Brooksville Plant Materials Center Progress Report of Activities

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Conservation Concerns:

- Improve and Maintain Water Quality
- Control Erosion on Cropland and Stabilize Critical Areas
- Improve Forage on Pasture and Rangeland
- Improve Wildlife Habitat

About the PMC:

The PMC consists of 39 acres of cultivated fields and 139 acres of native woodland and planted pine. It is located 7 miles north of Brooksville on US 41, 15 miles inland from the Gulf of Mexico. Our service area, indicated in green on the map below, includes all of Florida, Puerto Rico, and the US Virgin Islands; and the coastal areas of Georgia, South Carolina, and Alabama.

Mission of the Brooksville Plant Materials Center

The *Brooksville Plant Materials Center* (PMC) is operated by the USDA, Natural Resources Conservation Service (NRCS). The mission of the Plant Materials Program is to deliver state-of-the-art plant science technology to meet the nation's natural resource conservation needs. To this end, we indentify superior accessions of adapted plants which are tested and released for production to commercial growers. We also provide technical assistance in plant production and management methodologies. Evaluation and use of native plant materials is emphasized.

Plant Releases Completed in 2009

The original seed sources for **Sea Islands Germplasm** sweetgrass (*Muhlenbergia sericea*) were collected along the beachfront on Kiawah Island, SC, and Little St. Simons Island, GA. This native grass is used by the Gullah, descendants of African-American slaves living in the area around Mount Pleasant, SC, as the base material in their coiled-basketry. The U.S Army Corps of Engineers, Charleston District has been attempting to restore local sweet-grass populations decimated by urban development by incorporating Sea Islands Germplasm in their coastal restoration plantings.

Osceola Blue Germplasm lopsided indiangrass (*Sorghastrum secundum*) was developed for use as an ornamental native grass. Lopsided indiangrass has feathery seeds all held to one side of the stem in an attractive, but, unfortunately, short-lived display. Osceola Blue Germplasm is the result of a cross of three Florida accessions of lopsided indiangrass collected in Marion, Levy, and Gilchrist counties. These plants were selected for the blue coloration of their stems and foliage, which adds season-long visual interest to the plants.

2009
December

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Germplasm Development

Switchgrass (*Panicum virgatum*) remains a high priority species due to its national importance as a biofuel crop (see Technology Development on P. 3). Switchgrass is one of the most widely distributed warm season (C_4) native grasses in the United States. Although commonly associated with the tall grass prairie of the central United States, switchgrass is thought to have evolved in the tropical region of the world and moved into North America during the Miocene-Pliocene transition (8-6 MaBP). Glaciation events and changes in sea level associated with interglacial periods repeatedly destroyed the C_4 grasslands in North America. When much of the continent was covered with glaciers, the southeastern United States constituted a refuge for previously evolved C_4 grasses. The southeastern United States, particularly Florida, is considered to be a "suture zone" between the biota of the tropical and temperate regions of North America. The considerable species richness present in this region is due to the long term survival and divergence of genomes in this region.

Survival of the C_4 grasses in the Southeast facilitated the rapid re-colonization of the central United States after the last ice age, but loss of genomic diversity in switchgrass was a consequence of this rapid expansion out of the southeastern refugia. Most of the remnant prairie populations of switchgrass from the Midwest are comprised of plants of only one cytotype (chromosomal characteristics). The need to increase the genetic diversity of the switchgrass under evaluation for biomass production programs, particularly in the eastern U.S., has been recognized.

2009 Germplasm Collections

Coastal Plain Chaffhead
Carphephorus corymbosus

Powderpuff Mimosa
Mimosa strigillosa

Narrowleaf Silkgrass
Pityopsis graminifolia

Pine Barren Goldenrod
Solidago fistulosa

In 2009, staff at the Brooksville PMC cooperated with Dr. Melanie Harrison-Dunn, warm season grass curator of the National Plant Germplasm System (NPGS) in a trip funded by the USDA, ARS National Plant Exchange Office to collect switchgrass germplasm in central and northern Florida. The search area covered northern Florida from Jacksonville down to Daytona Beach on the eastern coast, across the northern portion of Florida, through the panhandle, and finally ending in the Pensacola area. There was a variety of habitats in the collection area, including dry areas adjacent to beach dunes, wetland and intercoastal areas, oak hammocks, and inland pine flatwoods.

Additional Germplasm Studies

FLPMC-P-9602-RA Evaluation of Lopsided Indiangrass: Tested germplasm of this important range species is needed for restoration planting. A polycross of the top 21 accessions has been made and seed is being increased for release.

FLPMC-P9605-RA Evaluation of Eastern Gamagrass: Adapted Florida ecotypes of eastern gamagrass are needed for pasture planting and rangeland restoration. A superior accession has been identified and breeder seed is being increased at two locations in Florida.

FLPMC-P-0001-RA Evaluation of Native Switchgrass: Better seed producing types of Florida-adapted material is needed. Plant increase and ploidy level (number of chromosome pairs) determination continued.

FLPMC-P-0108-RA Advanced Evaluation of Hairawn Muhly Seeded Types: Hairawn muhly is a vegetative component in many Florida rangelands and a source of seed for revegetation is needed. The ten top-rated accessions being increased for planting in crossing block in 2010.

FLPMC-P-0201-UR Advanced Evaluation of Hairawn Muhly – Ornamental Types: Adapted, native grasses for urban conservation are needed. Final plant selection was made, technical report is being developed, and breeder plants being increased.

FLPMC-P-0501-PA Evaluation of Slender Woodoats: Adapted native cool season forages are needed in Florida. The second year of advanced field evaluation was completed.

FLPMC-P-0601-PA Rhizoma Perennial Peanut Cultivar Development: Rhizoma perennial peanut adapted to wetter sites is needed. Newly available germplasm was increased in the greenhouse for field planting in 2010.

FLPMC-P-0901-BF Development of Elephantgrass Germplasm for Bioenergy Production: Higher producing elephantgrass cultivars are needed for biofuel production. Crossing blocks were established and pollen collected.

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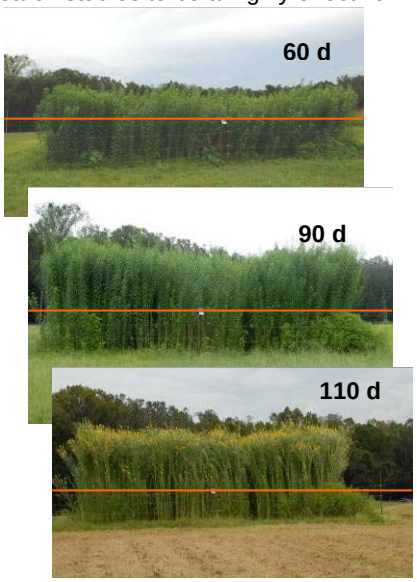
Technology Development

PM-T-0901 ICST Adaptability of Tropic Sun Sunn Hemp: 'Tropic Sun' sunn hemp (*Crotalaria juncea*), released by the Hawaii PMC, has been shown in multiple research studies to be a highly effective green manure crop. It can provide organic matter to the soil, suppress weeds, and reduce root-knot nematode infestations. Additionally being a legume, it can add nitrogen to the soil; at 60 d of growth Tropic Sun can produce over 145 lb of actual nitrogen per acre. Although a tropical species, the rapid growth rate of Tropic Sun, suggested that this release could be useful in large areas of the country. The Brooksville PMC along with all the other PMCs in the country except Alaska participated in the first nationally coordinated intercenter strain trial in 2009. This study attempted to determine the areas of the country with the potential to use sunn hemp for green manure and as a cover crop. In order to merge the data from all centers, it was important that methodology was as uniform as possible and planting method and harvest dates (30, 60, and 90 d) were coordinated. In addition to plant height and dry matter yield, flowering date, frost date, and plant height at killing frost were to be determined.



Sunn hemp was planted at Brooksville the middle of June and the photos above illustrate the changes in height (orange line is the top of the electric fence) and dry matter production of Tropic Sun at 60 and 90 d harvest dates. Harvesting photos on the left are from the 90 d harvest date. The stand was in full flower by 110 d after planting (early October), but has failed to produce any usable seed. We are going to take one more harvest of the material after killing frost, which we expect sometime in January 2010.

FLPMC-T-0803-BF Evaluation of Switchgrass Lines for Biofuel: One reason to consider switchgrass instead of sugarcane, elephantgrass, or energy cane for biofuel production in Florida is most switchgrass lines can be established from seed, whereas, these other species have to be vegetatively established.

In Florida, studies have shown switchgrass yields on mineral soils between 4,000 to 8,000 lb/acre/year. But yields have been as high as 12,000 lb/acre/year with the vegetatively established Florida cultivar, Miami, released by the Brooksville PMC. Nothing is known about switchgrass yields on organic soils such as occur in the Everglades Agricultural Area of south Florida. In 2008, a cooperative study with the University of Florida, Research and Education Center in Belle Glade was initiated to determine the interaction of harvest interval and line (Miami and six seeded lines) on the production and quality of switchgrass biomass when grown on organic soils in south Florida.

Total annual yield for 2008 and 2009 is shown in the table. High Tide emergence was poor in 2008, but the stand improved with time and was harvestable in 2009. Miami was visually and yield wise the superior entry in the trial both years. Samples are still being analyzed for fiber quality and nutritive value.

Dry matter yield (T/acre) in 2008 and 2009 for switchgrass planted in 2008 at Belle Glade, FL.

Line	2008	2009
Alamo	2.7	3.5
Timber	3.6	3.0
High Tide	0	2.4
Miami	7.6	9.6
Kanlow	2.3	4.7
Bowmaster	2.3	3.0
Performer	1.1	1.3

Additional Technology Studies

FLPMC-T-0801-PA Effect of Flooding Duration and Nitrogen Level on the Survival and Phosphorous Uptake of Three Forage Species in Florida: Proposed surface water storage on South Florida cattle ranches may impact production and survival of pasture grasses. The second year greenhouse testing was completed. Forage, soil, and water samples are being analyzed by USDA-ARS cooperator.

FLPMC-T-0802-WL Interaction of Time of Year and Landscape Position on Survival of Selected Florida Tree and Shrub Species Planted as Whips: Direct planting of woody whips may be useful for increasing species diversity on pond margins in restored phosphate mineland. Greenhouse testing and first year of field study completed. Field evaluations will be completed in summer 2010.

FLPMC-T-0902-WL Interaction of Seeding Rate and Soil Type on Establishment of Native Seed Mix on Recontoured Mineland: Recontoured phosphate mineland often consists of large patches of sand tailings and overburden. To determine optimum seeding rate, three different seeding rates of a native seed mix were planted in March 2009. Final stand counts will be made in 2010.

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Major Infrastructure Changes Construction of Greenhouse

Pouring footings for support columns

Finished 20' x 60' greenhouse

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PMC information is available online at:
http://www.fl.nrcs.usda.gov/program/flplantmaterials.html or
http://plant-materials.nrcs.usda.gov

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Publications:

Gonter, M.A. J.M. Grabowski, and M.J. Williams 2009. Notice of Sea Islands Germplasm Sweetgrass. Brooksville PMC, Brooksville, FL. 6 p.

Grabowski, J.M., R.J. Dufault, and M.J. Williams. 2009. Sea Islands Sweetgrass Brochure. Brooksville PMC, Brooksville, FL. 2 p.

Grabowski, J.M. and M.J. Williams. 2009. 2008 Progress Report of Activities. Brooksville PMC, Brooksville, FL.8 p.

Grabowski, J.M, and M.J. Williams. 2009. Plant Guide for Gulf Hairawn Muhly. Plants Database, Baton Rouge, LA. 4 p.

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Williams, B., and M.J. Williams. 2009. Effect of Season on Spatial Utilization by Cattle (*Bos* spp.) on Rangeland in South Florida. 62nd Society Range Management Annual Meeting, 8-12 Feb. 2009. Albuquerque, NM. Paper No. 2060-23. 1 p.

Williams, M.J. 2009. Plant Materials Fact Sheet – Planting Native Species for Flower Rich Pollinator Habitats. FL FOTG

Williams, M.J., and J.M. Grabowski. 2009. Notice of Release of Osceola Blue Germplasm Lopsided Indiangrass. Brooksville PMC, Brooksville, FL. 9 p.

Williams, M.J. R.A. Robbins, C. Ellis, and K.E. Spaeth. 2009. Use of Multivariant Analysis to Develop Forage Suitability Groups. American Forage Grassl. Council Annual Conf., 21-23 June 2009. Grand Rapids, MI. American Forage Grassl. Council, Elmhurst, IL. 1 p.

Presentations:

Gonter, M.A. 2009 Florida Nursery and Allied Trades Show. Setup and staff FL PMC Booth. Oct 1-3, 2009, Orlando, FL.

Grabowski, J.M. 2009. NRCS Plant Materials Program for Coastal Restoration. Coastal Dune Erosion Control and Restoration Workshop, 25 Mar 2009, Apalachicola, FL.

Grabowski, J.M. 2009. Brooksville Plant Materials Center Tour, FL NRCS Area 2 Florida Fish and Wildlife Conservation Commission Cooperators, 28 July 2009, Brooksville, FL.

Grabowski, J.M. 2009. Utilizing Bioengineering Techniques to Restore Woody Vegetation on Florida Phosphate Minelands. Soc. Mining, Metallurgy & Exploration, 24th Annual Regional Phosphate Conference, Oct 14-15.Lakeland, FL,

Grabowski, J.M., and M.J. Williams. 2009 Annual Meeting of the Society of American Foresters, Setup and staff National PMC Booth. Sep 31 – Oct 1, 2009, Orlando, FL.

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Williams, M.J. 2009. Considerations for Planting in the Dunes. Coastal Dune Erosion Control and Restoration Workshop, 25 Mar 2009, Apalachicola, FL.

Williams, M.J. 2009. NRCS Plant Materials Program – What's in it for you! 19 June 2009, FL NRCS Area 1 Meeting, Marianna, FL

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