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NRCS Natural Resources Conservation Service — Plant Materials Program

GOLDEN MEADOW PLANT MATERIALS CENTER

2010 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 re-establishment 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 began 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 nearly 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 is used 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.

CLIMATE AND SOILS

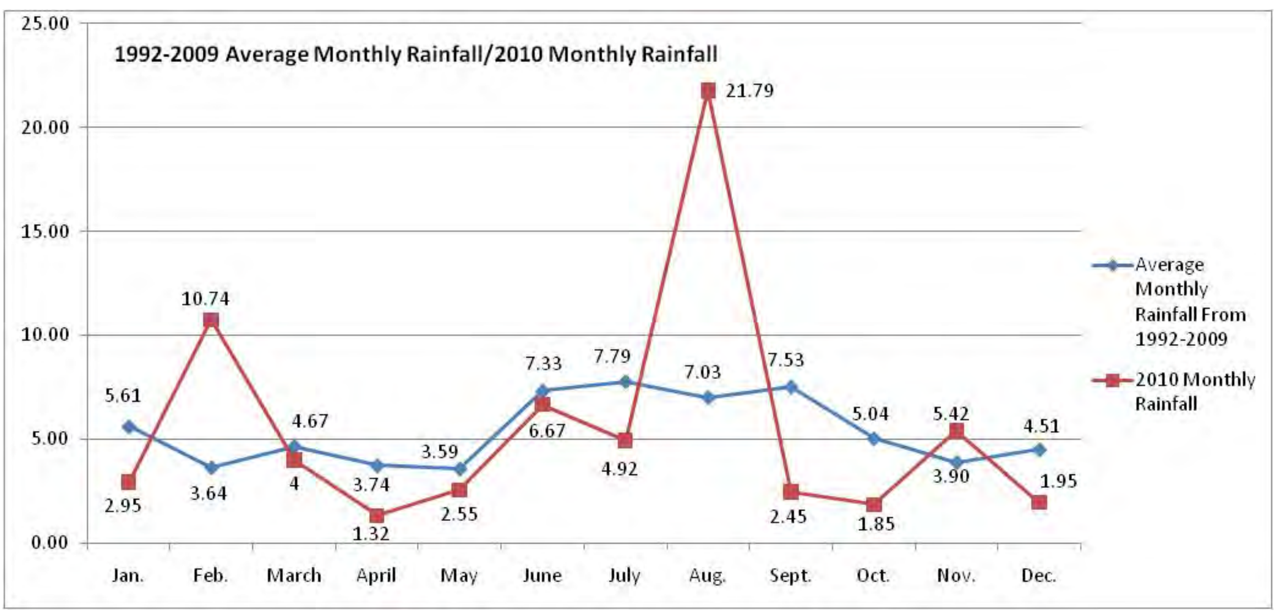
CLIMATE: The long summers are hot and humid but frequently cooled by breezes from the Gulf of Mexico. Winters are warm and only briefly interrupted by incursions of cool air from the north. Rainfall occurs throughout the year and precipitation is adequate for all crops. In winter the average temperature is 54^{o} F and the average daily minimum temperature is 44^{o} F. The average annual precipitation is 62 inches. Nine out of ten years there will be 245 days of temperatures above 32^{o} F. 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 1992-2010

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**
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**
2008	7.70	7.40	3.40	3.65	5.26	6.66	8.40	9.85	10.95	2.10	1.50	1.29	**68.16**
2009	1.05	3.04	1.95	1.06	7.12	2.97	11.10	8.60	4.40	7.50	1.34	13.18	**63.31**
Month Means	**5.61**	**3.64**	**4.67**	**3.74**	**3.59**	**7.33**	**7.79**	**7.03**	**7.53**	**5.04**	**3.90**	**4.51**	**64.38**
2010	**2.95**	**10.74**	**4**	**1.32**	**2.55**	**6.67**	**4.92**	**21.79**	**2.45**	**1.85**	**5.42**	**1.95**	**66.61**

Figure 1 Monthly 2010 and average rainfall from 1992-2009



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 than 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 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 the 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 aid 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. This species is 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

<u>Active Studies</u>

Study: LAPMC-P-9001-WE

Study Title: Evaluation of *Spartina spartinae* for a sexually propagated cultivar.

Study Leader: Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA

Introduction
Gulf cordgrass *(Spartina spartinae)* is a tufted perennial becoming occasionally sub-rhizomatous toward the outside of a large tuft. It is abundant in somewhat saline poorly drained flats along the Gulf coast. Although less common now, pastures and range areas of south Texas were managed for grazing by prescribed burning. Gulf cordgrass becomes less prevalent as you travel eastward in the coastal area of Louisiana. This species was identified in addition to 3 other coastal wetland species for assembly and evaluation when the PMC established. Gulf cordgrass then became of less importance in the plan of work for developing wetland plants for use in Louisiana. Interest in the potential use for this species has increased more recently.

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 need for commercial available plants used on large and small scale restoration projects is increasing.

Objective
To evaluate plant collections of gulf cordgrass *(Spartina spartinae)* for potential release for use in coastal marshes and selection for improved seed production traits.

Discussion
Sixty-five vegetative collections were assembled from Louisiana and Texas in 1986 and planted in rod rows at Golden Meadow PMC. Plants were rated for vigor, disease resistance, insect resistance, cold tolerance, heat tolerance, spread, height, seed culm production, and weight of seed produced. Thirty-two accessions were selected from the assembly for further testing in 1991. The accessions selected were vegetatively reproduced and replicated twenty-five times in a randomized complete block design with plants established on two-foot centers. Evaluation criteria were recorded and it soon became apparent that the spacing was too close for suitable evaluation. Plants were moved to a randomized complete block planting design. Single plants were established on eight-foot centers. Evaluation data was collected from 1995-2000.

In 2001, land where evaluation block was established was sold and individual accessions were extirpated and re-established in a nearby field. Off center evaluation site was established on Grand Terre Island, east of Grand Isle, LA. 3 randomized complete block designs were established using the complete assembly of gulf cordgrass.

Gulf cordgrass was evaluated in 2002 and again in 2003 to measure height, spread, plant vigor, and seed production. It was noted that visual evaluations for accession 9068190 expressed more favorable plant vigor and spread.

In 2007, complete assembly of gulf cordgrass was transplanted to 4 inch containers for advanced study increase. Establishment of randomized study plots located at the center was established in 2009. For 2010, no evaluations were taken due to unseasonably wet growing conditions and the time needed for plant maturity. Plant data will be collected in 2011 to evaluate plant height, vigor, spread, and flowering. Seed development protocols will be established to use initial evaluation plantings as crossing blocks for development of seed lines.

Study: LAPMC-P-0002-OT

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

Study Leader: Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA

Introduction

The lack of commercially available plant material capable of adapting 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 than 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 to Louisiana.

Problem

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

Objective

To evaluate local plant collections of switchgrass (*Panicum virgatum)* for the potential release of selections adapted to Louisiana's wet soils.

Procedures

Native populations of switch grass will be collected throughout South Louisiana that are located growing in coastal marsh habitats. Plants will be increased and maintained at the Center for field plantings received throughout Louisiana. Five vegetative propagules for each collection will randomly be established in crossing blocks. Crossing blocks will be managed for seed production and individual plant evaluations.

Discussion

21 populations throughout South Louisiana were collected and are currently being maintained in greenhouses for field evaluations. Initial evaluations will be performed to remove the undesirable accessions prior to starting advanced evaluations and field trials.

For 2010, field maintenance consisted of clean tillage throughout the growing season. No evaluations were taken in 2010 for 2 primary reasons. First, the PMC encountered an unseasonably wet growing season. Secondly, we needed to give the plants some time to further mature in order to get sufficient data. Plant data will be collected for 2011 in order to evaluate plant height, vigor and spread at the time of flowering. Additionally, seed production will be an additional parameter measured.

Study: LAPMC-P-0103-OT

Study Title: Chitimacha Tribe of Louisiana - Re-establishment of River Cane on Tribal Lands

Study Leader: Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA
Morris Houck, NRCS Plant Materials Specialists, LA

Cooperators: Patra Ghergich, NRCS Franklin Field Office, LA
Kim Walden, Chitimacha Tribe of Louisiana, LA

Introduction

Conservation of an ancient cultural tradition motivated the Chitimacha Tribe of Louisiana in their request for PMC assistance. The Chitimacha are the oldest recognized and indigenous tribe in Louisiana and have used river cane (*Arundinaria sp.*) in developing unique and alluring woven baskets and mats since the era of the Mississippi mound-building culture, a tradition dating back to the Middle Ages. *Arundinaria* is also known as giant cane, switch cane or bamboo.

The Chitimacha's dedicated most of their efforts to cultivating the soil, fishing, and developing the domestic arts. They display the greatest skill through the art of weaving baskets and their basketry reached such a degree of development that it might be placed among the higher arts.

Problem

The Chitimacha's craft is threatened by a shortage of native river cane populations. In addition, prior to this research, there were no river cane populations growing on the Chitimacha Reservation itself, which has shrunk to one-fourth of its established area in the mid-1800s.

Objective

The objective of this project is to evaluate the re-introduction and establishment of river cane (*Arundinaria sp.*) native to Chitimacha tribal lands to help sustain ancient cultural tradition.

Procedures

In February of 2001, vegetative divisions of *Arundinaria sp*. were collected from selected sites in St. Mary Parish. Initially, all accessions were thought to be species *Arundinaria gigantea*. Samples have been sent to authorities for more specific identification; however no definite conclusions have been drawn to date.

The plants were accessioned, further divided, planted into one gallon pots and grown for a period of one year. In March 2002, NRCS and the Chitimacha Tribe, with participation from the Chitimacha Tribal School, planted a total of 79 river cane plants at a site on the Chitimacha Reservation. Accession 9067613 was not planted because only one plant

survived in the greenhouse. Extra river cane plants not used in the 2002 planting were planted at the PMC in 'Field A2' for observation.
Measurements (height, number of small stems, number of large stems, diameter of the stems, and the diameter of the plants) were taken 14 days after planting and at 180 days after planting. In November 2004, the river cane were again measured.
Plants of some accessions were further collected in 2003 (9067604, 9067605, and 9067613) and in 2005 (9067604, 9067605, and 9067609). The 2005 collections were potted and are being grown out at the PMC.

Discussion
By 2004, most of the accessions grew and were doing well except for 9067609 and 9067612. When the measurements were first taken 2 weeks after planting in March 2002, 9067609 were grazed/browsed about 1-inch above the ground surface, apparently by animals. Some of the 9067612 plants did not survive in 2004. Accession 9067605 had the largest stem diameter, height, and number of small stems. Accession 9067610 had the largest number of large stems and 9067614 had the largest width of plants (diameter), followed closely by 9067605. Accession 9067605 was reported in 2001-2002 to be the most suitable river cane for weaving baskets and, overall, appeared to be the best accession for vegetative production, according to the measurements taken in 2004 (Table 2).

The PMC was successful in assisting the Chitimacha increase river cane populations; notable especially as these river cane collections are now on tribal lands. A review of the off-PMC planting site earlier in 2005 revealed excellent survival of the past plantings, with very good performance. The 2005-collected and potted plants, currently residing in a PMC greenhouse, have all successfully resprouted vegetative growth basally from rhizomes and laterally from nodes. These plants will eventually be planted on the reservation. Ongoing work will evaluate all past plantings and determine future usefulness to the Chitimacha tribe.

Table 1. *Arundinaria sp.* accessions collected in 2001 from St. Mary Parish, Louisiana.

Accession number	Collection location
9067604	North side of Bayou Teche, Franklin, LA
9067605	Bayou Teche and Wax Lake outlet intersection
9067609	Northeast of Baldwin, LA
9067610	Southwest side of Franklin, LA
9067611	South of Highway 90 and Garden City, LA
9067612	South of Highway 90 and Garden City, LA
9067613	South of Highway 90 and Garden City, LA
9067614	Outside of Franklin, LA

Table 2. Ranking of data collected in 2004, from 2002 plantings on Chitimacha

Accession number	Stem Diameter	Height	Number of Small Stems	Number of Large Stems	Diameter of Plant
9067604	4	4	6	3	5
9067605	1*	1*	1*	4	2
9067609	7	7	7	6	7
9067610	2	2	5	1*	3
9067611	5	5	2	5	4
9067612	6	6	3	7	6
9067614	3	3	4	2	1*

Reservation (1* = best performance, 7 = worst performance, of group)**.**

In 2009, there was a greater interest in the propagation of river cane and the management of existing stands. NRCS and the Chitimacha Tribe of Louisiana recognize the importance of river cane for use in traditional cultural arts such as basketry and additionally wildlife habitat, erosion control, windbreaks, and nutrient management. With the need to preserve a living cultural heritage, the NRCS is assisting to re-introduce and establish native river cane on Chitimacha tribal lands.

For 2010, the PMC obtained vegetative plant materials from the original collection sites with the cooperation of private landowners. Bare rooted plants will be used to establish designated tribal owned sites. Plant performance information will be used to develop planting and management guides. This information will be provided to the Chitimacha Tribal Council and NRCS Field Offices.

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 Center, LA
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Phase I – Part 1

Submersed Aquatic Vegetation Propagation and Planting Techniques for Restoration in Coastal Louisiana

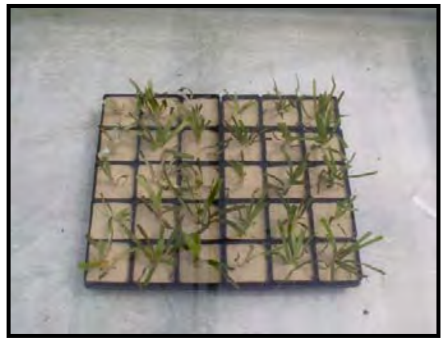
Introduction

The reasons submersed aquatic vegetation (SAV) is important to Louisiana coastal ecosystems include the minimization of storm damage by reducing wave action, stabilization of sediments, improvement of water quality by absorption of nutrients and contaminants, and it provides 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, estuarine SAV species are spread throughout the multitude of ponds and bayous of coastal Louisiana and include many species. 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 we do not have a broad understanding of the biology and ecology of the SAV communities, their importance has, until recently been overlooked. It is now recognized that SAV are important to the estuarine ecosystem and that techniques to propagate and plant need to be developed. Phase I objectives include the development of nursery propagation techniques for *Vallisneria americana* and *Ruppia maritima*, to determine 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 of the two species for transfer to the commercial growing trade.

V. americana **is important SAV in the Louisiana coastal ecosystem**

Procedure

The study was conducted at the USDA-Natural Resources Conservation Service (NRCS) Golden Meadow Plant Materials Center, Golden Meadow, LA in 2008-2009. Propagation tanks (4 ft x 8 ft) were fabricated from wood, and lined with a double layer of 10 mil poly sheeting to produce a 270 gallon water holding capacity. *V. americana* and *R. maritima* plants were collected from native stands growing in fresh to brackish marsh (.3 ppt) in Lafourche Parish, LA near Clovelly Farms on 13 May 2008. Plants were divided into 360 individual propagules of each species and planted in a 4 inch pot. A mixture of peat moss and pine bark was used to fill 25% of the pot (bottom) with the remaining 75% filled with commercial grade fine sand. Plants were grown under greenhouse conditions from 14 May 2008 until 5 November 2008. *V. americana* and *R. maritima* were cut 2.5 cm on 5 November 2008 and uniform plants of each species were submerged into each water-filled propagation tank to a depth of 14 inches. Propagation tanks were maintained in the greenhouse with temperature ranges from 90 to 100°F during the day (+/- 10) to 75 to 85°F at night (+/- 10).



***V. americana* was collected from Clovelly Farms, LA in May 2008.**

Planting *V. americana* at the USDA- NRCS Golden Meadow Plant Materials

After submerging the plants into assigned propagation tanks, light was reduced by covering each tank with an artificial shade of 0 (control), 63 and 90% using a commercial shade cloth material. A single layer of 63% shade was doubled to achieve a 90% shade. A commercial dye (Aqua Shade®, applied biochemist) was also included as a shade treatment. Dye was added to assigned propagation tanks according to manufactures label for achieving a coloration of 25 ppm. Performance data included vigor (health of the plant), spread, leaves and plant height using a rating scale of 1 to 9 with 1 = best and 9 = worst. Six plants were randomly selected for measurement. Plant height was determined by measuring from the media surface to average height of the plant. Average number of leaves per plant was determined by counting the number of visible leaves and dividing the sum by 6. Average spread, which is defined as the number of actively growing, vegetative buds on each plant, was determined by counting the number of healthy sprouts per plant and dividing the sum by 6. Plant performance measurements were made approximately every 2 weeks from December to May 2008-2009. Algal growth was not controlled in any of the propagation tanks to replicate a typical commercial propagation

Plants of *V. americana* submersed into propagation tank at the USDA-NRCS Golden Meadow Plant Materials Center.

operation. Experimental design included 4 shade levels with 3 replications arranged in a completely randomized design.

Results and Discussion

No data was collected for the *R. maritima* due to poor survival at all shade treatment levels including the control after the plants were submerged in the propagation tanks. A preliminary test was conducted to determine if survival could increase using other planting media such as coconut fiber mat. However, this test produced poor results. *R. maritima* survival and growth is sensitive to low water quality and lighting (USGS, 2006; Verhoevin's, 1979). Algae were not controlled in the tanks and may have contributed to poor water quality and subdued lighting in the tank, leading to poor plant survival. Additional propagation techniques will be explored in the future to increase survivability by modifying harvest methods, light intensity, water temperature, and salinity.

V. americana response to shading is presented in figures 1-4. Plant height increased as light intensity decreased with shading and dye treatment (fig 1). Plant height was greatest for the 90% shade which ranged from 18-33 cm over the 10 week period. However, the condition of the plants after week 3 is described as long, spindly, and exhibiting low vigor (fig 2). Furthermore, it is anticipated low light produced by 90% shade and dye treatment substantially reduced spread potential by limiting the production of spring buds and actively growing leaves at various evaluation dates (figs 3-4). Titus and Adams (1979) reported *V. americana* was tolerant of low light but responded to increasing light availability. Although we found *V. americana* to perform satisfactory where light was not limited, we also found it to perform poorly where light availability had significantly been reduced (90% shade and dye treatment).

Plant height measurements for 63% shade and dye treatment were similar but plant vigor for 63% shade was much greater than all treatments (fig 2). The 63% shade did not restrict aerial productivity, reduce plant vigor, or decrease active bud and leaf growth as did the 90% shade and dye treatment (fig 1-4). Consequently, the 63% shade provided the best plant performance when compared to the other actual shade treatments; however, results were similar to the control. These preliminary results suggest plants grown with no shade up to 63% shade may allow for sufficient plant growth and development that will warrant additional studies in Phase II.

Conclusion and Summary

No data was collected for *R. maritima* due to poor survival soon after the study began. Additional propagation techniques for plant survival will be explored in the future. *V. americana* plant performance was severely decreased with 90% shade and dye treatment due to significant light reduction. The no shade treatment and 63% shade provided the best plant performance for *V. americana*. These treatments will be further evaluated in Phase II to document and refine propagation techniques for production of *V. americana* for commercial nursery trade. Ultimately, we intend to produce a product for making field deployment and plant establishment of *V. americana* possible in Louisiana coastal restoration projects.

Reference

Boustany. R.G. 2003. A prevegetated mat technique for the restoration of submersed aquatic vegetation. Ecological Restoration 21:2

Titus, J.E., Adams M.S. 1979. Coexistence and the comparative light relations of the submersed macrophytes *Myriophyllum spicatum* L. and *Vallisneria amerciana* Michx. Am Midl Nat 102:263-272

Zieman, J.C. And R.T. Zieman. 1989. The ecology of the seagrass meadows of the west coast of Florida: a community profile. U.S. Fish and Wildl. Serv. Biol. Rep. 85(7.25). 155 pp.

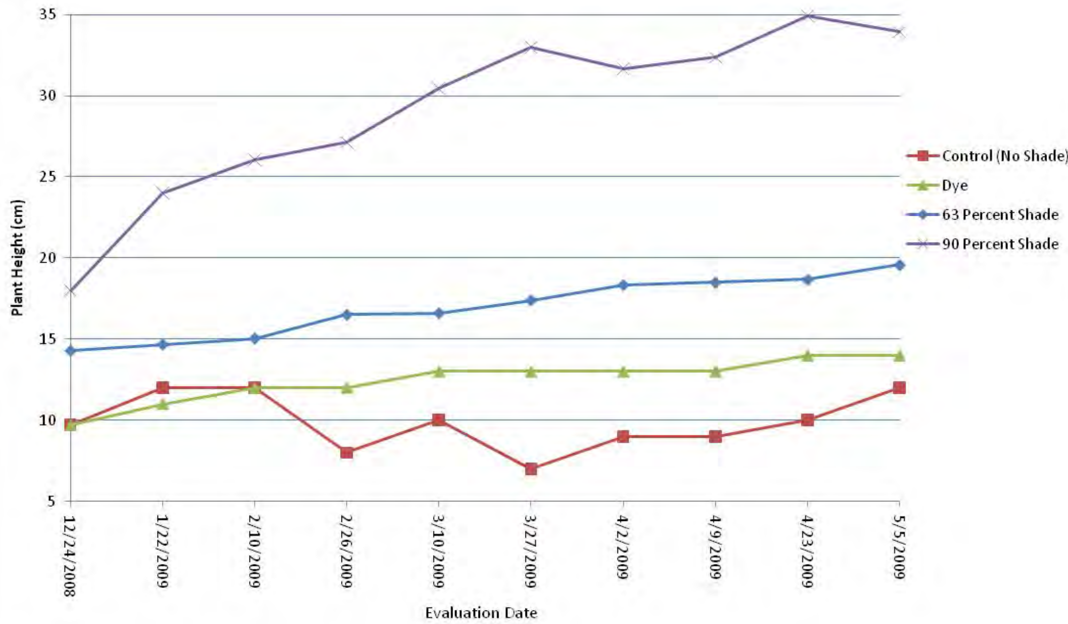


Figure 1. Plant height of *Vallisnaeria americana* Michx. as effected by various shade treatments. USDA-NRCS Golden Meadow Plant Materials Center, December 2008 to May 2009

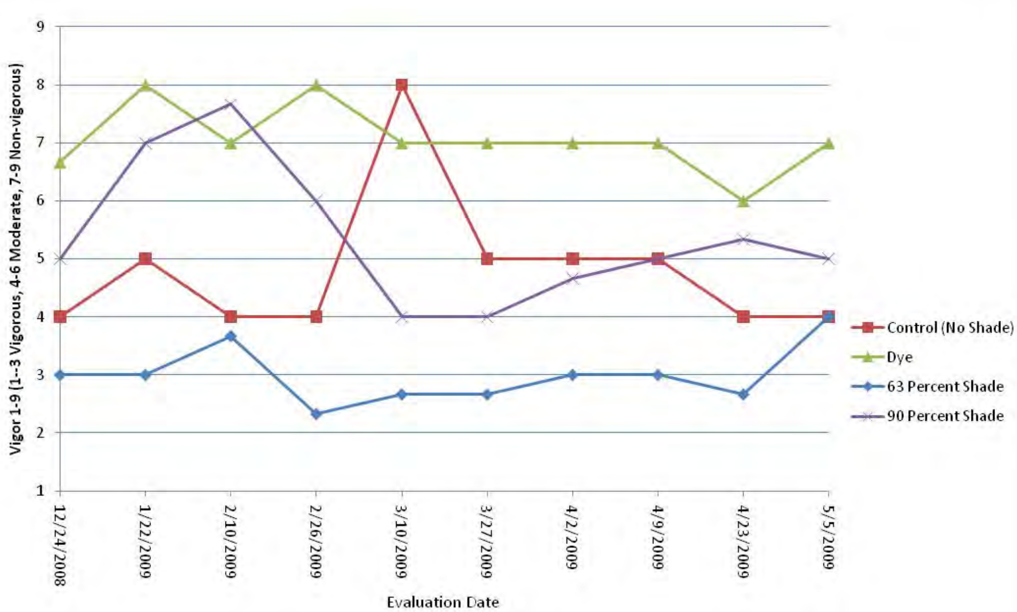


Figure 2. Plant vigor of *Vallisneria americana* Michx. as effected by various shade treatments. USDA-NRCS Golden Meadow Plant Materials Center, December 2008 to May 2009

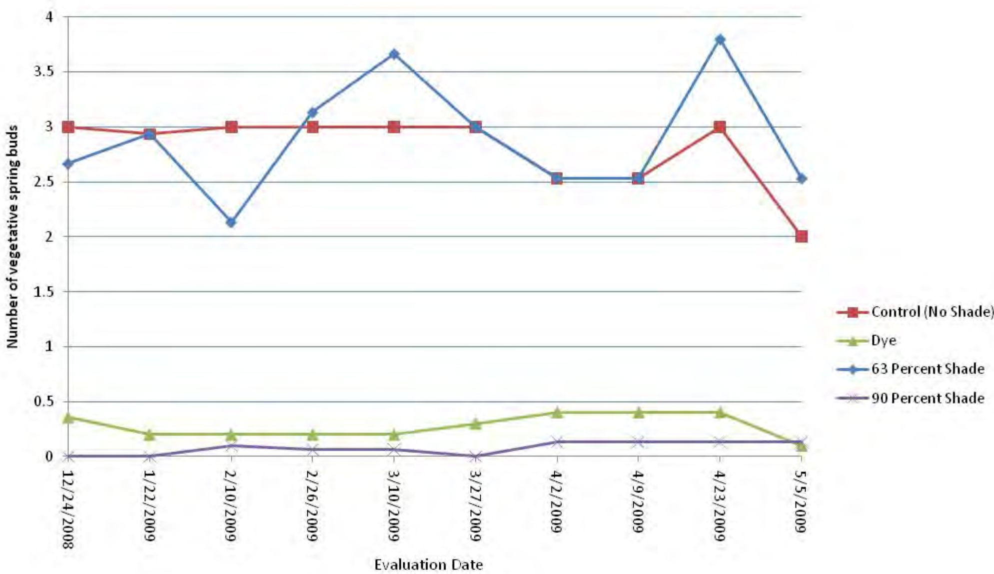


Figure 3. Number of spring buds produced by *Vallisneria americana* Michx. as effected by various shade treatments, USDA-NRCS Golden Meadow Plant Materials Center, December 2008 to May 2009

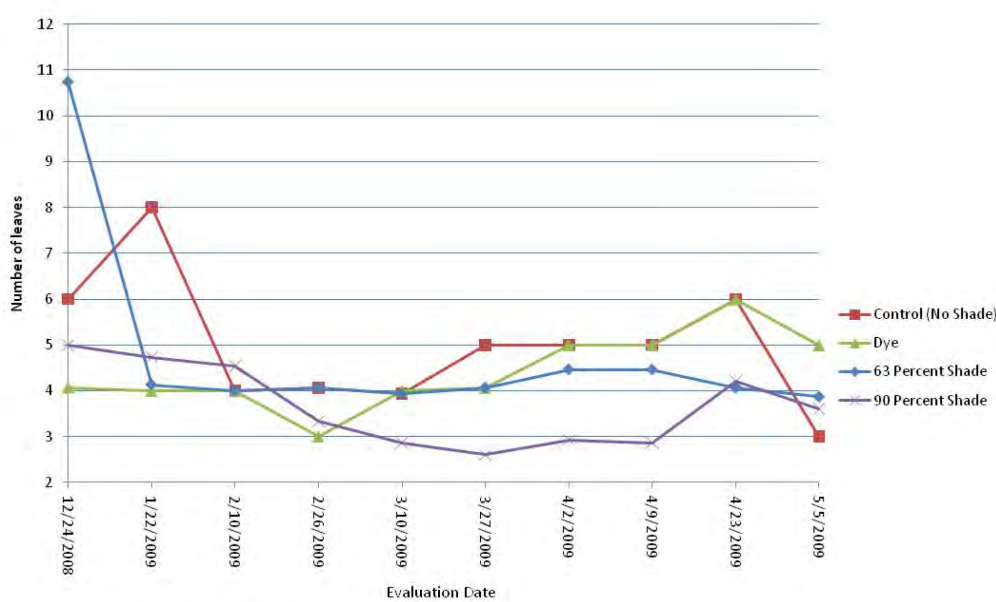


Figure 4. Number of actively growing leaves of *Vallisneria americana* Michx. as effected by various shade levels, USDA-NRCS Golden Meadow Plant Materials Center, December 2008 to May 2009

Phase I - Part 2

Comparison of the Growth Potential of *Vallisneria americana* Grown Under a 63% Shade and Without Shade.

Introduction

Preliminary results from Part 1 suggest that the 63% shades provided the best plant performance when compared to other actual shade treatments; however, results were similar to plants grown under no shade. To verify observations from Part 1, additional experiments were conducted to quantify initial results. Part 2 of the study will evaluate plants of *V. americana* grown in 4 inch pots under the 63% shade treatment and compare those to plants grown under no shade. Measurements used to compare the two treatments included plant height, number of actively growing leaves, and biomass measurements (total, leaf, and root).

Procedure


Photo showing UV protected low density polyethylene (Rubbermaid ® brand) 300 gallon propagation tank

The study was conducted at the USDA-Natural Resources Conservation Service (NRCS) Golden Meadow Plant Materials Center, Golden Meadow, LA in 2009-2010. *V. americana* plants were collected from native stands growing in fresh to brackish marsh in Lafourche Parish, LA near Clovelly Farms on 8 February 2010. Local conditions at harvest site were; air temperature 16.2°C; water temperature 10.3°C; water ph 4.89; water salinity .3ppt; and dissolved oxygen 10.3 ppm and 91%L. Plants were divided into 90 individual propagules and planted in a 4 inch square plastic nursery container. A 50/50 mixture of peat moss and pine bark was used to fill each container 25% full with the remaining 75% filled with commercial grade fine sand. To alleviate problems associated with the wooden frame, sheet plastic lined tanks used previously, tanks made of UV protected low density polyethylene (Rubbermaid ® brand) with a capacity of 300 gallon each were purchased for use. Plants were grown under greenhouse conditions from 12 February 2010 until 26 July 2010. *V. americana* were cut to 25 cm on 16 April 2010 and uniform plants of each species were submerged into each water-filled propagation tank to a depth of 55 cm. Propagation tanks were maintained in the greenhouse with temperature ranges from 90 to 100°F during the day (+/- 10) to 75 to 85°F at night (+/- 10). Algal growth was not controlled in any of the propagation tanks to replicate a typical commercial propagation operation. Experimental design included 2 treatments (63% shade and no shade) with 3 replications arranged in a completely randomized design.

After submerging the plants into assigned propagation tanks, light was reduced by covering 3 tanks with an artificial shade of 63% using a commercial shade cloth material and 3 tanks uncovered 0% (control). Air temperature, water temperature, water ph, water salinity (ppt) and dissolved oxygen (ppm and %L) were recorded on a weekly basis, between the hours of 8:00am and 10:00am, to monitor environmental conditions under greenhouse production (Table1.)

Table 1. Average environmental conditions.

	Low	High	Average
Water PH	5.88	9.64	8.21
Water Salinity ppm	0.2	0.3	0.22
Dissolved oxygen ppm	1.467	10.205	5.195
Dissolved oxygen %L	16.67	97.35	57.66
Water Temperature	15.33	32.33	23.71

Performance data included plant height (cm), number of actively growing leaves, and biomass measurements (total plant, root weight, top growth weight) were taken to measure overall plant performance. Five plants were randomly selected from each tank for measurements. Plant height was determined by measuring from the media surface to average height of the plant. Average number of leaves per plant was determined by counting the number of actively growing leaves and dividing the sum by 5. Plant biomass measurements were made on 26 July 2010. Individual plants were removed from containers and were washed of any potting media. Wet weights of each whole plant were recorded. Individual plants were placed in paper bags and dried for 24 hr at 60°C. Total dry weights were recorded for each plant. Plants were then separated at the plant/root interface with root and top growth being weighted separately. All plant weights were recorded as average weight/plant in grams.

Dry biomass plant sample of *V. americana*

Results and Discussion

V. americana response to shading as compared to growth in no shade is presented in figures 1 and 2. Plant height increased as light intensity decreased with 63% shading (fig 1). Cutler (1980) reported that leaf elongation in rice was directly related to light and dark conditions. Plant height was greatest for the 63% shade which ranged from 77 to 87 cm when compared to plants grown in no shade which had an average height of 47.6 to 56.2 cm (fig 1). Plants grown under no shade produced considerable differences in the number of actively growing leaves.

V. americana grown under shade produced an average of 39.5 leaves per pot as compared to plants grown under 63% shade only produced an average of 14.4 leaves per pot (fig 1). Titus and Adams (1979) reported *V. americana* was tolerant to low light but responded to increasing light availability. Although we found *V. americana* to perform satisfactory where light was limited (63% shade), we also found it to produce a significantly greater number of healthy actively growing leaves when it was grown under no shade (fig 1).

Total biomass for plants of *V. americana* grown under 63% shade was significantly less at 2.76 g/plant when compared to plants grown under no shade which had an average weight of 9.55 g/plant (fig 2). Total root biomass comparing 63% shade to no shade was 0.97 g as compared to 3.91 g. Total top growth biomass comparing 63% shade to no shade was 1.78 g as compared to 5.66 g. These results suggest plants grown under no shade allow for sufficient plant growth and development for commercial production.

Conclusion and Summary

Overall performance for plants grown under 63% shade shown to have greater leaf height, but produced fewer leaves and significantly less plant biomass (only 28.9% of the total no shade biomass). Overall performance for plants grown without shade produced shorter leaf height, but overall biomass weights and number of actively growing leaves were significantly greater.

In conclusion, plants grown under 63% shade produced viable transplants, however plants grown under no shade demonstrated to produce a healthier and more vigorous transplant that would allow for production of *V. americana* for commercial nursery trade. Additional propagation techniques will be explored using biodegradable bags compared to plants grown in plastic pots.

Reference

Cutler, J.M., 1980. Dymanic Aspects and Enhancements of Leaf Elongation in Rice. Plant Physiology 66:147-152

Titus, J.E., Adams M.S. 1979. Coexistence and the comparative light relations of the submersed macrophytes *Myriophyllum spicatum* L. and *Vallisneria amercian* Michx. Am Midl Nat 102:263-272

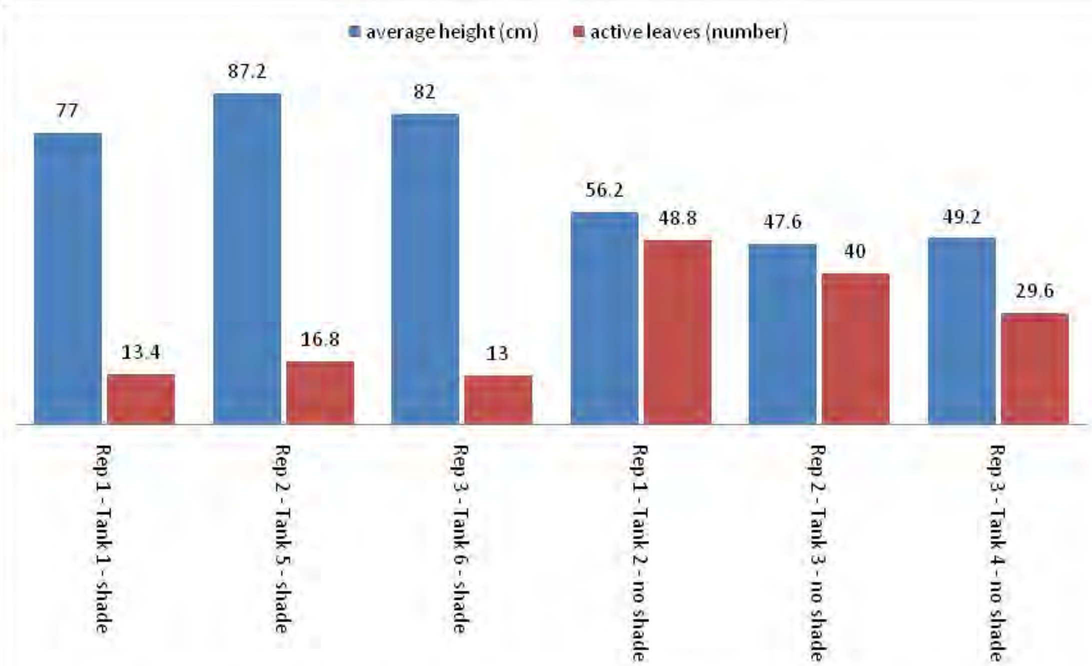


Figure 1. Number of actively growing leaves and average leaf height of *Vallisneria americana* grown in plastic pots as effected by 63% shade and no shade, USDA-NRCS Golden Meadow Plant Materials Center, February 2010 to July 2010

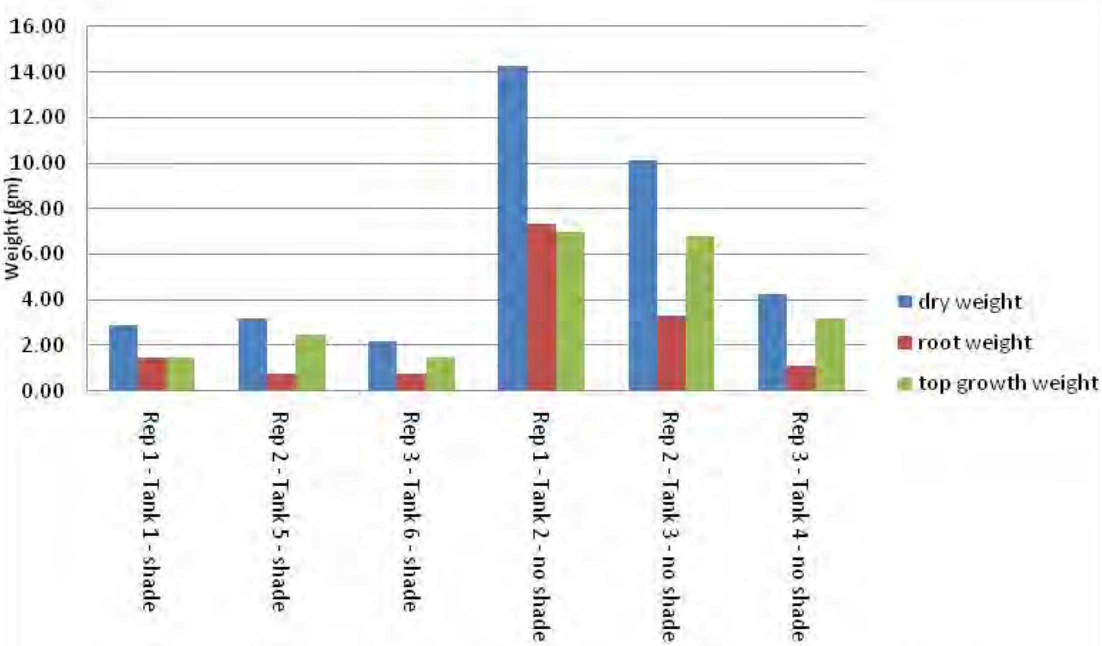


Figure 2. Average biomass weight of *Vallisneria americana* grown in plastic pots as effected by 63% shade and no shade, USDA-NRCS Golden Meadow Plant Materials Center, February 2010 to July 2010

Phase I - Part 3

Comparison of Growth Potential of *Vallisneria americana* Grown in Plastic Pots and Biodegradable Bags.

Introduction

Traditional planting stock for *Vallisneria americana* has included the use of bare-root plants and small container grown plants. Both methods although widely accepted and successful have limitations associated with cost of production, transportation, and labor associated with field deployment. Part 3 of the study will evaluate additional container or planting systems that may be useful for the propagation, nursery production, and field deployment of *V. americana*. Alternative methods considered for this study included; fibrous matting materials and biodegradable burlap bags.

Results from Part 2 suggests that *V. americana* planted in 4 inch plastic pots produced under a no shade environment provided the best plant performance when compared to those grown under the 63% shade treatment. For this study selected container systems or propagations methods will be evaluated under no shade. Measurements used to compare treatments will include plant height (cm), number of actively growing leaves, and biomass measurements (total plant, leaf, and root weight). During initial screening investigations, the fibrous matting materials proved temporarily unsuccessful results. Problems associated with the buoyancy of the material and the inability to successfully attach *V. americana* plantlets into the material, demonstrated the need for further long term investigations. Based on these initial findings, the biodegradable burlap bag was selected as the preferred method to evaluate and compare with plants grown in 4 inch square nursery pots.

Procedure

The study was conducted at the USDA-Natural Resources Conservation Service (NRCS) Golden Meadow Plant Materials Center, Golden Meadow, LA in 2009-2010. *V. americana* plants used for the study were collected from native stands growing in fresh to brackish marsh in Lafourche Parish, LA near Clovelly Farms on 8 February 2010. Local conditions at harvest site were; air temperature 16.2°C; water temperature 10.3°C; water ph 4.89; water salinity .3ppt; and dissolved oxygen 10.3 ppm and 91%L. Plants were divided into 180 individual propagules and 90 planted in a 4 inch square plastic nursery container and 90 planted into a small 6 x 10 inch burlap bag. Plastic pots were filled 25% full with a 50/50 mixture of peat moss and pine bark with the remaining 75% filled with commercial grade fine sand. Each burlap bag was filled with approximately 2 cups of inert coarse sand. No fertilizers or soil amendments were given to either treatment. To alleviate problems associated with the wooden frame, sheet plastic lined tanks used previously, tanks made of UV protected low density polyethylene (Rubbermaid ® brand) with a capacity of 300 gallon each were purchased for use.

Plants were grown under greenhouse conditions from 12 February 2010 until 26 July 2010. *V. americana* were cut to 25 cm on 16 April 2010 and uniform plants of each species were submerged into each water-filled propagation tank to a depth of 55 cm.

Propagation tanks were maintained in the greenhouse with temperature ranges from 90 to 100°F during the day (+/- 10) to 75 to 85°F at night (+/- 10). Algal growth was not controlled in any of the propagation tanks to replicate a typical commercial propagation operation. Experimental design included 2 treatments (pot vs. biodegradable burlap bags) with 3 replications arranged in a completely randomized design.

Air temperature, water temperature, water ph, water salinity (ppt) and dissolved oxygen (ppm and %L) were recorded on a weekly basis, between the hours of 8:00am and 10:00am, to monitor environmental conditions under greenhouse production (Table 1).

Table 1. Average environmental conditions.

	Low	High	Average
Water PH	5.88	9.64	8.21
Water Salinity ppm	0.2	0.3	0.22
Dissolved oxygen ppm	1.467	10.205	5.195
Dissolved oxygen %L	16.67	97.35	57.66
Water Temperature	15.33	32.33	23.71

Performance data included plant height (cm), number of actively growing leaves, and biomass measurements (total plant, root weight, top growth weight) was taken to measure overall plant performance. Five plants were randomly selected from each tank for measurements. Plant height was determined by measuring from the media surface to average height of the plant. Average number of leaves per plant was determined by counting the number of actively growing leaves and dividing the sum by 5. Plant biomass measurements were made on 26 July 2010. Individual plants were removed from containers and were washed of any potting media. Wet weights of each whole plant were recorded. Individual plants were placed in paper bags and dried for 24 hr at 60°C. Total dry weights were recorded for each plant. Plants were then separated at the plant/root interface with root and top growth being weighted separately. All plant weights were recorded as average weight/plant in grams.

Results and Discussion

A comparison of growth characteristics of *V. americana* grown in 4 inch plastic pot and biodegradable burlap bags is presented in figures 1-5. Average leaf length measurements of plants grown in plastic pots were similar to those grown in burlap bags (fig 1). Average leaf length for the plants grown in plastic pots was 51 cm as compared with those grown in burlap bag reaching an average length of 38 cm (fig 1). Consequently, the plastic pots produced a greater number of actively growing leaves, 39.5 for pot as compared to 29.3 for the burlap bags (fig 2).

Total biomass yield for plants of *V. americana* grown in the burlap bags was significantly less at 4.09 g/plant when compared to plant grown in the plastic pot which had an average weight of 9.54 g/plant (fig 3). Total top growth biomass comparing the plastic pots to the burlap bag was 5.64 g as compared to 2.22 g (fig 4), and total root growth biomass comparing plastic pots to burlap bags was 3.9 g as compared to 1.87 g (fig 5).

Conclusion and Summary

Although results were somewhat similar the data suggest that plants of *V. americana* grown in 4 inch plastic pots produced a slightly more robust plant. Visual observations suggest that there may have been some residual nutrients in the peat moss and pine bark mixture use in the plastic pot. The inert commercial sand use in the bag was void of any beneficial plant nutrients. This would account for the slight increased in overall performance of plants grown in the plastic pots. To verify these similar results, additional trials may need to be established using both methods with the incorporation of plant nutrients into the evaluation. However, initial results suggest that both plants grown in 4 inch plastic nursery pots and biodegradable burlap bags proved successful at establishing a marketable plant for commercial usage.

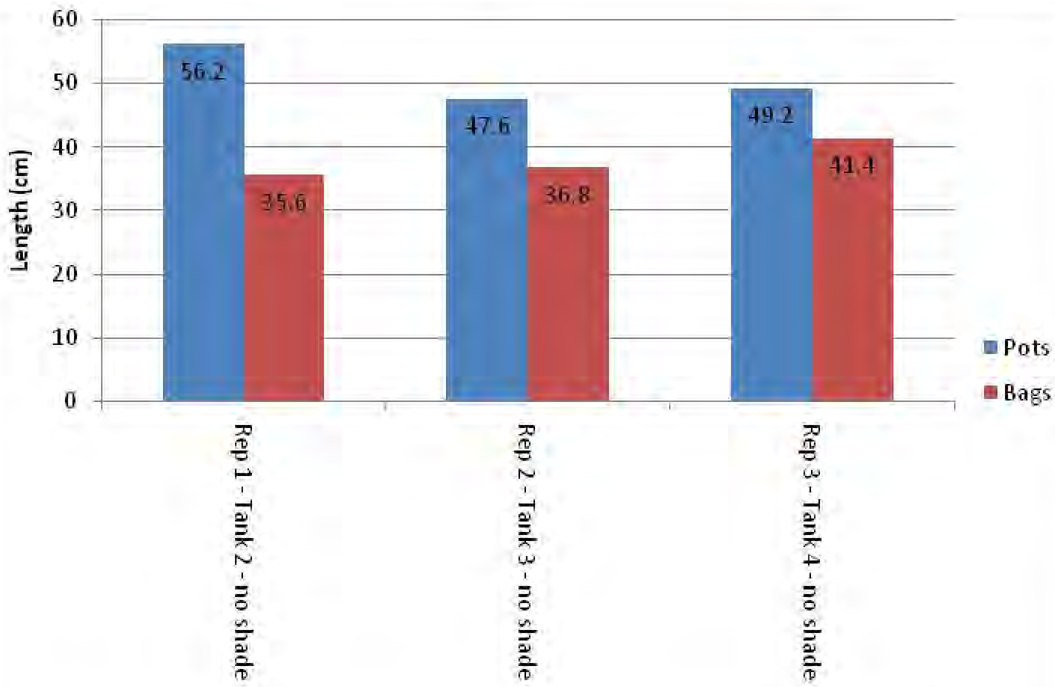


Figure 1. Comparison of average leaf length of *Vallisneria americana* grown in plastic pots and biodegradable bags, USDA-NRCS Golden Meadow plant Materials Center, February 2010 to July 2010

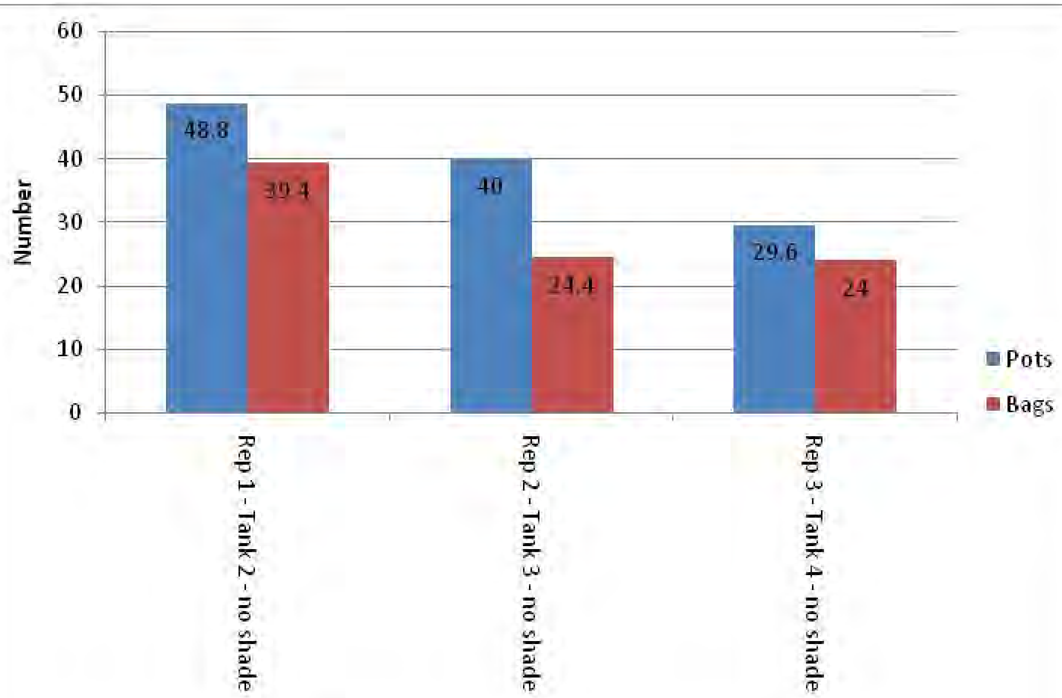


Figure 2. Comparison of the number of actively growing leaves of *Vallisneria americana* grown in plastic pots and biodegradable bags, USDA-NRCS Golden Meadow plant Materials Center, February 2010 to July 2010

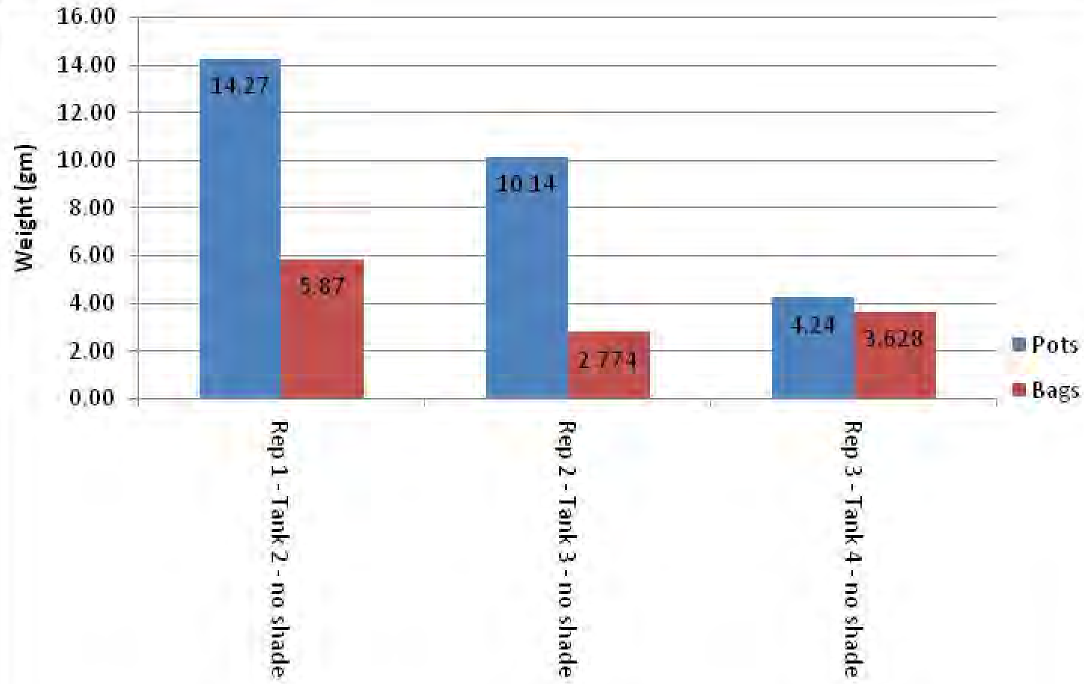


Figure 3. Comparison of total plant biomass of *Vallisneria americana* grown in plastic pots and biodegradable bags, USDA-NRCS Golden Meadow plant Materials Center, February 2010 to July 2010

Figure 5. Comparison of root biomass of *Vallisneria americana* grown in plastic pots and biodegradable bags, USDA-NRCS Golden Meadow plant Materials Center, February 2010 to July 2010

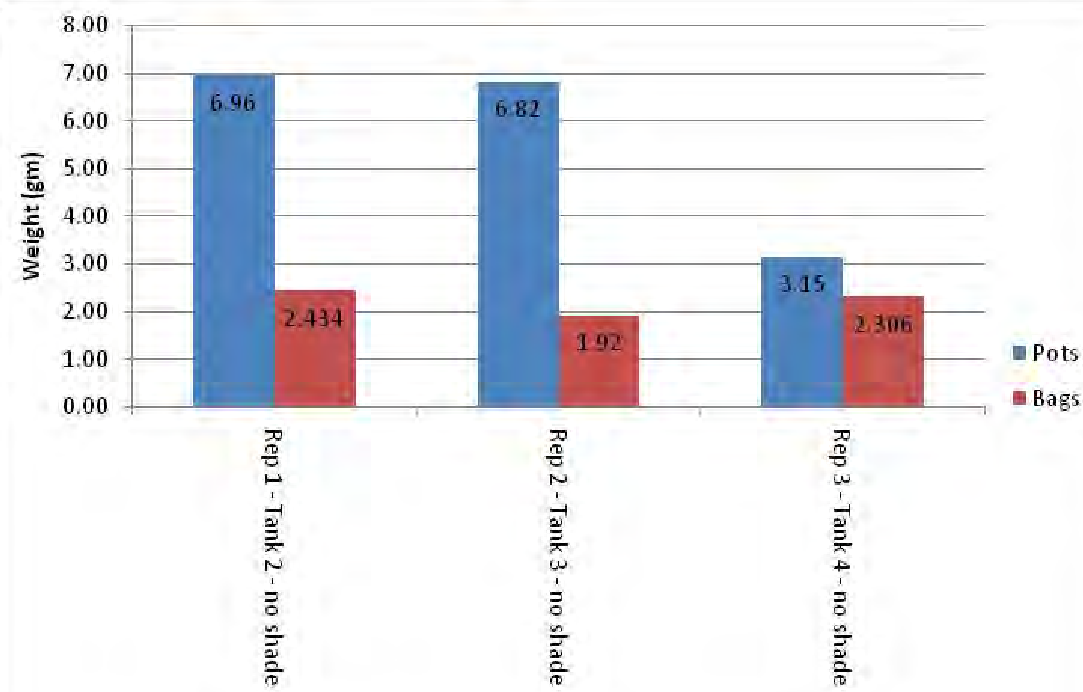


Figure 4. Comparison of top growth biomass of *Vallisneria americana* grown in plastic pots and biodegradable bags, USDA-NRCS Golden Meadow plant Materials Center, February 2010 to July 2010

Phase II

Submersed Aquatic Planting Techniques for Restoration in Coastal Louisiana

Introduction

Many attempts to re-establish Submersed Aquatic Vegetation (SAV) by methods of using plugs, peat pots, coconut erosion control mats, plastic pots, sods, wire mesh, seeds, and winter buds has had very little success. Many SAV restoration projects have failed as a result of poor selection of planting sites or plant material and incorrect use of planting methods. Results from Phase I determined that plants of *Vallisneria americana* grown under no shade had greater numbers of actively growing leaves and higher biomass measurements when compared to the shade treatments. Container systems evaluated under Phase 1 determined that plants of *V. americana* grown in 4 inch plastic pots and biodegradable burlap bags had similar biomass and growth measurements.

Phase II will evaluate and compare the field deployment of plants of V. *americana* grown in 4 inch pots and biodegradable bag under actual field conditions. Measurements used to compare the two container systems included; plant survival, % cover and average stem/leaf length.

Procedure

The study was conducted at the USDA-Natural Resources Conservation Service (NRCS) Golden Meadow Plant Materials Center, Golden Meadow, LA, and at two offsite locations in fresh/ brackish marsh in Lafourche Parish, LA near Clovelly Farms. Plants were grown under greenhouse conditions from 12 February 2010 until 26 July 2010.

Established plants grown under greenhouse conditions were taken to 2 selected field sites for evaluations. Fifteen plants from 4 inch pots and fifteen plants of biodegradable burlap bags were randomly removed from tanks and immediately placed in tubs filled with water for transport to the offsite evaluation area. Planting site was marked using PVC pipe to help identify the 6 ft x 6 ft plots for evaluation. Plants were carefully removed from the transport tubs and plastic containers were removed before plant was lowered into the water to be transplanted. Biodegradable bags were not removed during transplanting. Each plot contained 5 plants from either pots or biodegradable bags. Plants were space approximately 12 inches apart within row. Transplanting was completed on 2 July, 2010.

Field evaluations for the 2 sites were monitored on 5 August, 2010 approximately 30 days after planting. Each site was evaluated for plant survival, stem/leaf length (cm), and % plant cover. Due to depth of water and water clarity, plant survival was done by physically using hand to feel to verify the plant was present and actively growing. Plant % cover was also determined using hands to feel plant spread within a 12 X 12 inch area around the plant.

Results and Discussion

Initial field evaluation of *V. americana* is presented in Tables 1-3. Plant survival was highest for plants grown in 4 inch pots for site 1 at 93.3 %. However plant survival was higher for burlap bags at site 2 at 80 % (fig 1). Percent cover for biodegradable burlap bags was slightly higher compared to 4 inch pot (fig 2).

Initial stem/leaf length measurements for 4 inch pots compared to biodegradable bags for site 1 and 2 were not significantly different during the first evaluation. Plants in biodegradable burlap bags in site 1 averaged a greater stem/leaf length compared to 4 inch pots in site 2, and pots in site 1 averaged a greater stem/leaf length compared to burlap bags in site 2 (fig 3)

Conclusion and Summary

These preliminary results are based on only one evaluation. Results show some minor differences, but at this stage insufficient data has not been recorded to present ending results.

Additional monitoring will be conducted every month to record additional plant data. Additional field deployment is also scheduled at 2 evaluation sites for September 2010. Ultimately, we intend to produce a product for making field deployment and plant establishment of *V. americana* possible in Louisiana coastal restoration projects.

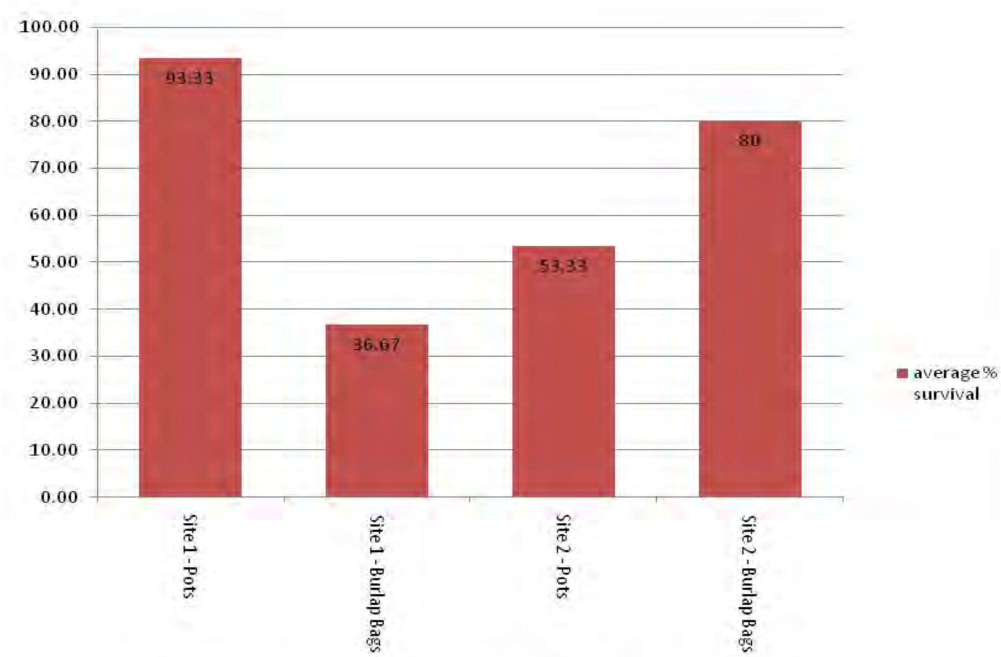


Figure 1. Average field survival of *Vallisneria americana*, USDA-NRCS Golden Meadow Plant Materials Center, July 2010

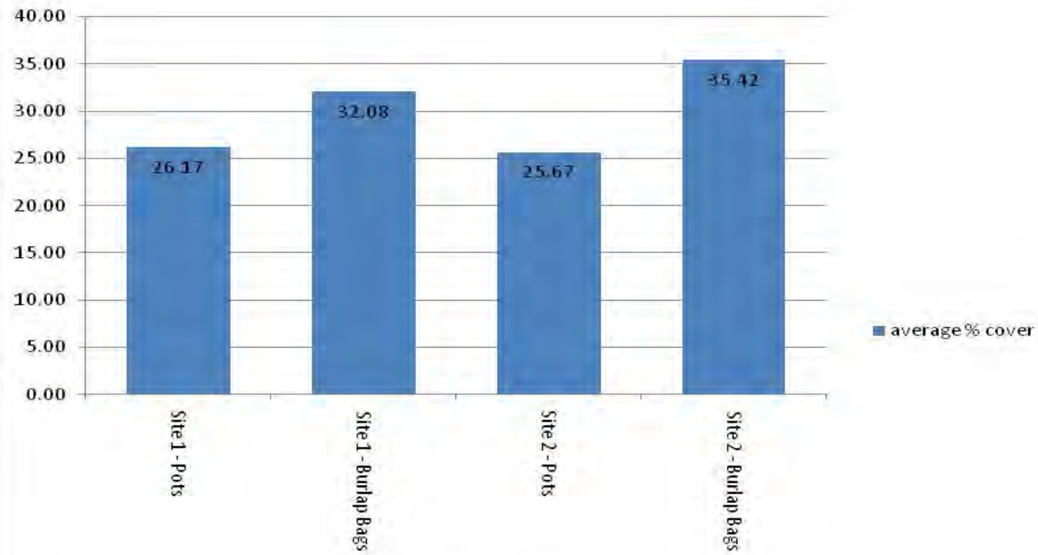


Figure 2. Average % cover of *Vallisneria americana*, USDA-NRCS Golden Meadow Plant Materials Center, July 2010

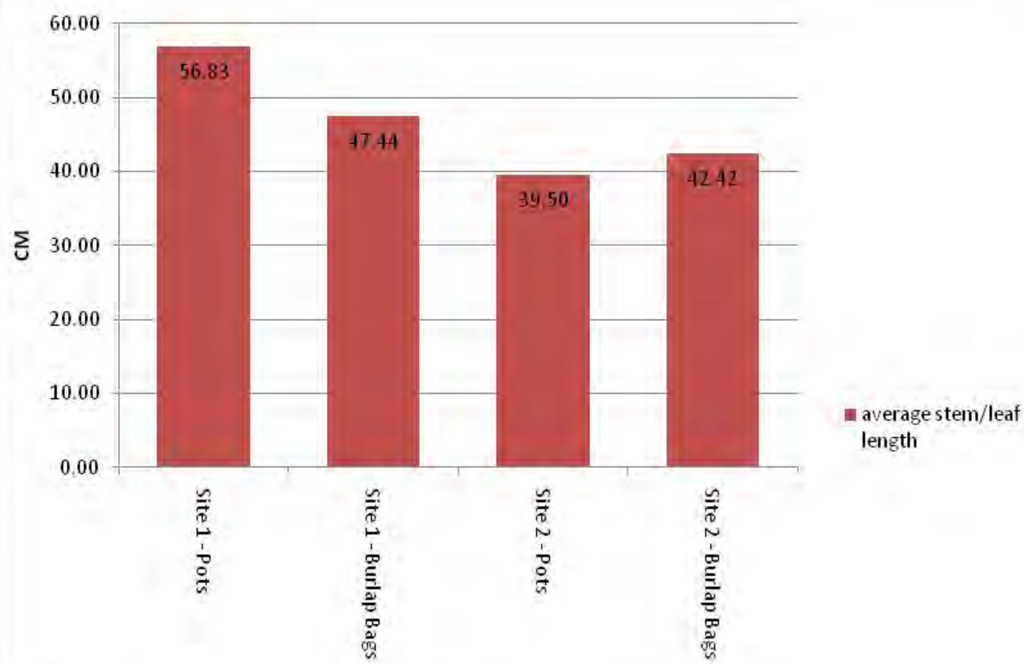


Figure 3. Average stem length of *Vallisneria americana*, USDA-NRCS Golden Meadow Plant Materials Center, July 2010

Study: LAPMC-P-0802-CP

Study Title: Evaluation of *Sorghastrum nutans* (Indiangrass)

Study Leader: Morris Houck, NRCS Plant Materials Specialists, LA
Gary Fine, Bayou Land RC&D, LA
Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA

Cooperators: Nicholls State University, Thibodaux, LA

Introduction

Indiangrass is a perennial, warm-season grass, and is a major component of tallgrass prairies. It is widely distributed across the U.S and this species is an important species, in addition to big bluestem, little bluestem, and switchgrass, that are commonly found in the Coastal Prairies of Louisiana and Texas. Indiangrass is an important coastal prairie grass and there are no locally adapted seed sources commercially available for use in Louisiana.

Problem

There is a growing interest in the public and private sectors to utilize locally adapted native plant materials for restoration and revegetation projects in Louisiana. Ensuring ecosystem stability and ensuring genetic integrity is a major concern for restoration and habitat creation projects. Despite a strong demand for native plant material for conservation, restoration, and habitat creation, it is not available. Louisiana consumers must purchase less adapted plant material from Texas and the Midwest. Many restoration projects in Louisiana have failed or been unable to proceed because of the lack of commercially available sources of plant material that are adapted to the state.

Objective

Two integral parts to the LNPI are seed collection and the increase and production of seed. The LNPI uses observational and/or quantitative evaluations in addition to plant breeding methods to isolate and/or select improved local ecotypes. The LNPI uses the USDA-Natural Resources Conservation (NRCS) Service Plant Materials Program model for seed collection, increase, and release of adapted native grasses, forbs and legumes for commercial production.

Procedures

Seed collected from breeder blocks will be cleaned, debearded, and percent seed germination determined. Seed germination will be determined by counting out 100 seeds and placing in a Petri dish. 4 replications of 100 seeds are required. Conduct 2 tests and take an average for actual germination. Seeds will be germinated in a germination chamber set at 20°/30° C (16 hr days/8 hrs nights). Counts will be made at 7, 14, and 21 days. Finally, percent total germination will be calculated.

If germination percentage is low, place germination box in refrigerator at 38° F for 2 week stratification. After 2 weeks, place in germination chamber for standard germination trial.

Discussion

An assembly of Indiangrass was established at McNeese State University in 2004. The assembly originated from plant material collections made from remnant populations found in Louisiana's Coastal Prairie. The assembly was transplanted to Nicholls State University Farm in 2006. Five ramets from each of 22 accessions were planted to Block 1 in a completely randomized planting design. Plots consist of single plants spaced on 4 ft by 4 ft centers. The assembly was managed for seed production in 2008. Hurricane Gustav hit the coast of Louisiana September 1. 2008. Thibodaux experienced hurricane force winds. The assembly was in the beginning stages of anthesis. Storm winds flattened the standing vegetation which did not recover, or stand upright and complete flowering. The storm's damages resulted in no seed production for the 2008 crop year.

October 12, 2009 seed was hand harvested from Nicholls State University Farm. Seed was then brought to the Plant Materials Center for processing. A total of 1.98 pounds was cleaned for 2009 seed crop.

The 2010 crop year, though still experiencing interior lodging, produced 3.0 bulk pounds (1.4 kg) of seed or an estimated 150 pounds (68 kg) per acre.

All established plots (110 each) remain vigorous and are persisting well. A fungal disease identified as *Puccini virgata* (rust) has been reported to be specific to Indiangrass, but has not been found in plots at the Nicholls Farm in Thibodaux, LA.

Study: LAPMC-P-0803-CP

Study Title: Evaluation of *Andropogon gerardii* (Big Bluestem)

Study Leader: Morris Houck, NRCS Plant Materials Specialists, LA
Gary Fine, Bayou Land RC&D, LA
Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA

Cooperators: Nicholls State University, Thibodaux, LA
McNeese State University, Lake Charles, LA

Introduction

Big bluestem is the dominant native grass species of the Midwestern tallgrass prairie and is widely distributed across the U.S. Big bluestem is also an important species found in the Coastal Prairies of Louisiana and Texas. There are no locally adapted seed sources of big bluestem available for planting in Louisiana. Native seed sources from remnant populations of big bluestem existing in Louisiana are generally found in small colonies that are not of sufficient size to harvest seeds for restoration.

Problem

There is a growing interest in the public and private sectors to utilize locally adapted native plant materials for restoration and revegetation projects in Louisiana. Ensuring both ecosystem stability and genetic integrity is a major concern for restoration and habitat creation projects. Despite a strong demand for native plant material for conservation, restoration, and habitat creation, it is not available. Louisiana consumers must purchase less adapted plant material from Texas and the Midwest. Many restoration projects in Louisiana have failed or been unable to proceed because of the lack of commercially available sources of plant material that are adapted to the state.

Objective

Two integral parts to the LNPI are seed collection and the increase and production of seed. The LNPI uses observational and/or quantitative evaluations in addition to plant breeding methods to isolate and/or select improved local ecotypes. The LNPI uses the USDA-Natural Resources Conservation (NRCS) Service Plant Materials Program model for seed collection, increase, and release of adapted native grasses, forbs and legumes for commercial production.

Procedures
Seed collected from breeder blocks in 2007 will be cleaned, de-bearded, and percent seed germination determined. Seed germination will be determined by counting out 100 seeds and placing in a Petri dish. 4 replications of 100 seeds are required. Conduct 2 tests and take an average for actual germination. Seeds will be germinated in a germination chamber set at 20°/30° C (16 hr days/8 hrs nights). Counts will be performed at 7, 14, and 21 days. Finally, total percent germination will then be calculated.

If germination percentage is low, place germination box in refrigerator at 38° F for 2 week stratification. After 2 weeks, place in germination chamber for standard germination trial.

Discussion
An assembly of populations sampled from coastal remnants was collected and planted at McNeese State University in 2004. Plant materials were taken from the McNeese planting to establish a crossing block consisting of 111 plants at Nicholls State University Farm July 13, 2006. Additional vegetative samples were taken from McNeese State University on June 18, 2007 and transplanted to the NSU Farm block to complete the assembly. Plant characterization data was collected for each plot in the assembly for the 2008 growing season. The stand of big bluestem is being managed for cross pollination and seed production to capture the potential genetic makeup of Louisiana ecotypes. Seed harvest was not completed this year due to Hurricane Gustav. Storm winds laid the standing seed culms flat, and plants did not recover. The seed crop was lost for 2008. Seeds harvested from the 2007 crop year will be used for planting the first foundation seed increase field (F1) at the NSU Farm.

October 21, 2009 seed was hand harvested from Nicholls State University Farm. Seed was then brought to the Plant Materials Center for processing. A total of 13.67 pounds was cleaned for 2009 seed crop.

Plant materials assembled and established exhibited excellent vigor and persistence for the duration of this project. Seeds harvested for the 2010 crop year appear to be the best production year to date. The seed lot was thrashed in early November, 2010 and hand screened to remove inert materials. Final processing has resulted in 40 bulk pounds (18.2 kg) of seed harvested from a 0.06 acre block (estimated 666 bulk pounds (302 kg) per acre. Germination tests will be used to determine pure live seed (PLS) as a measure of seed quality and yield this spring. The PLS determination will be used to efficiently plant an F1 foundation seed increase block in 2011.

Study: LAPMC-P-0804-CP

Study Title: Evaluation of *Tripsacum dactyloides* (Eastern Gamagrass)

Study Leader: Morris Houck, NRCS Plant Materials Specialists, LA
Gary Fine, Bayou Land RC&D, LA
Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA

Cooperators: Nicholls State University, Thibodaux, LA
McNeese State University, Lake Charles, LA

Introduction

Eastern gamagrass is a stout, warm season, clump forming perennial grass. Leaves are wide and flattened, especially near the base. Foliage color ranges from dull to vivid green. Flowers grow along spikes with females below and males above. This fact leads some to believe that this is a predecessor to modern corn. Flowering occurs from May to November. Fruits develop in a jointed fashion and ripen independently as the plant matures.

Problem

There is a growing interest in the public and private sectors to utilize locally adapted native plant materials for restoration and revegetation projects in Louisiana. Ensuring both ecosystem stability and genetic integrity is a major concern for restoration and habitat creation projects. Despite a strong demand for native plant material for conservation, restoration, and habitat creation, it is not available. Louisiana consumers must purchase less adapted plant material from Texas and the Midwest. Many restoration projects in Louisiana have failed or been unable to proceed because of the lack of commercially available sources of plant material that are adapted to the state.

Objective

Two integral parts to the LNPI are seed collection and the increase and production of seed. The LNPI uses observational and/or quantitative evaluations along with plant breeding methods to isolate and/or select improved local ecotypes. The LNPI uses the USDA-Natural Resources Conservation (NRCS) Service Plant Materials Program model for seed collection, increase, and release of adapted native grasses, forbs and legumes for commercial production.

Procedures
Seed collected from breeder blocks in 2007 will be cleaned, debearded, and percent seed germination determined. Seed germination will be determined by counting out 100 seeds and placing in a Petri dish. 4 replications of 100 seeds are required. Conduct 2 tests and take an average for actual germination. Seed will be germinated in a germination chamber set at 20°/30° C (16 hr days/8 hrs nights). Counts will be performed at 7, 14, and 21 days. Finally, total percent germination will be calculated.

If germination percentage is low, place germination box in refrigerator at 38° F for 2 week stratification. After 2 weeks, place in germination chamber for standard germination trial.

Discussion
An assembly of plant collections made from endemic populations found throughout southeast Louisiana and northeast Louisiana has been established in Block 6. Random crossing blocks were established by using propagules from each collection. Considerable variation exists between ecotypes. Plant characterization data was collected during the 2008 growing season. Data will be used to identify germplasm that may have potential for specific uses such as grazing lands, hayland, bioenergy, wildlife habitat, riparian, and buffers. Seed was hand harvested from each plot in the assembly in August 2008. Seed weights will be measured and estimates of production by ecotype will be determined. The USDA NRCS East Texas Plant Materials Center will assist with germination and seed quality determinations.

July 14, 2009 seed was hand harvested from Nicholls State University Farm. Seed was then brought to the Plant Materials Center for processing. A total of 11 pounds was cleaned for the 2009 seed crop.

Seed crops for 2008 and 2009 were bulked together and planted in Field C on March 29, 2010. Unfortunately, no seedlings have been observed to date. The 2010 seed was hand harvested from Block A6 (Field A) on July 21, 2010 and processed.

Clean seed yielded 10 bulk pounds (4.5 kg) of seed from a 0.08 acre plot or estimated 125 pounds (57 kg) per acre. The current seed crop will be used to attempt another F1 Foundation seed increase block in Field C in late December 2010. A successful planting will be managed for seed production and subsequent seed distribution for field testing and field increase at other locations if shown promising for conservation use.

Study: LAPMC-T-1001-CR

Study Title: Evaluation of selected plant materials and installation techniques to stabilize and control erosion along the South Lafourche Hurricane Protection Levee

Study Leader: Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA
Morris Houck, NRCS Plant Materials Specialists, LA

Cooperators: Windell Curole, South Lafourche Levee District, LA

Introduction

The South Lafourche Levee District was signed into existence in 1970 under the name of South Louisiana Tidal Water Control Levee District. In 1978 the name was changed to South Lafourche Levee District.

The South Lafourche Levee District office is located in Galliano, Louisiana. The hurricane protection system consists of over 48 miles of ring levee and has 33,400 acres within the flood protection system. There are 6 pumping stations within the system. The total acreage of the levee district exceeds 439,000.

Problem

The South Lafourche Levee District has made major improvements from Larose to the Golden Meadow Hurricane Protection System over the past year, and currently has several projects under construction in an ongoing effort to improve flood protection for the area.

Storm surges from the hurricanes of 2005 caused extensive damages to several existing levee systems across southern Louisiana where vegetative cover was weak or non-existent.

The hurricane season of 2008 again flooded a major portion of South Louisiana. In the South Lafourche Levee District, flood waters for Hurricane Gustav reached over 8 feet in the southern area with only a 2 foot surge reported near the Intracoastal Waterway. It was reported no flooding occurred within the existing system.

The South Lafourche Hurricane Protection Levee is in the process of constructing new levees and raising the effective height of existing levees to provide protection to the area. It is critical to find establishment and management techniques of grasses that will provide vegetative protection from tidal storm surges that could damage or weaken newly constructed storm protection levees.

Objective

This project targets the identified need by the Levee District to find cost effective solutions to establish and restore vegetative cover to existing and newly constructed levees. Factors that will be considered include:

- the evaluation of species useful for the re-vegetation of the levee
- the evaluation of planting techniques and bioengineering practices helpful in restoring cover
- evaluation of soil enhancement techniques to reduce compaction and improve soil health
- the development of publications and guidelines

Procedures

1. Species Evaluation Trials

   Using the species as identified in Table 1 a detailed planting plan will be developed for study sites. Plant material will be installed as it relates to location inside and outside the hurricane protection levee (Figure2). Additional species may be added. Sites will be designed only to provide vegetative erosion control to protect the hurricane protection levee.

2. Evaluation of planting techniques and bioengineering practices

   To evaluate the success of using various planting techniques as they relate to specific plant material. Techniques that will be considered include:

   - No-till drill
   - Brillion® Seeding
   - Hydroseeding
   - Improved broadcast methods

3. Evaluation of soil enhancement techniques to reduce compaction and improve soil health.

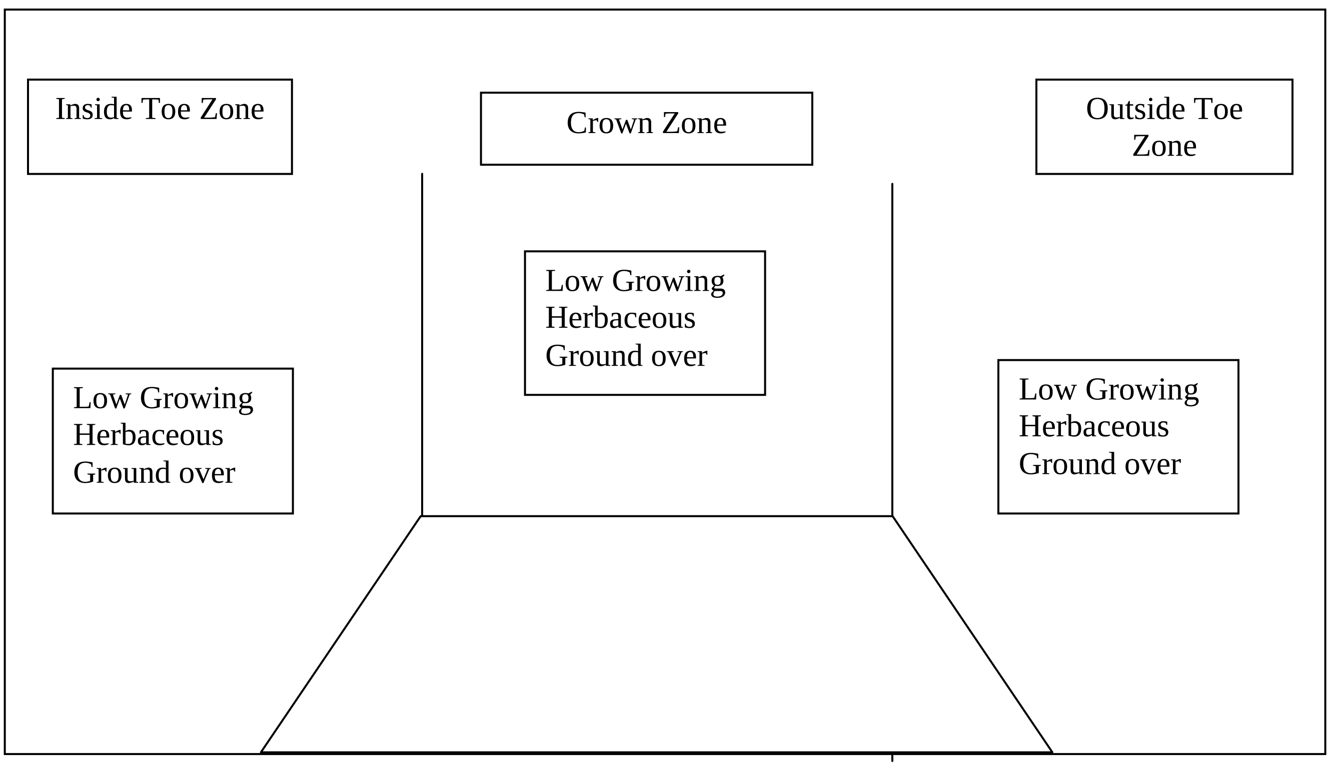
   To evaluate the success of using various planting amendments to improve soil health:

   - fertilizer amendments
   - sprays
   - mycorrhizal fungi

Table 1

Bahiagrass	Seed varieties; Pensacola, Argentine, TifQuik, Tifton 9
Bermudagrass	Seed varieties; Sahara, Pasto Rico
Bermuda/Bahiagrass blends	Seed
Bermuda/Bahiagrass blends w/cover crop	Fall/Winter Blend (bermudagrass, bahiagrass with annual ryegrass), Spring/Summer Blend (bermudagrass, bahiagrass with browntop millet)
Marshhay cordgrass (*Spartina patens*)	Vegetative variety - Gulf Coast
Seashore Paspalum (*Paspalum vaginatum*)	Seed
Switchgrass (*Panicum virgatum*)	Seed - Alamo (lower toe only)
Others as Identified	

Figure 2



Discussion
Study sites will be identified to evaluate species and techniques needed to establish and maintain the vegetative cover on levee systems. Levee elevations are increasing on average 4-5 feet above existing levels. Improvements will raise the levee from its current elevation of 10-11 feet depending on location to an elevation of 14-16 feet depending on location.

Study Site 1 – This site will be typical of the majority of the system that is being reworked to increase the effective height of the levee. This site will exhibit characteristics associated with compacted heavy soils. Seven plots will be installed to evaluate individual varieties and mixture.

March 24, 2010 - Plantings were performed and completed as outlined below. Cultipacking was somewhat difficult due to the high clay content of the soils. In addition to the heavy soils, droughty conditions did persist.
Plot Sizes
- 90 feet X 300 feet = .62 ac (45 feet either side of levee center line by 300 feet)
- 200 feet open between plots
- All plots seeded at 2X critical area rate (15lb/ac X 2 = 30 lb/acre rate, (30lbs X .62ac per plot = 18.6 lb/ac)

Plot 1 - Mixture - Bahiagrass/Bermudagrass/Browntop Millet Mixture
- Hancock Seed Spring/Summer Mix(April-October) - mixture of 33% Pensacola bahiagrass, 33% unhulled bermudagrass, and 34% browntop millet
- No-till drilled

Plot 2 - TifQuik Bahiagrass
- No-till drilled

Plot 3 - Mixture - Bahiagrass/Bermudagrass
- 50 % Sahara Bermudagrass and 50 % Pensacola Bahiagrass
- No-till drilled

Plot 4 - Pensacola Bahiagrass
- 25% seeded with No-till drill and 75% seeded with Brillion seeder

Plot 5 - Argentine Bahiagrass
- No-till drilled

Plot 6 - Mixture - Seedland Pasto Rico Bermudagrass Mixture
- 50% Giant Bermudagrass and 50 % common Bermudagrass
- No-till drilled

Plot 7 - Tifton 9 Bahiagrass
- No-till drilled

April 28, 2010 - Site evaluation to evaluate germination. No evidence of any seed germination. Abundant amounts of existing stands of bermudagrass and seashore paspalum are present.

August 6, 2010 - Site evaluation revealed the following observations.

Plot 1 - the west end had very little vegetation present. Across the remainder of the plot browntop millet observed at <5%, bermudagrass at <10% and bahiagrass at 0%.

Plot 2 - TifQuik Bahiagrass - 0% observed (Note - good stand of seashore paspalum)

Plot 3 - Mixture - Bahiagrass/Bermudagrass - bermudagrass <10%, bahiagrass 0%

Plot 4 - Pensacola Bahiagrass - 0% observed (Note - good coverage of bermudagrass)

Plot 5 - Argentine Bahiagrass - <10% mainly located within sediment accumulated in rills and through bermudagrass patches.

Plot 6 - Mixture - Seedland Pasto Rico Bermudagrass Mixture - < 10 % observed

Plot 7 - Tifton 9 Bahiagrass - 10 - 20% coverage

November 18, 2010 - Site evaluation revealed that existing stands (not planted) of bermudagrass and seashore paspalum were providing sufficient cover, and if managed properly, could potentially provide the protection needed. Although bahaigrasses were observed from planting, additional time is needed to fully evaluate its usage. Overall, the seed planted in respective plots germinated poorly. Factors related to soil compaction, drought conditions, and slope of planting sites are all believed to contribute to the low successes of the plantings.

For more information call us at 985.475.5280 or visit our web site at http://www.plant-materials.nrcs.usda.gov/lapmc