United States Department of Agriculture

NRCS Natural Resources Conservation Service

Plant Materials Program

# Golden Meadow
# Plant Materials Center

# 2007 Annual Technical Report

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Helping People Help the Land...

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## INTRODUCTION

The Mission of the NRCS Plant Materials Program is to develop and transfer plant materials and plant technology for the conservation of natural resources. In working with a broad range of plant species, including grasses, forbs, trees, and shrubs, the program seeks to address priority needs of field offices and land managers in both public and private sectors. Emphasis is focused on using native plants as a sustainable way to solve conservation problems and protect ecosystems.

The Golden Meadow Plant Materials Center (PMC) is funded and operated by the Natural Resources Conservation Service (NRCS), an agency of the United States Department of Agriculture (USDA). It is part of a national network of PMCs and Plant Materials Specialists (PMS) that are organized to form the NRCS Plant Materials Program. The purpose of the Plant Materials Program is to provide effective vegetative solutions to address conservation problems and needs. PMCs are located across the country to serve regional areas that have similar, but unique, natural resource conservation concerns and needs.

The Golden Meadow PMC was established because of a critical need to study and develop vegetative solutions and wetland plant technology for Louisiana's eroding coastal wetlands. Louisiana accounts for nearly 80% of the United States coastal land loss. It is estimated that Louisiana is losing 25-35 square miles of coastline each year. Coastal wetland remediation, restoration, and enhancement with vegetation have proven effective in retarding the conversion of marsh to open water, reducing erosion, and promoting the re-establishment of emergent vegetation.

To address coastal land loss and meet the objectives of the Plant Materials Program, the Golden Meadow PMC:

- Develops improved plants that will persist in a dynamic coastal marsh environment.
- Develops cultural techniques for the successful use of improved plant materials.
- Develops and transfers effective plant science technology that addresses critical wetland conservation needs.
- Releases and provides foundation plant materials for the commercial increase of improved conservation plants.
- Promotes the use of tested and proven plant materials to solve specific coastal wetland conservation problems.
- Serves as a learning center to stimulate and foster an understanding of the importance of plants in the environment and their role in conservation programs.

## HISTORY

Coastal erosion and wetland loss in Louisiana are serious problems of national importance with long-term economic and social consequences. The progressive loss of Louisiana's coastal wetlands may deny Louisiana, the Gulf Coast region, and the nation as a whole, of one of the most productive ecosystems in the world. With this in mind the

NRCS realized a critical need for vegetative solutions to address coastal wetland loss and restoration.

It was during the late seventies that the NRCS initiated projects to evaluate the benefits of planting marsh grasses for erosion control and restoration of Louisiana's coastal wetlands. These plantings were successful in proving that establishing marsh grasses are an effective means of retarding the conversion of marsh to open water, to reduce the erosion of shorelines, canal banks, or other marsh-water interfaces, and to promote the reestablishment of emergent wetland vegetation. It was the success of these trial plantings that prompted the establishment of the Louisiana Marshlands Plant Materials Laboratory in 1985.

The Laboratory began as a collaborative effort of federal, state, and private entities. The Louisiana Land and Exploration Company provided 11.5 acres of land to develop the plant materials laboratory. The purpose of the facility was essentially to identify and collect selected native coastal wetland plant species and evaluate them for their potential use as conservation plants. The prevailing thought was that such a facility would provide a source of tested and proven plant materials that could be used in Louisiana's coastal restoration program.

With a vision and purpose firmly in mind, the physical features of the facility soon took shape. The facility began with the construction of fifteen shallow ponds in the late summer of 1985. Hurricane Juan delayed the completion of pond construction until April of 1986. The collection of plant materials had already begun by the time pond construction was completed. Vegetative propagules representing each collection were planted directly to evaluation plots in the newly created ponds. The first plant species selected for study was smooth cordgrass (*Spartina alterniflora* Loisel.). This effort resulted in the first plant release in 1989. The new conservation plant selection was named 'Vermilion'. The benefits and success of planting 'Vermilion' for coastal restoration was evident soon after its release. This and other efforts prompted the U.S. Congress to authorize funding for the Laboratory and inclusion in the NRCS Plant Materials Program in 1989. The name was then changed to the Golden Meadow Plant Materials Center.

The Golden Meadow PMC facilities have continued to grow since 1989. Land improvements and structures now cover 92 acres. State-of-the-art facilities have been built that are used to develop, transfer, and promote coastal wetland plant science technology.

## LOCATION AND FACILITIES DESCRIPTION

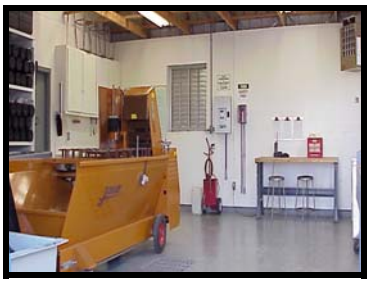
The Golden Meadow PMC is located in Lafourche Parish, Louisiana, approximately 70 miles southwest of New Orleans. This area is unique and of national significance as it lies within the Barataria-Terrebonne Estuary. This is the largest and most productive estuarine system in the United States. The Barataria-Terrebonne Estuary consists of over 6,300 square miles of swamps, expansive marshes, lakes, bays, and bayous. This is essentially a living laboratory from which to study and advance coastal wetland plant technology.

Facilities and equipment have been constructed and acquired to propagate, and grow wetland plant materials for a variety of conservation uses. The PMC has 23 constructed ponds that range in size of 0.3 acres to 2.2 acres. There are 50 acres used for study plot and field scale plant increase. Facilities have been built with the capability to produce most any type of plant material needed for study plots on and off of the PMC. Off-Center plantings (e.g. Field Evaluation Planting - FEP) are used to test plant assemblies and selected plant materials in actual-use settings; sites that exhibit environmental conditions proposed for the intended use of the plant. Onsite facilities used for the increase of plant materials include:

- Three greenhouses totaling 6,180 Square feet.
- Plant propagation and production facility.
- Shadehouse structures totaling 5,520 square feet.

An Office/Conference facility is available for PMC operations, and use as a learning center. The Conference facility consists of a 2,016 square foot meeting room and a dormitory that will house up to 32 people. The intended use of the conference facility is to foster an understanding of the importance of coastal wetlands and conservation plants, and to provide a forum for the exchange of coastal wetland issues, knowledge, and ideas.

Propagation & Production Facility



Laboratory

Greenhouses

Shadehouse

## CLIMATE AND SOILS

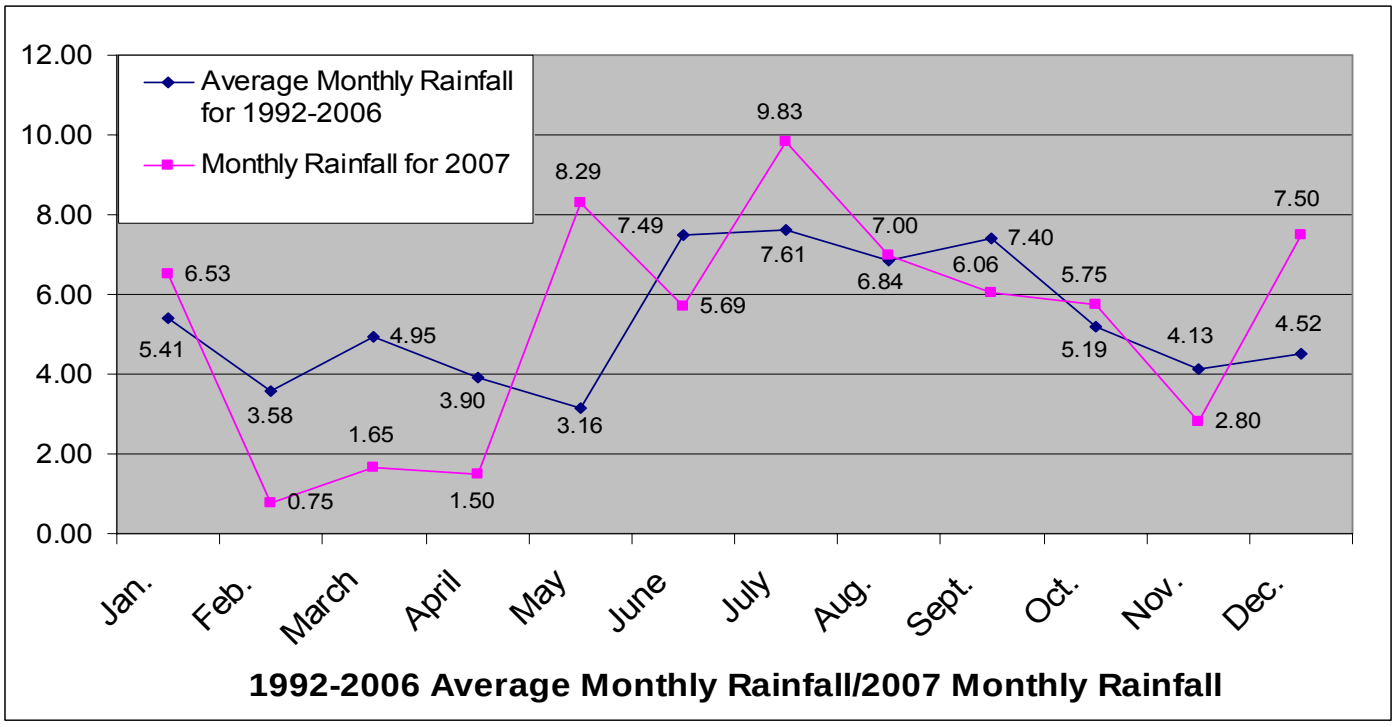
**CLIMATE:** The long summers are hot and humid but frequently cooled by breezes from the Gulf of Mexico. Winters are warm and only briefly interrupted by incursions of cool air from the north. Rainfall occurs throughout the year and precipitation is adequate for all crops. In winter the average temperature is 54 $F^o$ and the average daily minimum temperature is 44 $F^o$. The average annual precipitation is 62 inches. Nine out of ten years there will be 245 days of temperatures above 32 $F^o$. There is sunshine on an average of 60% of the time during the winter. The prevailing winds are from the southeast.

## Precipitation Data

Table 1 Golden Meadow Plant Materials Center Rainfall (inches) from 1992-2007

| Year | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1992** | 11.00 | 5.75 | 5.15 | 3.55 | 1.10 | 10.58 | 7.70 | 7.00 | 0.00 | 0.00 | 4.00 | 6.00 | **61.83** |
| **1993** | 8.50 | 3.45 | 7.50 | 6.45 | 7.15 | 5.70 | 9.15 | 5.80 | 7.70 | 6.15 | 5.05 | 5.10 | **77.70** |
| **1994** | 5.35 | 1.60 | 2.60 | 6.60 | 3.50 | 10.56 | 6.86 | 13.15 | 2.79 | 8.63 | 0.71 | 1.20 | **63.55** |
| **1995** | 4.15 | 1.07 | 9.31 | 0.61 | 4.49 | 3.64 | 9.66 | 3.26 | 1.74 | 3.33 | 5.30 | 0.69 | **47.25** |
| **1996** | 5.45 | 0.00 | 2.65 | 3.09 | 1.32 | 3.50 | 4.83 | 6.82 | 5.61 | 1.69 | 1.14 | 7.32 | **43.42** |
| **1997** | 0.00 | 8.91 | 2.38 | 3.05 | 11.71 | 7.86 | 9.69 | 2.27 | 5.52 | 3.66 | 9.49 | 2.53 | **67.07** |
| **1998** | 20.45 | 7.59 | 8.66 | 2.83 | 0.02 | 3.12 | 3.96 | 3.28 | 28.48 | 1.75 | 6.65 | 4.93 | **91.72** |
| **1999** | 2.42 | 2.66 | 5.91 | 0.04 | 1.99 | 8.08 | 6.41 | 4.20 | 10.35 | 4.10 | 2.25 | 3.95 | **52.36** |
| **2000** | 3.46 | 0.41 | 6.11 | 0.20 | 0.45 | 9.54 | 3.29 | 2.14 | 8.11 | 7.19 | 9.38 | 3.50 | **53.78** |
| **2001** | 0.00 | 0.00 | 2.38 | 0.27 | 0.60 | 13.18 | 8.85 | 7.97 | 12.01 | 4.39 | 4.70 | 3.90 | **58.25** |
| **2002** | 5.16 | 2.77 | 3.06 | 4.63 | 0.64 | 4.57 | 6.37 | 8.69 | 13.66 | 15.37 | 3.39 | 0.85 | **69.16** |
| **2003** | 0.12 | 3.60 | 9.26 | 2.50 | 1.46 | 17.74 | 7.19 | 6.33 | 6.22 | 3.53 | 2.34 | 4.22 | **64.51** |
| **2004** | 6.96 | 6.55 | 0.64 | 13.10 | 3.96 | 9.98 | 7.02 | 4.13 | 0.86 | 14.99 | 4.31 | 6.57 | **79.07** |
| **2005** | 4.51 | 7.58 | 8.38 | 8.18 | 7.61 | 2.45 | 13.74 | 18.59 | 4.00 | 0.08 | 1.93 | 2.40 | **79.45** |
| **2006** | 3.64 | 1.83 | 0.31 | 3.37 | 1.45 | 1.80 | 9.46 | 8.95 | 4.02 | 3.00 | 1.30 | 14.65 | **53.78** |
| **Month Means** | **5.41** | **3.58** | **4.95** | **3.90** | **3.16** | **7.49** | **7.61** | **6.84** | **7.40** | **5.19** | **4.13** | **4.52** | **64.19** |
| | | | | | | | | | | | | | |
| **2007** | **6.53** | **0.75** | **1.65** | **1.50** | 8.29 | **5.69** | **9.83** | **7.00** | **6.06** | **5.75** | **2.80** | **7.50** | **63.35** |

Figure 1 Monthly 2007 and average rainfall from 1992-2006



**SOILS:** The Golden Meadow Plant Materials Center is located on soils of mineral and organic consistency. The soils series names and descriptions follow.

- **Allemands series** consists of poorly drained and very poorly drained organic soils that formed in moderately thick accumulations of decomposed herbaceous material overlying clayey alluvium. These soils are in freshwater coastal marshes. Unless drained, they are ponded and flooded most of the time. Elevation ranges from about 1-ft. above sea level to six-ft. below sea level. Slope is less that 0.5%.

- **Sharkey series** consists of poorly drained, very slowly permeable, firm, mineral soils that formed in clayey alluvium. These soils are on low and intermediate positions on the natural levees of Bayou Lafourche and its tributaries. Elevation ranges from about 1-5 ft. above sea level. Slope is less than 1%.

- **Rita series** consists of poorly drained very slowly permeable, firm mineral soils that have a subsoil that is permanently cracked in the upper part. These soils formed in thin, herbaceous material over clayey alluvium. They are in freshwater marshes that have been drained and protected from flooding. Elevation ranges from 2-6 ft. below sea level. Slope is less than 0.5%. Rita soils commonly are near Allemands muck, drained, Rita Variant, Sharkey and Tunica soils.

## SERVICE AREA

The Golden Meadow PMC service area of responsibility includes the coastal area of Mississippi Louisiana and southeast Texas. Major Land Resources Areas within the center's service area include: 131A Southern Mississippi River Alluvium (southern portion); 134 Southern Mississippi Valley Loess (southern portion); 150A Gulf Coast Prairie; 151 Gulf Coast Marsh; and 152A Eastern Gulf Coast Flatwoods.

## PLANT MATERIALS CENTER OPERATIONS

### Plant Species Selection, Evaluation and Release

The PMC has responsibility to assemble, test, release, and provide for the commercial production and use of conservation plants developed by the Center. Plant studies and species selection is based on ecological and conservation needs of the service area. Vegetative plant materials or seed of selected species are collected from native populations throughout the area of intended use for assembly. Commercial sources and established cultivars are included in assemblies if available. Each plant collection (accession) is given an identification number. The assembly forms a base population from which a selection nursery is established. All assemblies are established on the PMC for comparative evaluation. Assemblies are also established off Center to field evaluation planting (FEP) sites. FEPs are selected to represent actual use conditions for the desired use of the conservation plant. Plant performance criteria are determined and gathered from all planting sites over a specified period of time, generally several years. Superior performing plant materials are then selected based on the performance criteria. The top 10-20 % of the best performing plants are selected from the assembly. Selections

are then increased vegetatively or by seed to provide plants for further testing. Enough plants are produced for planting to replicated plots on and off the Center. Advanced testing of the superior plants may be sufficient for release or several cycles of recurrent phenotypic selection may be needed before a release is made.

After thorough testing and documentation of superior performance, improved or selected plants may be released to the public, i.e., made available for commercial plant increase. Techniques to improve the successful use of plant releases such as establishment methods, culture, management, production, suitable use and range of adaptation are also made available. Names are given to new plant varieties, i.e., pre-varietal and cultivar releases. Cultivar names aids in the selection of appropriate varieties for use in conservation plantings. The cultivar name can be used to define the limits of performance expected of any plant variety in any environment.

## Plant Materials Releases

**'Vermilion' smooth cordgrass (*Spartina alterniflora*)** was released for commercial production in 1989. 'Vermilion' originates from a population of native plants collected from Vermilion Parish, Louisiana. The 'Vermilion' ecotype was selected for its superior performance in comparative evaluation trials of over 89 accessions collected from throughout the Gulf of Mexico basin. 'Vermilion' is a native, herbaceous, warm-season, perennial grass that forms dense colonies along shorelines and intertidal flats of coastal wetlands. It is a robust and vigorously spreading plant that tolerates diurnal tidal inundation and relatively high salinities. 'Vermilion' is an important cultivar used to maintain the stability of saltwater marshes and shorelines. 'Vermilion' is recommended for shoreline, canal bank, levee, and intertidal erosion control. This cultivar is also an effective soil stabilizer on interior tidal mudflats, dredge fill sites, and other areas of loose and unconsolidated soils associated with marsh restoration. 'Vermilion' smooth cordgrass is a sustainable and renewable restoration resource. When properly established in the appropriate habitat, this cultivar will persist providing an important conservation tool for coastal restoration and preservation.

**Pelican Germplasm black mangrove (*Avicennia germinans*)** was released for commercial production in 1995. Pelican is a source-identified germplasm pre-varietal release. Pelican was released to provide a locally adapted and known ecotype for use on Louisiana's coastal marshes and barrier islands. It is a neo-tropical shrub that grows in salt marshes near high tide elevation. Pelican serves as a sediment stabilizer, contributes leaf biomass to the marine food chain and detrical cycle, and provides habitat for numerous biological organisms. It is an important vegetative component for pelican nesting habitat found on Louisiana's barrier islands. Pelican black mangrove is recommended for planting on protected intertidal flats and shorelines of Louisiana's saline marshes, shorelines of protected shallow bays, and marshy barrier islands.

**Fourchon Germplasm bitter panicum (*Panicum amarum*)** was released for commercial production in 1998. Fourchon is a selected class pre-varietal release. It

is recommended for beach dune enhancement and stabilization on coastal beaches and barrier islands of the north central Gulf of Mexico basin. Fourchon is an early colonizing species that can tolerate the harsh environments of the dune system which is subject to salt spray, storm surges, occasional inundation, high temperatures, low soil moisture and fertility, sand abrasion, and smothering by drifting sand. The above ground portion of the plant reduces wind velocity allowing sand to drop out of the wind stream and accumulate. The below ground portion of the plant stabilizes and holds the sand in place with an extensive fibrous root and rhizome system. Fourchon bitter panicum was selected for its vigorous growth, persistence after storm events, and performance in stabilizing dunes enhanced or created with sand fencing structures.

**Brazoria Germplasm seashore paspalum (*Paspalum vaginatum*)** was released for commercial production in 1999. Brazoria is a selected class pre-varietal release. Seashore paspalum is a perennial semi-aquatic, warm season, native grass. A dense sod-like turf is formed from an extensive system of rhizomes and stolons. Seashore paspalum is an effective pioneering plant that can be used in coastal restoration and conservation programs. It spreads rapidly and can be established on fresh to brackish soils with salinities to 10 parts per thousand. Brazoria is recommended for intermediate to brackish marshes, shorelines, coastal beach dunes, canal banks, mudflats, dedicated dredge materials, and areas of ephemeral soil deposition.

**Caminada Germplasm seaoats (*Uniola paniculata*)** was released for commercial production in 2001. Caminada is a sourced identified release. Caminada seaoats is a warm season native perennial grass that spreads primarily by rhizomes. It is recommended for beach dune enhancement and stabilization on coastal beaches and barrier islands of the north central Gulf coast, primarily Louisiana west of the Mississippi River. This release has demonstrated characteristics that allow it to grow and persist on beaches subject to storm surge overwash, sites affected by salt spray and rapidly accreting sand that is arid and low in fertility.

**'Gulf Coast' marshhay cordgrass (*Spartina patens*)** was released for commercial production in 2003. 'Gulf Coast' is a cultivar release. 'Gulf Coast' marshhay cordgrass is native, warm season perennial grass that grows to 122 cm in height and spreads primarily by rhizomes. It is recommended for conservation plantings in coastal areas of the north central Gulf of Mexico basin. 'Gulf Coast' has proven effective for marsh restoration, shoreline and levee stabilization, and coastal beach and barrier island sand dune enhancement and stabilization.

**Timbalier Germplasm gulf bluestem (*Schizachyrium maritimum*)** was released for commercial production in 2006. Timbalier is a selected release. Timbalier Germplasm Gulf bluestem is native warm-season perennial grass that spreads by seed and short rhizomes. Plants are rhizomatous and colonial, stems usually decumbent, glacous, reddish, and flattened at the base, terminal inflorescences with stalked spikelets. Found native to coastal and offshore islands of the Florida panhandle west to Louisiana. It is recommended for beach and barrier island plantings of the north central Gulf coast. Gulf bluestem is potentially imperiled in Louisiana because of its rarity and factors that make it especially vulnerable to extirpation. Gulf bluestem is an important species on dunes, beaches, and barrier islands to combat erosion and added species diversity.

**Bayou Lafourche Germplasm California bulrush (*Schoenoplectus californicus*)** was released for commercial production in 2007. Bayou Lafourche is a selected release. Bayou Lafourche California bulrush is an herbaceous, native rhizomatous perennial that forms dense vegetative colonies along shorelines, in open water, or on mudflats. California bulrush is an emergent wetland plant that spreads primarily by vegetative propagation, producing new stems from an extensive system of underground rhizomes, or, to a limited extent, through seed dispersal. An important characteristic of California bulrush is that it can grow in relatively deep water. It is not uncommon for extensive colonies to grow in 36 inches or more of water. Bayou Lafourche Germplasm has a fair tolerance to intermediate marsh habitats (salinity 0.5 to 3.5 ppt.) and a low tolerance to brackish marsh habitats (salinity 3.5 to 10.0 ppt.). Bayou Lafourche Germplasm is recommended for erosion control along shorelines, canal banks, levee banks, and other areas of soil-water interface. California bulrush maybe used in the creation and restoration of wetlands, to improve water quality, and reduce suspended sediments. It also provides habitat for mammals, birds and fish that visit the sites and promote establishment zones for many submerged aquatic plants.

# STUDIES

## Active Studies

**Study:** LAPMC-P-0001-OT

**Study Title:** Evaluation of *Quercus virginiana* for coastal beaches and barrier islands of the north central Gulf of Mexico basin.

**Study Leader:** Garret Thomassie, NRCS Plant Materials Center, LA

### Introduction

Live oak (*Quercus virginiana)* is native to coastal plains of the southern Atlantic states and Gulf of Mexico. Live oaks are long-lived trees typically having relatively short trunks with very large girth and wide spreading limbs. Several variants have been identified as more scrubby and are found growing on deep sands along the coast of the Gulf of Mexico.

Live oak ecotypes are of interest for use on Louisiana's vanishing barrier islands and other sandy coastal habitats. This study is being conducted at two locations - Grand Isle, LA and the Golden Meadow Plant Materials Center (PMC), 'Field B'.

### Problem

Gulf of Mexico shoreline erosion (mainly beach and dune) occurs from Florida to Texas. In years of more severe tropical storms, this erosion is exacerbated, and the resulting loss of land along the coast is measured in acres per day. The addition of a woody component to vegetative plantings on barrier islands and other sandy coastal habitats will improve soil stabilization, restore lost biodiversity, and increase wildlife habitat.

### Objective

The objective of this study is to evaluate live oak ecotypes collected from coastal plains and barrier islands along the south Atlantic coast and the Gulf of Mexico.

### Procedures

Acorns were collected from South Carolina, Georgia, Alabama, Florida, Mississippi, Louisiana, and Texas from barrier islands and coastal beaches that are prone to salt spray, storm surges, and other tropical events. Natural Resources Conservation Service (NRCS) employees serving these states made the acorn collections in the fall of 1999. Two accessions (9067581 and 9067582) were collected in the fall of 2000. (Table 1)

In May 2001, three randomized complete blocks, consisting of 30 accessions were established on 50 foot centers at the Golden Meadow PMC. In 2003, four randomized complete blocks using 25 accessions were planted on Grand Isle on 25 foot centers.

Quantitative measurements were taken annually for basal diameter (at approximately 7 cm from the ground), overall height, and plant vigor (1-9 = best-poorest ratings). Qualitative data recorded included pests and pest damage observed, and the presence of acorns (Table 2).

**Discussion of PMC location results**

Despite slight damage caused by local deer population, mechanical lawnmower disturbances, and three tropical storms in 2005, the live oak planting at the PMC is reasonably well established. Many trees had acorns set at evaluation time (July).

In the study plots at the PMC in 2005, plant vigor was highest in accessions 9068339 and 9068357 (from St. Simons Island, GA and Mobile, Al, respectively). The accessions with the highest average stem diameters were 9068339, 9068343 (Effingham, GA), and 9068357. The tallest growing accessions recorded were 9068343, 9068339, 9068344 (Chatham, GA), and 9068338 (Mobile, AL). Overall, at the PMC, accession 9068339 had the highest number of attributes. Again, this accession originated from St. Simon's Island, GA.

No Data for 2006 and 2007 collected. Trees had suffered significant damage from Hurricane's Katrina and Rita. High winds caused trees to be uprooted and caused damage to root systems. Trees were tied and stacked to allow for trees to establish a new root system to support themselves. This study will be inactive until further notice.

**Discussion of Grand Isle location results**

The live oak study planting at Grand Isle had a very low survival rate in 2005, with the majority of the planting either dead or missing. Only 9.6% (10 plants) were surviving at evaluation time (August). In 2004, 79% of all trees planted had survived by evaluation time. In 2005, representatives of only seven of the 25 planted accessions remained (28%), as compared to the 100% survival of represented accessions in 2004.

Some Grand Isle *Q. virginiana* loss may have been due to poor soil characteristics, wind damage, inundation and/or immersion from flooding during tropical storms in 2003, 2004 and/or 2005. Other losses may be attributed to mechanical lawnmower damage and/or removal by the private landowner if the plant appeared to have died.

At the Grand Isle study plot location, plant vigor and canopy spread are reportedly highest in 9068315 (a Jefferson Parish, LA accession), with three of four original plants surviving. The tallest tree, and the one with the largest trunk diameter, is the one surviving member of accession 9068354 (from Baldwin, AL). Only two trees of this planting on Grand Isle were noted to have acorns in 2004 (9068315 and 9068317). In 2005, acorns were not observed on any trees at Grand Isle.

No data for 2006 and 2007 was collected due to damage caused by Hurricane's Katrina and Rita. Site was inundated with salt water for an extended period of time which caused trees to die. Due to the damage to the study sites, this study will be inactive until further notice.

Table 1. *Q. virginiana* collections (1999-2000).

| Accession # | Origin Location City/Parish/County/State |
|---|---|
| 9067581 | Okaloosa County, FL |
| 9067582 | Escambia County, FL |
| 9068314 | Okaloosa Co., FL |
| 9068315 | Jefferson Parish, LA |
| 9068316 | Jefferson Parish, LA |
| 9068317 | Nueces, TX |
| 9068319 | Hancock, MS |
| 9068320 | Hancock, MS |
| 9068321 | Hancock, MS |
| 9068322 | Hancock, MS |
| 9068338 | Mobile, AL |
| 9068339 | St. Simons Island, GA |
| 9068340 | Glynn, GA |
| 9068341 | Camden, GA |
| 9068342 | Effingham, GA |
| 9068343 | Effingham, GA |
| 9068344 | Chatham, GA |
| 9068345 | Chatham, GA |
| 9068347 | Charleston, SC |
| 9068349 | Charleston, SC |
| 9068350 | Colleton, SC |
| 9068351 | Colleton, SC |
| 9068352 | Baldwin, AL |
| 9068353 | Baldwin, AL |
| 9068354 | Baldwin, AL |
| 9068355 | Baldwin, AL |
| 9068356 | Baldwin, AL |
| 9068357 | Mobile, AL |
| 9068358 | Mobile, AL |
| 9068360 | Mobile, AL |
| 9068367 | Georgetown, SC |
| 9068368 | Georgetown, SC |

**Study:** LAPMC-P-0002-OT

**Study Title:** *Panicum virgatum* for coastal Louisiana pastures and marshes

**Study Leader:** Garret Thomassie, NRCS Plant Materials Center, LA

**Introduction**
The lack of commercially available plant material that is adapted across the state of Louisiana is the largest contributing factor to stand failures. Plant materials that are not adapted to the state exhibit signs of summer stress and are less vigorous with lower biomass production then local ecotypes of the same species. Performance may also be affected by changes in flowering date, seed set, dormancy initiation and precipitation. Restoration experts agree that plant materials native to an area must be used in conservation projects to achieve long term sustainability. Commercial available sources of locally adapted plant materials have the potential to provide substantial ecological and economic benefits for Louisiana.

**Problem**
Many releases of *Panicum virgatum* are not well adapted for wet soils commonly found in South Louisiana.

**Objective**
Commercially available cultivars and local plant collections will be assembled and tested. Study plots will be monitored and evaluated for adaptability to Louisiana's wet soils.

**Procedures**
Louisiana vegetative collections will be made by the LAPMC. Plants will be increased and maintained at the center for field plantings around Louisiana.

**Discussion**
12 assemblies were collected and established in rod rows. Initial evaluations will be made to remove the undesirable accessions before starting advanced evaluations and field trials.

**Study:** LAPMC-P-0207-OT BTNEP Phase II
LAPMC-T-0203-CR Port Fourchon Dedicated Dredge
LAPMC-P-0101-OT BTNEP Phase I

**Study Title:** An Accelerated Program of Woody Plant Species Selection for Conservation, Restoration, and Neotropical Habitat Enhancement

**Study Leaders:** Garret Thomassie, NRCS Plant Materials Center, LA

**Cooperators:** Morris Houck, NRCS Plant Materials Specialist, LA
Barataria-Terrebonne National Estuary Program

**Introduction**

The continued degradation of Louisiana's coastline has resulted in an increase in the effort to restore barrier islands and other outer-marsh habitats. Dredge-fill material has been used to restore many of the islands and coastal wetlands in the state. The revegetation of these restored areas is essential in the effort to ensure habitat for the variety of wildlife that inhabits the Louisiana coastal zone. Prior to this effort, the majority of the revegetation has consisted of grass species. The goals of this project include the development of woody species technology applicable to increased productivity of the coastal region, coastal wetland restoration efforts, and wildlife habitat improvement.

**Problem**

Coastal erosion and wetland deterioration are serious and widespread problems affecting Louisiana's coastal zone. With coastal wetland losses of 16,000 to 20,000 acres per year in Louisiana, the long term social, environmental, and economic consequences will deprive not only Louisiana, but the Gulf of Mexico region and the nation as a whole of virally important fish, wildlife, and other wetland-related economic and environmental benefits.

Louisiana's coastal wetlands value is often measured in terms such as storm protection, fisheries, oil and gas infrastructure protection, and recreation. Land-loss and economics however, only begin to suggest the importance of Louisiana's coastal wetland ecosystem and the extent of modern damage. To a significant segment of wildlife, migratory girds and waterfowl for example, Louisiana's coastal wetlands and barrier islands are prodigiously productive systems that over winter as much as 66% of the migratory birds that use the Mississippi Flyway. In addition, barrier islands, bay islands, and other coastal environments are critically important habitats for neotropical migrants that depend on Louisiana's coastal marshes for summer breeding, winter foraging, and stopover along their spring and fall migration routes.

**Objective**

Phase 1
Applied research to evaluate harvesting, seed treatment, and techniques for planting selected adapted woody plant species (Figure 1). This is a three phase project.

Phase 2
Monitoring program to determine the suitability of selected plant species to planting sites (Figure 2).

Phase 3
Outreach and educational effort to extend technological findings.

**Procedures**
The PMC will establish nursery seed trees of suitable species to begin producing foundation seed. The PMC will develop cultural practices that will be used by the commercial nursery industry.

An action team organized by BTNEP identified and selected the ten species for planting and evaluation (Table 1).

This study will monitor adaptation and performance woody species on five discrete sites including a barrier island, a dredge sediment disposal impoundment, a brackish marsh, a protected bay and a control (Table 2). Each site will be visited two times during the growing season. Evaluations will include survival, basal diameter, canopy spread, height and vigor.

There will also be demonstration sites established to evaluate plant species interaction, test cultural practices for improved productivity and planting success, and demonstrate plant biodiversity and woody species attributes for enhancing coastal environments.

**Discussion**
**Port Fourchon –** 11 species planted in a randomized complete block design was established on 3 sites on 12/18/2003. Yaupon (*Ilex vomitoria)* was not ready for establishment when planting was completed. Sites were evaluated on 9/16/2003, 5/10/04, 9/21/2004, 5/10/2005 and 5/24/2006. Performance data collected was basal diameter, overall height, overall spread and plant vigor. Remarks were noted for pest and disease damage (Tables 3-5).

**Grand Isle** – 12 species planted in a randomized complete block design were established on 3 sites on 3/2/2003. Yaupon (*Ilex vomitoria)* was not ready for establishment when planting was completed. Sites were evaluated on 5/24/2004, 6/16/2004, 10/5/2004 and 5/10/2005. Performance data collected was basal diameter, overall height, overall spread and plant vigor. In 2006 site was unable to be evaluated due to the storm debris left behind by Hurricane's Katrina and Rita. Both hurricanes have caused storm surges that allowed salt water to stand on the study site for a long period of time. This site will no

longer be evaluated because of the damage to the area making it impossible to find the study site.

**Barataria Waterway** – 10 species planted in a randomized complete block design were established on 1 site on 5/1/2003. Yaupon (*Ilex vomitoria)* was not ready for establishment when planting was completed. Site was evaluated on 5/26/2004, 10/13/2004 5/12/2005 and 3/7/2006. Performance data collected were basal diameter, overall height, overall spread and plant vigor. Remarks were noted for pest and disease damage (Table 6).

**Lumcon** – 6 species planted in a randomized complete block design were established on 2 sites on 11/8/2003. Yaupon (*Ilex vomitoria)* was not ready for establishment when planting was completed. Site was evaluated on 10/6/2004 5/11/2005 and 3/6/2006. Performance data collected were basal diameter, overall height, overall spread and plant vigor. Remarks were noted for pest and disease damage (Tables 7-8).

**Trinity Island** – 12 species planted in a randomized complete block design were established on 4 sites on 3/25/2004. Yaupon (*Ilex vomitoria)* was not ready for establishment when planting were completed. Sites were evaluated on 10/28/2004 5/13/2005 and 5/23/2006. Performance data collected was basal diameter, overall height, overall spread and plant vigor. Remarks were noted for pest and disease damage (Tables 9-12).

**PMC** – 11 species planted on rod rows (5 plants per row) were planted at PMC Field E in 9/22/2004. Plant establishment and growth has been poor.

**Demonstration Site** – 1 planting was established in the Barataria Waterway in 2003. This planting was unsuccessful.

Figure 1 Grow out of woody seed collections

Figure 2 Field Evaluation of *Morella cerifera* and *Celtis laevigata*

**Table 1. Selected Plant Species**

| Scientific Name | Common Name |
|---|---|
| *Acacia farnesiana* | sweet acacia |
| *Callicarpa americana* | American beautyberry |
| *Celtis laevigata* | sugarberry |
| *Diospyros virginiana* | persimmon |
| *Gleditsia triacanthos* | honey locust |
| *Ilex vomitoria* | yaupon |
| *Morella cerifera* | way myrtle |
| *Morus rubra* | red mulberry |
| *Quercus virginiana* | live oak |
| *Zanthoxylum clava-herculis* | Hercules club |

**Table 2. Field Planting Sites**

| Location | Site Description | Parish |
|---|---|---|
| Port Fourchon | Dedicated sediments | Lafourche |
| Barataria Waterway | Spoilbank | Jefferson |
| LUMCOM | Developed site | Terrebonne |
| Grand Isle | Barrier island | Jefferson |
| Trinity Island | Barrier island | Terrebonne |

Table 3. Evaluation data sheet Port Fourchon Site No. 2

| Species | Basal Diameter (mm) | Overall Height (cm) | Overall Spread (cm) | Plant Vigor | Disease | Pest |
|---|---|---|---|---|---|---|
| Acacia farnesiana | * | 229 | 353 | 4 | N | N |
| Callicarpa americana | - | - | - | 9 | N | N |
| Celtis laevigata | 15.81 | 83 | 34 | 8 | N | N |
| Diospyros virginiana | - | - | - | 9 | N | N |
| Gleditsia triancanthos | 14.89 | 90 | 35 | 6 | N | N |
| Lantana camera | - | - | - | 9 | N | N |
| Morella cerifera | * | 228 | 232 | 6 | N | N |
| Morus rubra | 10.81 | 63 | 15 | 8 | N | N |
| Parkinsonia aculeata | - | - | - | 9 | N | N |
| Quercus virginiana | 27.43 | 169 | 105 | 7 | N | N |
| Zanthoxylum clava-herculis | 16.26 | 60 | 10 | 9 | N | N |

* Multiple truck species, basal diameter was not measured
− dead

Table 4. Evaluation data sheet, Port Fourchon Site No. 5

| Species | Basal Diameter (mm) | Overall Height (cm) | Overall Spread (cm) | Plant Vigor | Disease | Pest |
|---|---|---|---|---|---|---|
| Acacia farnesiana | * | 226 | 347 | 4 | N | N |
| Callicarpa americana | - | - | - | 9 | N | N |
| Celtis laevigata | 19.76 | 93 | 24 | 7 | N | N |
| Diospyros virginiana | - | - | - | 9 | N | N |
| Gleditsia triancanthos | 15.71 | 50 | 20 | 8 | N | N |
| Lantana camera | - | - | - | 9 | N | N |
| Morella cerifera | - | 199 | 187 | 7 | N | N |
| Morus rubra | 60.04 | 260 | 50 | 9 | N | N |
| Parkinsonia aculeata | 17.26 | 115 | 78 | 5 | N | N |
| Quercus virginiana | 20.85 | 100 | 53 | 7 | N | N |
| Zanthoxylum clava-herculis | - | - | - | 9 | N | N |

* Multiple trunk species, basal diameter was not measured
− dead

Table 5. Evaluation data sheet, Port Fourchon Site No. 8

| Species | Basal Diameter (mm) | Overall Height (cm) | Overall Spread (cm) | Plant Vigor | Disease | Pest |
|---|---|---|---|---|---|---|
| Acacia farnesiana | * | 215 | 344 | 4 | N | N |
| Callicarpa americana | - | - | - | 9 | N | N |
| Celtis laevigata | 16.54 | 68 | 40 | 7 | N | N |
| Diospyros virginiana | - | - | - | 9 | N | N |
| Gleditsia triancanthos | - | - | - | 9 | N | N |
| Lantana camera | - | - | - | 9 | N | N |
| Morella cerifera | * | 149 | 184 | 7 | N | N |
| Morus rubra | 12.43 | 93 | 59 | 6 | N | N |
| Parkinsonia aculeata | 15.62 | 60 | 55 | 7 | N | N |
| Quercus virginiana | 21.73 | 93 | 60 | 5 | N | N |
| Zanthoxylum clava-herculis | - | - | - | 9 | N | N |

* Multiple trunk species, basal diameter was not measured

− dead

Table 6. Evaluation data sheet, Barataria Waterway Site No. 1

| Species | Basal Diameter (mm) | Overall Height (cm) | Overall Spread (cm) | Plant Vigor | Disease | Pest |
|---|---|---|---|---|---|---|
| Acacia farnesiana | * | - | - | 4 | N | N |
| Callicarpa americana | - | - | - | 9 | N | N |
| Celtis laevigata | 11.47 | 50 | 10 | 8 | N | N |
| Cornus drummondii | - | - | - | 9 | N | N |
| Diospyros virginiana | - | - | - | 9 | N | N |
| Gleditsia triancanthos | 16.85 | 55 | 20 | 8 | N | N |
| Lantana camera | - | - | - | 9 | N | N |
| Morella cerifera | - | - | - | 9 | N | N |
| Morus rubra | 18.15 | 110 | 50 | 8 | N | N |
| Parkinsonia aculeata | 60.29 | 310 | 230 | 4 | N | N |
| Quercus virginiana | 13.02 | 80 | 30 | 8 | N | N |
| Zanthoxylum clava-herculis | - | - | - | 9 | N | N |

* Multiple trunk species, basal diameter was not measured

− dead

Table 7. Evaluation data sheet, Lumcon Site No. 1

| Species | Basal Diameter (mm) | Overall Height (cm) | Overall Spread (cm) | Plant Vigor | Disease | Pest |
|---|---|---|---|---|---|---|
| Acacia farnesiana | * | 193 | 258 | 6 | N | N |
| Morella cerifera | - | - | - | 9 | N | N |
| Morus rubra | 27.95 | 180 | 60 | 9 | N | N |
| Parkinsonia aculeata | 47.29 | 277 | 151 | 5 | N | N |
| Quercus virginiana | 34.21 | 198 | 85 | 8 | N | N |
| Zanthoxylum clava-herculis | - | - | - | 9 | N | N |

* Multiple trunk species, basal diameter was not measured

− dead

Table 8. Evaluation data sheet, Lumcon Site No. 2

| Species | Basal Diameter (mm) | Overall Height (cm) | Overall Spread (cm) | Plant Vigor | Disease | Pest |
|---|---|---|---|---|---|---|
| Acacia farnesiana | * | 208 | 168 | 7 | N | N |
| Morella cerifera | - | - | - | 9 | N | N |
| Morus rubra | - | - | - | 9 | N | N |
| Parkinsonia aculeata | 23.56 | 135 | 118 | 8 | N | N |
| Quercus virginiana | 21.49 | 170 | 100 | 9 | N | N |
| Zanthoxylum clava-herculis | - | - | - | 9 | N | N |

* Multiple trunk species, basal diameter was not measured

− dead

Table 9. Evaluation data sheet, Trinity Island Site No.1

| Species | Basal Diameter (mm) | Overall Height (cm) | Overall Spread (cm) | Plant Vigor | Disease | Pest |
|---|---|---|---|---|---|---|
| Acacia farnesiana | * | 10 | 12 | 8 | N | N |
| Callicarpa americana | - | - | - | 9 | N | N |
| Celtis laevigata | - | - | - | 9 | N | N |
| Cornus drummondii | - | - | - | 9 | N | N |
| Diospyros virginiana | - | - | - | 9 | N | N |
| Gleditsia triancanthos | - | - | - | 9 | N | N |
| Lantana camera | - | - | - | 9 | N | N |
| Morella cerifera | - | - | - | 9 | N | N |
| Morus rubra | - | - | - | 9 | N | N |
| Parkinsonia aculeata | - | - | - | 8 | N | N |
| Quercus virginiana | - | - | - | 9 | N | N |
| Zanthoxylum clava-herculis | - | - | - | 9 | N | N |

* Multiple trunk species, basal diameter was not measured

− dead

Table 10. Evaluation data sheet, Trinity Island Site No 2.

| Species | Basal Diameter (mm) | Overall Height (cm) | Overall Spread (cm) | Plant Vigor | Disease | Pest |
|---|---|---|---|---|---|---|
| Acacia farnesiana | * | 23 | 75 | 7 | N | N |
| Callicarpa americana | - | - | - | 8 | N | N |
| Celtis laevigata | - | - | - | 9 | N | N |
| Cornus drummondii | - | - | - | 9 | N | N |
| Diospyros virginiana | - | - | - | 9 | N | N |
| Gleditsia triancanthos | - | - | - | 9 | N | N |
| Lantana camera | - | - | - | 9 | N | N |
| Morella cerifera | - | - | - | 9 | N | N |
| Morus rubra | - | - | - | 9 | N | N |
| Parkinsonia aculeata | - | - | - | 9 | N | N |
| Quercus virginiana | - | - | - | 8 | N | N |
| Zanthoxylum clava-herculis | - | - | - | 9 | N | N |

* Multiple trunk species, basal diameter was not measured

− dead

Table 11. Evaluation data sheet, Trinity Island Site No. 3

| Species | Basal Diameter (mm) | Overall Height (cm) | Overall Spread (cm) | Plant Vigor | Disease | Pest |
|---|---|---|---|---|---|---|
| Acacia farnesiana | * | 45 | 160 | 7 | N | N |
| Callicarpa americana | - | - | - | 9 | N | N |
| Celtis laevigata | - | - | - | 9 | N | N |
| Cornus drummondii | - | - | - | 9 | N | N |
| Diospyros virginiana | - | - | - | 9 | N | N |
| Gleditsia triancanthos | - | - | - | 9 | N | N |
| Lantana camera | - | - | - | 9 | N | N |
| Morella cerifera | - | - | - | 9 | N | N |
| Morus rubra | - | - | - | 9 | N | N |
| Parkinsonia aculeata | - | - | - | 7 | N | N |
| Quercus virginiana | - | - | - | 9 | N | N |
| Zanthoxylum clava-herculis | - | - | - | 9 | N | N |

* Multiple trunk species, basal diameter was not measured

− dead

Table 12. Evaluation data sheet, Trinity Island Site No. 4

| Species | Basal Diameter (mm) | Overall Height (cm) | Overall Spread (cm) | Plant Vigor | Disease | Pest |
|---|---|---|---|---|---|---|
| Acacia farnesiana | * | - | - | 9 | N | N |
| Callicarpa americana | - | - | - | 9 | N | N |
| Celtis laevigata | - | - | - | 9 | N | N |
| Cornus drummondii | - | - | - | 9 | N | N |
| Diospyros virginiana | - | - | - | 9 | N | N |
| Gleditsia triancanthos | - | - | - | 9 | N | N |
| Lantana camera | - | - | - | 9 | N | N |
| Morella cerifera | - | - | - | 9 | N | N |
| Morus rubra | - | - | - | 9 | N | N |
| Parkinsonia aculeata | - | - | - | 9 | N | N |
| Quercus virginiana | - | - | - | 9 | N | N |
| Zanthoxylum clava-herculis | - | - | - | 9 | N | N |

* Multiple trunk species, basal diameter was not measured

− dead

**Study:** LAPMC-P-0501-WE

**Study Title:** Evaluation of Panicum hemitomon

**Study Leader:** Garret Thomassie, NRCS Plant Materials Center, LA

**Cooperators:** Scott Edwards, RC&D Coordinator, LA
Johanna Pate, NRCS State Range Conservationist, LA

**Introduction**

Maidencane's forage value has been rated excellent for livestock. It is known to produce as much as 5 tons of forage per acre, with high crude protein. When grazed, the digestibility is at a peak of 50% and protein is at a peak of 10 to 11%. One acre of the best range of maidencane will support an animal unit for a six- month grazing period. However, as the plant dies back, it becomes tougher and less desirable as forage. The best practice is using the grass during the winter and spring, with a rest in the summer and fall. In wetter areas, cattle walkways may be needed for greater accessibility (Selena Dawn Newman, 2000).

**Problem**

High fuel and transportation cost, and the accumulation of salt in their production fields is forcing many rice farmers to find alternative use of the land. Many are converting to cattle production. Using warm season introduced grass (Bermuda) in these fields may be problematic due to drainage. Maidencane is a viable alternative.

**Objective**

The objective of this trial is to demonstrate the feasibility of using maidencane (Panicum hemitomon) as viable warm-season perennial forage alternative for producers converting rice land to pasture. The results could provide livestock producers additional forage alternatives to fit into their grazing programs.

**Procedures**

Phase I

20 vegetative collections will be made throughout coastal Louisiana. Plants will be increased in the greenhouse before being planted in an initial evaluation wet cell. Local collections will be compared to 'Halifax' a commercial release currently on the market released from the Jamie L. Whitten, Mississippi PMC and Citrus a commercial release from the Brooksville, Florida PMC. This is a three phase project.

Phase II

Will test the feasibility of field establishment using vegetative growth instead of rhizomes. Promising accessions will have top growth clipped, 4 inches above ground level with a sickle bar mower, 3 times a year. Clipped plots will be fertilized with 30 lbs per acre of N to stimulate regrowth. Each clipping will be bulked then planted in 0.33

acre strips in an adjoining wet cell by spreading clippings onto a weed free prepared seedbed then rototilled and cultipacked. Pond will be flooded to keep the top 3 inches of soil moist.

Phase III
Field Evaluation. Material from local Louisiana composite, Citrus and Halifax will be clipped, bailed and moved to on farm demonstration. Establishment techniques will be tested and stand establishment will be evaluated.

**Discussion**
An assembly was collected and transplanted (3/14/2005) at the Golden Meadow PMC. These collections will be allowed to establish themselves for clipping trials that will begin in May 2006. Accession 9068027 American cupscale *Sacciolepis striata* was included into the maidencane study for comparison.

**May test:**

- 5/22/07 randomly selected plots were cut for May test. Refer to plot plan figure2. G3 pond was flooded soon after planting to moisten soil.
- 6/4/07 nothing seemed to be sprouting in any of the treatments.
- 6/11/07 plots 101, 102, 203 and 205 had maidencane beginning to grow.
- Reasons for plots 105, 106 and 204 for no growth could be that the material floated away during flooding of pond and experienced heavy rains during same time of planting
- 6/18/07 plots 101, 102, 203 and 205 were noted to having maiden cane growing. Plot 102 had the most maidencane growing in it.
- 6/25/07 weeds are beginning to become a problem. Same results were found from 6/18/07
- My observations show that the plots that were disked had material that rooted and produced plants. Although disking showed to be better than broadcasting, the shredded disked plots didn't do as well as the unshredded material.

**June test:**

- 6/25/07 randomly selected plots were cut for June test. Refer to plot plan figure2. G3 pond was flooded soon after planting to moisten soil.
- 7/9/07 nothing seemed to be sprouting in any of the treatments.
- 7/16/07 nothing seemed to be sprouting in any of the treatments.
- 7/23/07 didn't see anything sprouting, but observed most of the material used for the test was beginning to decay.

**July test:**

- July test was cancelled due to wet soil conditions preventing equipment from preparing the area for treatments.

From the observations and problems having to produce maidencane from clippings, this project will be inactive until further notice. Additional literature researching will be made before reopening.

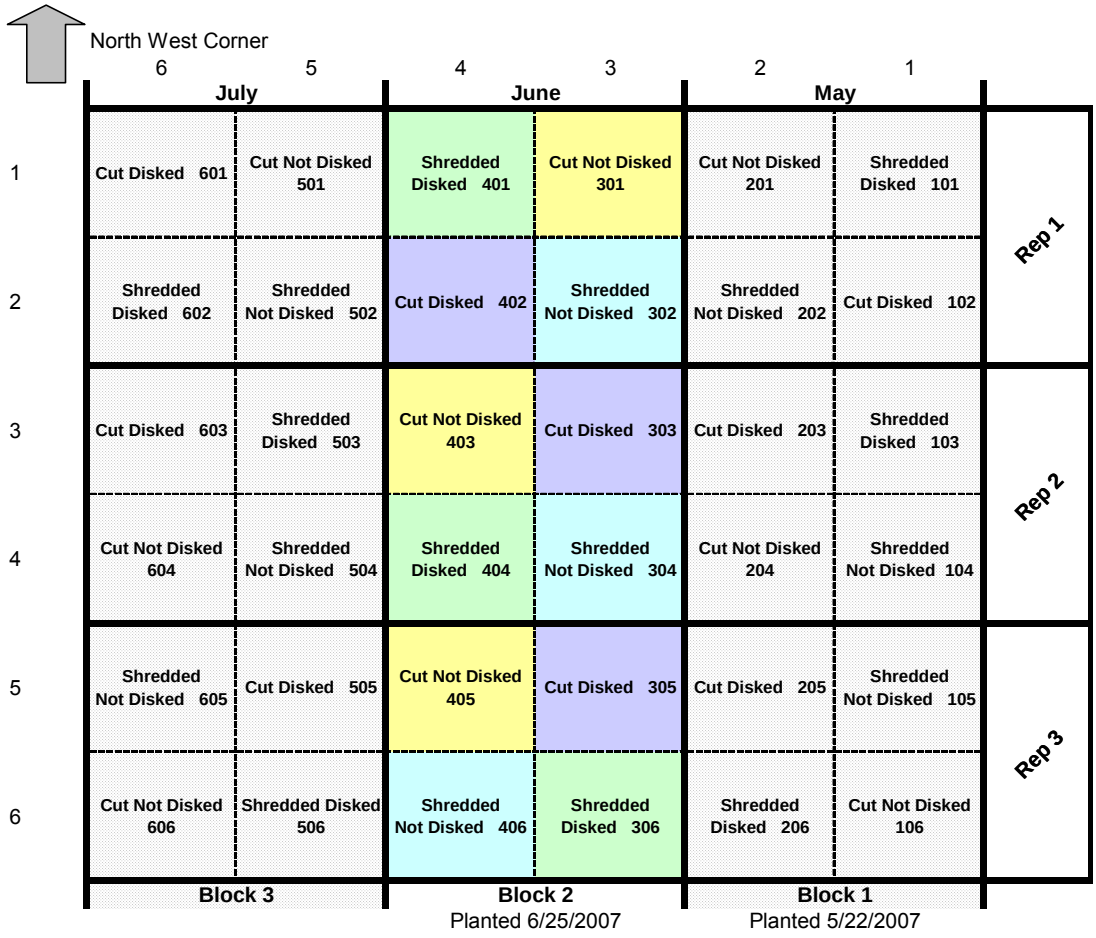
**Literature Cited**

Newman, Selena Dawn, 2000; NRCS Plant Guide MaidenCane *Panicum hemitomon* J.A. Schultes; http://plants.nrcs.usda.gov/plantguide/pdf/pg_pahe2.pdf.

Figure 1

| Accession Number | Location | Parish/State |
|---|---|---|
| 421993 Citrus | | |
| 434171 'Halifax' | | |
| 9068013 | Valentine | Lafourche, LA |
| 9068014 | Intercoastal Waterway | Lafourche, LA |
| 9068015 | Cheramie's Pasture | Lafourche, LA |
| 9068016 | Stakes Road | Acadia, LA |
| 9068017 | Kaplan Hwy 13 | Vermilion, LA |
| 9068018 | Franklin Hwy 90/3211 | St. Mary, LA |
| 9068019 | Mamou intersection Hwy 10/13 | Evangeline, LA |
| 9068020 | Houma/ Raceland Exit Hwy 90 | Lafourche, LA |
| 9068021 | LAPMC Field A | Lafourche, LA |
| 9068022 | Hwy 165 | Allen, LA |
| 9068023 | LA 26 / Hwy 165 | Allen, LA |
| 9068024 | Gibstown Bridge | Cameron, LA |
| 9068025 | Intersection Dave Dugas Road / Hwy 27 | Calcasieu, LA |
| 9068026 | Boyette Animal Hospital | Calcasieu, LA |
| 9068027 (American cupscale) | Sweet Lake | Cameron, LA |
| 9068028 | Willow Lake | Cameron, LA |
| 9068029 | Hwy 27 | Calcasieu, LA |
| 9068033 | West Lake | Calcasieu, LA |
| 9068048 | Lake Des Allemands | Lafourche, LA |
| 9068049 | Lake Des Allemands / South Vacherie | St. John the Baptist, LA |
| 9068050 | Bayou Des Allemands / Golden Ranch Canal | Lafourche, LA |

Figure 2 Plot Plan



**Study:** LAPMC-P-0503-WE

**Study Title:** Evaluation of saltgrass (*Distichlis spicata*)

**Study Leader:** Garret Thomassie, NRCS Plant Materials Center, LA

**Introduction**

Saltgrass (*Distichlis spicata*) is a mat-forming, strongly rhizomatous perennial grass that prefers moist, saline soils, and is often found in sandy, alkaline locations. It is particularly useful in saline/alkaline wetland restoration. It is significant in the salt marshes, which provide nesting grounds for birds, fish and larvae of many species of marine invertebrate animals.

Saltgrass is found in saline areas, brackish marshes, and in salt flats along the coasts of the Atlantic and Pacific Oceans, and the Gulf of Mexico. It inhabits upper/high marsh (irregularly flooded) areas, in which the water levels vary between 2 inches above the soil surface and 6 inches below the soil surface. It is also one of the most drought-tolerant grass species.

Under favorable soil and moisture conditions, studies have shown that saltgrass is a beneficial source of forage in pastures irrigated with saline water and that total dry matter can yield 10 T/AC with a total protein production of 2,866 lbs. /AC. It is grazed by both cattle and horses and it has a forage value of fair to good because it remains green when most other grasses are dry during the drought periods. It is resistant to grazing and trampling. It is cropped both when green and in the dry state; however, it is most commonly used in the winter for livestock feed.

It may be propagated by seeds, which are produced many times in a growing season and are dispersed by wind and water; however, it is easier and more often propagated by its extensively creeping rhizomes.

**Problem**

Saltgrass is a highly desired plant for coastal and saline wetland restoration projects; it is frequently included on contract project plant lists put out for bid by many conservation partners, including those representing federal, state and parish governments and private consultants. However, there is a lack of quality, tested plants of the species, especially in sufficient numbers for growers to obtain for commercial production.

**Objective**

Evaluation of Louisiana ecotypes for selection and use in salt marshes of the coastal zone of Louisiana.

**Procedures**

Since 2004, saltgrass collections have been made from various locations across the coastal areas of south Louisiana. The PMC currently has 18 different collections of 15 four-inch pots each (Table 1). A plot plan layout has been designed and each accession will be planted in a block for initial evaluation in one of the ponds on the PMC. The ponds are drainable for control of water inundation periods.

**Discussion**

Decision making on the type of data to be measured and collected for this initial evaluation is in progress and has not yet been finalized to date. Accessions may likely be evaluated for vigor, drought and flooding tolerance, seed viability and yield, as well as typical characteristics such as height and perhaps rhizome-forming ability.

Table 1. List of saltgrass collections, and collection locations.

| | |
|---|---|
| 9068011 | Terrebonne, LA |
| 9068012 | Jefferson, LA |
| 9068030 | Cameron, LA |
| 9068031 | Cameron, LA |
| 9068305 | Lafourche, LA |
| 9068306 | St. Bernard, LA |
| Fourchon source | Lafourche, LA |
| 9068109 | St. Tammany, LA |
| 9068110 | Lafourche, LA |
| 9068111 | Lafourche, LA |
| 9068112 | Vermilion, LA |
| 9068113 | Cameron, LA |

**Study:** LAPMC-P-9804-WE

**Study Title:** Evaluation of *Schoenoplectus californicus* for coastal wetland restoration and stabilization

**Study Leader:** Garret Thomassie, NRCS Plant Materials Center, LA

**Cooperators:** Herry S. Utomo, LSU Rice Research Station, Crowley, LA

**Introduction**

California bulrush (*Schoenoplectus californicus)* is a herbaceous, native, rhizomatous perennial that forms dense vegetative colonies along shorelines, in open water, or on mudflats. California bulrush spreads primarily by vegetative propagation, producing new stems from an extensive system of underground rhizomes, or, to a limited extent, through seed dispersal. Plant stems are obtusely triangular and generally will range from 5 feet to 10 feet in height; taller in nutrient-rich environments.

An important characteristic of California bulrush is that it can grow in relatively deep water. It is not uncommon for extensive colonies to grow in 36 inches or more of water. California bulrush colonies tend to grow parallel to and continuous along shorelines or in unobstructed habitats, in solid somewhat circular stands of an acre or larger. California bulrush has a relatively low tolerance to salinity and is generally restricted to fresh and intermediate marsh habitats (Materne, 2000).

**Problem**

California bulrush currently has only one known commercial release 'Restorer' that originated from Hillsborough County, Florida. A Louisiana release of California bulrush is desperately needed to satisfy the needs of native plant materials for use on state funded marsh restoration projects.

**Objective**

The objective for this study is the collection and release of a Louisiana native cultivar.

**Procedures**

Plants were collected from coastal Louisiana marshes. Collections will be transplanted to containers and grown in greenhouse until they are ready for study. Study will have one off-center and one on-center planting.

**Discussion**

Vegetative plant materials were collected from native plant communities found growing in coastal marshes of Louisiana and Texas. Fifty-two collections were delivered to the Golden Meadow PMC for plant increase and testing (Table 1). Vegetative materials were established in study pond H7 in 2000. Plants were planted with five one gallon

containerized plants per plot on two foot centers within plots and thirty foot between plots. Performance data was evaluated for stem height (average 3 stems), width, vigor and stand density. Stand spread was only recorded until the lateral growth reached the plots. Evaluation data for this study was taken on 6/14/2001, 12/20/2001, 11/15/2002, 12/9/2003 and 5/19/2004. Plot spread was only monitored for 6/14/2001 and 12/20/2001 (Table 2-4).

In 2006, a selected ecotype release of California Bulrush was made and named Bayou Lafourche Germplasm. It was released for fresh and intermediate marsh habitats for controlling erosion along shorelines, canal banks, levee banks and other areas of soil-water interface. It may be utilized for streambank and shoreline stabilization, wetland restoration and creation, wildlife habitat and water quality improvement.

Additional advanced research is ongoing to identify collections that may have higher salt salinity tolerance.

**Literature Sited**

Materne, Mike, 2000; Plant Guide *Schoenoplectus californicus* California Bulrush; produced by LSU AgCenter Communications.

Table 1

| Accession | Location |
|---|---|
| 68265 | PMC Composite |
| 68267 | Calcasieu |
| 68268 | Cameron |
| 68269 | Cameron |
| 68270 | Cameron |
| 68271 | Lafourche |
| 68272 | Lafourche |
| 68273 | Terrebonne |
| 68274 | Terrebonne |
| 68275 | Calcasieu Texas GIWW |
| 68276 | Cameron Willow Lake |
| 68277 | St Mary East Cote Blanche |
| 68278 | Calcasieu GIWW |
| 68279 | Iberia Avery Island |
| 68280 | Cameron Black Bayou |
| 68281 | Vermilion Judge's |
| 68282 | Cameron Parish Amoco Plant |
| 68283 | Vermilion Exxon |
| 68284 | Calcasieu Goose Lake |
| 68286 | Cameron Grand Lake |
| 68287 | Lafourche cat food plant |
| 68293 | Lafourche Clovelly |
| 68294 | Lafourche Clovelly Loop |
| 68295 | St Charles Bayou DesAllemands |
| 68296 | St. Charles Lake Salvador |
| 68298 | St. Charles LaBranche |
| 68299 | St. Charles LaBranche |

| Accession | Location |
|---|---|
| 68301 | Terrebonne H-H Canal |
| 68309 | Cameron Mermenau River |
| 68310 | St. Charles Kenner |
| 68311 | St. Charles LaBranche |
| 68312 | Tangiahoa Manchac |
| 68313 | Orange County Tx |
| 68323 | Cameron Johnson Bayou |
| 68324 | Cameron North Island Road |
| 68325 | Cameron Jim Bel Marsh |
| 68326 | Cameron Sabine National Refuge |
| 68327 | Calcasieu River |
| 68328 | Cameron Hwy 82/27 |
| 68329 | Cameron Scott Rosteet Launch |
| 68330 | Cameron Johnson Bayou |
| 68331 | Iberia Bayou Carlin |
| 68332 | Iberia Weeks Bayou |
| 68333 | Vermilion Freshwater Bayou |
| 68334 | Vermilion Keyhole |
| 68335 | Vermilion Northside |
| 68336 | Vermilion Bell Ile Bayou |
| 68337 | Vermilion River GIWW |
| 68370 | Cameron Gueydan Canal |
| 68371 | St. Mary |
| 68372 | St. Charles Labranche |
| Restorer | Released Collection |

| Plot | Height (cm) | | | | | | Stem Width (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6/14/2001 | 12/20/2001 | 11/15/2002 | 12/9/2003 | 5/19/2004 | | 6/14/2001 | 12/20/2001 | 11/15/2002 | 12/9/2003 | 5/19/2004 |
| | | | | | | | | | | | |
| 101 | 230 | 275 | 260 | 234 | 250 | | 17.53 | 16.30 | 13.66 | 12.78 | 9.81 |
| 102 | 220 | 306 | 223 | 180 | 225 | | 18.54 | 12.75 | 13.16 | 12.01 | 8.77 |
| 103 | 230 | 291 | 253 | 183 | 210 | | 17.02 | 12.00 | 14.08 | 11.31 | 11.28 |
| 104 | 260 | 275 | 230 | 175 | 200 | | 13.21 | 13.83 | 12.61 | 9.61 | 7.05 |
| 105 | 250 | 275 | 200 | 160 | 235 | | 20.83 | 13.40 | 11.41 | 12.76 | 10.46 |
| 106 | 210 | 260 | 265 | 198 | 220 | | 16.26 | 10.14 | 16.27 | 9.75 | 8.57 |
| 107 | 230 | 306 | 295 | 249 | 280 | | 15.50 | 9.09 | 15.25 | 12.32 | 9.39 |
| | | | | | | | | | | | |
| 201 | | | | | | | | | | | |
| 202 | 240 | 306 | 158 | 224 | 250 | | 17.27 | 14.70 | 12.51 | 10.32 | 9.16 |
| 203 | 230 | 260 | 197 | 216 | 210 | | 14.22 | 12.84 | 13.89 | 10.50 | 8.60 |
| 204 | 255 | 245 | 280 | 183 | 235 | | 19.30 | 13.84 | 14.41 | 15.00 | 9.89 |
| 205 | 250 | 275 | 274 | 196 | 205 | | 17.78 | 17.30 | 15.46 | 10.70 | 10.21 |
| 206 | 190 | 239 | 236 | 170 | 190 | | 14.99 | 10.98 | 13.02 | 9.26 | 7.33 |
| 207 | 180 | 230 | 200 | 180 | 195 | | 11.94 | 12.79 | 12.90 | 11.60 | 5.79 |
| | | | | | | | | | | | |
| 301 | | | | | | | | | | | |
| 302 | 200 | 217 | 217 | 173 | 210 | | 21.59 | 17.52 | 18.40 | 12.67 | 9.32 |
| 303 | 230 | 282 | 268 | 165 | 230 | | 15.75 | 12.28 | 18.64 | 11.48 | 11.04 |
| 304 | 220 | 306 | 255 | 180 | 235 | | 19.81 | 21.27 | 12.48 | 12.70 | 9.13 |
| 305 | 220 | 275 | 273 | 193 | 220 | | 12.45 | 14.97 | 14.70 | 12.19 | 8.99 |
| 306 | 200 | 275 | 270 | 198 | 250 | | 18.03 | 19.55 | 15.20 | 14.47 | 11.61 |
| 307 | 250 | 306 | 253 | 239 | 285 | | 13.46 | 15.04 | 12.16 | 12.76 | 9.77 |
| | | | | | | | | | | | |
| 401 | | | | | | | | | | | |
| 402 | 200 | 272 | 221 | 193 | 230 | | 14.99 | 14.31 | 18.18 | 9.94 | 9.08 |
| 403 | 250 | 297 | 243 | 203 | 220 | | 16.26 | 10.79 | 12.87 | 11.19 | 7.94 |
| 404 | 200 | 275 | 168 | 165 | 240 | | 15.49 | 18.86 | 14.29 | 14.30 | 10.70 |
| 405 | 210 | 285 | 231 | 208 | 250 | | 15.49 | 13.42 | 10.77 | 11.37 | 10.93 |
| 406 | 240 | 260 | 254 | 213 | 255 | | 14.48 | 19.09 | 13.68 | 13.74 | 9.67 |
| 407 | 210 | 300 | 270 | 254 | 250 | | 16.51 | 17.47 | 17.25 | 12.95 | 10.92 |
| | | | | | | | | | | | |
| 501 | | | | | | | | | | | |
| 502 | 240 | 324 | 253 | 211 | 270 | | 15.75 | 14.25 | 12.78 | 13.00 | 10.12 |
| 503 | 210 | 306 | 300 | 198 | 280 | | 14.22 | 18.22 | 11.99 | 11.59 | 10.53 |
| 504 | 210 | 275 | 280 | 191 | 260 | | 15.49 | 18.57 | 10.43 | 13.51 | 10.55 |
| 505 | 200 | 285 | 294 | 196 | 250 | | 14.22 | 20.93 | 16.99 | 15.34 | 14.38 |
| 506 | 230 | 288 | 240 | 201 | 240 | | 14.99 | 16.11 | 14.01 | 12.00 | 8.97 |
| 507 | 230 | 321 | 252 | 218 | 270 | | 17.78 | 16.83 | 13.35 | 14.04 | 9.82 |
| | | | | | | | | | | | |
| 601 | | | | | | | | | | | |
| 602 | 200 | 312 | 291 | 201 | 320 | | 13.72 | 17.34 | 15.31 | 15.53 | 13.75 |
| 603 | 240 | 282 | 270 | 208 | 285 | | 17.27 | 14.64 | 14.09 | 14.84 | 10.16 |
| 604 | 200 | 272 | 243 | 216 | 280 | | 15.49 | 15.55 | 13.69 | 11.80 | 11.13 |
| 605 | 220 | 291 | 168 | 211 | 270 | | 16.00 | 14.26 | 17.45 | 13.48 | 12.00 |
| 606 | 230 | 285 | 280 | 274 | 310 | | 15.75 | 14.59 | 17.79 | 13.86 | 11.90 |
| 607 | 190 | 285 | 250 | 224 | 265 | | 14.22 | 17.85 | 14.11 | 15.52 | 11.46 |
| | | | | | | | | | | | |
| 701 | | | | | | | | | | | |
| 702 | 230 | 306 | 293 | 244 | 330 | | 17.02 | 14.79 | 18.97 | 15.85 | 14.82 |
| 703 | 230 | 275 | 235 | 224 | 280 | | 14.99 | 14.55 | 10.56 | 11.64 | 10.21 |
| 704 | 240 | 291 | 270 | 236 | 280 | | 14.73 | 16.97 | 12.33 | 16.07 | 10.56 |
| 705 | 260 | 318 | 310 | 259 | 290 | | 19.81 | 16.05 | 16.43 | 17.38 | 11.62 |
| 706 | 180 | 282 | 257 | 234 | 290 | | 13.72 | 17.83 | 15.89 | 17.67 | 10.30 |
| 707 | 200 | 272 | 245 | 203 | 260 | | 12.70 | 14.59 | 13.26 | 11.64 | 9.22 |
| | | | | | | | | | | | |
| 801 | | | | | | | | | | | |
| 802 | 230 | 306 | 286 | 211 | 270 | | 11.43 | 14.43 | 14.95 | 11.56 | 12.24 |
| 803 | 230 | 291 | 268 | 267 | 320 | | 14.99 | 16.75 | 13.39 | 14.09 | 10.34 |
| 804 | 230 | 291 | 264 | 224 | 275 | | 13.72 | 20.78 | 18.05 | 13.76 | 15.72 |
| 805 | 190 | 153 | 161 | 76 | 175 | | 12.95 | 12.50 | 8.52 | 7.57 | 10.86 |
| 806 | 210 | 306 | 265 | 259 | 280 | | 13.72 | 18.56 | 12.95 | 14.98 | 12.97 |
| 807 | 190 | 282 | 290 | 284 | 290 | | 18.80 | 15.60 | 10.69 | 11.60 | 11.19 |

| Plot Spread (cm2) | | | | | Plot Spread | | Vigor (1-9) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6/14/2001 | 12/20/2001 | 11/15/2002 | 12/9/2003 | 5/19/2004 | Increase (cm2) | | 6/14/2001 | 12/20/2001 | 11/15/2002 | 12/9/2003 | 5/19/2004 |
| | | | | | | | | | | | |
| 138600 | 495000 | N/A | N/A | N/A | 158763 | | 5 | 5 | 7 | 7 | 7 |
| 129600 | 392000 | N/A | N/A | N/A | 130715 | | 4 | 5 | 7 | 5 | 6 |
| 138000 | 406000 | N/A | N/A | N/A | 136320 | | 4 | 5 | 7 | 6 | 7 |
| 153600 | 473100 | N/A | N/A | N/A | 157025 | | 4 | 6 | 8 | 8 | 8 |
| 92500 | 382800 | N/A | N/A | N/A | 119135 | | 5 | 8 | 9 | 9 | 6 |
| 111800 | 427500 | N/A | N/A | N/A | 135155 | | 5 | 5 | 9 | 8 | 8 |
| 100800 | 388600 | N/A | N/A | N/A | 122663 | | 6 | 4 | 7 | 4 | 5 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 110000 | 351000 | N/A | N/A | N/A | 115548 | | 5 | 7 | 6 | 7 | 7 |
| 110000 | 376200 | N/A | N/A | N/A | 121858 | | 7 | 8 | 9 | 8 | 7 |
| 140000 | 338100 | N/A | N/A | N/A | 119820 | | 5 | 9 | 9 | 9 | 6 |
| 144000 | 639000 | N/A | N/A | N/A | 196153 | | 3 | 6 | 5 | 8 | 6 |
| 131600 | 609000 | N/A | N/A | N/A | 185543 | | 4 | 3 | 6 | 8 | 6 |
| 97500 | 533000 | N/A | N/A | N/A | 157993 | | 4 | 6 | 7 | 7 | 6 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 117500 | 308700 | N/A | N/A | N/A | 106830 | | 7 | 9 | 8 | 8 | 6 |
| 159600 | 380000 | N/A | N/A | N/A | 135215 | | 5 | 7 | 7 | 6 | 6 |
| 188700 | 531200 | N/A | N/A | N/A | 180343 | | 4 | 5 | 4 | 6 | 5 |
| 153600 | 578000 | N/A | N/A | N/A | 183283 | | 4 | 3 | 4 | 4 | 6 |
| 155000 | 680800 | N/A | N/A | N/A | 209365 | | 5 | 3 | 6 | 5 | 6 |
| 153000 | 653200 | N/A | N/A | N/A | 201958 | | 4 | 2 | 6 | 3 | 4 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 135000 | 452400 | N/A | N/A | N/A | 147190 | | 5 | 7 | 9 | 8 | 5 |
| 153700 | 494100 | N/A | N/A | N/A | 162305 | | 4 | 6 | 8 | 7 | 8 |
| 69000 | 367200 | N/A | N/A | N/A | 109355 | | 5 | 5 | 8 | 6 | 6 |
| 139500 | 364000 | N/A | N/A | N/A | 126180 | | 5 | 7 | 7 | 6 | 5 |
| 175000 | 648000 | N/A | N/A | N/A | 206155 | | 3 | 3 | 5 | 5 | 4 |
| 155100 | 779000 | N/A | N/A | N/A | 233968 | | 4 | 1 | 5 | 4 | 5 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 178500 | 634800 | N/A | N/A | N/A | 203728 | | 3 | 3 | 3 | 3 | 3 |
| 115000 | 549000 | N/A | N/A | N/A | 166378 | | 3 | 2 | 6 | 4 | 3 |
| 139500 | 582400 | N/A | N/A | N/A | 180863 | | 3 | 5 | 7 | 5 | 5 |
| 126000 | 572000 | N/A | N/A | N/A | 174883 | | 4 | 3 | 5 | 5 | 5 |
| 102600 | 616000 | N/A | N/A | N/A | 180045 | | 6 | 3 | 5 | 4 | 4 |
| 150400 | 702000 | N/A | N/A | N/A | 213520 | | 5 | 6 | 6 | 6 | 4 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 76000 | 463600 | N/A | N/A | N/A | 135243 | | 5 | 5 | 5 | 3 | 1 |
| 126000 | 572700 | N/A | N/A | N/A | 175055 | | 1 | 3 | 6 | 2 | 4 |
| 72000 | 341700 | N/A | N/A | N/A | 103720 | | 5 | 5 | 7 | 6 | 4 |
| 134400 | 546000 | N/A | N/A | N/A | 170473 | | 6 | 3 | 3 | 5 | 4 |
| 88000 | 544000 | N/A | N/A | N/A | 158373 | | 4 | 4 | 4 | 3 | 3 |
| 159800 | 607200 | N/A | N/A | N/A | 192145 | | 6 | 3 | 5 | 7 | 4 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 73800 | 345000 | N/A | N/A | N/A | 104998 | | 6 | 2 | 4 | 1 | 1 |
| 96000 | 401500 | N/A | N/A | N/A | 124695 | | 5 | 4 | 6 | 6 | 3 |
| 91200 | 413000 | N/A | N/A | N/A | 126373 | | 4 | 4 | 4 | 5 | 2 |
| 108000 | 456000 | N/A | N/A | N/A | 141340 | | 4 | 3 | 4 | 4 | 2 |
| 99000 | 516000 | N/A | N/A | N/A | 154115 | | 6 | 2 | 5 | 5 | 3 |
| 45000 | 268800 | N/A | N/A | N/A | 78710 | | 6 | 5 | 6 | 5 | 3 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 98900 | 465000 | N/A | N/A | N/A | 141318 | | 3 | 5 | 7 | 6 | 3 |
| 57600 | 339200 | N/A | N/A | N/A | 99493 | | 3 | 5 | 5 | 1 | 1 |
| 66000 | 344500 | N/A | N/A | N/A | 102920 | | 4 | 5 | 5 | 5 | 3 |
| 88200 | 245100 | N/A | N/A | N/A | 83575 | | 2 | 7 | 7 | 9 | 8 |
| 68400 | 402000 | N/A | N/A | N/A | 117918 | | 2 | 1 | 3 | 5 | 1 |
| 32200 | 347200 | N/A | N/A | N/A | 95145 | | 6 | 3 | 4 | 5 | 3 |

Rating Scale 1-3 Excellent, 4-6 Good, 7-9 Poor

| Stand Density (1-9) | | | | | | Seed Rating (1-9) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6/14/2001 | 12/20/2001 | 11/15/2002 | 12/9/2003 | 5/19/2004 | | 6/14/2001 | 12/20/2001 | 11/15/2002 | 12/9/2003 | 5/19/2004 |
| | | | | | | | | | | |
| 4 | 3 | 7 | 6 | 6 | | 2 | N/A | N/A | 8 | 5 |
| 5 | 3 | 5 | 7 | 6 | | 3 | N/A | N/A | 7 | 5 |
| 6 | 3 | 7 | 7 | 7 | | 4 | N/A | N/A | 9 | 8 |
| 4 | 3 | 5 | 8 | 8 | | 3 | N/A | N/A | 9 | 9 |
| 7 | 7 | 9 | 9 | 8 | | 5 | N/A | N/A | 9 | 6 |
| 5 | 3 | 4 | 7 | 8 | | 4 | N/A | N/A | 8 | 6 |
| 5 | 4 | 5 | 5 | 5 | | 5 | N/A | N/A | 7 | 5 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 6 | 7 | 7 | 8 | 6 | | 4 | N/A | N/A | 9 | 7 |
| 6 | 9 | 8 | 9 | 8 | | 4 | N/A | N/A | 9 | 8 |
| 6 | 9 | 9 | 8 | 6 | | 4 | N/A | N/A | 9 | 8 |
| 4 | 6 | 7 | 8 | 5 | | 4 | N/A | N/A | 9 | 7 |
| 4 | 3 | 6 | 5 | 6 | | 4 | N/A | N/A | 8 | 8 |
| 4 | 3 | 4 | 7 | 6 | | 4 | N/A | N/A | 8 | 4 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 6 | 9 | 9 | 9 | 8 | | 7 | N/A | N/A | 9 | 8 |
| 6 | 8 | 7 | 9 | 7 | | 4 | N/A | N/A | 8 | 7 |
| 5 | 4 | 5 | 6 | 5 | | 4 | N/A | N/A | 8 | 5 |
| 3 | 3 | 4 | 6 | 5 | | 4 | N/A | N/A | 9 | 5 |
| 6 | 3 | 6 | 6 | 7 | | 3 | N/A | N/A | 9 | 5 |
| 3 | 3 | 4 | 4 | 3 | | 4 | N/A | N/A | 9 | 5 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 7 | 7 | 8 | 9 | 6 | | 4 | N/A | N/A | 7 | 4 |
| 2 | 6 | 7 | 7 | 9 | | 5 | N/A | N/A | 7 | 8 |
| 7 | 8 | 8 | 8 | 7 | | 6 | N/A | N/A | 8 | 5 |
| 5 | 8 | 8 | 7 | 5 | | 3 | N/A | N/A | 8 | 3 |
| 3 | 4 | 7 | 5 | 3 | | 4 | N/A | N/A | 9 | 5 |
| 4 | 1 | 5 | 4 | 3 | | 4 | N/A | N/A | 9 | 4 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 2 | 2 | 5 | 2 | 3 | | 4 | N/A | N/A | 9 | 5 |
| 6 | 3 | 7 | 6 | 3 | | 4 | N/A | N/A | 7 | 5 |
| 3 | 5 | 7 | 6 | 3 | | 3 | N/A | N/A | 9 | 5 |
| 5 | 4 | 6 | 6 | 3 | | 4 | N/A | N/A | 8 | 6 |
| 6 | 6 | 5 | 5 | 3 | | 4 | N/A | N/A | 9 | 4 |
| 5 | 5 | 6 | 5 | 3 | | 4 | N/A | N/A | 9 | 4 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 6 | 7 | 6 | 4 | 1 | | 4 | N/A | N/A | 9 | 5 |
| 1 | 2 | 7 | 6 | 3 | | 3 | N/A | N/A | 9 | 6 |
| 6 | 6 | 6 | 7 | 4 | | 3 | N/A | N/A | 9 | 5 |
| 6 | 3 | 5 | 6 | 3 | | 4 | N/A | N/A | 8 | 3 |
| 5 | 3 | 4 | 3 | 3 | | 3 | N/A | N/A | 9 | 5 |
| 6 | 5 | 6 | 6 | 4 | | 4 | N/A | N/A | 5 | 4 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 6 | 5 | 5 | 4 | 2 | | 6 | N/A | N/A | 9 | 6 |
| 5 | 4 | 7 | 3 | 6 | | 5 | N/A | N/A | 9 | 6 |
| 5 | 3 | 6 | 4 | 4 | | 4 | N/A | N/A | 9 | 6 |
| 3 | 2 | 6 | 3 | 2 | | 4 | N/A | N/A | 9 | 6 |
| 6 | 6 | 7 | 6 | 4 | | 4 | N/A | N/A | 9 | 6 |
| 5 | 8 | 8 | 7 | 3 | | 4 | N/A | N/A | 9 | 6 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 4 | 3 | 5 | 5 | 4 | | 4 | N/A | N/A | 9 | 4 |
| 4 | 5 | 5 | 3 | 2 | | 4 | N/A | N/A | 9 | 4 |
| 5 | 6 | 4 | 6 | 4 | | 2 | N/A | N/A | 6 | 1 |
| 2 | 9 | 9 | 9 | 9 | | 1 | N/A | N/A | 9 | 3 |
| 4 | 2 | 7 | 3 | 1 | | 3 | N/A | N/A | 9 | 5 |
| 7 | 8 | 5 | 6 | 3 | | 5 | N/A | N/A | 9 | 5 |

Rating Scale 1-3 Excellent, 4-6 Good, 7-9 Poor

**Study Title:** Maritime Forest Habitat Restoration and Enhancement

**Study Leader:** Garret Thomassie, NRCS Plant Materials Center, LA

**Cooperators:** Morris Houck, NRCS Plant Materials Specialists
Dr. Terry Clason, NRCS State Forester
Richard Aycock, NRCS State Agronomist
Richard DeMay, Senior Scientist, Barataria-Terrebonne National Estuary Program (BTNEP)
Greater Lafourche Port Commission (GLPC)
Gulf of Mexico Program
Gulf of Mexico Foundation
National Oceanographic and Atmospheric Administration (NOAA)

**Introduction**

The coastal region of Louisiana encompasses nearly 8 million acres. Coastal marshes cover about one-third of the area and the remaining coastal land mass is dry land such as beaches, cheniers, natural marsh ridges, and barrier islands. Manmade dry land habitats include levees, spoil banks, levied and drained marsh, and dedicated sediment disposal sites. Coastal dry land habitat supports important forested plant communities. Forested plant communities are important ecological systems that with coastal marshlands provide excellent habitat for many avian species.

The concept of reestablishing maritime forest on created marsh ridge and marsh fringe habitat is being undertaken by a partnership coordinated by the Greater Lafourche Port Commission and the Barataria-Terrebonne National Estuary Program in Lafourche Parish, Louisiana.

**Problem**

Much of the dry land mass supporting tree and shrub plant communities or maritime forest has declined due to coastal erosion, saltwater intrusion, and manmade influences. Natural ridges that supported maritime forest habitat once bordered Bayou Moreau and Bayou Cochon near Port Fourchon (Fig 1). Only small remnants of these ridges exist today.

An important factor that contributes to the number of avian species that frequent Louisiana's coast is the proximity to the Mississippi Valley migratory flyway. Many of the trans-gulf migrant species fly south in the fall to over winter in the neotropics and then fly back north in the spring to breeding grounds in North America. Coastal Louisiana is the first land mass the migrants encounter on their northward migration over the Gulf of Mexico from South and Central America in the spring. Louisiana's coastal habitats, particularly forested habitats, provide food and shelter to these weary birds. Conversely, birds forage heavily in Louisiana's forest and wetland habitats during the fall, prior to their migration back across the gulf.

Forested coastal habitat is not only important to neotropical migratory birds; many species find the climate favorable for year long residence and some northern birds will often overwinter in southern Louisiana. Louisiana also affords a strategic east-west location that receives nearly all of the species of the eastern United States and many species of western states.

Figure 1. The Port Fourchon Area. The white line drawn in near Bayou Cochon represents the ridge/marsh restoration project discussed in this report.


**Objective**

The purpose of this project is to establish suitable plant species on the first 2,000 ft of newly constructed ridge/marsh habitat and on an additional 2,000 ft of marsh fringe on an adjoining ridge segment when it is constructed in the future.

**Procedures**

This project concerns the establishment of selected plant materials on 2000 ft of ridge which was constructed in 2004 and early 2005 (two 1000 ft ridge segments). When the area dewatered, the ridge segments were approximately 200 ft wide and 8 ft high at the top, then dropped gradually to a 100-ft ridge slope and marsh fringe on each ridge side, for a total estimated ridge width of 400 ft (Fig 2). Plant materials are also proposed for 2000 ft of marsh fringe alone (100 ft wide), on only the north side of another ridge

segment being constructed adjacent to the primary project location. Ridge construction will continue on that segment.

Plant materials are being selected, propagated, and established to demonstrate plant species alternatives, specific environmental parameters, and solutions for creating maritime forest and marsh fringe associated with constructed ridge habitat. Site characterization information is being gathered by testing soils, and determining site profiles and elevations of the ridge and associated fringe marsh. Planting plans developed will identify species, plant placement, numbers, and spacing. Tasks identified to accomplish this project include:

Task 1
Conduct literature review to identify potential annual and perennial seeded species that can be used for early cover and pioneering crops that will stabilize and improve productivity of the newly placed ridge materials.

Task 2
Comprehensive soil testing to a depth of 6 inches will begin immediately after final shaping of ridge (estimated January 2005). Soil samples will be collected at 5 fixed locations across the profile of each 1000 ft section of ridge. At each location, 10 sub samples will be bulked for analysis. Soil texture, pH, salinity, macro and micro nutrients will be measured at each location. Soil sampling will begin immediately following construction and final ridge shaping and will continue at 60 day intervals until conditions are considered favorable for plant growth, which may involve the addition of a variety of recommended soil amendments.

Soil amendments (e.g. calcium, lime, etc.) may be recommended, based on soil sampling results, at any given point in time during the project as soil conditions may change. These amendments are expected to alter soil conditions (e.g. soil pH) for more favorable planting conditions. The unknown need for amendments, to date, may necessitate the addition of project tasks, which may in turn incur additional costs, to be paid for by BTNEP.

Task 3
The Plant Materials Center will work to plant and, with BTNEP, identify and use applicable volunteer labor to conduct plantings, on the ridge/marsh surface.

Various species are being, and will be, planted across ridge zones including marsh fringe, tidal creeks, fresh water ponds, and elevated ridges (Fig. 2). Various establishment methods will be demonstrated including the use of bareroot and container-grown plant materials, and broadcast seeding. Potential species that will be used include:

1. Live oak (*Quercus virginiana*)
2. Hackberry (*Celtis laevigata*)
3. Yaupon (*Ilex vomitoria*)
4. Black mangrove (*Avicennia germinans*)
5. French mulberry (*Callicarpa americana*)
6. Wax myrtle (*Morella cerifera*)
7. Hercules' club (*Zanthoxylum clava-herculis*)
8. Smooth cordgrass (*Spartina alterniflora*)
9. Marshhay cordgrass (*Spartina patens*)
10. Seashore paspalum (*Paspalum vaginatum*)
11. Saltgrass (*Distichlis spicata*)

12. Other species as identified from literature review and discussions with BTNEP's "Protection of Habitat for Migratory and Resident Birds" Action Plan Team (Task 1).

**Services and Deliverables**
Services and tasks that will be completed as part of this project will be:

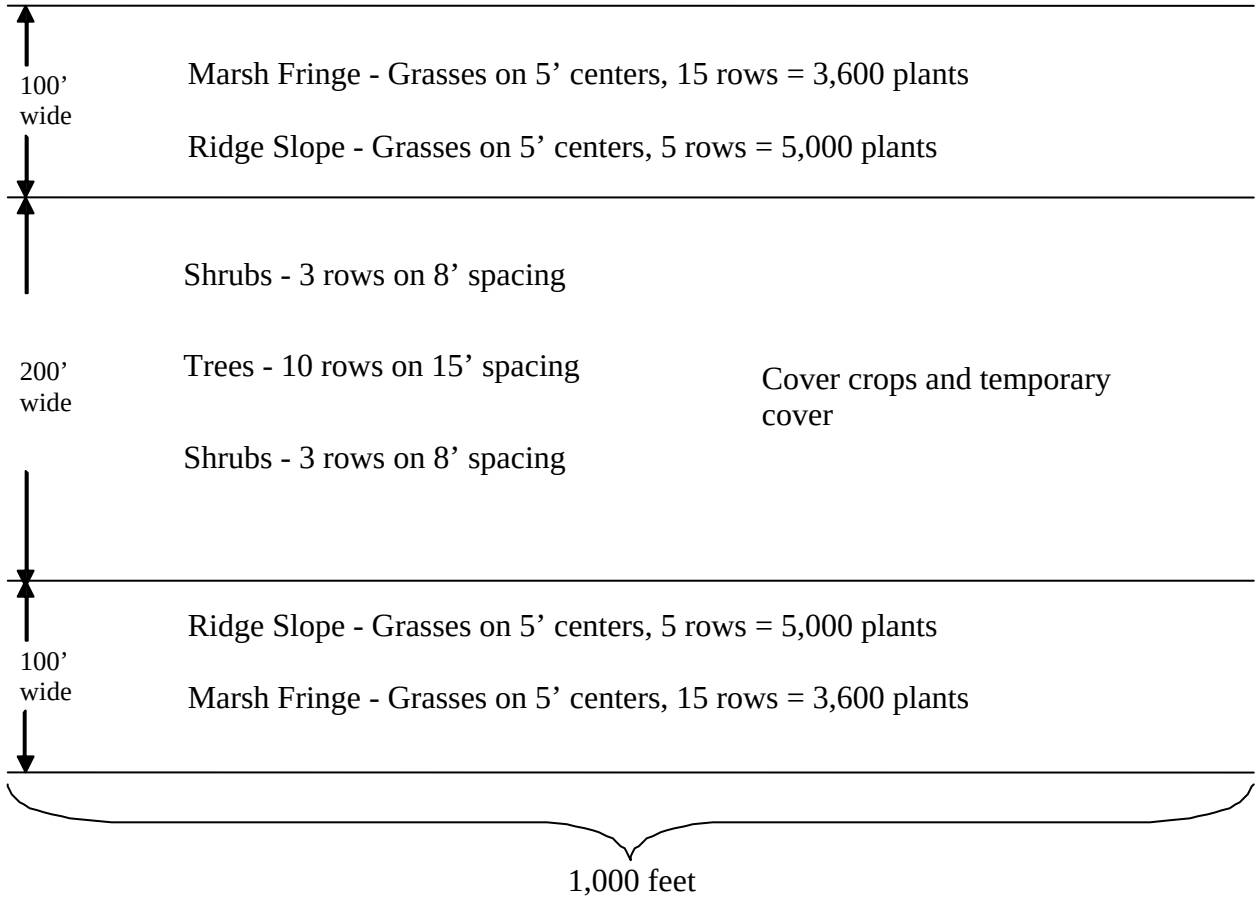
Deliverable 1
Develop planting plans and specifications that will be used for future revegetation work. Plans will recommend species by elevation, plant density, soil amendments and method of establishment.

Deliverable 2
Plant 2000 ft of constructed ridge and 2000 ft of marsh fringe, according to planting plans specified in Deliverable 1.

Deliverable 3
Develop appropriate reports (e.g. final report) from species establishment, performance and adaptation observations and results.

Deliverable 4
Joint plant material releases between the NRCS Golden Meadow Plant Materials Center and the Barataria-Terrebonne National Estuary Program of woody species that will increase the number of species commercially available to coastal restoration projects.

**Figure 2. Proposed Maritime Forest Ridge and Marsh Fringe Planting Diagram.**




**Discussion**

The GLPC completed a 2,000 linear foot section of the planned ridge in May, 2005. A contractual agreement has been developed with the NRCS to begin vegetating the ridge as soon as site and soil conditions allow. The following tasks addressing this project were addressed as specified:

Task 1

A literature search to identify potential seeded herbaceous species for early cover was conducted in January, 2005. As a result two warm season herbaceous species typically established from seeds were selected for testing. Sordan 79 and German R Strain Millet have been reported to tolerate moderate to high levels of soil salinity. Two cool season herbaceous seeded crops have also been identified. These include 'Jose' tall wheatgrass and winter ryegrass.

Task 2

Thirty-six soil samples were collected at 0-6 inch, 6-12, and 12-18 inch depths on May 26, 2005 (Table 1). The ridge top and marsh apron were sampled across the 2,000 foot length of the ridge. The salinity levels were relatively high and more soil samples will be taken as the project continues. An early 2006 study was planted to test the hypotheses that gypsum may alleviate some of the high salinity levels. Also, through time, soil salts are expected to leach out of the ridge, albeit it will be a slow process.

Task 3

Joni Blanchard, BTNEP, organized volunteer planting days on May 26-27, and June 21 and 27, 2005. The May plantings resulted in over 100 volunteers assisting the NRCS to plant 7,000 plugs of *Spartina alterniflora* 'Vermilion' (smooth cordgrass, or oystergrass) over marsh platforms on each side of the constructed ridge. In addition 3,000 vegetative plugs of *Spartina patens* 'Gulf Coast' (marshhay cordgrass, or wiregrass) were planted on both ridge side slopes.

Joni assisted with another volunteer planting effort on June 21. This planting effort resulted in 50 volunteers assisting in the establishment of 600 trade gallon containers of *Lycium carolinianum* (Christmas-berry or Carolina wolfberry). A third volunteer planting was accomplished on June 27, 2005 with 20 volunteers planting *L. carolinianum,* and five trade-gallon containers each of *Morus rubra* (red mulberry), *Celtis laevigata* (hackberry), *Quercus virginiana* (live oak), *Callicarpa americana* (French mulberry or American beautyberry), and *Ilex vomitoria* (yaupon).

Sordan 79 (Sorghum-Sudangrass hybrid) was broadcast seeded at a rate of 50 bulk pounds per acre and German R strain millet at a rate of 18 bulk pounds per acre on June 21, 2005. Seeding was followed by applying 9.75 pounds actual N-P-K and then lightly disking.

In December 2005, PMC staff disked the ridge top and planted 'Jose' tall wheatgrass *(Thinopyron ponticum)* on the top and on the south side. 200 bulk pounds of seed was broadcast in all of these areas with the exception of where the breach cuts are planned to be made. Also during this time, seeds of other plants that were collected were broadcast, including Hercules' club, yaupon holly, French mulberry, hackberry, honeylocust, bitter panicum, and 'Alamo' switchgrass.

No plant data for 2006 collected. Area had suffered significant damage from Hurricane's Katrina and Rita. High storm surge pushed large amounts of debris covering planting site. This study will be inactive until further notice.

In 2007, observations were made that the plant debris covering the planting site acted as a mulch material and held moisture in soil allowing for struggling and new plants to thrive. Continued visits to site will be made to evaluated plant survival.

## Table 1. Soil test results from 0-6, 6-12 and 12-18 inches on May 26, 2005

**North Apron**

| Sample ID # | Depth (inch) | Sodium (ppm) | ph | Total Salts (ppm) |
|---|---|---|---|---|
| 1 | 0-6 | 5,372.14 | 8.28 | 18,150.40 |
| 4 | 0-6 | 5,843.65 | 8.19 | 20,531.20 |
| 7 | 0-6 | 4,655.07 | 8.3 | 17,433.60 |
| 10 | 0-6 | 4,366.49 | 8.26 | 15,270.40 |
| | **Ave** | **5,059.34** | **8.26** | **17,846.40** |
| 2 | 6-12 | 2,763.18 | 8.28 | 8,716.80 |
| 5 | 6-12 | 3,764.95 | 8.16 | 13,094.40 |
| 8 | 6-12 | 2,960.38 | 8.23 | 9,625.60 |
| 11 | 6-12 | 3,040.20 | 8.41 | 9,216.00 |
| | **Ave** | **3,132.18** | **8.27** | **10,163.20** |
| 3 | 12-18 | 3,074.49 | 8.36 | 10,713.60 |
| 6 | 12-18 | 3,757.36 | 8.04 | 12,198.40 |
| 9 | 12-18 | 3,238.24 | 8.38 | 10,521.60 |
| 12 | 12-18 | 3,103.52 | 8.38 | 9,318.40 |
| | **Ave** | **3,293.40** | **8.29** | **10,688.00** |

**Ridge Top**

| Sample ID # | Depth (inch) | Sodium (ppm) | ph | Total Salts (ppm) |
|---|---|---|---|---|
| 13 | 0-6 | 5,269.43 | 8.27 | 18,483.20 |
| 16 | 0-6 | 4,604.04 | 8.24 | 15,091.20 |
| 19 | 0-6 | 6,853.85 | 8.31 | 23,488.00 |
| 22 | 0-6 | 4,275.00 | 8.28 | 14,758.40 |
| | **Ave** | **5,250.58** | **8.28** | **17,955.20** |
| 14 | 6-12 | 3,579.70 | 8.23 | 10,304.00 |
| 17 | 6-12 | 4,233.33 | 8.36 | 12,582.40 |
| 20 | 6-12 | 4,231.02 | 8.27 | 12,505.60 |
| 23 | 6-12 | 4,459.11 | 8.44 | 13,312.00 |
| | **Ave** | **4,125.79** | **8.33** | **12,176.00** |
| 15 | 12-18 | 3,872.00 | 8.26 | 12,569.60 |
| 18 | 12-18 | 5,070.59 | 8.21 | 16,230.40 |
| 21 | 12-18 | 4,542.70 | 8.28 | 12,582.40 |
| 24 | 12-18 | 3,275.86 | 8.29 | 10,777.60 |
| | **Ave** | **4,190.29** | **8.26** | **13,040.00** |

**South Apron**

| Sample ID # | Depth (inch) | Sodium (ppm) | ph | Total Salts (ppm) |
|---|---|---|---|---|
| 25 | 0-6 | 6,061.17 | 8.37 | 22,540.80 |
| 28 | 0-6 | 5,713.27 | 8.36 | 21,235.20 |
| 31 | 0-6 | 3,091.92 | 8.27 | 9,523.20 |
| 34 | 0-6 | 2,908.54 | 8.42 | 9,036.80 |
| | **Ave** | **4,443.73** | **8.36** | **15,584.00** |
| 26 | 6-12 | 2,976.47 | 8.32 | 11,916.80 |
| 29 | 6-12 | 3,278.97 | 8.24 | 11,673.60 |
| 32 | 6-12 | 2,882.35 | 8.34 | 9,011.20 |
| 35 | 6-12 | 5,038.50 | 8.26 | 18,099.20 |
| | **Ave** | **3,544.07** | **8.29** | **12,675.20** |
| 27 | 12-18 | 3,055.07 | 8.37 | 10,560.00 |
| 30 | 12-18 | 3,504.12 | 8.49 | 11,353.60 |
| 33 | 12-18 | 5,063.21 | 8.24 | 17,292.80 |
| 36 | 12-18 | 495 | 8.49 | 9,062.40 |
| | **Ave** | **3,029.35** | **8.40** | **12,067.20** |

**Study:** LAPMC-T-0601-WO

**Study Title:** Live Oak Salinity Remediation Screening

**Study Leader:** Garret Thomassie, NRCS Plant Materials, LA
Dr. Terry Clason, NRCS State Forester, LA

**Cooperators:** Morris Houck, NRCS Plant Materials Specialists, LA
Richard Aycock, NRCS State Agronomist,
Richard DeMay, Senior Scientist, Barataria-Terrebonne National Estuary Program (BTNEP); Greater Lafourche Port Commission, Gulf of Mexico Program; Gulf of Mexico Foundation and National Oceanographic and Atmospheric Administration (NOAA)

**Introduction**
Forested plant communities are important ecological systems that with coastal marshlands provide excellent habitat for many avian species. Many of the trans-gulf migrant avian species fly south in the fall to over winter in the neotropics and then fly back north in the spring to breeding grounds in North America. Coastal Louisiana is the first land mass the migrants encounter on their northward migration over the Gulf of Mexico from South and Central America in the spring. Louisiana's coastal habitats, particularly forested habitats, provide food and shelter to these weary birds. Conversely, birds forage heavily in Louisiana's forest and wetland habitats during the fall, prior to their migration back across the gulf. Much of the dry land mass supporting tree and shrub plant communities or maritime forest has declined due to coastal erosion, saltwater intrusion, subsidence, and manmade influences.

**Problem**
High levels of sulfides present in the dredged spoil, used for wetland mitigation projects, have made it difficult to establish woody species on these restored areas.

**Objective**
The objective is to determine optimum gypsum fertilization rates required to achieve acceptable live oak survival and growth during Maritime Forest Habitat Restoration.

**Procedures**
The study will evaluate salinity remediation practices using two live oak ecotypes and five gypsum fertilization rates. Live oak ecotypes include a coastal Louisiana ecotype and a Florida beach ecotype. Gypsum will be applied to achieve sulfur rates of 0, 23, 45, 68, and 90 lbs per 1000 $ft^2$. Each replication will contain ten seedlings, one seedling per ecotype/gypsum rate interaction.

The planting hole for each seedling will be 24 inches in diameter and approximately 12 inches deep. Soil will be excavated and transferred to a container, the appropriate gypsum rate will be added to the container; soil and gypsum will be mixed and returned to the excavated hole; and then the tree will be planted.

Study will be established on Jan. 17-18, 2006. Survival and growth determination will be taken at 3, 6 and 9 months after establishment. Treatment soil samples (top 6 inches) will be collected and analyzed at establishment and at 3, 6 and 9 months.

**Discussion**

30 accessions of live oaks from Louisiana and 30 accessions from Florida were used to determine which rate of gypsum will increase the plant survival on saline soils. Five rates of gypsum were used during planting. Planting hole was 24 inches in diameter and 12 inches deep. Six replicated blocks, ten plants in each block, were identified for study (Table 1). Soil was excavated and transferred to a container adding the appropriate gypsum rate to the container. Soil and gypsum was mixed and returned back to the excavated hole. The live oak was then planted into the hole with the soil conditioner (Table 2). Soil samples were taken from each of the six replicated blocks for testing.

**Table 1:** Plot Plan

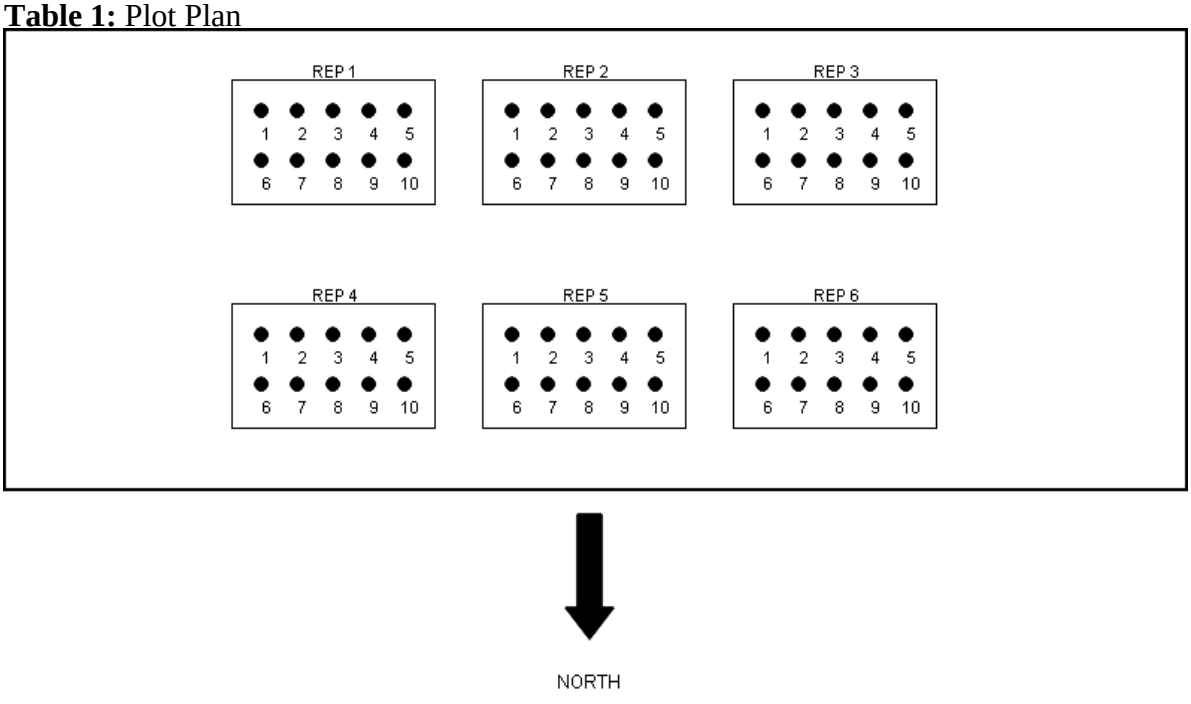


**Table 2:** Soil Treatment

| REP 1 | | REP 2 | | REP 3 | |
|---|---|---|---|---|---|
| Tree 1 | TRT 24 | Tree 1 | TRT 24 | Tree 1 | TRT 23 |
| Tree 2 | TRT 13 | Tree 2 | TRT 10 | Tree 2 | TRT 13 |
| Tree 3 | TRT 22 | Tree 3 | TRT 23 | Tree 3 | TRT 14 |
| Tree 4 | TRT 10 | Tree 4 | TRT 21 | Tree 4 | TRT 20 |
| Tree 5 | TRT 23 | Tree 5 | TRT 14 | Tree 5 | TRT 22 |
| Tree 6 | TRT 12 | Tree 6 | TRT 20 | Tree 6 | TRT 11 |
| Tree 7 | TRT 21 | Tree 7 | TRT 11 | Tree 7 | TRT 10 |
| Tree 8 | TRT 11 | Tree 8 | TRT 13 | Tree 8 | TRT 24 |
| Tree 9 | TRT 14 | Tree 9 | TRT 22 | Tree 9 | TRT 21 |
| Tree 10 | TRT 20 | Tree 10 | TRT 12 | Tree 10 | TRT 12 |
| | | | | | |
| REP 4 | | REP 5 | | REP 6 | |
| Tree 1 | TRT 23 | Tree 1 | TRT 23 | Tree 1 | TRT 22 |
| Tree 2 | TRT 13 | Tree 2 | TRT 13 | Tree 2 | TRT 23 |
| Tree 3 | TRT 24 | Tree 3 | TRT 11 | Tree 3 | TRT 24 |
| Tree 4 | TRT 22 | Tree 4 | TRT 20 | Tree 4 | TRT 20 |
| Tree 5 | TRT 11 | Tree 5 | TRT 14 | Tree 5 | TRT 10 |
| Tree 6 | TRT 14 | Tree 6 | TRT 24 | Tree 6 | TRT 13 |
| Tree 7 | TRT 21 | Tree 7 | TRT 10 | Tree 7 | TRT 11 |
| Tree 8 | TRT 12 | Tree 8 | TRT 22 | Tree 8 | TRT 14 |
| Tree 9 | TRT 10 | Tree 9 | TRT 21 | Tree 9 | TRT 21 |
| Tree 10 | TRT 20 | Tree 10 | TRT 12 | Tree 10 | TRT 12 |

**Study:** LAPMC-T-0602-WE

**Study Title:** Submersed Aquatic Vegetation Propagation and Planting Techniques for Restoration in Coastal Louisiana

**Study Leader:** Garret Thomassie, NRCS Plant Materials, LA
Richard Neill, NRCS Plant Materials, LA

**Cooperators:** Ron Boustany, NRCS Natural Resource Specialist, LA
Dean Blanchard, Habitat Enhancement Coordinator, Barbataria-Terrebonne National Estuary Program (BTNEP)

**Introduction**

The main focus of Louisiana coastal restoration efforts is generally the reestablishment of sustainable coastal wetland ecosystems that support a variety of important emergent wetland species. Submersed aquatic vegetation (SAV) is considered a critical component of sustainable coastal ecosystems in Louisiana however, very little is known about the methodology by which to restore SAV in Louisiana.

**Problem**

The importance of SAV to Louisiana coastal ecosystems includes the minimization of storm damage by reducing wave action, stabilization of sediments, improvement of water quality by absorbing nutrients and contaminants, and provide critical habitat for wintering waterfowl and many commercially important fish species, (Zieman and Zieman 1989, Boustany 2003). Very little is known on the status of SAV throughout the coastal region of Louisiana. Unlike seagrasses, which include few species and inhabit very limited areas of the gulf coast in typically clear marine waters, the estuarine species that are spread out throughout the multitude of ponds and bayous of coastal Louisiana are more numerous. These areas are often in locations difficult to access, difficult to view in the murky waters, and occur in the entire range of different habitat types. Because of the lack of understanding of these species, the common recognition of the need to sustain and restore SAV communities in coastal Louisiana, and the lack of restoration techniques available, it is necessary to begin to develop the necessary means by which to carry out successful SAV restoration projects.

**Objectives**

1. To identify native submersed aquatic species suitable for use in coastal restoration
2. Evaluate and document performance of species in nursery propagation
3. Develop propagation and nursery management practices relative to these species
4. Develop recommendations that can be used for the successful use and establishment of these SAV species in using various field planting techniques

These objectives will be achieved by documenting procedures used both in the propagation and field plants. Detailed annual performance documentation collected from the greenhouse propagation and study plots will be provided including evaluations of propagation methods and success of plots using various field planting techniques. Additional information may be provided where verifiable within the scope of the project

including suitability or qualification of restoration sites and observations on size feasibility of restoration efforts and relative success and expected coverage per restoration effort.

**Procedures**
**Sampling Process Design (Experimental Design)**

**Collection:** At least two species of SAV, including *Vallisneria americana* Michx. and *Ruppia maritima* L., will be collected from various representative collection sites located within the Barataria/Terrebonne Basins to serve as seed source and plant stock for the project. Plants will be collected as close to planned restoration sites to minimize any potential ecotypic differences that could occur from area to area. Soil will be gently washed away from the plants upon collection and placed in insulated containers partially filled with water from the collection site. Plants will then be transported to the greenhouse facilities at the Natural Resource Conservation Service Golden Meadow Plant Materials Center. At the greenhouse facilities, the plants will be sorted out by collection site and placed into holding containers in preparation for propagation.

**Propagation:** Development of propagation methods will include determination of the optimal growth conditions, type of container system to grow the plants in, growth media, proper handling and care of the plants, and development of standard operating procedures for transfer to the commercial growing trade. Additionally, the propagation will occur in two phases: 1) development of stock plants for restoration; 2) propagation of plants in artificial substrates in preparation for field plantings.

For developing stock materials, a series of containers will be set up in a randomized block design to facilitate analysis of various growth conditions on growth success. The varying growth conditions will include different levels of shading to determine optimal light conditions. The containers will be monitored weekly for temperature, pH, and dissolved oxygen. Temperature and dissolved oxygen will be measures using a Yellow Springs Instruments (YSI) Model 55 meter (YSI 2007) and pH will be measured using a Hanna HI 9024 pH meter (Hanna 2007).

Notations will be made on water clarity, algae growth, and vegetation density (% cover). In order to evaluate growth per treatment, monthly plant sample will be harvested to make growth measurements, including above- and belowground biomass and stem lengths as described in Boustany et al. 2001.

**Field Development:** Once the optimal growth conditions are determined for propagation of stock material, preparations will be made for transfer of materials to the field to test various restoration methods. Some plants will be grown out in six inch plastic pots to be transplanted as plant plugs and some will be prepared in fibrous matting material to test an alternative method. In the case of the potted plants, the plants will be grown out in the pots using the preferred media and light conditions, and when matured, the plugs will be removed from the pots in the field and planted into a hole in the conventional method of planting. Plants that are pre-rooted in the fibrous matting materials will be transported along with the mats to the field site and anchored to the native substrate adjacent to plug

plantings. Several sizes of mats and arrangement out of plantings will be evaluated for the plant's ability to spread from the media into the native substrate.

The matted plants will be woven into a biodegradable fibrous matting (exact material not yet determined). The mats will be laid out in the growing containers to allow for the plants to root and mature in the substrate. A thin layer (5 – 10 cm) of growth media will be placed in the bottom of the trough (under the mat) to promote root development. Once plants are determined to be established, the mats will be transported to the study sites for planting.

In preparation for transport, the mats will be rolled up and wrapped in a plastic non-porous bagging to prevent desiccation in transport. The mats will then be immediately transported to the field site for planting with minimal delay (ca. 2-3 hours) to minimize trauma to the plants. Once in the field, the bagging will be removed and the mats will be set on bottom of the restoration site and anchored with biodegradable staking. The pre-selected sites will consist of one in the Barataria Basin and one in the Terrebonne Basin.

**Sampling Methods**

The two field sites (one in Barataria Basin and one in Terrebonne Basin) will be monitored on a monthly basis to note environmental conditions and general qualitative growth conditions. Environmental information will include notations on weather conditions and water quality conditions including dissolved oxygen, temperature, pH, water depth, and water clarity (secchi depth) (Wetzel and likens 1991). Quantitative growth measures will be taken during the first year, 6 weeks following plantings and at the end of the years growing measurements will be performed three times during the active growing season – May 1, June 15 and September 1. The growth parameters will include determination of absence or presence of planting, percent cover within a 1 m grid of the individual planting unit, and stem lengths for each planting unit (see sample field data sheet – Figure 3).

Analysis of Variance (ANOVA) will be used to determine the differences in growth success using various propagation scenarios in the greenhouse and, in the field, comparisons will be made to evaluate planting methods.

Greenhouse design will consist of 2 species (*Vallisneria americana, Ruppia maritima*), 4 light levels and 3 reps for a total of 24 units.

The field analysis will consist of 2 species plots per basin with 3 reps each for a total of 12 units. Within each species plot, one of each type of planting unit (mats vs plugs) will be placed in a randomized block design extending from the shoreline out in 3 m increments for a total of 15 m.

Therefore, there will be a total of 2 plantings per planting block, 5 blocks per rep and 3 reps per site for a total of 30 plantings (2 x 5 x 3 = 30) per site. Two sites have been chosen for field plots, one in Lafourche and one in Terrebonne Parish, bringing the total number of plantings to 60.

Propagation techniques will be based on the ease of propagation and vigor of the plants involved. Since these techniques will be passed to commercial growers, success will be determined by techniques credible to the growers. Out planting techniques will be likewise evaluated by successful establishment with a mind to end user who will use the technology.

5. Conservation Plant Releases

| Release Name | Scientific Name | Common Name | Year | Plant Type | Release Type |
|---|---|---|---|---|---|
| Vermilion | Spartina alterniflora | smooth cordgrass | 1989 | grass | cultivar |
| Pelican Germplasm | Avicennia germinans | black mangrove | 1994 | shrub | source-identified |
| Fourchon Germplasm | Panicum amarum | bitter panicum | 1998 | grass | selected |
| Fort Polk | Vetiveria zizanioides | vetivergrass | 1995 | grass | informal |
| Brazoria Germplasm | Paspalum vaginatum | seashore paspalum | 1999 | grass | selected |
| Caminada Germplasm | Uniola paniculata | seaoats | 2001 | grass | selected |
| Gulf Coast | Spartina patens | marshhay cordgrass | 2003 | grass | cultivar |
| Timbalier Germplasm | Schizachyrium maritimum | gulf bluestem | 2006 | grass | tested |
| Bayou Lafourche Germplasm | Schoenoplectus californicus | california bulrush | 2007 | grass | selected |

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