC.	Mistflower	M,S
Cyperus odoratus L.	Fragrant Sedge	M,S
Cyperus polystachyos Rottb.	Sedge	M,S
Decodon verticillatus (L.) Elliott	Water-willow	M,S
Dichromena colorata (L.) Hitchc.	White-top Sedge	M,S
Echinochloa crusgalli (L.) Beauv.	Barnyard grass	M,S
Eleocharis albida Torr.	Spikerush	M,S
Eleocharis baldwinii (Torr.) Chapman.	Spikerush	S
Eleocharis macrostachya Britt	Largespike Spikerush	M
Eleocharis parvula (R.&S.) Link.	Dwarf Spikerush	M,S
Eupatorium capillifolium (Lam.) Small.	Dog-fennel	M,S
Fuirena pumila (Torr.) Spreng.	Umbrella Grass	S
Hibiscus lasciocarpus Cav.	Marsh Mallow	M,S
Hydrocotyle ranunculoides L.	Floating Pennywort	S
Hydrocotyle umbellata L.	Marsh Pennywort	M,S
Ipomoea sagittata Poir in Lam.	Saltmarsh Morningglory	M
Kosteletzkia virginica (L.) K. Presl ex Gray	Seashore Marshmallow	M
Leersia oryzoides (L.) Sw.	Rice Cutgrass	M,S
Limnobium spongia (Bosc.) Steud.	Common Frogbit	S
Ludwigia leptocarpa (Nutt.) Hara	False Loosestrife,	M,S
Myrica cerifera L.	Waxmyrtle	M,S
Panicum hemitomon Schult.	Maidencane, Paille Fine	M,S
Panicum sp.		M,S
Paspalum vaginatum Sw.	Seashore Paspalum	M,S
Phragmites australis (Cav.) Trin. ex Steud.	Common Reed, Roseau Cane	M,S
Phyla lanceolata (Michx.) Greene	Lance-leafed Frogfruit	M,S
Polygonum punctatum Ell.	Dotted Smartweed	M,S
Pontedaria cordata L.	Pickerelweed	M
Ptilimnium capillaceum (Michx.) Raf.	Mock Bishop's Weed	M
Sacciolepis striata (L.) Nash	Bagscale	M,S
Sagittaria lancifolia L.	Bulltongue	M,S
Sagittaria latifolia Wild.	Arrowhead, Wapato	M,S
Scirpus americanus Pers.	Three Square	M
Scirpus cubensis Poepp. & Kunth in Kunth	Sedge	S
Setaria geniculata (Lam.) Beauv.	Foxtail	M,S
Solidago sempervirens L.	Seaside Goldenrod	M,S
Thelypteris palustris Schott.	Marsh Fern	M,S
Triadenum virginicum (L.) Raf.	Marsh St. John's-wort	M,S
Typha latifolia L.	Cattail	M,S
Vigna luteola (Jacq.) Benth.	Deerpea	M

*M=Maidencane, S=Spikerush

Fisheries Resources

Little is known about fish use of tidal fresh-water marshes. However, the open water in the project area is extensively used for recreational bass fishing. In addition, commercial fisheries for blue crab (*Callinectes sapidus*) and channel catfish (*Ictalurus punctatus*) occur in the project area. The project area might be used by white shrimp (*Penaeus setiferus*) (postlarval, juvenile, and subadult), menhaden (*Brevoortia patronus*)(postlarval/juvenile), and red drum (*Sciaenops ocellatus*)(postlarval/juvenile). However, the Louisiana Department of Wildlife and Fisheries (LDWF) sampling stations are much lower in the estuary (Condrey et al. 1995). The best available data for the project area's fishes comes from the Allen et al. (1985) study of Lake Penchant (Table 2).

Essential Fish Habitat

The project area has a tidal signal of less than 5 cm (Sasser et al. 1994). The project area is recognized as essential fish habitat (EFH) for postlarval, juvenile, and subadult white shrimp and postlarval and juvenile red drum. Submerged aquatic vegetation, marsh ponds, interior marsh, and marsh edge in the project area provide essential habitat for white shrimp. The essential habitats used by red drum in the project area consist of submerged aquatic vegetation, estuarine mud bottoms, and marsh edge. Field deployment (of physical structures) will have minimal impacts to EFH habitat by converting water bottoms and submerged aquatic vegetation (SAV) to physical structures. Impacts from deployment activities would be temporary – such as turbidity from installation – and not significant to EFH. If successful in establishing floating marsh, the project would convert a small area to EFH that is as – or more – productive than mud bottom or SAV.

Social and Economic Conditions

In 2002, Terrebonne Parish was home to 105,454 people with a per capita personal income of $23,036 (Bureau of Economic Analysis 2005). The largest industry in wages in 2003 was mining (17.9%) followed by healthcare (12.7 %), and manufacturing (11.3%) (Louisiana Department of Labor 2004). An average of 49,337 people were employed in Terrebonne Parish in 2003 (Louisiana Department of Labor 2004).

Terrebonne Parish contains approximately 325,000 hectares (803,000 acres) of land. However, only a small percentage of this land area is habitable. In 1968, the Louisiana Department of Public Works determined that 28% of Terrebonne Parish was open water and 54% marsh. The marsh is a major income source for local residents and is the backbone of a culture that is being impacted by the loss of wetland. From 1932 to 1990, Terrebonne has lost approximately 20% of its wetlands (Dunbar et al. 1992). Current loss rates range from 2,200 ha/yr (4,500 acres/yr) (Dunbar et al. 1992) to 2,600 ha/yr (6,500 acres/yr) (Barras 1994).

Table 2. Fish species expected in the project area. Based on Allen et al. (1985).

Abundance in Lake Penchant	Ecological Affinity	Scientific Name	Common Name
Abundant	Fresh water	*Dorosoma cepedianum*	Gizzard shad
Abundant	Fresh water	*Dorosoma petenense*	Threadfin shad
Abundant	Fresh water	*Gambusa affinis*	Mosquitofish
Abundant	Fresh water	*Lepisosteus oculatus*	Spotted gar
Abundant	Fresh water	*Lepomis macrochirus*	Bluegill
Abundant	Fresh water	*Lepomis punctatus*	Spotted sunfish
Common	Fresh water	*Alosa chrysochloris*	Skipjack herring
Common	Fresh water	*Heterandria formosa*	Least killifish
Common	Fresh water	*Ictalurus furcatus*	Blue catfish
Common	Fresh water	*Ictalurus punctatus*	Channel catfish
Common	Fresh water	*Lepomis microlophus*	Redear sunfish
Common	Fresh water	*Lepomis symmetricus*	Bantam sunfish
Common	Fresh water	*Micropterus salmoides*	Largemouth bass
Common	Fresh water	*Morone mississippiensis*	Yellow bass
Common	Estuarine	*Lucania parva*	Rainwater killifish
Common	Estuarine/Marine	*Brevoortis patronus*	Gulf menhaden
Common	Estuarine/Marine	*Elops saurus*	Ladyfish
Rare	Fresh water	*Amia calva*	Bowfin
Rare	Fresh water	*Aplodinotus grunniens*	Freshwater drum
Rare	Fresh water	*Cyprinus carpio*	Common carp
Rare	Fresh water	*Erimyzon sucetta*	Lake chubsucker
Rare	Fresh water	*Ictalurus natalis*	Yellow bullhead
Rare	Fresh water	*Lepisosteus osseus*	Longnose gar
Rare	Fresh water	*Lepisosteus spatula*	Alligator gar
Rare	Fresh water	*Lepomis gulosus*	Warmouth
Rare	Fresh water	*Morone chryssops*	White bass
Rare	Fresh water	*Notemigonus crysoleucas*	Golden shiner
Rare	Fresh water	*Poecilia latipinna*	Sailfin molly
Rare	Fresh water	*Pomoxis nigrmaculatus*	Black crappie
Rare		*Morone saxatilis*	Striped bass
Rare	Estuarine	*Menidia beryllina*	Inland silversides
Rare	Estuarine/Marine	*Leiostomus xantharus*	Spot
Rare	Estuarine/Marine	*Micropogonias undulatus*	Atlantic croaker
Rare	Estuarine/Marine	*Mugil cephalus*	Striped mullet
Rare	Estuarine/Marine	*Strongylura marina*	Atlantic needlefish

The importance of productive coastal ecosystems is demonstrated by the harvest of wild organisms. Marine fisheries harvest in Terrebonne Parish in 2003 consisted primarily of 23,185,000 lbs. of shrimp and 12,150,000 lbs. of crabs, while freshwater fisheries harvest consisted primarily of 612,000 lbs of crawfish (LSU Agcenter 2004). Other economically important wetland products in 2003 include 11,342 pelts of fur animals (primarily nutria) and 52,687 ft of alligator skins, and in addition, 192,000 acres were leased for hunting (LSU Agcenter 2004).

While Terrebonne Parish wetlands serve as a recreational bonanza in the form of hunting and fishing, exact figures for the revenue derived from these activities do not exist. Wetland recreational activities are estimated to contribute more than $450,000,000 to the State's economy.

Cultural Resources

Terrebonne Parish is an area rich in cultural resources with many archeological and historical sites ranging in age from paleo-Indian to twentieth century. These cultural resources are located on natural levees and preferentially at distributary confluences (Brown et al. 2000). No cultural resources have been identified within the project area boundaries.

PROBLEMS AND OPPORTUNITIES

Historical Conditions and Problems

The marshes in the project area have remained fresh since they were first mapped by O'Neil (1949). However, in large parts Terrebonne Parish vegetation associations have changed from thick-mat maidencane dominated marsh to thin-mat spikerush dominated marsh (Visser et al. 1999) and within the project area fresh maidencane marsh has converted to open water. The largest change in Terrebonne Parish occurred between 1968 and 1978 when maidencane dominated marsh dropped from 67% to 34% of the fresh and oligohaline marshes. The loss of maidencane marsh continued and only 19% remained in 1992 (Visser et al. 1999). At the same time, spikerush marsh increased from 3% in 1968 to 53% in 1992 (Visser et al. 1999). From 1932 to 1990, 44% of the wetlands were converted to open water in the GIWW Coast 2050 mapping unit that covers the project area (LCWCRTF 1999). Wetland loss in this region has been attributed to the direct removal during the construction of the intracoastal waterway, which in combination with oil and gas access canals altered the hydrology of the area (LCWCRTF 1999).

Nutria (*Myocastor coypus*) is a rodent introduced to Louisiana in 1937 (Evans 1970). Since its introduction the nutria population has increased rapidly becoming the dominant grazer in fresh and oligohaline marshes (Lowery 1974, Condrey et al. 1995). The best evidence of the importance of grazing by fur bearers in the mainland marshes of coastal Louisiana is from the herbivory damage surveys completed by Linscombe and Kinler utilizing observations made from a helicopter. For example their survey of Barataria and Terrebonne marshes (Linscombe and Kinler, 1994) detected 91 damaged areas totaling approximately 15,500 acres. Since they

surveyed about 28% of the total fresh, intermediate and brackish marsh in the region, this translates to about 55,000 acres of damage in the basin. Over one half of the damage occurred in fresh marshes and 66-86% of the damage was classified as moderate or severe. Floating marshes are the preferred habitat with nutria densities as high as 18 animals per acre. It has been shown that *P. hemitomon* can grow in the areas that were once dominated by this species, and that the main reason for its absence is grazing by nutria (Sasser et al. 2004).

The Coastwide Nutria Control Program (CNCP) monitoring shows that nutria herbivory damage along the coast has declined since the inception of the program in 2003 (Marx et al. 2004). The number of nutria damaged sites was reduced from 94 sites in 2002 to 69 sites in 2004. The CNCP recorded the harvest of almost 160,000 animals in Louisiana freshwater marshes in both the 2003 and 2004 harvest seasons. During the 2003 harvest season, the largest percentage of the harvest came from Terrebonne Parish, while Terrebonne obtained the second largest percentage of the harvest in the 2004 season. The reduction in nutria damage makes this the perfect time to explore ways to restore areas previously impacted by this damage.

Traditional methods for restoring wetland areas that have converted to open water, such as marsh creation with dredged sediment are not practical in these areas. As most of these areas have soft organic bottoms that do not support dredged sediments and in general no local sediment is available for backfilling.

Buoyancy and mat strength are perhaps the most critical factors in creation and restoration of floating marshes (Sasser et al. 1993). Thus particular attention must be paid to the building of an organic substrate that is held together by the root system of the emergent plants growing on it. Strategies for floating marsh development must include provisions for:

1) *floating substrate* -- This may be composed of natural materials such as a mass of floating aquatic vegetation that can be invaded by emergent plants. It also may be composed of an artificial substrate of floating or suspended material that can be colonized by emergent plants. Several different substrates will be evaluated in this project.
2) *appropriate vegetation* -- Apparently few emergent plant species are able to form a strong, thick floating mat. On the Louisiana coast, *P. hemitomon* is probably the best mat former, since it has a strong, extensive, interlocking root system. This project will evaluate several methods to increase establishment, growth, and buoyancy of *P. hemitomon*.
3) *hydrologic protection* -- Floating substrate and vegetation may need protection from wave action and other hydrologic forces that might break up mats, especially during formative stages. This protection is provided by different containment systems proposed in this project. Mats must be anchored or tethered where deployed in areas subject to flows that could carry them downstream by local currents.
4) *herbivory* -- The importance of grazing by nutria in Louisiana coastal wetlands is becoming increasingly apparent. Vegetation and mats need protection from herbivores, especially in the early stages of growth. Therefore, testing will initially be performed in a controlled pond setting. Field testing will be performed as much as possible in areas where the nutria population is controlled by regular culling of the population. Fences will be added to the designs to prevent herbivore access during the plant establishment phase.

Large Scale Application

The designs selected in this project can be considered modular units. Many of these units can be combined to restore larger areas. The Barataria and Terrebonne basins contain approximately 99,000 ha (245,000 acres) of fresh open water (Evers et al. 1996). A third of this open water area is estimated to be suitable for the restoration technique(s) developed in this project.

SCOPE OF THE PROJECT PLAN/EA

Scoping of Concerns

This section of the Plan/EA addresses the concerns of landowners, land users, and various agencies relative to the impact of the project on several issues. No major concerns were voiced during public meetings on this demonstration project.

Formulation, Description, and Comparison of Alternatives

Formulation Process

Floating Marsh Creation Demonstration Project was developed by NRCS, Louisiana State University and the University of New Orleans. The CWPPRA Task Force agencies, LDNR, and the public provided input during project evaluation, public meetings for the Twelfth Priority List Candidates, and throughout the planning process.

Description of Alternative Plans

Two alternative plans were considered for the Floating Marsh Creation Demonstration Project:

1. No Action Alternative
   This alternative consists of no evaluation of floating marsh creation methods to restore shallow freshwater areas to historic maidencane marsh conditions.
2. Demonstration Project Alternative
   This alternative consists of two phases. Phase 1 is the development of artificial floating-marsh systems (AFS) and has two components. The first component is development of a floating system which provides the structure that keeps the substrate in place and provides the buoyancy during the period in which *P. hemitomon* plants establish. Each design will include nutria exclusion measures that protect plants during the establishment phase. The eight designs that will be tested are provided in Figure 2. The second component consist understanding the plant response to environmental effects in order to maximize the establishment and growth of *P. hemitomon* in an AFS. Based on the information resulting from Phase 1, three designs will be selected. Phase 2 consist of testing these three designs under sheltered and exposed hydrologic conditions.

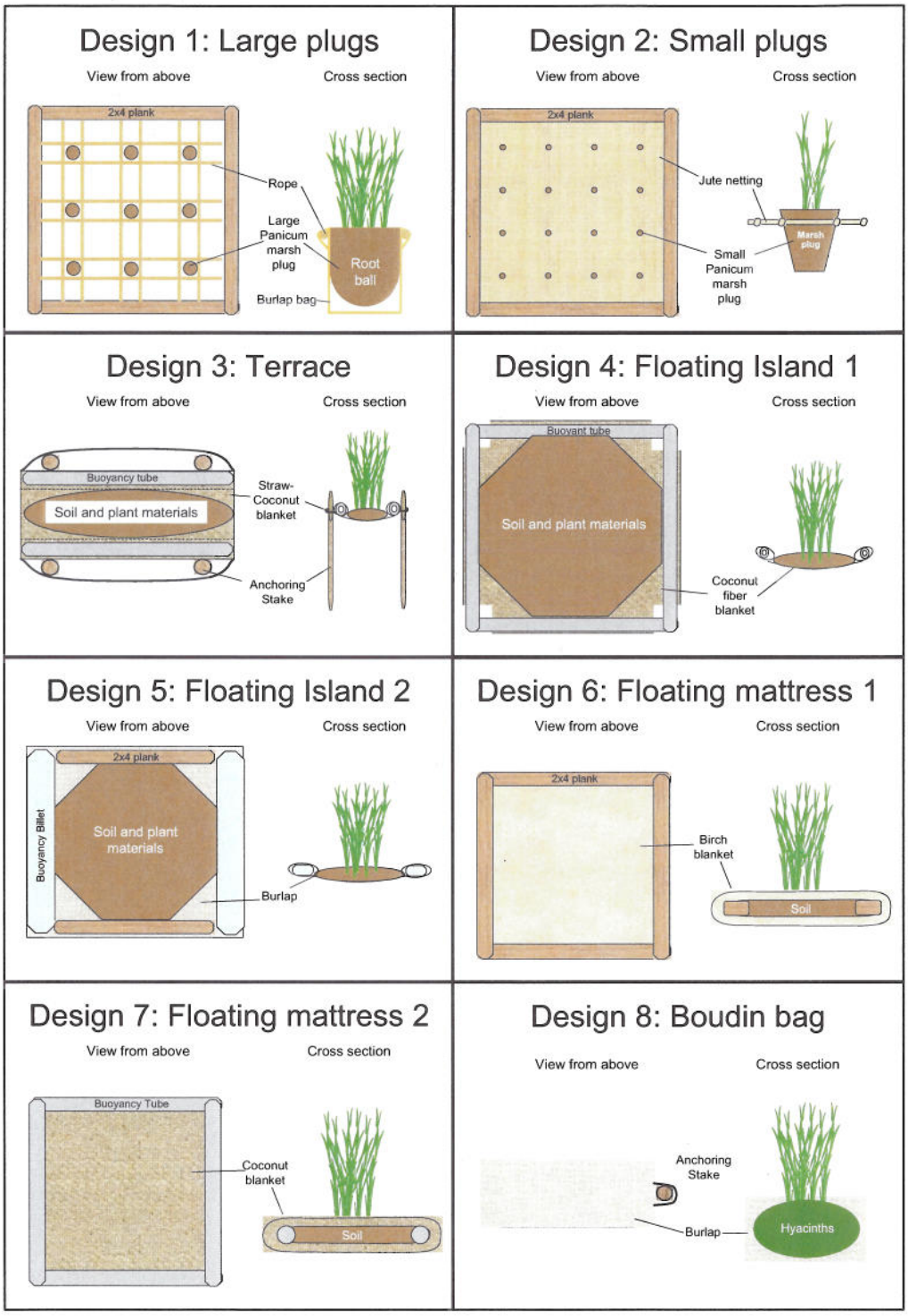

Figure 2. Eight structural designs that will be tested during phase 1 of the project.

Comparison of Alternative Plans

The No Action Alternative provides no measures to restore shallow freshwater areas to historic maidencane marsh conditions.

The Demonstration Project Alternative is designed to impact a very small area of shallow freshwater (1.2 ha or 3 acres). Therefore, any negative impacts of the proposed unproven methods will be limited to a very small area. If any of the structures should become a hazard to fish and wildlife, or to navigation they will be removed. If certain designs are successful recommendations will be made on how to translate the restoration methods to 33,000 ha (82,000 acres) of shallow freshwater in coastal Louisiana. The potential benefits of developing management tools to restore a large area of shallow freshwater exceed the risk of negatively impacting 1.2 ha (3 acres).

Impacts to Significant Resources

Vegetated Wetlands

Since this project will be located in fresh open water areas no vegetated wetlands will be impacted.

Water Quality

The proposed project will not discharge to waters of the state, and all precautions will be taken to control nonpoint source pollution from this project. The proposed project is not expected to have any impact on the groundwater of the region. Created floating islands have been used to improve water quality (AGA Group 2003, Kangas 2003). Vegetation on floating islands improves water quality primarily through the uptake of nutrients.

Air Quality

As required by LAC 33:111.1405B of the Louisiana Department of Environmental Quality air regulations, an applicability determination was made for current conditions and for separate items of the proposed project. The applicability was based upon direct emissions. Indirect emissions were not considered, since no other federal actions such as licensing or subsequent actions relating to construction, are anticipated from this project. It was assumed that if any indirect emissions would occur they would be negligible. The no action alternative would have no impact on present conditions. The Demonstration Project Alternative should have no long-term adverse impact on present conditions, but could have minor short-term negative impacts during construction. The analysis of total direct emissions was based upon the estimated construction hours and subsequent horsepower output of equipment used in the construction of this project. Categories of emissions from nitrogen oxides (NO_x) and volatile organic compounds (VOC's) were evaluated. The total tons of VOC emissions for this project were calculated to be 0.01 tons, which is significantly lower than the threshold limit applicable to VOC's for the Parishes with the most stringent requirement (50 ton/yr) in effect. Based on this applicability determination, the emissions for this project are classified as *de minimus* and no further action is required.

Wildlife

Due to the small area affected by this demonstration project adverse impacts on fish and wildlife populations are not expected. If management techniques developed from this demonstration project are successful, fresh floating wetlands can be created with potential for large scale application. This should benefit wildlife habitat. Floating islands have been created to provide habitat for aquatic birds (Henderson 1992, RSPB 2003)

Essential Fish Habitat

The project will involve short-term construction impacts such as disturbance of the bottom where AFSs are anchored and potentially the death of a few benthic organisms. These short-term impacts will be minimal, and will dissipate quickly with no long-term or cumulative impacts to Essential Fish Habitat (EFH). All other impacts are beneficial and will accrue from the increased presence of a highly productive fresh-water floating marsh. Per consultation requirements for EFH by the Magnuson-Stevens Fishery Conservation and Management Act, all work to be performed has been reviewed by NOAA National Marine Fisheries Service (Appendix C).

Threatened and Endangered Species

Bald eagles presently occur within the proposed project area. However, the proposed project is not expected to adversely affect this species. All work to be performed has been reviewed by the U.S. Fish and Wildlife Service (Appendix C). They concur that the proposed project is unlikely to adversely affect threatened and endangered species.

Cultural Resources

Terrebonne Parish is an area rich in cultural resources with archeological and historical sites ranging from paleo-Indian to twentieth century. Most of these cultural sites are concentrated on natural levees. No construction, structural or otherwise, is planned as a component of this project in the vicinity of a reported site. Therefore, no impacts to cultural sites are anticipated as a result of project installation. All work to be performed has been reviewed by the State Historic Preservation Officer, and a letter of no objection has been obtained prior to finalization of this document (Appendix C). Should unknown sites be encountered during construction, the LSU Agricultural Center will conduct proper coordination with the appropriate agencies.

Recreational Resources

Freshwater sport fishing is the primary recreational activity in the study area. Hunting for waterfowl and deer, boating, and bird watching are other activities that occur in the project area. Implementation of this project is not expected to adversely impact the recreational activities in the area.

Risk, Uncertainty, and Rationale for Plan Selection

Review of available information, expertise of personnel involved in the planning process, and consideration of potential impacts of alternatives have been utilized in recommending a project plan. This plan addresses the most critical needs in information for floatant creation while

striving to minimize adverse impacts. The project is not anticipated to cause any long-term, significant, adverse environmental impacts.

CONSULTATION AND PUBLIC PARTICIPATION

Coordination has been maintained with the following agencies concerning the proposed project: U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, U.S. Army Corps of Engineers, and Louisiana Department of Natural Resources. Federal, state, and local agencies, as well as other interested parties, will receive a copy of this Plan/EA and the Finding of No Significant Impact. A copy of the mailing list is available upon request.

Project development and selection under CWPPRA utilizes input from the public, as well as local, state, and federal agency input. Public involvement in CWPPRA is achieved through the Citizen Participation Group and annual public meetings conducted during the project development and selection stages.

RECOMMENDED PLAN

Project Objective

The objective of this project is to develop methods for restoration of open areas within thin and deteriorated mats that once supported thick-mat maidencane marsh and other fresh water areas where establishment of maidencane marsh is desired.

Project Components

This project will be accomplished in two phases. The first phase is a development phase consisting of two components. The first development component is the development of structures that provide a floating substrate in which Panicum hemitomon can establish. Each structure will include nutria exclusion measures that protect plants during the establishment phase. A minimum of eight different structures that use different combinations of different structures and mat materials will be tested during the development phase (Figure 2). The second development phase component is optimizing plant responses to accelerate the development of floating marsh. The information from the two components in the first phase will be used to design three artificial floating systems for field testing in the second phase of the project.

Benefits

This project is designed to impact a very small area (less than 1.2 ha or 3 acres). The methods used are unproven and will be tested on a small scale. However, if certain combinations are successful, recommendations will be made on how to translate the restoration methods to larger areas. Potential benefited areas include all shallow open water areas which are estimated at 33,000 ha (82,000 acres).

Costs, Financing, and Installation

Total project cost was estimated and includes all aspects of planning, engineering, administration, landrights acquisition, construction, inspection, and monitoring. Operation and maintenance are not included in demonstration projects. Cost information is provided in Appendix B.

The project is funded under CWPPRA, and therefore will be cost-shared between the federal sponsoring agency (USDA-NRCS) and the State of Louisiana (LDNR). Pursuant to the Louisiana Coastal Wetlands Conservation Plan approved on November 30, 1997, the federal government provides 85% of the project cost and the State of Louisiana provides the remaining 15%. The USDA NRCS and LDNR have executed a cost-sharing agreement for this demonstration project.

Installation of the project features will begin after all regulatory permits, approvals, landrights and engineering (design, plans, and specifications) are complete. Project construction will be administered by the LDNR in cooperation with NRCS.

Monitoring, Operation, Maintenance, and Rehabilitation

Funding for the project includes funds dedicated for monitoring for the 5-year project life. LDNR is responsible for monitoring. Operation, maintenance, and rehabilitation are not included in this demonstration project.

ENVIRONMENTAL COMPLIANCE

Permits and Compliance

All necessary permits and approvals will be obtained before project construction is authorized. Applicable federal and state statutes are shown in Table 3. The proposed action is not expected to cause adverse environmental impacts requiring environmental mitigation.

CONCLUSION

The United States Department of Agriculture, Natural Resources Conservation Service finds no adverse impacts to cultural resources, threatened or endangered species, essential fish habitat, fisheries, wildlife, vegetated wetlands, water quality, and air quality. Project implementation is expected to provide new designs that could increase our ability to manage and restore floating marshes and could identify management techniques that can be applied to a larger area and potentially benefit 33,000 ha (85,000 acres) of fresh shallow open water.

Table 3. Environmental Compliance.

Statute	Compliance
Archeological and Historic Preservation Act	Full
Clean Air Act, as amended	Full
Coastal Barrier Resources Act (PL 97-348; 1982)	N/A
Coastal Zone Management Act of 1972, as amended	Full
Endangered Species Act of 1973, as amended	Full
Executive Order 11988, Floodplain Management	Full
Executive Order 11990, Protection of Wetlands	Full
Farmland Protection Policy Act	Full
Federal Water Pollution Control Act	Full
Magnuson-Stevens Fishery Conservation and Management Act	Full
National Environmental Policy Act of 1969, as amended	*
National Historic Preservation Act of 1966, as amended	Full
Subtitle B, Highly Erodable Land Conservation, and Subtitle C, Wetland Conservation, of the Food Security Act of 1985	Full
Wild and Scenic River Act, as amended	N/A

*Full compliance and applicable documentation will be completed prior to construction.

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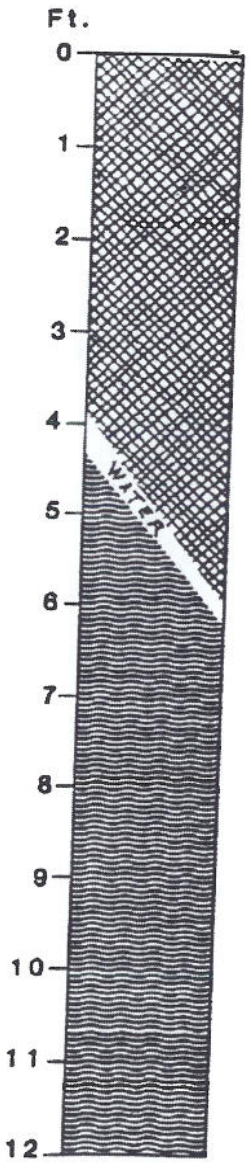
APPENDICES

APPENDIX A: SOIL PROFILES

SOIL PROFILE



CARLIN SERIES

This series consist of very poorly drained semi-fluid organic soils which occupy freshwater coastal marsh areas. These soils formed in herbaceous plant remains over mineral sediments. Slope is less than 1 percent.

Carlin soils are associated with the Kenner, Allemands, and Maurepas soils. All of these soils have a lower fiber content and lack of hydric layer. In some places, Carlin is adjacent to Barbary and Harris soils. Barbary is a semifluid mineral soil which occupies ponded backswamps. Harris is a firm mineral soil which occurs in coastal marshes.

Soil Characteristics

Typically the Carlin soils have a surface layer of strongly acid to neutral, very dark grayish brown mucky peat about 12 inches thick. The underlying layer is moderately alkaline, very dark grayish brown mucky peat. The fibrous peat surface layer floats on a layer of water that is greater than 50 inches to the mineral layers.

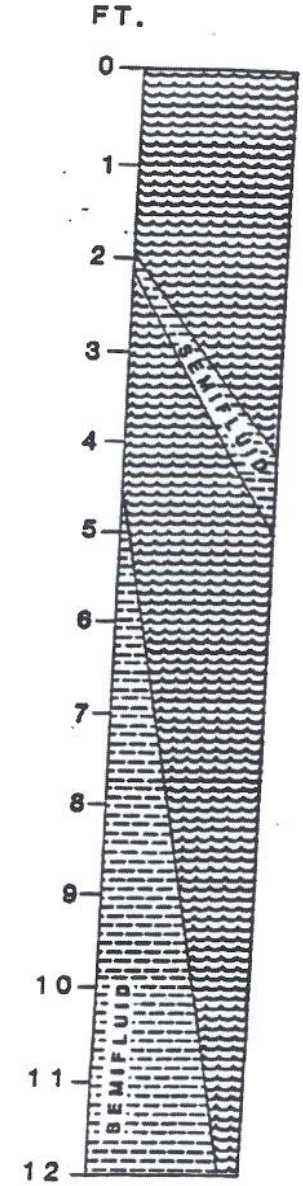
Use and Management

The major land use for this soil is related to wildlife. Most of it is managed for hunting, trapping, and fishing. Alligator, crawfish, geese, nutria, and duck populations are usually high. The typical plants growing on this soil are Paille fine, hyacinth, ricefield, cutgrass, cattail, plumegrass, and water primrose.

The dominant limitations influencing use and management of the Carlin soil are the high subsidence potential, low bearing strength, danger of deep flooding during storms, and the threat of salt water intrusion which could change the vegetative type. Water control structures for wildlife management purposes are extremely difficult to install because of the water layer and the unstable nature of the organic material. A few areas of this soil may change locations due to winds from hurricanes. This soil is not suited to cropland, pastureland, and urban uses.

SOIL PROFILE

KENNER MUCK



This unprotected, undrained soil occupies low elevations in fresh or slightly saline coastal marshes. Typically this soil consists of very poorly drained, organic soils that have more than 51 inches of very dark gray to black, well decomposed organic material stratified with thin semifluid gray clay layers. Small areas of other soils with different properties may be included with this soil.

The water table ranges from 1/2 foot below to 1 foot above the soil surface. Surface runoff is very slow. Permeability is rapid in the organic material and very slow in the mineral layers. If disturbed this soil tends to liquefy.

The potential is very poor for all uses other than wildlife and recreation due to wetness, flooding, poor accessibility and low strength.

APPENDIX B: COST INFORMATION

Coastal Wetlands Conservation and Restoration Plan Priority Project List XII
Freshwater Floating Marsh Demo

Project Construction Years:	2	Total Project Years	22
Interest Rate	6.125%	Amortization Factor	0.088071
Fully Funded First Costs	$868,200	Total Fully Funded Costs	$1,080,900

Annual Charges	Present Worth	Average Annual
First Costs	$893,135	$78,660
Monitoring	$129,820	$11,433
O & M Costs	$39,288	$3,460
Other Costs	$1,773	$156
Total	$1,064,000	$93,700
Average Annual Habitat Units		NA
Cost Per Habitat Unit		#VALUE!
Total Net Acres		NA

B-1

Coastal Wetlands Conservation and Restoration Plan

Freshwater Floating Marsh Demo

Project Costs

Year		Fiscal Year	E&D	Land Rights	Federal S&A	LDNR S&A	Corps Proj. Man.	Monitoring	S&I	Contingency	Construction Costs	Total First Cost
Phase I												
0	Compound								-	$0		$0
3	Compound	2002	$0	$0	$0	$0	$0	$0	-	$0		$0
2	Compound	2003	$124,923	$2,692	$5,115	$1,615	$665	$75,560	-	$0		$210,571
1	Compound	2004	$107,077	$2,308	$4,385	$1,385	$333	$0	-	$0		$115,486
		TOTAL	$232,000	$5,000	$9,500	$3,000	$998	$75,560	$0	$0	$0	$326,058
Phase II												
4	Compound	2001	-	-	-	-	-	-	-	$0	$0	$0
3	Compound	2002	-	-	-	-	-	-		$0	$0	$0
2	Compound	2003	-	-	-	-	-	-		$0	$0	$0
1	Compound	2004	-	-	$9,500	$3,000	$333	$124,800	$0	$73,000	$292,000	$502,633
		TOTAL	$0	$0	$9,500	$3,000	$333	$124,800	$0	$73,000	$292,000	$502,633
Total First Costs			$232,000	$5,000	$19,000	$6,000	$1,330	$200,360	$0	$73,000	$292,000	$828,690

Year		FY	Monitoring	O&M	Corps PM	Other
1	Discount	2005	$64,800	$11,768	$665	-
2	Discount	2006	$36,960	$11,768	$665	-
3	Discount	2007	$42,960	$21,216	$665	-
4	Discount	2008	$0	$0	$0	-
5	Discount	2009	$0	$0	$0	-
6	Discount	2010	$0	$0	$0	-
7	Discount	2011	$0	$0	$0	-
8	Discount	2012	$0	$0	$0	-
9	Discount	2013	$0	$0	$0	-
10	Discount	2014	$0	$0	$0	-
11	Discount	2015	$0	$0	$0	-
12	Discount	2016	$0	$0	$0	-
13	Discount	2017	$0	$0	$0	-
14	Discount	2018	$0	$0	$0	-
15	Discount	2019	$0	$0	$0	-
16	Discount	2020	$0	$0	$0	-
17	Discount	2021	$0	$0	$0	-
18	Discount	2022	$0	$0	$0	-
19	Discount	2023	$0	$0	$0	-
20	Discount	2024	$0	$0	$0	-
		Total	$144,720	$44,752	$1,995	$0

All dates are in Federal Fiscal Years (October 1 to September 30)

Coastal Wetlands Conservation and Restoration Plan

Freshwater Floating Marsh Demo

Present Valued Costs — Total Discounted Costs: $1,064,016 — Amortized Costs: $93,709

Year		Fiscal Year	E&D	Land Rights	Federal S&A	LDNR S&A	Corps Proj. Man.	Monitoring	S&I	Contingency	Construction Costs	Total First Cost
Phase I												
0	1.000	0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	1.195	2002	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	1.126	2003	$140,695	$3,032	$5,761	$1,819	$749	$85,100	$0	$0	$0	$237,156
1	1.061	2004	$113,635	$2,449	$4,653	$1,469	$353	$0	$0	$0	$0	$122,560
		Total	$254,330	$5,481	$10,414	$3,289	$1,102	$85,100	$0	$0	$0	$359,716
Phase II												
4	1.268	2001	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	1.195	2002	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	1.126	2003	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1	1.061	2004	$0	$0	$10,082	$3,184	$353	$132,444	$0	$77,471	$309,885	$533,419
		Total	$0	$0	$10,082	$3,184	$353	$132,444	$0	$77,471	$309,885	$533,419
Total First Cost			$254,330	$5,481	$20,496	$6,473	$1,455	$217,544	$0	$77,471	$309,885	$893,135

Year		FY	Monitoring	O&M	Corps PM	Other
-1	0.942	2005	$61,060	$11,089	$627	
-2	0.888	2006	$32,617	$10,449	$590	
-3	0.837	2007	$35,943	$17,750	$556	
-4	0.788	2008	$0	$0	$0	
-5	0.743	2009	$0	$0	$0	
-6	0.700	2010	$0	$0	$0	
-7	0.660	2011	$0	$0	$0	
-8	0.622	2012	$0	$0	$0	
-9	0.586	2013	$0	$0	$0	
-10	0.552	2014	$0	$0	$0	
-11	0.520	2015	$0	$0	$0	
-12	0.490	2016	$0	$0	$0	
-13	0.462	2017	$0	$0	$0	
-14	0.435	2018	$0	$0	$0	
-15	0.410	2019	$0	$0	$0	
-16	0.386	2020	$0	$0	$0	
-17	0.364	2021	$0	$0	$0	
-18	0.343	2022	$0	$0	$0	
-19	0.323	2023	$0	$0	$0	
-20	0.305	2024	$0	$0	$0	
		Total	$129,620	$39,288	$1,773	$0

All dates are in Federal Fiscal Years (October 1 to September 30)

Coastal Wetlands Conservation and Restoration Plan

Freshwater Floating Marsh Demo

Fully Funded Costs Total Fully Funded Costs $1,080,900 Amortized Costs $95,196

Year		Fiscal Year	E&D	Land Rights	Federal S&A	LDNR S&A	Corps Proj. Man.	Monitoring	S&I	Contingency	Construction Costs	Total First Cost
Phase I												
0	0.000	0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	1.000	2002	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	1.027	2003	$128,296	$2,765	$5,254	$1,659	$683	$77,600	$0	$0	$0	$216,257
1	1.055	2004	$112,937	$2,434	$4,625	$1,460	$351	$0	$0	$0	$0	$121,807
		TOTAL	$241,233	$5,199	$9,878	$3,119	$1,034	$77,600	$0	$0	$0	$338,063
Phase II												
4	0.974	2001	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	1.000	2002	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	1.027	2003	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1	1.055	2004	$0	$0	$10,020	$3,164	$351	$131,630	$0	$76,995	$307,981	$530,141
		TOTAL	$0	$0	$10,020	$3,164	$351	$131,630	$0	$76,995	$307,981	$530,141
Total Cost			$241,200	$5,200	$19,900	$6,300	$1,400	$209,200	$0	$77,000	$308,000	$868,200

Year		FY	Monitoring	O&M	Corps PM	Other
-1	1.083	2005	$70,192	$12,747	$720	
-2	1.112	2006	$41,116	$13,091	$740	
-3	1.142	2007	$49,081	$24,239	$760	
-4	1.180	2008	$0	$0	$0	
-5	1.219	2009	$0	$0	$0	
-6	1.259	2010	$0	$0	$0	
-7	1.301	2011	$0	$0	$0	
-8	1.344	2012	$0	$0	$0	
-9	1.388	2013	$0	$0	$0	
-10	1.434	2014	$0	$0	$0	
-11	1.481	2015	$0	$0	$0	
-12	1.530	2016	$0	$0	$0	
-13	1.581	2017	$0	$0	$0	
-14	1.633	2018	$0	$0	$0	
-15	1.687	2019	$0	$0	$0	
-16	1.742	2020	$0	$0	$0	
-17	1.800	2021	$0	$0	$0	
-18	1.859	2022	$0	$0	$0	
-19	1.921	2023	$0	$0	$0	
-20	1.984	2024	$0	$0	$0	
		Total	$160,400	$50,100	$2,200	$0

APPENDIX C: AGENCY COMMENTS AND RESPONSES

The following pages document the comments on the Draft EA that were received from federal and state agencies and other parties and the response to those comments. Copies of all letters received are provided at the end of this Appendix.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Comment: The EA appears very well written. We do, however, suggest that you clarify whether the U.S. Fish and Wildlife has been consulted regarding the presence or use of the existing open water habitat by any threatened or endangered species (T&E). While you indicate that no such species are present in the area, it is unclear how this determination was made. We agree that it is unlikely that any adverse impacts would occur to T&E species and make this recommendation only to ensure document completeness and to shed light on how this technology for wetlands restoration might affect larger areas if it is successful and results subsequently extrapolated.

Response: The section on impacts to threatened and endangered species on page 14 was changed from:

"No Federally listed threatened or endangered species, or their critical habitat, presently occur within the proposed project area."

to:
"Bald eagles presently occur within the proposed project area. However, the proposed project is not expected to adversely affect this species. All work to be performed has been reviewed by the U.S. Fish and Wildlife Service. They concur that the proposed project is unlikely to adversely affect threatened and endangered species."

Comment: Similarly, we recommend expanding the discussion of the Essential Fish Habitat (EFH). If successful, the newly created floating marsh habitat will replace shallow, open water, unvegetated habitat, submerged aquatic vegetation communities. Regardless of such habitat change, certainly the small area to be impacted in this demonstration dictates that any EFH impacts will be minor. However, if successful, greater areas might be converted from open water habitat to floating marsh in follow up application, hence our suggestion that this issue be addressed in greater detail.

Response: We agree that, if proven successful, this demonstration project may lead to future larger-scale efforts. However, no follow-up endeavors addressing larger areas are funded as a component of this project. Potential impacts to EFH and other pertinent resources from any future large-scale applications would be evaluated and addressed through the NEPA process if and when such applications are approved and funded. NOAA's National Marine Fisheries Service has reviewed the draft EA and finds that it adequately describes the potential impacts of the project on EFH and marine fishery resources. Therefore no changes were made to the text.

Comment: In the event of any project trial failure or deposit on the landscape of fugitive, unvegetated debris, will the structures be removed?

Response: The *Description of Alternative Plans* Section in the final version has been revised and includes the following statement: If any of the structures become a hazard to fish and wildlife or navigation, they will be removed.

Comment: Will plants in the trials be fertilized? If so, is there potential for localized water quality problems?

Response: The plants will only be fertilized if nutrient levels in the project area are found to be insufficient for optimum plant growth. Previous experience in similar areas has shown that the application of slow-release fertilizers (the type that will be used if necessary), did not extend beyond the immediate area of application. In general, floating islands are expected to reduce nutrient concentrations in the surrounding water.

Comment: Will herbicides or pesticides be used? If so, is there potential for localized environmental impacts from such applications.

Response: No herbicides or pesticides will be applied as part of the proposed project.

Comment: Are there other water quality related issues that could be associated with this project, either in its success or failure?

Response: Not that we are aware of.

STATE OF LOUISIANA, Department of Environmental Quality

Comment: If your project results in a discharge to waters of the state, submittal of a Louisiana Pollutant Discharge Elimination System application may be necessary.

Response: The proposed project will not discharge to waters of the state. The section on impacts to water quality in the final version of this document has been revised for clarification.

Comment: LDEQ has stormwater general permits for construction areas equal to or greater than one acre. It is recommended that you contact Yvonne Baker at (225) 219-3111 to determine if your proposed improvements require one of these permits.

Response: We have contacted Yvonne Baker, and she has determined that no such a permit is required for this project because the project is not located on land.

Comment: All precautions should be observed to control nonpoint source pollution from construction activities.

Response: All precautions will be taken to control nonpoint source pollution from this project. The section on impacts to water quality in the final version of this document has been revised for clarification.

Comment: If any of the proposed work is located in wetlands or other areas subject to the jurisdiction of the U.S. Army Corps of Engineers, you should contact the Corps to inquire about the possible necessity for permits. If a Corps permit is required, part of the application process may involve a Water Quality Certification from LDEQ.

Response: A permit application for this project has been submitted to the LA Department of Natural Resources Coastal Management Division for consistency review, to the US Army Corps of Engineers for either a section 404 permit or Programmatic General Permit, and to the LA Department of Environmental Quality for review and, if deemed necessary, a Water Quality Certificate.

Comment: All precautions should be observed to protect the groundwater of the region.

Response: The proposed project is not expected to have any impact on the groundwater of the region. The section on impacts to water quality in the final version of this document has been revised for clarification.

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
3737 Government Street
Alexandria, LA 71302

March 16, 2005

Ms. Pam Breaux
State Historic Preservation Officer
Department of Culture, Recreation and Tourism
P.O. Box 44247
Baton Rouge, Louisiana 70804

Date: 4-20-05
No known archaeological sites or historic properties will be affected by this undertaking. This effect determination could change should new information come to our attention.
Pam Breaux: Pam Breaux
State Historic Preservation Officer

Dear Ms. Breaux:

RE: Coastal Wetlands Planning Protection and Restoration Act
Floating Marsh Creation Demonstration Project (LA-05)
Terrebonne Parish , Louisiana

The Natural Resources Conservation Service (NRCS) is authorized to develop and field test an assortment of artificial floating marsh systems. These systems will be deployed at a site within the boundaries of the Mandalay National Wildlife Refuge in Terrebonne Parish (see attached map). Deployment of the floating mats will not require any ground disturbing (aerial or sub aqueous) activities.

A review of your site files by NRCS personnel revealed that there are no known cultural sites located in or near the project area. It is our opinion that there will be no impact to any known or unidentified cultural resources. We request that your office comment on our determination that no further cultural resource investigations are needed.

Please reply to: Joe Conti
3737 Government Street
Alexandria, La. 71302

Sincerely,

Acting For
Donald W. Gohmert
State Conservationist

Attachment

cc: Cindy Steyer, Soil Conservationist, Project Manager, NRCS, Baton Rouge, Louisiana

MAR 18 2005

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer

CHITIMACHA
TRIBE OF LOUISIANA

CULTURAL DEPARTMENT

October 21, 2005

W. Britt Paul
3737 Government Street
Alexandria, Louisiana 71302

RE: Floating Marsh Creation Demonstration Project (LA-05)
Terrebone Parish, Louisiana

Dear Mr. Paul,

I am in receipt of your letter and accompanying Draft Plan/Environmental Assessment dated September 12, 2005, informing the Chitimacha Tribe of the US Department of Agriculture Natural Resources Conservation Service project concerning the floating marsh creation demonstration project (LA-05) in Terrebonne Parish.

The parish where the proposed project is to take place is part of the aboriginal Chitimacha homeland. That is, historically and prehistorically the Chitimacha Tribe of Louisiana was located in this area. This homeland contains many village sites, religious/sacred sites, and burial sites, which must be taken into account in the planning process.

Our records and oral traditions do not indicate that a specific Chitimacha archaeological site or Traditional Cultural Property is in the immediate vicinity of your project, therefore we have no objection to the implementation of the proposed activity. However, if archaeological remains representing a village site and/or burial site are discovered during the process of construction you should stop and contact the tribe and the State Historic Preservation Office immediately, in order to begin consultation regarding the encountered remains.

The Chitimacha Tribe of Louisiana appreciates your compliance with federal and state laws concerning Native American notification and consultation. Should you have any questions, do not hesitate to contact me at (337) 923-9923.

Sincerely,

Kimberly S. Walden,
Director, Cultural Department

KW: JD

105 Houma Drive P.O. Box 661 Charenton, LA 70523 (337) 923-9923 FAX (337) 923-6848

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
P.O. Box 16030
Baton Rouge, LA 70893

RECEIVED
MAR 2005

47-05-803

March 7, 2005

Mr. Russell Watson
Field Supervisor
U.S. Fish and Wildlife Service
646 Cajundome Boulevard, Suite 400
Lafayette, LA 70506

RE: Coastal Wetlands Planning, Protection, and Restoration Act
Floating Marsh Creation Demonstration Project (LA-05)

Dear Mr. Watson:

The National Environmental Protection Act process has been initiated for the above referenced Floating Marsh Creation Demonstration Project, and the Project Plan/Environmental Assessment is currently being drafted. The purpose of this project is to develop and field test an assortment of designs of Artificial Floating-marsh Systems (AFS). For the field testing phase, the AFS will be deployed at selected sites within the Mandalay National Wildlife Refuge, north of the Gulf Intracoastal Waterway in Terrebonne Parish. For additional details, please refer to the attached map.

By this letter, I am requesting a determination as to whether the proposed project, as described in the attached project fact sheet, would have any significant impacts to any listed or proposed threatened or endangered species. If there are any questions regarding this matter, please contact me at 225-389-0334, or cindy.steyer@la.usda.gov . Thank you very much for your assistance.

Sincerely,

Cindy S. Steyer

Cindy S. Steyer
Coastal Vegetative Specialist
USDA NRCS

This project has been reviewed for effects to Federal trust resources under our jurisdiction and currently protected by the Endangered Species Act of 1973 (Act). The project, as proposed,
( ) Will have no effect on those resources
(X) Is not likely to adversely affect those resources.
This finding fulfills the requirements under Section 7(a)(2) of the Act.

Deborah A. Fuller March 17 2005

Acting Supervisor
Louisiana Field Office
U.S. Fish and Wildlife Service

Date

Cc: Britt Paul, ASTC/WR, NRCS, Alexandria, LA
Randolph Joseph, Jr., ASTC/FO, NRCS, Lafayette, LA
Michael Trusclair, DC, NRCS, Thibodaux, LA

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701

October 14, 2005 F/SER46/BH:jk
225/389-0508

Ms. Cindy Steyer
U.S. Department of Agriculture (USDA-NRCS)
Natural Resources Conservation Service
Post Office Box 16030
Baton Rouge, Louisiana 70893

Dear Ms. Steyer:

NOAA's National Marine Fisheries Service (NMFS) has received the draft Project Plan and Environmental Assessment (EA) titled **"FLOATING MARSH CREATION DEMONSTRATION PROJECT (LA-05), LOUISIANA"** transmitted by a letter from Mr. W. Britt Paul dated September 12, 2005. The draft EA evaluates the potential impacts of the development, deployment, and monitoring of artificial floating marsh systems. This project has been funded under the auspices of the Coastal Wetlands Planning, Protection, and Restoration Act with the Natural Resources Conservation Service acting as the Federal sponsor.

NMFS has reviewed the draft EA and finds it adequately describes the potential project impacts of the project on essential fish habitat and marine fishery resources. As such, NMFS has no comments to provide on the draft EA. Because the project has the potential to create and protect habitat supportive of NMFS-trust resources, we support project implementation and recommend the project be constructed as soon as possible.

We appreciate the opportunity to review and comment on the draft EA.

Sincerely,

for Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc:
FWS, Lafayette
EPA, Dallas
NOD, Podany
LA DNR, Consistency
F/SER46, Reubsamen
Files

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

OCT 17 2005

W. Britt Paul
Assistant State Conservationist for Water Resources
Natural Resources Conservation Service
3737 Government Street
Alexandria, Louisiana 71302

Dear Mr. Paul:

My staff has conducted its review of the Environmental Assessment (EA) for the Floating Marsh Creation Demonstration Project (LA-05) in Terrebonne Parish, Louisiana. We acknowledge that the action addressed in the EA is a planned demonstration of a new approach to develop floating coastal wetland mats, with the intent of adding to the coastal restoration toolbox. We support constructive, scientific efforts that build on the work currently carried out through the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) and look forward to the results from this project.

CWPPRA demonstration projects are typically applied research on a small scale, so the potential for significant environmental impacts is generally low. The project's segmentation into two phases gives opportunity for development and demonstration of the substrate support system, followed by establishing vegetative communities that might thrive in these environments. We believe observations made during each of the project's phases will give further opportunity to minimize impacts.

The EA appears very well written. We do, however, suggest that you clarify whether the U.S. Fish and Wildlife Service has been consulted regarding the presence or use of this existing open water habitat by any threatened or endangered species (T&E). While you indicate that no such species are present in the area, it is unclear how this determination was made. We agree that it is unlikely that any adverse impacts would occur to T&E species and make this recommendation only to ensure document completeness and to shed light on how this technology for wetlands restoration might affect larger areas if it is successful and results subsequently extrapolated.

Similarly, we recommend expanding the discussion of Essential Fish Habitat (EFH). If successful, the newly created floating marsh habitat will replace shallow, open water, un-vegetated habitat and submerged aquatic vegetative communities. Regardless of such habitat change, certainly the small area to be impacted in this demonstration dictates that any EFH impacts will be minor. However, if successful, greater areas might be converted from open water habitat to floating marsh in follow up application, hence our suggestion that this issue be addressed in greater detail.

Internet Address (URL) • http://www.epa.gov
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Finally, several other questions have arisen during our review that should be addressed in the text of this document:

- In the event of any project trial failure or deposit on the landscape of fugitive, un-vegetated debris, will the structures be removed?
- Will plants in the trials be fertilized? If so, is there potential for localized water quality problems? Will herbicides or pesticides be used? If so, is there potential for localized environmental impacts from such applications? Again, it is unlikely that this project will result in significant environmental problems, but the EA would be improved were these issues addressed at this point.
- Are there other water quality-related issues that could be associated with this project, either in its success or failure?

It is our hope that you will have notable success in demonstrating the capability of rebuilding floating marshes through this project. Kenneth Teague of my staff is available to discuss our comments or answer any questions you may raise (214) 665-6687.

Sincerely,

Sharon Fancy Parrish

Sharon Fancy Parrish
Chief
Wetlands and Marine Section

State of Louisiana

Department of Environmental Quality

KATHLEEN BABINEAUX BLANCO
GOVERNOR

MIKE D. McDANIEL, Ph.D.
SECRETARY

September 29, 2005

Ms. Cindy Steyer, Project Manager
United States Department of Agriculture
Natural Resources Conservation Service
Field Office Project Support Staff
P. O. Box 16030
Baton Rouge, LA 70893

RE: DEQ0609210051; Draft Environmental Assessment;
Terrebonne Parish
Proposed Floating Marsh Creation Demonstration
Project (LA-05)

Dear Ms. Steyer:

The Department of Environmental Quality, Office of Environmental Assessment and Office of Environmental Services has received your request for comments on the above referenced project.

There were no objections based on the limited information submitted to us. However, the following comments have been included and/or attached. Should you encounter a problem during the implementation of this project, please make the appropriate notification to this Department.

The Office of Environmental Services recommends that you investigate the following requirements that may influence your proposed project:

1. If your project results in a discharge to waters of the state, submittal of a Louisiana Pollutant Discharge Elimination System application may be necessary.
2. LDEQ has stormwater general permits for construction areas equal to or greater than one acre. It is recommended that you contact Yvonne Baker at (225) 219-3111 to determine if your proposed improvements require one of these permits.
3. All precautions should be observed to control nonpoint source pollution from construction activities.
4. If any of the proposed work is located in wetlands or other areas subject to the jurisdiction of the U.S. Army Corps of Engineers, you should contact the Corps to inquire about the possible necessity for permits. If a Corps permit is required, part of the application process may involve a Water Quality Certification from LDEQ.

5. All precautions should be observed to protect the groundwater of the region (SEE ATTACHMENT).

Currently, Terrebonne Parish is classified as an attainment parish with the National Ambient Air Quality Standards for all criteria air pollutants.

Please forward all future requests to the Louisiana Department of Environmental Quality, Office of Management and Finance, Contracts & Grants, P. O. Box 4303, Baton Rouge, LA 70821-4303, and we will expedite your request as quickly as possible. Should you need any additional information please call me at (225) 219-3815.

Sincerely,

Lisa L. Miller
Contracts & Grants

llm:vhn
Enclosure

Our goals

- Educate Louisiana communities about their drinking water sources.
- Educate Louisiana communities about the importance of protecting their drinking water sources.
- Educate Louisiana communities about actions they can take to protect their drinking water sources.

We need your help!

Help Louisiana protect its drinking water. We need volunteers to serve on local committees dedicated to the protection of our drinking water sources. Other volunteer opportunities are available within your community, such as visiting schools, taking part in local Hazardous Waste Collection Days, and educating your neighbors on how to protect drinking water sources. For more information, please contact the DEQ Drinking Water Protection Team.

Louisiana Department of Environmental Quality
Office of Environmental Assessment
Environmental Evaluation Division
Aquifer Evaluation and Protection Section
Post Office Box 4314
Baton Rouge, Louisiana 70821-4314

Phone: 1-888-763-5424
Website: www.DEQ.Louisiana.GOV/evaluation/aeps/
Email: SECTAQEVA@LA.GOV

This is the fourth printing of this public document, published at a total cost of $3515.00 for 5000 copies by the Louisiana Department of Environmental Quality, P.O. Box 4314, Baton Rouge, Louisiana 70821-4314 to provide the public with environmental information under the authority of La. R.S. 30:2011. The material was printed in accordance with the standards for printing by state agencies established pursuant to R.S. 43:31 of the Revised Louisiana Statutes.

Louisiana Drinking Water

Protection Program

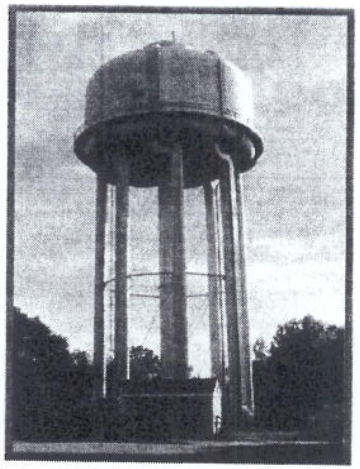
Drinking Water Protection Program

The Louisiana Drinking Water Protection Program (LDWPP) is a voluntary program designed to assist Louisiana communities in protecting their drinking water. The goal of the program is to increase public awareness on the importance of protecting drinking water sources. The program is also designed to educate communities on actions they can take to protect their drinking water sources.

The Louisiana Department of Environmental Quality (DEQ) mapped and assessed all community water wells, surface water intakes, and potential sources of contamination (PSOCs) in the state through the Source Water Assessment Program (SWAP). PSOC's may include gas stations, dry cleaners or other facilities that sell, store, use or dispose of chemicals. Chemicals, if not handled properly, have the potential to contaminate our ground water. The SWAP assessments also considered other factors, such as well depth or age of surface water intake, that can increase the susceptibility of a drinking water source to contamination.

DEQ issued a final report to each system assessed through the SWAP program. The report ranked each system's susceptibility to contamination. These rankings are used by the LDWPP team to work first with systems that have the highest susceptibility.

The LDWPP team visits ground water systems and encourages them to become members of DEQ's Wellhead Protection Program. The goal of the team is to work with local governments to encourage the adoption of drinking water protection ordinances and the use of the SWAP assessments in planning and zoning. The team enlists the help of local volunteers to form citizen committees to assist them in educating area businesses and the general public about the importance of protecting our drinking water. The team works with all of these stakeholders to implement best management practices (BMPs). BMPs are measures taken to prevent or reduce the possibility of contamination, such as holding hazardous waste collection days to dispose of chemicals properly.



The LDWPP team uses brochures, videos, road signs, press releases, public service announcements, promotional materials, public presentations, youth educational materials, and collaborations with other organizations to help spread the word to the public.

Why are we doing this?

We want to make everyone aware of their drinking water sources and how important it is to protect them.

Water is easy to contaminate but difficult and expensive to clean up. We all need to do our part to ensure that the water we drink remains clean and pure.