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2010 ANNUAL TECHNICAL REPORT

JIMMY CARTER
PLANT MATERIALS CENTER

‘Tropic Sun’ Sunn Hemp Study

A Technical Summary of Plant Materials Studies
At the Jimmy Carter Plant Materials Center
Americus, Georgia

NRCS Natural Resources Conservation Service

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STATE CONSERVATIONISTS ADVISORY COMMITTEE

Purpose: The purpose of the committee is to provide leadership in the coordination, communication, support, and integration of applied plant science technology within and between states, the Regional and National Plant Materials Advisory Committees and other partners.

James E. Tillman, Sr. – Chairman	Athens, GA
Ann English	Columbia, SC
Dr. Bill Puckett	Auburn, AL
J.B. Martin	Raleigh, NC

PLANT MATERIALS TECHNICAL COMMITTEE

The Plant Materials Technical Committee provides input to the PM Advisory process. The PM Technical Committee may be on a state, multi-state or other regional/local level for a single PMC or for multiple Plant Materials Centers. Responsibilities include:

- Provides overall technical leadership in the identification, integration, and prioritization of plant technology needs.
- Develops recommendations for addressing needs and submits information to the State Conservationist's Plant Materials Advisory Committee for review and approval.
- Promotes the transfer of developed applied science technology.

Technical Committee Members

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Vacant, SRC, NRCS	Columbia SC
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INTRODUCTION

The Jimmy Carter Plant Materials Center (PMC) is part of a national plant materials program operated by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), formerly recognized as the Soil Conservation Service (SCS). The purpose of the PMC is: to assemble, evaluate, and release new plant materials for conservation use; to determine techniques for their successful use; to provide for their commercial increase; and to promote the use of plant materials needed to meet the objectives of the National Conservation Program.

The Plant Materials Center serves NRCS field offices, public agencies, commercial seed and plant producers, and the general public in Georgia, Alabama, South Carolina, North Carolina, and parts of Florida and Tennessee. These states present a wide range of climatic and soil conditions and include a total of 13 major land resource areas (MLRAs) representing 120,377,913 acres across the Southeastern United States.

PMC activities are guided by a five-year program focusing on the development of the following high priority items for **Farm Bill Implementation**:

I. Evaluation of native grasses for grazing lands that support sustainable agriculture. (Conservation buffers, forage, erosion control, wildlife habitat improvement, urban landscapes, bio-fuels Farm Bill Implementation)

II. Evaluation of native plants for water quality (riparian forest areas, conservation buffers, filter strips, constructed wetlands, and streambank stabilization, Farm Bill Implementation).

III. Evaluation of plants for conservation tillage (green manure, pollinators, organic gardening, carbon sequestration and winter cover)

LOCATION AND FACILITIES

The PMC is located on the northwest corner of Americus, Georgia approximately 40 miles north of Albany, Georgia. The facility consists of 327 acres of land with 19 buildings, including a new office building (conference room), greenhouse, seed cleaning /seed storage facilities, pesticide storage, and an underground irrigation system that covers approximately 85 acres. The center's land includes seven soil types, with Orangeburg predominating. Approximately two-thirds of the acreage is open for cultivation, and Muckalee Creek runs through the southwest corner.

HISTORY

The PMC was established in 1936 to produce planting material, mainly pine seedlings for use by the Civilian Conservation Corps (CCC) and for former SCS demonstration projects. The site was originally rented, but was purchased by the federal government in 1942. The center was operated on contract by the University of Georgia Experiment Station from 1954 to 1975, was SCS-operated from 1976 to 1994, and is currently NRCS-operated. Historically, the PMC's objective has been to find erosion-minimizing plants. Today the center seeks to solve problems confronting soil, water, air, plants, and animals.

PARTNERSHIPS

The PMC has conducted cooperative programs with the following organizations:

Alabama Agricultural Experiment Stations	Alabama A&M University
Alabama Crop Improvement Association	Auburn University
Fort Valley State University	Georgia Forestry Commission
Georgia Crop Improvement Association	Georgia Department of Transportation
Alabama S&W Conservation Commission	RC & D Councils
Clemson University	North Carolina A&T University
Quail Unlimited	Georgia Seed Development Commission
Georgia Agricultural Experiment Stations	Wildlife Management Institute
Georgia Department of Natural Resources	The University of Georgia
Tuskegee University	United States Environmental Protection Agency
United States Army	United States Forest Service
United States Fish & Wildlife Service	Georgia Soil & Water Conservation Commission
Lamar Co S & W CD	Flint River S & W CD
United States Department of Agriculture (ARS)	Lower Chattahoochee S & W C D
Alabama Forest Commission	Georgia Association of Conservation Districts
Alabama Association of Conservation Districts	Pulaski County and Hawkinsville

PLANT MATERIALS PROGRAM

The Plant Materials Program has established a **systematic process to evaluate and release plants** to address the conservation problems outlined in the long-range program. The intensity and time of evaluation will vary according to the class of release. A cultivar will require many years of intense evaluation whereas a source identified plant can be released in 1-2 years with little evaluation. The following illustrates the steps involved in this process**: 1**. A problem is identified in the PM Advisory and Technical Committee **2** Plants are assembled to address problem **3** These plants are evaluated on and off PMC **4** Plants are increased on PMC **5** Field Plantings are established off the PMC in S&WCD **6** A new plant is named and released as a Source identified, Selected, Tested or Cultivar for use in conservation by the American people.
In addition to the release of new plants, the PMC develops new technology to better utilize plant materials for our high priority concerns.

DESCRIPTION of SERVICE AREA

The Jimmy Carter PMC serves Alabama, Georgia, South Carolina, North Carolina, and parts of Tennessee and Florida. These states present a wide range of climatic and soil conditions.

Elevations range from sea level to over 6,000 feet. Low temperatures will vary from -20 degrees F at the higher elevations to 10 degrees F along the coast while summer high temperatures range from 70 F in the mountains to 110 F at lower elevations.

Frost-free days vary from 260 days near the coast to 130 days at the higher elevations.

Annual rainfall over the area ranges from 45 to 80 inches.

The states served by the center are represented by the eleven major land resource areas.

MAJOR LAND RESOURCE AREAS SERVED

123 Nashville Basin
128 Southern Appalachian Ridges and Valleys
129 Sand Mountain
130 Blue Ridge
133A Southern Coastal Plain
134 Southern Mississippi Valley Silty Uplands
135 Alabama and Mississippi Blackland Prairies
136 Southern Piedmont
137 Carolina and Georgia Sandhill
152 Gulf Coast Flatwoods
153 Atlantic Coast Flatwoods

Soil Conditions vary widely -- deep droughty sand, heavy plastic clay subject to excessive intermittent wetness and drying, highly acid to alkaline extremes, and swamps and marshes - fresh and salt. Farming enterprises also vary widely. The area contains a number of heavily populated suburban areas surrounding centers of industry and commerce. The mountains, seashore, and other areas of natural beauty are being rapidly developed to meet the demand for recreation.
Such diversity of climate, soil, and enterprises requires many different types and kinds of vegetation to provide for protecting the land when it is properly treated for soil and water conservation.

Summary of Weather Conditions- Jimmy Carter PMC-2010
1929-2010

	TEMPERATURE (°F)		PRECIPITATION (Inches)			
Month	**2010 Average High**	**2010 Average Low**	**Month Total 2010**	**81 Year Average**	**81 Year High Month**	**81 Year Low Month**
January	52	29	10.5	4.37	11.19	.64
February	52	30	2.49	4.50	12.28	.56
March	63	40	3.57	5.26	12.11	.28
April	78	51	1.88	3.80	12.26	.00
May	85	63	5.19	3.27	8.35	0.0
June	91	70	4.69	4.31	11.69	.03
July	93	69	1.09	5.16	24.79	1.09
August	93	72	3.48	4.26	12.18	.99
Sept	90	63	2.03	3.45	14.00	.10
October	80	50	1.16	2.12	9.60	.00
Nov	69	41	1.44	2.99	10.63	.05
Dec	53	26	1.90	4.30	14.7	.42
Total	-	-	39.42	47.79		

PROJECT 13I128R - EVALUATION AND INCREASE OF BIG BLUESTEM (*ANDROPOGON GERARDII*)

INTRODUCTION:

Big bluestem (*Andropogon gerardii*) is a perennial, warm season grass. It is cross-pollinated and has several ploidy levels (X = 20, 40, 60). Big bluestem is photoperiod sensitive. It is widely distributed in the United States. It occurs in tall grass prairies of the Midwest as well as in forested areas of the southeast. It also has potential for other conservation concerns, such as, wildlife habitat improvement (WHIP), farm bill implementation, erosion control, and warm season native forages. It has been utilized for forage and hay production. This study attempts to evaluate big bluestem ecotypes for cultivar development for the Southeast.

MATERIALS AND METHODS:

In 1989-1990, the PMC assembled 750 vegetative ecotypes of southeastern big bluestems. These ecotypes were placed into an initial evaluation block. Each entry was planted to ten-foot rows with one foot between clones. All entries were separated by three-foot middles. Each entry was replicated twice.

RESULTS AND DISCUSSION:

In 1990 and 1991, the evaluation process began. The following were the evaluation criteria: 1) vigor, 2) stem color, 3) inflorescence color, 4) foliage amount, 5) foliage height (cm), 6) foliage color, 7) forage potential, 8) disease/insect resistance, 9) boot date, bloom date, maturing date, and percent germ, 10) seed amount, 11) uniformity, 12) leaves height on stem, 13) total height, 14) stem size, 15) tillering, 16) steminess, 17) basal foliage, 18) lodging, 19) late maturity.

In spring 1992, Dr. Edzard van Santen of Auburn University began a cooperative big bluestem study with the Jimmy Carter PMC. The following criteria were added to the existing evaluation process: 1) percent stand, 2) forage mass, 3) greening up date, 4) biomass at flowering (green weight and dry weight), 5) surface area of plot, 6) morphological data, and 7) % ADF of stem.

In June 1993, four pairs of cow/calf units were allowed to graze the big bluestem area. Cattle were removed and Dr. van Santen evaluated the cattle's preference for specific ecotypes. After regrowth, cattle were again allowed to graze the vegetation down to 8-inch stubble residues.

Dr. van Santen's data was processed and determined which ecotypes were selected for **'biomass type'** crossing blocks in 1994. These blocks should produce germplasm for comparison testing against a standard big bluestem cultivar. The three blocks consist of early maturing ecotypes, late maturing ecotypes and median maturing ecotypes.
Early maturing crossing block
Lines - 23, 52, 54, 62, 71, 78, 81, 84, 94, 97, 140, 142, 161, 231, 260, 305, 322, 336, 351, 368, 481, 484, 542, 561, 578, 595, 624, 661, 676, 704,719
Median maturing crossing block
Lines - 1, 7, 10, 18, 20, 38, 44, 57, 61, 69, 75, 77, 85, 88, 89, 91, 93, 111, 116, 159, 200, 204, 223, 373, 432, 438, 452, 496, 497, 513, 532, 560, 580, 592, 598, 627, 689, 691, 709, 738
Late maturing crossing block
Lines - 4, 14, 32, 42, 46, 48, 50, 58, 59, 66, 73, 76, 98, 99, 106, 107, 122, 123, 124, 126, 127, 130, 131, 134, 143, 366, 399, 406, 692

Each line was represented by three replications per crossing block to ensure proper pollination.

In 1995, seed was collected from the three-biomass crossing blocks. All seed collected expressed high dormancy characteristics. Dr. van Santen worked to resolve this seed dormancy problem.
In March 1998, Dr. van Santen determined which ecotypes should constitute crossing blocks for production of big bluestem '**forage type**' germplasm. The crossing blocks consist of early maturing ecotypes, median maturing ecotypes and late maturing ecotypes. Each line was replicated three times per crossing block to ensure proper pollination.

Early maturing crossing block
Lines - 15, 84, 105, 110, 135, 136, 140, 154, 166, 179, 198, 215, 216, 218, 245, 247, 260, 290, 297, 361, 364, 385, 389, 397, 436, 439, 455, 484, 488, 500, 548, 561, 568, 641, 661, 693, 707, 743.

Median maturing crossing block
Lines - 7, 17, 18, 26, 77, 114, 155, 181, 200, 214, 228, 234, 252, 266, 296, 328, 334, 377, 414, 420, 446, 447, 472, 482, 505, 510, 520, 524, 537, 559, 569, 584, 649, 651, 689, 700, 717, 725.

Late maturing crossing block
Lines - 3, 4, 14, 42, 46, 49, 59, 60, 66, 90, 98, 122, 124, 126, 131, 144, 170, 206, 219, 249, 254, 261, 298, 312, 325, 333, 341, 362, 366, 406, 426, 540, 575, 635, 658, 678, 679, 747.

In 2001 wildlife biologists with NRCS selected big bluestem lines to constitute a **wildlife type** big bluestem seed production block.

In 2004 late maturing seed was collected and tested for germination and seedling vigor. Results indicate very little seed fill and germination. Therefore in 2005 the PMC altered the cultural techniques used on the big bluestem fields. Fields were burned during growing season instead of dormant season to stimulate inflorescence production and sprayed in summer with insecticide to prevent possible insect (midges) infestation of the seed heads. Seed was harvested in October 25, 2005. This seed showed very little germ % in seed laboratory results. In **2006** seed production fields were **not burned** or **sprayed** for insects. Seed laboratory results for late maturing **forage and biomass** big bluestem were pure seed 13.91%, **germination 37%**. **Wildlife selection** pure seed was 14.75 % and **germination 54%**. Due to these improved seed germination results**, Dr van Santen of Auburn University** planted the forage/biomass and the wildlife seed to the greenhouses at the Auburn University in late summer 2007. The PMC **transplanted the resulting big bluestem seedlings to the field** in Americus in **August 2007**. Seedlings from the same lots were also planted at Auburn University. In **2008** seed from these field plantings were collected and planted in **March 2009 at the PMC** to expand the seed production fields. If seed collected in **2010** from these blocks produce enough viable seed they will be used in a replicated biomass study with standards for comparison .

Big Bluestem Seed Increase at the Jimmy Carter PMC

COASTAL PLAIN GRAZING SYSTEM DEMONSTRATION

INTRODUCTION:

In 2008 Dr Dennis Chessman (Grazing Specialist NRCS Georgia) with assistance from GLCI funds helped repair and install fencing on existing PMC pastures. Several existing projects (13A142R-Grazing Management of 'Pete' Eastern Gamagrass, 13A144R-Grazing Management of 'Americus' Yellow Indiangrass, 13A151B-Silvopasture Demonstration Project, 13A152R-Rotational Grazing Management of a Mixed Native Grass Pasture (switchgrass,big bluestem, little bluestem and indiangrass) were combined into a comprehensive year long rotational grazing system. Prior information on each pasture project is available in previous Annual Technical Reports (ATR). This ATR contains basic background information on each of these projects. In addition to the existing projects, pastures of 1) common bermudagrass, 2) common bermudagrass/ 'Pensacola' Bahiagrass and 3) 'Ky-31' tall fescue pastures were included into the rotation This ATR will give a summary of the pastures involved in the year round system , with additional information from Dr Mary Goodman (Auburn University) concerning the Silvopasture project. If necessary in the future each of the pasture projects can again be evaluated as individual studies as in past years. The following is a summary of the rotational pasture system for 2008-2010.

MATERIALS AND METHODS:

Perimeter energized fence was completed around approximately 50 acres at the Jimmy Carter PMC in January, 2008. The 50 acres are divided into paddocks, each of which consists of a different forage plant community. Primary species in each of the paddocks are as follows: 1) common bermudagrass, 2) Open common bermudagrass/ 'Pensacola'bahiagrass, 3) 'Ky-31'tall fescue, 4)'Pensacola' bahiagrass in longleaf pine silvopasture, 5) mixed native warm-season grasses (NWSG), dominate 'Alamo' switchgrass 6) 'Americus' Indiangrass, and 7)'Pete' eastern gammagrass. October **2007**, approximately 35 acres of the system (open common bermudagrass/ 'Pensacola' bahiagrass and 'Pensacola' bahiagrass in longleaf pine silvopasture) were planted with cereal rye and crimson clover to provide winter pasture. On March 31, **2008**, twenty-two mostly Angus beef cows with calves were introduced to the system. Cattle grazed the winter pasture until warm-season species were available. Herd residence time in a paddock was 6 to 10 days. The native warm season grasses were grazed to a height of approximately 8 inches, then, depending on species, allowed to re-grow for 25 to 45 days before re-grazing. Introduced species were grazed to 2 to 3 inches then allowed to re-grow at least 30 days depending on rainfall.

The open common bermudagrass/'Pensacola' Bahiagrass and 'Pensacola' bahiagrass in silvopasture paddocks were over-seeded in November **2008** with a mixture of rye, crimson clover and annual ryegrass. A 'Coastal' bermudagrass hay field on the north end of the PMC was cut and bailed for winter use. A new 6 acre pasture of pearl millet was planted late May **2009** .

October **2009** PMC over seeded ryegrass/ crimson clover to 25 acres of open common bermudagrass/ 'Pensacola' bahiagrass and 'Pensacola bahiagrass' in the silvopasture. Also October **2009** grazing brassica (turnip) was planted to 6 acres of new pasture.

October **2010** rye, ryegrass, red clover, crimson clover, and arrowleaf clover was seeded to 25 acres of open common bermudagrass/'Pensacola bahiagrass and 'Pensacola' bahiagrass in the silvopasture.

Also in **October 2010** the turnip field was seeded to Max-Q fescue and Durana white clover.

RESULTS AND DISCUSSION:

Average daily gain on calves between 31 March and 1 July **2008** was 2.3 lbs. Below are representative values for crude protein and digestible OM for the various forages at different times of the year.

Data was obtained from fecal sample analysis

Table1. NIRS Fecal Analysis 2008

Forage	Date	Crude Protein (%)	DOM (%)
Pensacola Bahiagrass in Silvopasture with winter seeding	4/21/08	16.7	66.0
Mixed NWSG-Dominate Alamo Switchgrass	5/07/08	16.7	63.1
Pete Eastern Gammagrass	5/15/08	14.4	67.2
Mixed NWSG-Dominate Alamo Switchgrass	7/7/08	8.5	62.3
Americus Indiangrass	8/7/08	9.9	66.0
Pensacola Bahiagrass in Silvopasture	8/20/08	10.4	64.5
Pete Eastern Gamagrass	9/20/08	10.7	65.7

All cows calved during January and February **2009**.The same grazing protocol used in 2008 was followed in 2009. Twenty – one mostly Angus beef cows with calves utilized the system. Calves produced an average daily gain of 2.2 lbs. from birth to weaning during July **2009.**

Cattle Grazing Pearl Millet (left) and Eastern Gamagrass (Right)

Below are values of crude protein and total digestible nutrients (TDN) obtained from fecal sample analysis.

Table 2. NIRS Fecal Analysis 2009

Forage	Date	Crude Protein (%)	TDN (%)
Coastal Bermudagrass Hay	2/18/09	7.7	60
Open Common Bermudagrass/Pensacola Bahiagrass with winter seeding	3/30/09	17.7	68
Pete Eastern Gamagrass	5/4/09	11.9	70
Mixed NWSG-Dominate Alamo Switchgrass	5/12/09	12.6	68
Pensacola Bahiagrass in Silvopasture with winter seeding	5/15/09	14.6	66
Open Common Bermudagrass/Pensacola bahiagrass with winter seeding	5/28/09	12.8	67
Pete Eastern Gamagrass	6/9/09	8.7	65
Mixed NWSG-Dominant Alamo Switchgrass	6/22/09	11.7	66
Pensacola Bahiagrass in Silvopasture with winter seeding	6/30/09	6.0	65
Open Common Bermudagrass/Pensacola Bahiagrass	7/9/09	11.6	69
Pearl Millet	7/20/09	15.1	71
Americus Indiangrass	7/26/09	7.2	65.2
Pete Eastern Gamagrass	8/2/09	10.6	67
Pensacola Bahiagrass in Silvopasture	8/14/09	8.4	60
Stockpiled Common Bermudagrass	11/15/09	10.1	59
Stockpiled KY- 31 Tall Fescue	12/16/09	9.0	57

In 2010, a turnip pasture was fenced into 4 paddocks and grazed on 1-2 day grazing periods. Other pastures averaged 6-7 day grazing periods with 4 grazing cycles during growing seasons. All cows calved during January and February **2010**. Twenty – one mostly Angus beef cows with calves utilized the system. Calves produced an average daily gain of 2.21 lbs. from birth to weaning during July **2010.**
Below are values of crude protein and digestible organic matter (DOM) obtained from fecal sample analysis.

Table 3. NIRS Fecal Analysis 2010

Forage	Date	Crude Protein (%)	DOM (%)
Turnip Pasture/ Pensacola bahia hay	2/17/10	9.79	56.76
Turnip Pasture/Pensacola bahia hay	2/19/10	8.71	57.63
Turnip Pasture/Pensacola bahia hay	2/22/10	9.38	56.20
Turnip Pasture/Pensacola bahia hay	2/24/10	8.91	58.29
Turnip Pasture/Pensacola bahia hay	2/26/10	9.94	61.91
Silvopasture-bahiagrass-crimson clover-ryegrass	3/15/10	11.51	60.1
Silvopasture-bahiagrass-crimson clover-ryegrass	3/18/10	12.06	59.81
Silvopasture-bahiagrass-crimson clover-ryegrass	3/22/10	11.91	59.84
Open common bermudagrass-bahiagrass-crimson clover-ryegrass	3/25/10	11.31	59.1
Silvopasture-bahiagrass-crimson clover-ryegrass	5/04/10	12.75	62.61
Pete eastern gamagrass	5/21/10	8.84	63.19
Silvopasture-bahiagrass-crimson clover-ryegrass	6/17/10	9.1	58.78
Silvopasture-bahiagrass-crimson clover-ryegrass	6/22/10	9.54	59.45
Silvopasture-bahiagrass-crimson clover-ryegrass	6/25/10	10.48	59.26
Mixed NWSG – Dominant Alamo switchgrass	7/6/10	5.85	58.8
Pete eastern gamagrass	7/10/10	11.34	63.44
Open bermudagrass-bahiagrass	8/06/10	8.18	61.05
Silvopasture-bahiagrass	8/10/10	10.31	61.71
Open bermudagrass-bahiagrass	8/20/10	9.17	60.74

Table 3 continued

Forage	Date	Crude Protein (%)	DOM (%)
Mixed NWSG – Dominant Alamo switchgrass	9/10/10	6.41	57.36
Pete eastern gamagrass	9/17/10	5.97	58.50
Americus Indiangrass	9/24/10	6.79	60.38
Ky-31 Tall fescue	10/10/10	7.03	57.33
Open bermudagrass-bahiagrass	10/24/10	8.28	58.35
Stockpiled bermudagrass hay	11/80/10	10.99	59.82
Ky-31 Tall fescue	11/17/10	8.30	57.03
Ky-31 Tall fescue	11/19/10	9.03	56.42
Pete eastern gamagrass	12/07/10	9.67	57.93
Pete eastern gamagrass	1/07/11	5.50	56.89

PROJECT 13A142R - GRAZING MANAGEMENT OF EASTERN GAMAGRASS

INTRODUCTION:

Eastern gamagrass, *Tripsacum dactyloides*, is a warm-season, native, perennial grass suited to most of the Eastern United States. One of its potential uses is forage for livestock. The Jimmy Carter Plant Materials Center in Americus, Georgia is demonstrating intensive grazing management of this plant. The uses of eastern gamagrass are grazing land, wildlife habitat improvement, critical area stabilization, biofuels, alternative fuels, streambank stabilization, nutrient reclamation/uptake, filter strip, conservation buffers, and urban conservation.

MATERIALS AND METHODS:

In the spring of 1993, a 4.5 acre field of Eastern gamagrass, (variety 'Pete'), was planted in 36 inch rows using a corn planter. This 4.5-acre pasture was allowed to establish through 1994 and into 1995.

This demonstration is located on the northwest side of the town of Americus, Georgia, where mean annual precipitation is 125 cm (about 49"), and the mean annual temperature is 18.5 degrees Celsius (about 65.3 degrees Fahrenheit).

The demonstration site is divided into ten paddocks, approximately 0.2 hectares (about 0.45 acre) each, using a single strand of electric fence wire about 90 cm high. Water is provided to each paddock using one inch black plastic pipe and 60 gallon portable water trough. The water source is Muckalee Creek.

PROJECT 13A144R - GRAZING MANAGEMENT OF YELLOW INDIANGRASS (*SORGHASTRUM NUTANS*)

INTRODUCTION:
Yellow indiangrass (*Sorghastrum nutans*) is a native perennial warm season grass. It can be utilized for forage and hay production. This test attempts to demonstrate the use of a PMC selection known as 'Americus'. Emphasis will be placed upon establishment and management techniques for forage production for the Southeast.

MATERIALS AND METHODS:

In the fall of 1993, a three-acre bahiagrass pasture was sprayed with Roundup. In February 1994, the pasture was disked. In March 1994, 450#/Ac of 0-14-14 fertilizer was applied. On May 5, 1994 the pasture area was disked and cultipacked to firm the seedbed. 'Americus' Indiangrass seed was applied with a Solo fertilizer spreader set on No. 24 for a 12-14 foot swath. The rate of seeding was 25 #/Ac or 10# pls/Ac. The area was then cultipacked perpendicular to original cultipacking for proper seed covering. In June 1994, broadleaf weeds were sprayed with 2-4-D at a rate of 1 qt/Ac. A good stand of indiangrass was observed during the summers of 1995 - 1996.

PROJECT 13A151B - SILVOPASTURE DEMONSTRATION PROJECT

INTRODUCTION:

In past years, silvopasture studies were conducted by various research institutions in the southeast. They found that tree production and cattle production could be accomplished in one management regime. However, there is a lack of silvopasture demonstration at the present time. This study was established to demonstrate the establishment, management and maintenance of a system designed to produce several valuable products (cattle, pasture, and trees) over the long-term.

MATERIALS AND METHODS:

In 2000, longleaf pine trees were planted on the PMC. Containerized trees were planted on 6 foot spacing within a row with 10 feet between double rows and 40 feet between outside rows. Tree density was about 290 trees/Ac. Trees were planted into existing 'Pensacola' bahiagrass mixed pasture. Pasture was sprayed to reduce grass competition. Spraying was continued in 2002. **Dr. Goodman of Auburn University** is working with the PMC to produce maximum data and knowledge from this study concerning forage production, forage composition, and soil characteristics.

RESULTS AND DISCUSSION:

Southern-pine silvopasture can be established by thinning an existing forest plantation then adding or improving a forage component, or by adding low densities of trees to existing pasture. Studies in mature loblolly (Pinus taeda L.) pine silvopasture (26 years) developed from a thinned plantation on the Western Coastal Plain of Louisiana, USA estimated higher forage biomass production for open-pasture versus silvopasture. However, little is known about temporal and spatial dynamics of forage productivity and soil quality in permanent pastures being converted to silvopasture on the Southern Coastal Plain of the Southeastern USA. The objectives of this research were to determine the impact of nitrogen (N) source (legume-N versus fertilizer-N), pasture type (silvopasture versus open-pasture), and alley position relative to trees in young Southern Coastal Plain silvopasture on (1) forage productivity and quality; (2) soil aggregate stability, density of fungal hyphae, and soil penetration resistance. This research was conducted in a randomized complete block design with three replications from 2005 to 2007 at Americus, Georgia, USA in a young longleaf pine (Pinus palustris Mill.)-bahiagrass (Paspalum notatum Flugge) silvopasture and adjoining bahiagrass pasture without trees (open-pasture). Treatments included either fertilizer-N or overseeded crimson clover (Trifolium incarnatum L. 'Dixie'). Silvopasture forage parameters were monitored at two (2005: 1.0 and 6.1 m) or three (2006–2007: 1.0, 3.5, and 6.1 m) alley positions relative to the tree base; soil parameters were monitored at two alley positions (1.0 and 6.1 m). Cool season (April or May) forage biomass was 40% higher and forage N concentration 27% higher for the legume-N

versus fertilizer-N treatment. When compared to the 3.5- or 6.1-m alley positions, forage productivity at the 1.0-m alley position decreased when the pines were 6 years old. Lower N and higher acid detergent fiber (ADF) levels were found in forage from silvopasture versus open-pasture in August 2006, and July and September 2007, the result of pine straw accumulation in the forage alleys. Water stable aggregates were 5% lower in silvopasture versus open-pasture. Soil penetration resistance was lower in silvopasture versus open-pasture at 10–15- and 15–20-cm in 2005, and at 15–20-cm in 2007. This research found that forage productivity and forage and soil quality can be improved, and N fertilizer additions replaced by introduction and maintenance of crimson clover into young longleaf pinebahiagrass silvopasture during the hay-production period of pasture to silvopasture conversion on Southern Coastal Plain soil in the Southeastern USA.

PROJECT 13A152R- ROTATIONAL GRAZING MANAGEMENT OF A MIXED NATIVE GRASS PASTURE

INTRODUCTION:

Native grass pasture systems are used commonly in the Midwestern U.S. However, these systems are rarely utilized in the Southeastern United States. This study attempts to establish a mixture of native warm season grasses and to demonstrate their use in a managed rotational grazing system.

MATERIALS AND METHODS:

In April 2001 the PMC planted a 5-acre native mixed grass pasture using a Truax no-till drill. Since the planting area is sandy soil, a cover of oats was grown to stabilize the soil. Before planting the warm season grasses, the oats were sprayed with herbicide. The oat field was not mowed before planting because the mowed debris can interfere with the planting mechanisms of the planter. The oats were not completely killed before planting. Drill was set to plant switchgrass ('Cave in Rock' and 'Alamo' combined) at 4 # pls/Ac, 'Americus' indiangrass at 2.5 # pls/Ac, Oklahoma selection of little bluestem at 4.1 # pls/Ac, and 'Earl' big bluestem at 2.5 # pls/Ac. Each year the entire pasture is burned.

Cattle Grazing Mixed Native Grass Pasture

PROJECT 13A150R - QUANTITATIVE AND QUALITATIVE RESPONSE OF NATIVE GRASSES VERSUS INTRODUCED WARM SEASON PASTURE PLANTS AS INFLUENCED BY DIFFERENT BURN REGIMES

INTRODUCTION:

Very little comparative testing between native and introduced warm season forage plants has been documented in the Southeastern United States. This test attempts to establish, evaluate, and analyze different warm season pasture plants and mixtures subjected to different burn regimes. Data should provide qualitative and quantitative information relative to native and introduced pasture species performance in different burn management regimes. The response variable is species composition. This is a cooperative effort between the NRCS and Dr. Mary S. Goodman of Auburn University.

MATERIALS AND METHODS:

On May 6, 1997, the following experimental split plot design was established:
Split plot (cultivars) with main plots (burn regime) in RBD with three (3) reps. Main plots (50' x 300') are burn #1 and burn #2. Split plots (50' x 50') are six cultivars and cultivar mixes. (1) pure 'Cave-In-Rock' switchgrass (2) pure 'Earl' big bluestem , (3) pure 'coastal' bermudagrass, (4) pure 'Pensacola' bahiagrass, (5) a mixture of 30% "Oklahoma Select" little bluestem, 25% "Earl" big bluestem, 20% 'Americus' indiangrass, and 25% "Cave in Rock" switchgrass, (6) a mixture of 50% little bluestem and 50% 'Serala' lespedeza. Grass seeds were planted at a rate of 10 # PLS/Acre and coastal bermuda-grass was planted at a rate of .15 Bu/120 sq. ft. Serala lespedeza was seeded at 20 #/Acre.

RESULTS AND DISCUSSION:

PHASE I

In 1998 all plots were burned. Since 1999, burn #1 plots were burned every year and burn #2 plots burned every two years during dormant season. In 1998 - 2002, percent species composition was recorded for each plot. In 1999- 2002, species frequency was recorded for each plot. Dr. Mary S.Goodman conducted analysis of percent species composition and species frequency. **The following is an abstract from a poster based on this study presented by Dr Goodman and the PMC at the Second National Conference on Grazing Lands held in Nashville Tennessee December 7-10 2003.**
Accumulation of desirable canopy cover is necessary during pasture establishment to protect pasture soil and provide optimum forage quantity and quality. The objective of this study was to evaluate long-term responses of desirable and invasive cover components of forage swards to burn frequency during pasture establishment in a humid, southeastern environment. Forages were sown or sprigged spring 1997 at Americus Ga. in 6 blocks of six 50 by 50 foot plots that included (a) little bluestem +big bluestem +switchgrass +indiangrass (b) little bluestem + serecia lespedeza (c) bahiagrass (d) bermudagrass (e) big bluestem (f) switchgrass. All blocks were burned spring 1998; thereafter, one-half of the blocks were burned every, and one-half every-other year. Percent canopy cover was estimated each fall (1998-2002) and analyzed as a split plot design with year after establishment the main plots; burn frequency the subplots. Percentages of 70-yr average rainfall (48in) for 1997 to 2002 were 117, 92,60, 77, 100, 98, respectively. Burn frequency had significant and varying impacts on cover of specific desirable and invasive species and these impacts often occurred in interaction with impacts of year after establishment and mixture. For example, little bluestem cover in first mix was not different in year 1 (13%) versus year 5 (17%) after establishment if the mix was burned every year. However, when burned every other year, little bluestem cover in first mix was higher (P=. 016) in year 5 (38%) versus year 1 (16%). In second mix little bluestem cover was higher (P=.010) after year 5 when burned every year (32%) versus every other year (16%). Also bahiagrass as an invasive was reduced after year 5 compared to year 1 in some cases. During pasture establishment, desirable and invasive cover components responded positively and negatively to burn frequency over time and these responses varied within a species when sown in different mixtures.

PHASE II

The **burning regime** for the study was changed in 2004 from a **cool season burn** to a **growing season burn (May-June).** Also **burning frequency** was changed from burn every year and burns every other year to **burn every year and burn every third year**. 2004 was the establishment year. The first cycle for burn every third year was conducted in 2007. Percent species composition was recorded from all plots .Data was analyzed in an ANOVA for **2004-2010**.Data was analyzed utilizing year as main plot and burn frequency as sub –plot. All data was analyzed using LSD comparison at $p<0.05$. Due to lack of personnel burn was late in 2006 (August 2006). In 2010 'Cave in Rock' switchgrass in a 4 way mixture was not analyzed due to excessive missing data. It appears to show lack of adaptability to the study area.

Data in **Table 1** indicate that 'Earl' big bluestem in a monoculture produces higher % composition when burned every third year as opposed to burning every year. This could be a response to a pulse of available accumulated nutrients after the third year fire. The % composition has maintained a similar level over the past five years. The data was transformed to smooth distribution points.

Data in **Table 2** indicate 'Pensacola' Bahiagrass in a monoculture is able to exhibit good % composition over 7 years of this study with no burn effect observed.

The 'Cave in Rock' Switchgrass monoculture (**Table 3**) data did not display a normal distribution and no statistic was determined. However, there is a trend that indicates burning every year reduces the switchgrass % composition as opposed to burning every third year. Also a trend for deduced % composition over time indicates 'Cave in Rock' switchgrass is not adapted well to the study area.

Growing Season Burn June 6

Table 4 The data for 'Oklahoma Select' Little bluestem in a 4 way mixture indicates an increase of little bluestem % composition with a burn regime of every third year. This is a similar response observed in "Earl' big bluestem monoculture plots. A level % composition has been maintained through the entire 7 year study. The data was transformed to smooth distribution points.

Tab**le 5** Data indicates no difference in % composition of 'Earl' big bluestems in a 4 way mixture due to burn regime. There is also no difference between the years of study. 'Earl' big bluestem did express a response to the 3 year burn regime in a monoculture. The grass mixture may buffer some of the effect of burn regime differences. The data was transformed to smooth distribution points.

Graph 1 Shows data of 'Americus' indiangrass % composition in a 4 way mixture. Since an interaction occurred between burn and year the data was analyzed for simple effect means of the interaction. In 2007 the first burn cycle for burn every third year fire regime was begun. This resulted in a significant decrease in % indiangrass composition for this regime compared to burning every year regime. The accumulation of vegetative material could have produced a more intense burn on the burn every third year burn regime and reduced the % composition compared to the burn every year burn regime. The other years show no difference between the burn regimes even in 2010 when every third year burn regime was conducted again.

The positive or negative response to different fire regimes depends on the particular type of grass and the plant association.

Table 1. Percent Composition of 'Earl' Big Bluestem Monoculture Burned Every Year and Every Third Year During Growing Season ,USDA-NRCS Jimmy Carter Plant Materials Center, Americus, Ga. 2004-2010

Burn Regime [1/]	2004	2005	2006	2007	2008	2009	2010	Mean
	---------- %----------							
Year 1	71.43	75.93	51.00	53.67	54.33	51.77	46.00	57.73 b
Year 3	67.73	71.23	67.57	67.37	72.67	70.87	68.00	69.35a
Mean	69.58 ab[2/]	73.58a	59.28c	60.52c	63.50bc	61.32c	57.00c	

1/- burn regime—Year 1=burn every year in growing season; Year 3 = burn every third year in growing season 2/- means in rows and columns followed by the same letters are not statistically significant at P<0.05

Table 2. Percent Composition of 'Pensacola' Bahiagrass Monoculture Burned Every Year and Every Third Year During Growing Season ,USDA-NRCS Jimmy Carter Plant Materials Center, Americus, Ga. 2004-2010

Burn Regime [1/]	2004	2005	2006	2007	2008	2009	2010	Mean
	---------- %----------							
Year 1	80.70	76.23	65.87	60.37	53.67	55.73	55.33	63.99a
Year 3	71.47	64.80	61.43	76.20	60.67	65.50	74.00	67.72a
Mean	76.08 a[2/]	70.52ab	63.65bc	68.28ab	57.17c	60.62bc	64.67bc	

1/- burn regime—Year 1=burn every year in growing season; Year 3 = burn every third year in growing season 2/- means in rows and columns followed by the same letters are not statistically significant at P<0.05

Table 3. Percent Composition of 'Cave in Rock' Switchgrass Monoculture Burned Every Year and Every Third Year During Growing Season ,USDA-NRCS Jimmy Carter Plant Materials Center, Americus, Ga. 2004-2010

Burn Regime [1/]	2004	2005	2006	2007	2008	2009	2010	Mean
	---------- %----------							
Year 1	8.57	4.20	1.33	1.33	0.67	0.0	0.0	2.30
Year 3	34.0	31.53	24.57	13.47	13.33	6.13	4.33	18.20
Mean	21.28	17.87	12.95	7.4	7.00	3.07	2.17	

1/- burn regime—Year 1=burn every year in growing season; Year 3 = burn every third year in growing season

Table 4. Percent Composition of 'Oklahoma Select' Little Bluestem in 4-Way Mixture Burned Every Year and Every Third Year During Growing Season ,USDA-NRCS Jimmy Carter Plant Materials Center, Americus, Ga. 2004-2010

Burn Regime [1/]	2004	2005	2006	2007	2008	2009	2010	Mean
	---------- %----------							
Year 1	13.03	12.30	6.07	10.57	12.33	8.67	10.33	10.47 b
Year 3	12.97	12.10	18.03	17.23	22.67	28.07	14.33	17.91a
Mean	13.00 a[2/]	12.20a	12.05a	13.90a	17.50a	18.37a	12.33a	

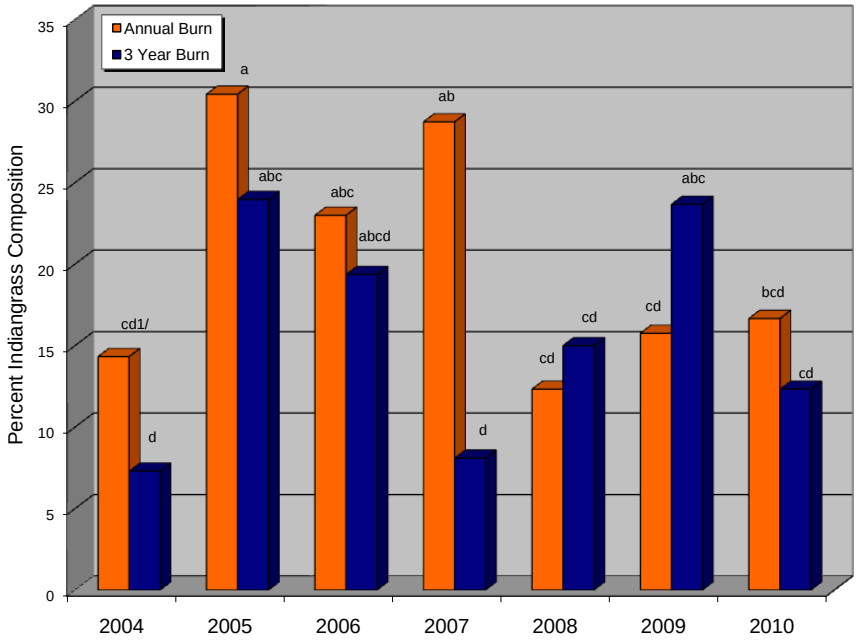
1/- burn regime—Year 1=burn every year in growing season; Year 3 = burn every third year in growing season 2/- means in rows and columns followed by the same letters are not statistically significant at P<0.05

Table 5. Percent Composition of 'Earl' Big Bluestem in 4-Way Mixture Burned Every Year and Every Third Year During Growing Season ,USDA-NRCS Jimmy Carter Plant Materials Center, Americus, Ga. 2004-2010

Burn Regime [1/]	2004	2005	2006	2007	2008	2009	2010	Mean
	---------- %----------							
Year 1	16.47	14.07	8.83	5.03	13.00	9.60	7.67	10.67 a
Year 3	12.50	8.07	9.13	7.67	13.67	12.27	18.00	11.62a
Mean	14.48 a[2/]	11.07a	8.98a	6.35a	13.33a	10.93a	12.83a	

1/- burn regime—Year 1=burn every year in growing season; Year 3 = burn every third year in growing season 2/- means in rows and columns followed by the same letters are not statistically significant at P<0.05

Graph1. Percent Composition of 'Americus' Indiangrass in 4-Way Mixture Burned Every Year and Every Third Year During Growing Season, USDA-NRCS Jimmy Carter Plant Materials Center, Americus, GA, 2004-2010



1/Bars with same letters are not statistically significant at P<0.05

PROJECT GAPMC-T-0154-CP ALTERNATIVE CROPS FOR SMALL FARMER'S DEMO AT THE JIMMY CARTER PMC (PHARMACEUTICAL PLANTS)

INTRODUCTION:

Humans have utilized plants for thousands of years. For example therapeutic agents for treating many aliments are derived from various herbs. Several plants produce economically important organic compounds such as **phytochemicals** and pesticides. The USDA-ARS is looking at many legumes for pharmaceutical purposes such as velveteen (contains **L-DOPA**, which is used to treat **Parkinson's disease**). Dr. Morris with ARS (Griffin Georgia) states many obscure legumes can provide valuable multiple resources in addition to medicines such as human food, animal feed, cover crops, green manure and erosion control. This study will attempt to assemble, grow, increase and demonstrate new and different crops for small farmers. These farmers will subsequently produce valuable plant material for many uses including medicine, food, and conservation.

MATERIALS AND METHODS:

Pharmaceutical plants that do not produce much seed at Griffin Georgia (ARS) are grown in rod rows at the JCPMC for seed increase and morphological information.

RESULTS AND DISCUSSION:

In 2010 the PMC planted and grew 9 *Lablab purpureus* accessions and 1 *Canavalia ensiformis.* The *Lablab purpureus* did not bloom early enough to make seed. However, the *Canavalia ensiformis* did bloom and seed was collected for Dr. Morris.

PROJECT GAPMC-T-0155-GW CARBON SEQUESTRATION STUDY

INTRODUCTION:

Concerns over global warming have increased interest in carbon and carbon sequestration. Scientists estimate agriculture is responsible for about 7 % of the total U. S. contribution of greenhouse gases. Plants remove carbon dioxide from the atmosphere and store it in plant parts as carbon. When plants die and decompose some carbon is released back to the atmosphere while some is sequestered as soil carbon, especially under conservation tillage systems. This amounts to a natural giant carbon storage sink. This study will compare perennial crops ability to sequester carbon. This will be determined by soil organic matter testing of several entries in a long-term study.

MATERIALS AND METHODS:

A randomized complete block design with four replications was planted to 'Earl' big bluestem, 'Iuka' eastern gamagrass and 'Alamo' switchgrass in May 2001 with a check of naturalized weed species. Soil organic matter content measured at 0-2 and 2-6 inch depth for each ground cover over time will be the main measured variable.

RESULTS AND DISCUSSION:

Table 1 indicates no difference between ground cover for % soil organic matter sequestered at 0-2 inch depth in 2010. This data was transformed before analysis. Data for 2-6 inch depth was not normally distributed and was therefore not evaluated. It could take another year or two to develop a difference in ground cover % soil organic matter content.

Table 1 Percent Soil Organic Matter Sequestered by Ground Covers Taken from 0 -2 Inch Depth of Carbon Sequestration Study at Jimmy Carter PMC-2010

GROUND COVER	% Soil Organic Matter
'Alamo' Switchgrass	**2.86a**[1]
'Earl'Big Bluestem	**2.92a**
'Iuka' Eastern Gamagrass	**4.64a**
Control (Natural Weed Cover)	**3.04a**
Mean	**3.37**

1 – means in rows and columns followed by the same letters are not statistically significant at P<0.05

PROJECT GAPMC-P-0456-WL LONGLEAF PINE NATIVE UNDER STORY PLANT COLLECTION AND INCREASE STUDY

INTRODUCTION:

The longleaf pine ecosystem of the Southeast is one of the most threatened in the United States. The loss of longleaf pine forests and related plant communities not only jeopardizes the extant plant species but also the native fauna that depend on the resources and structure provided by the vegetation. The objectives of this study are to locate, collect, and grow various native grasses, legumes and forbs which make up the understory vegetation of longleaf pine forest of the southeast United States. Later, seed will be increased for field planting and distribution to growers Any seed produced by small farmers from these native seeds will be marketed for planting on **CRP longleaf pine sites**. Also seed grown by small farmers will be used to **restore natural areas** to longleaf pine and its native understory plant species.

MATERIALS AND METHODS:

Old growth longleaf pine sites have been identified in Southwest Georgia for seed collection. The PMC staff collected longleaf pine understory seed from locations in Worth, Irwin, Miller and Decatur Counties Georgia. The understory vegetation will be grown on upland soil at the JCPMC. The soil series is Orangeburg sandy loam. New Material will be added as needed. Plant Material will be in rod rows, 20 feet long and 6 foot spacing and 10 foot alleys. Seed will then be placed into increase blocks at the PMC for seed production and future use. Since this study is primarily a collection and increase of native understory vegetation for longleaf pine no statistical design will be employed**.**

RESULTS AND DISCUSSION:

The following is a list of **taxa collected in 2004**: Pineywoods Dropseed *Sporobolus junceus*, *Helianthus radula,* Little Bluestem *Schizachyrium scoparium, Lespedeza angustifolia, Lespedeza hirta ,Lespedeza virginica,* Wiregrass *Aristida stricta,* Grass Leaved Golden Aster *Pityopsis adenolepis,* Blue Sage *Salvia* azurea, Sweet Goldenrod *Solidago odora, Crotalaria purshii*, Pencil Flower *Stylosanthes biflora,* Scurf Pea *Psoralea canescens,* Sensitive Brier *Mimosa microphylla*, Goat's Rue *Tephrosia virginiana,* Dollar Plant *Rhynchosia reniformis,* Wild Indigo *Baptisia lanceolata,* Black-Eyed Susan *Rudbeckia hirta, Andropogon gyrans.* In **2005** Queens delight *Stillingia sylvatica* , Split beard bluestem *Andropogon ternarius* , Dusty clover *Lespedeza capitata* , Rattle-box *Crotalaria rotundifolia,* Purple Elephants- foot *Elephantopus nudatus* was added to the seed collection. In **2006** Hairy small- leaf ticktrefoil *Desmodium ciliare* Velvetleaf ticktrefoil *Desmodium viridiflorum*, Pinebarren ticktrefoil *Desmodium strictum,* White– topped aster,*Aster tortifolius* **,** Rattlesnake Master, *Eryngium yuccifolium,* Blazing star *Liatris gracilis,Liatris elegans,Liatris tenuifolia,* Beaked panicum,*Panicum anceps* ,Thoroughwort, *Eupatorium semiserratum, Eupatorium hyssopifolium,* Lopsided indiangrass**,** *Sorghastrum secundum*, Slender bluestem, *Schizachyrium tenerum,* Deers tongue, *Carphephorus odoratissimus,* Black senna, *Seymeria cassioides,* Summer farewell, *Dalea pinnata,* Narrow plumegrass, *Erianthus strictus* and Golden aster, *Chrysopsis gossypina,* was added to the seed collection. In **2007** Ironweed *Veronia angustifolia,* Wild sensitive Plant *Chamaecrista nictitans,* Chinquapin *Castanea pumila,* Slimleaf ticktrefoil *Desmodium tenuifolia,* Panicledleaf ticktrefoil *Desmodium paniculatum,* Stiff ticktrefoil

Desmodium obtusum, Thin paspalum *Paspalum setaceum,* Purpletop *Tridens flavus,* and Throughwort *Eupatorium altissimum,* was added to the seed collection. In **2008** seed was cleaned and land was prepared for seed increase. In **Spring 2009** summer legumes were selected from the seed collection and planted for increase at the PMC. All seed were inoculated and started in greenhouse before transfer to irrigated field plots. Vigor and stand were good in Spring and early summer. In late summer all taxa developed chlorosis and never developed seed. However the following legumes sprouted in Spring **2010.** They produced blooms and seed. Seed was collected from them for future increases.

Longleaf Pine Understory Legumes Producing Seed in 2010

Taxa	Origin of Seed
Crotalaria purshii	Worth Co Ga
Crotalaria purshii	Irwin Co Ga
Rhynchosia reniformis	Worth Co Ga
Rhynchosia reniformis	Irwin Co Ga
Desmodium viridiflorum	Miller Co Ga
Desmodium paniculatum	Worth Co Ga
Desmodium tenuifolium	Worth Co Ga
Desmodium ciliare	Worth Co Ga
Desmodium strictum	Worth Co Ga

Seed Collection in Worth Co Georgia

Also in **2010** taxa of the following composite plants were planted for increase at the PMC. No seed was produced during this first year. However, the composite field will be monitored for seed production in 2011.

Longleaf Pine Understory Composites Planted in 2010

Taxa	Origin of Seed
Eupatorium hyssopifolium	Worth Co Ga
Eupatorium hyssopifolium	Miller Co Ga
Solidago odora	Worth Co Ga
Eupatorium album	Worth Co Ga
Helianthus radula	Worth Co Ga

PROJECT GAPMC-T-0758-WL RESTORATION STUDY FOR ENHANCEMENT OF BOBWHITE QUAIL HABITAT

INTRODUCTION:

Native warm season grasses and forbs constitute a major source of food, shelter and structure for bobwhite quail populations. However modern farming practices in the Southeastern U.S. have eliminated much of this habitat. Efforts such as this project at Jimmy Carter PMC and also at private sites in the entire region will demonstrate modification of conventional farming systems to enhance wildlife and upland bird habitat.

MATERIALS AND METHODS:

The site at the JCPMC for this restoration project and demonstration is on 10 acres of bahiagrass-bermudagrass pasture and hayland. The soil series is Orangeburg sandy loam. The first phase of the restoration is the elimination of competitive vegetation by use of herbicides and disking. Next, native warm season grasses and forbs were planted to the site. Shrubs may also be added at a later date. Once a stand of desirable vegetation has been established wildlife habitat rankings will be determined by wildlife biologists.
In October 2006 PMC personnel applied chopper, plateau ,and BASF 693 to the restoration site to eliminate competitive vegetation. In June 2007 journey was applied to the remaining pasture vegetation. In summer /fall 2007 the pasture was 95% free of competitive vegetation. All seed used in the study were Southeastern ecotypes from a native plant seed company. In Feburary 2008 half of the treated pasture was planted according to specifications of **Alabama NRCS biologists**
In April 2008 the other half of the treated pasture was planted according to **Georgia NRCS biologists** specifications**.** These planting will reflect the special needs of both states regarding demonstration of wildlife habitat improvement for bobwhite quail in the southeast. In May 2008 plateau was again applied to the Alabama planting to control ryegrass
In 2008 the Georgia planting displayed an infestation of bahiagrass. Plateau was applied in October 2008 to the Georgia planting to control bahiagrass. In March 2009 gramoxone was applied to the Alabama planting to control ryegrass. Also in March 2009 plateau was again applied to both Alabama and Georgia planting to control ryegrass and bahiagrass. October 2009 plateau and roundup (spot spraying) were applied to the Alabama and Georgia plantings to control bahiagrass. In March 2010 gramoxone was sprayed on the Alabama side to control ryegrass.

RESULTS AND DISCUSSION:

The following are wildlife habitat ratings by Georgia DNR wildlife biologists conducted **November 2008**.
Alabama Planting

Type Planting[1]	Seeding Rate (Pounds pure live seed per acre)	Nest Cover Rating	Brood Cover Rating	Escape Cover Rating
Bearded NWSG Mix (BB,IN,LB,BES) [2]	BB-2 IN-2 LB-2 BES-. 5	Fair	Poor	Too Early to rate
Debearded Seed (BB, IN, PP) [3]	BB-3.5 IN- 2.5 PP-2.5	Poor	Fair	Too early to rate
Debearded Seed (BB, IN,PP) [4]	BB-3.5 IN-2.5 PP-2.5	Fair-Good	Good -Excellent	Too early to rate
Debearded Seed (BB,IN,BES) [5]	BB-3.5 IN-2.5 BES-.5	Fair-good	Poor	Too early to rate
Debearded Seed(BB, IN, PP) [6]	BB-3.5 IN 2.5 PP-2.5	Fair	Good	Too early to rate
Debearded Seed (BB, IN, BES) [7]	BB-3.5 IN 2.5 BES-.5	Good	Poor	Too Early to rate

1- During establishment a cyclone spreader distributed the seed and a cultipacker pressed seed into soil approximately .25 inches deep
2- BB= Big Bluestem, IN= Indiangrass, LB= Little Bluestem BES= Blackeyed Susan. Pelleted lime used as seed carrier.
3- PP= Partridge Pea . Oats were used as a seed carrier
4- No seed carrier
5- Sand used as seed carrier
6- Cat Litter used as seed carrier
7- Pelleted lime as seed carrier

The following are wildlife habitat ratings by Georgia DNR wildlife biologists conducted **October 2009**.
Alabama Planting

Type Planting[1]	Seeding Rate (Pounds pure live seed per acre)	Nest Cover Rating	Brood Cover Rating	Escape Cover Rating
Bearded NWSG Mix (BB,IN,LB,BES) [2]	**BB-2 IN-2 LB-2 BES-. 5**	**Excellent**	**Good**	**Fair**
Debearded Seed (BB, IN, PP) [3]	**BB-3.5 IN- 2.5 PP-2.5**	**Excellent -Good**	**Excellent**	**Fair**
Debearded Seed (BB, IN,PP) [4]	**BB-3.5 IN-2.5 PP-2.5**	**Good**	**Good -Excellent**	**Fair**
Debearded Seed (BB,IN,BES) [5]	**BB-3.5 IN-2.5 BES-.5**	**Poor**	**Excellent**	**Fair**
Debearded Seed(BB, IN, PP) [6]	**BB-3.5 IN 2.5 PP-2.5**	**Poor**	**Excellent**	**Fair**
Debearded Seed (BB, IN, BES) [7]	**BB-3.5 IN 2.5 BES-.5**	**Good**	**Good**	**Poor**

1- During establishment a cyclone spreader distributed the seed and a cultipacker pressed seed into soil approximately .25 inches deep
2- BB= Big Bluestem, IN= Indiangrass, LB= Little Bluestem BES= Blackeyed Susan. Pelleted lime used as seed carrier.
3- PP= Partridge Pea . Oats were used as a seed carrier
4- No seed carrier
5- Sand used as seed carrier
6- Cat Litter used as seed carrier
7- Pelleted lime as seed carrier

The following are wildlife habitat ratings by Georgia DNR wildlife biologists conducted **September 2010**.
Alabama Planting

Type Planting[1]	Seeding Rate (Pounds pure live seed per acre)	Nest Cover Rating	Brood Cover Rating	Escape Cover Rating
Bearded NWSG Mix (BB,IN,LB,BES) [2]	**BB-2 IN-2 LB-2 BES-. 5**	**Excellent**	**Good**	**Fair**
Debearded Seed (BB, IN, PP) [3]	**BB-3.5 IN- 2.5 PP-2.5**	**Fair**	**Excellent**	**Good**
Debearded Seed (BB, IN,PP) [4]	**BB-3.5 IN-2.5 PP-2.5**	**Fair**	**Excellent**	**Good**
Debearded Seed (BB,IN,BES) [5]	**BB-3.5 IN-2.5 BES-.5**	**Good**	**Excellent**	**Good**
Debearded Seed(BB, IN, PP) [6]	**BB-3.5 IN 2.5 PP-2.5**	**Fair**	**Excellent**	**Good**
Debearded Seed (BB, IN, BES) [7]	**BB-3.5 IN 2.5 BES-.5**	**Poor**	**Excellent**	**Good**

1- During establishment a cyclone spreader distributed the seed and a cultipacker pressed seed into soil approximately .25 inches deep
2- BB= Big Bluestem, IN= Indiangrass, LB= Little Bluestem BES= Blackeyed Susan. Pelleted lime used as seed carrier.
3- PP= Partridge Pea . Oats were used as a seed carrier
4- No seed carrier
5- Sand used as seed carrier
6- Cat Litter used as seed carrier
7- Pelleted lime as seed carrier

In most cases habitat ratings have improved from 2008 to 2010. This improvement is primarily due to reduced weed completion especially ryegrass and bahiagrass after herbicide application. Partridge pea is spreading and becoming a dominant in most of the Alabama plots in association with native grasses.

Georgia Planting

This planting used a truax grass drill to place and cover seed at planting to approximately .25 inches deep. All seed was debearded. Big Bluestem, Indiangrass, and Little bluestem were planted at the rate of 1.5 pounds of pure live seed per acre. Switchgrass was planted at rate of .5 pounds of pure live seed per acre. Florida beggarweed , partridge pea, Illinois bundle flower and common ragweed were planted at rate of .25 pounds of pure live seed per acre.

Wildlife Habitat Rating by Georgia DNR wildlife Biologists.

November 2008

In areas with heavy bahiagrass infestation **Nest Cover Rating** and **Brood Cover Rating** was very bad.

October 2009

Nest Cover Rating-Poor **Brood cover rating**-Poor **Escape cover rating**-Good

September 2010

Nest Cover Rating-Good Brood Cover rating- Good-Excellent Escape cover rating- Excellent

From 2008-2010 habitat rating improvement was due primarily to reduced bahiagrass completion due to herbicide application.

Georgia Planting July

PROJECT GAPMC-T-0959-CP ADAPTABILITY of 'TROPIC SUN' SUNN HEMP

INTRODUCTION:

Sunn Hemp (*Crotalaria juncea*) has been touted as a great green manure and cover crop since the 1930's. Sunn hemp produces high organic matter yields while fixing large amounts of nitrogen. Due to increased energy costs and subsequent increased nitrogen costs sunn hemp could become a very important nitrogen producer for agriculture. This study attempts to determine the areas of the country with potential to use sunn hemp for green manure and cover crops. The anticipated use of sunn hemp is a 30-45 day green manure crop. Since it does not produce seed through most of the US and is sensitive to frost it has little potential to become weedy. In Georgia it behaves as a sub-tropical summer annual legume. The study will attempt to collect data on dry matter production, height growth and nitrogen production. This same test is being conducted at several PMCs across the U.S

MATERIALS AND METHODS:

A randomized complete block design with four replications was planted to 'Tropic Sun' Sunn Hemp June 16, **2009**. Seed was drilled at a seeding rate of 50 lbs/ac. Row spacing was approximately 8 inches on a clean firm seedbed. A fence was constructed to prevent deer damage. Plots were clipped at 30 days, 60 days, and 90 days after planting date and after frost (December 17,2009). Three 0.5 m^2 quadrats per clipping date per rep were clipped just above the soil surface. Dry matter production and height was determined and subsamples generated nitrogen production data. Nitrogen production data will be presented later.

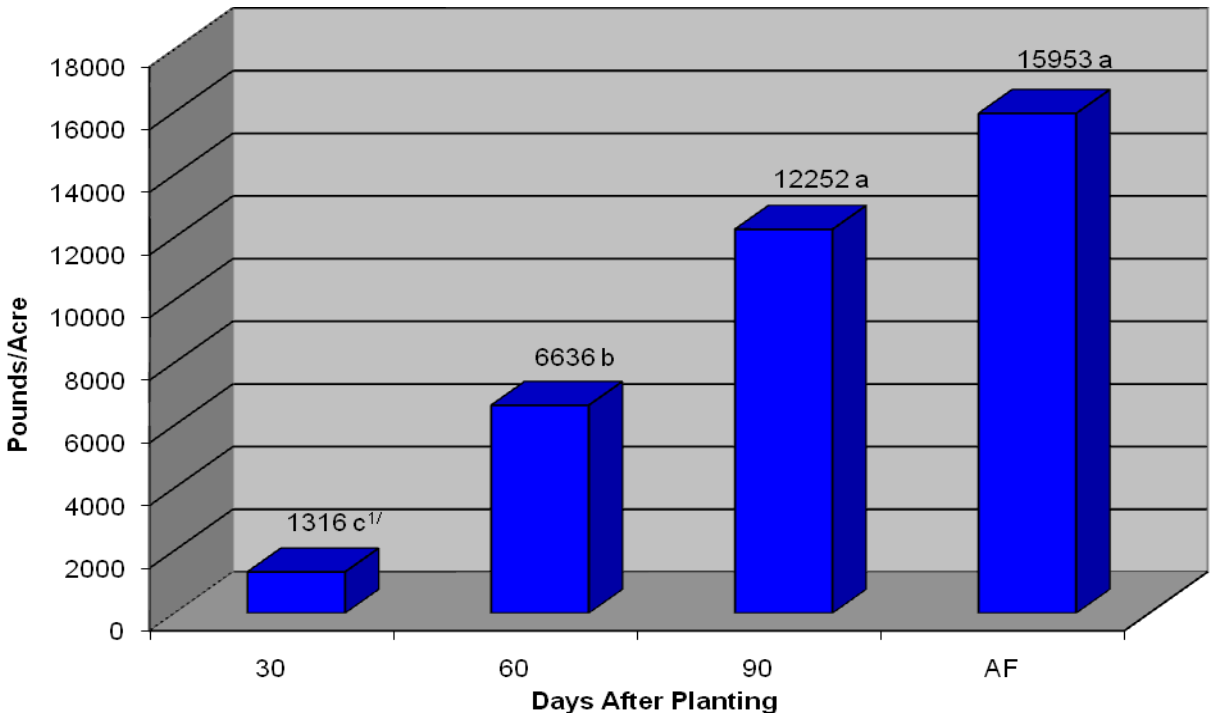
In **2010** a new study was initiated, a split-plot design with four replications was planted to 'Tropic Sun' Sunn Hemp July,26 **2010**. Seed was drilled at 20,40 and 60lbs/Ac. Row spacing was approximately 8 inches on a clean firm seedbed. A fence was constructed to prevent deer damage. These seeding rates constituted the main plots of the test. Sub- plots were clipping dates after planting of 44 and 64 days. Two Subsamples (1.0 $m^{2)}$ quadrats were taken from each plot to determine yield. Green weight and dry matter production in lbs/ac were calculated. Height measurements were also taken but due to lack of normal distribution points data was not analyzed.

RESULTS AND DISCUSSION:

Data from **2009** clipping at the Jimmy Carter PMC (Graph 1 and Graph 2) indicate by 90 days after planting Tropic Sun produces the maximum amount of dry matter in lbs/acre. However, height growth continues to increase until after frost December 17.

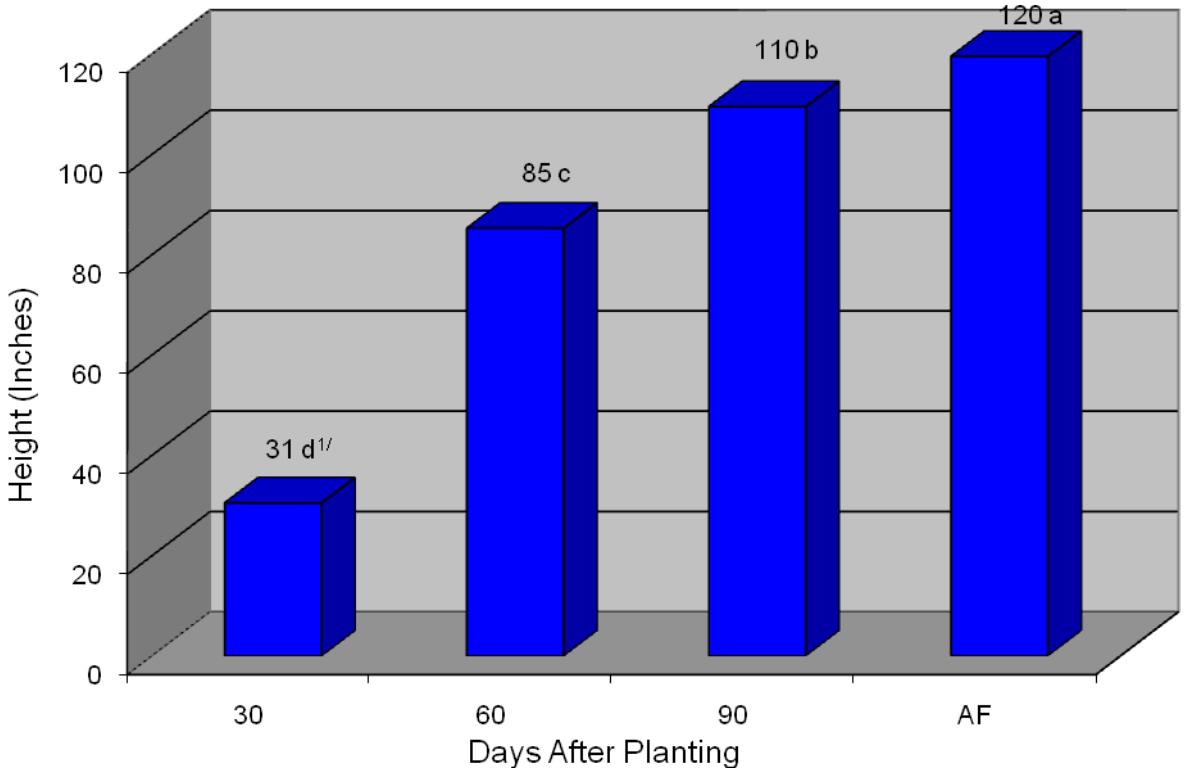
In **2010** clipping data (Table 1) at the Jimmy Carter PMC indicate no significant differences in dry matter yield production between the seeding rates of 20,40 and 60 lbs/ac . However clipping 64 days after planting produced significantly more dry matter yield than clippimg 44 days after planting. This data indicates no benefit is achieved from increasing the seeding rate above 20lbs/ac.

Graph 1. Tropic Sun Sunn Hemp Dry Matter Production 30- 60- 90 Days After Planting and After Frost (AF), USDA-NRCS Jimmy Carter Plant Materials Center, Americus, Georgia, 2009.



1/ Bars with same letters are not statistically significant at P<0.05

Graph 2. Tropic Sun Sunn Hemp Height 30- 60- 90 Days After Planting and After Frost (AF), USDA-NRCS Jimmy Carter Plant Materials Center, Americus, Georgia,2009.



1/ Bars with same letters are not statistically significant at P<0.05

Table 1. Tropic Sun Sunn Hemp Dry Matter Production (lbs/Ac) with seeding rates of 20-40-60 lbs/ac and Clipping 44 and 64 Days After Planting. USDA-NRCS Jimmy Carter Plant Materials Center, Americus, Georgia, 2010.

Clipping Date (Days After Planting)	Seeding Rate 'Tropic Sun' Sunn Hemp			
	20lbs/Ac	40lbs/Ac	60lbs/Ac	Mean
	----------lbs/ Ac----------			
44 Days	3078.3	3050.9	3319.6	3150 b
64 Days	5026.4	5298.8	4748.5	5025 a
Mean	4052.3 a[1/]	4174.9a	4034.0a	

1/ – means in rows and columns followed by the same letters are not statistically significant at P<0.05

PROJECT GAPMC-P-0759-OT OBSERVATIONAL PLANTINGS

INTRODUCTION:

The plant material program began a new study at each PMC to conduct adaptation planting of future releases. Releases and future releases are sent to various PMCs around the U.S. to determine the range of adaptation of the release material.

MATERIALS AND METHODS:

Each PMC will plant one or two small rows of selected material from other PMCs to determine their adaptation and range. They will be evaluated for morphological characters such as stand, vigor, drought tolerance, insect problems, disease problems, seed production and plant height.

RESULTS AND DISCUSSION:

In 2010 the following plant material was grown at the JCPMC for adaptation response. Results were forwarded to the PMC's.

PLANT MATERIAL	TAXA	RELEASING PMC
Florida Paspalum	*Paspalum floridanum-9093786*	Alabama
Florida Paspalum	*Paspalum floridanum-9093787*	Alabama
Florida Paspalum	*Paspalum floridanum-9093788*	Alabama
Eastern Gamagrass	*Tripsacum dactyloides*	Florida
Blue Maidencane	*Amphicarpum muehlenbergianum*	Florida
Florida Paspalum	*Paspalum floridanum-9094217*	NPMC
Grassed-leaved golden Aster	*Pityopsis graminifolia*	NPMC
Florida Paspalum	*Paspalum floridanum-Harrison*	East Texas
Herbaceous Mimosa	*Mimosa strigillosa-Crocket*	East Texas
Velvet Rosettegrass	*Dichanthelium scoparium*	East Texas

PROJECT GAPMC-T-1060-PA GROWTH CURVE OF ALAMO SWITCHGRASS AT JIMMY CARTER PMC

INTRODUCTION:

'Alamo' switchgrass (*Panicum virgatum*) is widely planted in the southern U.S. for soil stabilization, forage, critical area use, and recently for bio-fuel evaluation. It is adapted to most upland sites in the south but very little information concerning its growth pattern in the Southeastern U.S. has been documented and recorded. This study attempts to determine the growth curve for Alamo at the Jimmy Carter PMC in Americus, Georgia. The MLRA is 133A. This information should help the NRCS and other agencies determine models and expectations for forage production, soil conservation, and plant production parameters of the cultivar. This information could be used in RUSLE or ESIS.

MATERIALS AND METHODS:

An existing field of Alamo switchgrass was utilized for this study. A randomized complete block design with three replications was clipped in early April, May, June, July, August, September, and October (after frost). Plots (2Mx2m) were clipped from $1m^2$ quadrats. Each plot was clipped only once at or near ground level. Clipped samples were weighed. Subsamples were taken to determine **dry matter production** from each quadrat. Plant height was recorded and **phenological stage** at clipping was determined. Percent(**%) growth** was also determined for each clip date.

RESULTS AND DISCUSSION:

All data was analyzed using LSD comparisons at $p< 0.05$. The data was transformed to smooth distribution points. Table 1, Table 2 and Graph 1 indicate production of 'Alamo' switchgrass at Americus, Georgia in 2010 increased from April to August. Production then decreased in September and October. This can be explained by spring and summer growth due to adequate moisture, temperature and day length. This was followed by shorter day lengths, cooler and dryer weather which resulted in loss of seed and plant matter.

Table 1. Dry Matter Production (#/Acre) of Alamo Switchgrass by Clip Date and Phenological Stage at Jimmy Carter PMC 2010

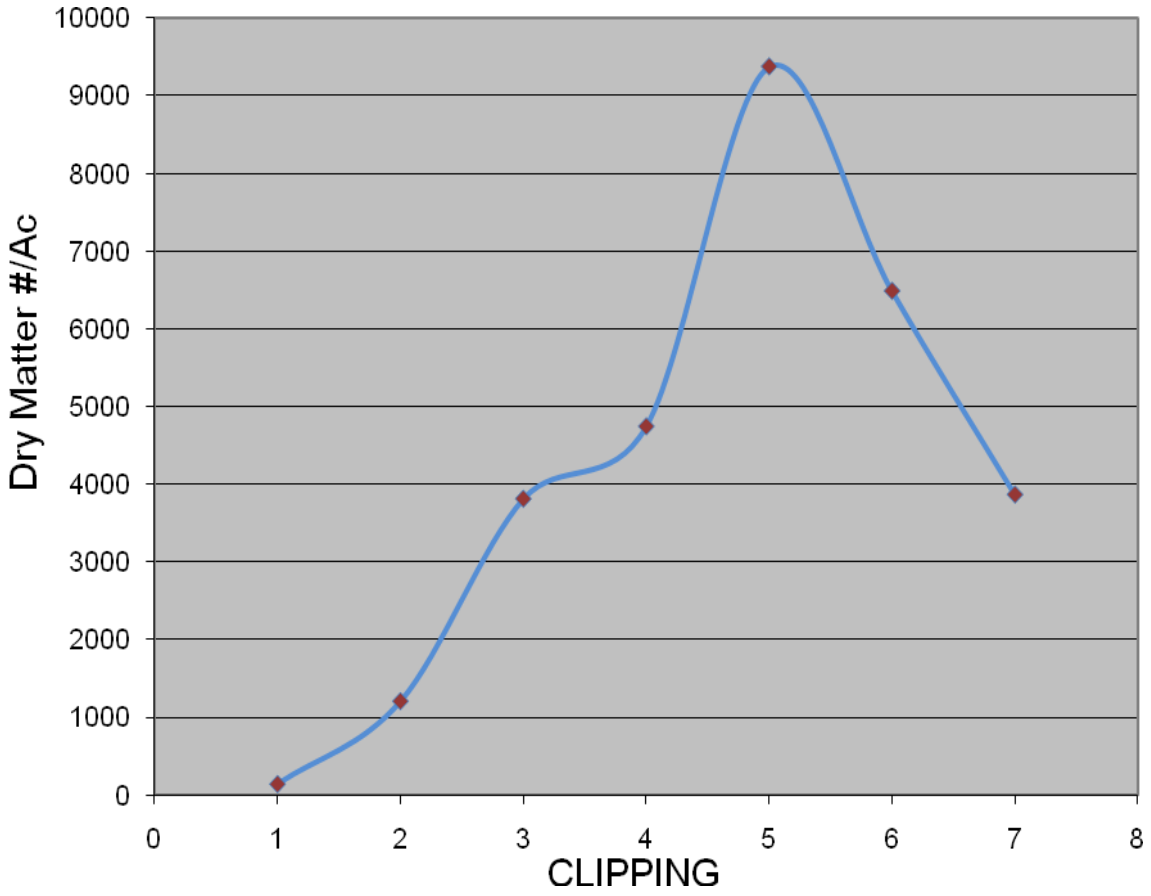
Clip Date and Phenological Stage	Dry Matter Production (#/Acre)
April 7-3 Leaf	148.6 d[1/]
May 6-Early Stem Elongation	1213.5 cd
June 7- Stem Elongation	3814.8 bc
July 7- Boot	4745.1 ab
August 9- Inflorescence Emerged	9369.5 a
September 7- Seed Hard Dough	6486.2 ab
October 6- Mature Seed	3868.8 bc
Mean	4235.2

1/ – means in rows and columns followed by the same letters are not statistically significant at $P<0.05$

Table 2. Percent Growth of Alamo Switchgrass by Clip Date and Phenological Stage at Jimmy Carter PMC 2010

Clip Date and Phenological Stage	Percent (%) Growth
April 7- 3 Leaf	2
May 6- Early Stem Elongation	11
June 7- Stem Elongation	28
July 7- Boot	10
August 9- Inflorescence Emerged	49
September 7- Seed Hard Dough	0
October 6- Mature Seed	0
Percent (%)- Total Growth	100

Graph 1. Dry Matter Production (#/Acre) of Alamo Switchgrass by Clip Date {1- April 7, 2- May 6, 3- June 7, 4- July 7, 5- August 9, 6- September 7, 7- October 6} at Jimmy Carter PMC 2010



PROJECT GAPMC-T-1061-OT BEE MEADOW DEMONSTRATION-POLLINATOR PLANTING JIMMY CARTER PMC 2010

INTRODUCTION:

Insect pollination is crucial in the production of numerous important crops in the United States including apples, blueberries, cherries, pears, plums, peaches, squash, tomatoes, clovers, and watermelons. In recent years biologists have noticed a decline in many of the pollinator insects especially among honey bees and bumble bees. A national effort has begun to conserve and enhance pollinator populations. Protecting and establishing pollinator plants is an important step in this effort.
This study attempts to demonstrate practical methods to establish pollinator plants in Southwest Georgia MLRA 133A.
The study will attempt to determine planting and cultural techniques to successfully establish native wildflower mixtures for pollinators especially on former agricultural lands.

MATERIALS AND METHODS:

Planting Techniques Plot size 20X45 feet .**1** Land tilled before planting. **2**. Land tilled and sown to oat s (35#/acre) before planting **3.** Roundup applied before planting **4.** Roundup and oats(35#/acre) applied before planting. **Post Herbicide Treatments (June 29). 1** Control-no herbicide **2** Select Max 16 ounces/acre with crop oil 32 ounces/acre plus ammonium sulfate 32 ounces/acre **3**. Basagran 32 ounces/acre with crop oil 32 ounces /acre plus herbicide treatment (2) **4**. Panoramic 8 ounces/acre with 3.2 ounces / acre of scanner plus herbicide treatment (2) **Wildflower mixture** planted **May 12** by hand and followed with cutipacker**.** Mixture was approximately 60-70 seed /square foot with approximately 10 seed/square foot for each entry. Mixture consisted of the following wildflowers: Partridge pea (*Chamaecrista fasiculata*) , Goldenmane tickseed (*Coreopsis basalis*) , Blackeyed susan (*Rudbeckia hirta*), Rattlesnake master (*Eryngium yuccifolium*), Spotted bee balm (*Monarda punctata*) , Butteryfly Milkweed (Asclepias tuberosa) , Mayflower beard tongue (*Penstemon multiflorus*) .

RESULTS AND DISCUSSION:

Data indicate that land preparation of **tilled**, **tilled with oats**, and **roundup** before planting produces moderate coverage of wildflowers. The only effective herbicide treatment producing moderate wildflower coverage was **Select Max 16 ounces/acre with crop oil 32 ounces/acre plus ammonium sulfate 32ounces /acre.** All other herbicide treatments produce 0-<5% coverage. The following wildflowers were adapted to the test conditions.: Partridge Pea(*Chamaecrista fasiculata),* Goldenmane tickseed (*Coreopsis basalis*), and Blackeyed susan (Rudbeckia hirta) Table 1. The PMC plans to conduct a replicated herbicide test with wildflower pollinators in 2011.

Table 1 Pollinator Wildflower Mixture % Coverage by Seedbed Treatment and Herbicide Treatment Summer 2010 at Jimmy Carter PMC

Evaluation Dates	Seedbed Treatment	Herbicide Treatment	Wildflower Mixture Blooming	% Wildflower Mixture Coverage
July, August, September	Tilled	Select Max	Partridge Pea, Goldenmane Tickseed, Blackeyed Susan	10-15%
July, August, September	Tilled + Oats	Select Max	Partridge Pea, Goldenmane Tickseed, Blackeyed Susan	20-30%
July, August, September	Roundup	Select Max	Partridge Pea, Goldenmane Tickseed, Blackeyed Susan	12-20%
July, August, September	Roundup + Oats	Select Max	Partridge Pea, Goldenmane Tickseed, Blackeyed Susan	5%

Goldenmane Tickseed (Coreopsis basalis) in PMC Study

SPECIAL PUBLICATIONS

In **2010** the PMC in cooperation with Jim Lathem and Sherry Carlson of the NRCS in Georgia produced a new wetland plant identification cd**.** The cd, entitled **Georgia Wetland Plants Version 3.0 February 2010**, was distributed to the field offices in Georgia and copies were sent to the surrounding states. The cd is designed to assist field offices in wetland plant identification for use in wetland determinations.

Meadow Beauty (***Rhexia alifanus***)

Savannah Primrose-Willow (*Ludwigia virgata*)

RELEASES FROM JIMMY CARTER PMC

Common Name (Year of Release)	Scientific Name	Primary Use
'Pensacola' Bahiagrass ('44)	*Paspalum notatum*	Forage Production
'Amclo' Arrowleaf Clover ('63)	*Trifolium vesiculosum*	Forage Production
'Dove' Proso Millet ('72)	*Panicum miliaceum*	Wildlife Food
'Flageo' Marshhay Cordgrass* ('90)	*Spartina patens*	Beach Stabilization
(The 'Flageo' Marshhay Cordgrass release involved a cooperative effort with Fort Valley State Univ.)		
'Big O' Crabapple* ('92)	*Malus coronaria*	Wildlife Food
'Wetlander' Giant Cutgrass* ('93)	*Zizaniopsis miliacea*	Constructed Wetlands
'Restorer' Giant Bulrush* ('93)	*Scirpus californicus*	Constructed Wetlands
'Americus' Hairy Vetch ('93)	*Vicia villosa*	Winter Cover Crop and Conservation Tillage
(The 'Americus' Hairy Vetch release involved a cooperative effort with the University of Georgia)		
'AU Early Cover' Hairy Vetch ('94)	*Vicia villosa*	Winter Cover Crop and Conservation Tillage
(The 'AU Early Cover' Hairy Vetch release involved a cooperative effort with Auburn University)		
'AU Ground Cover' Caley Pea ('94)	*Lathyrus hirsutus*	Winter Cover Crop and Conservation Tillage
(The 'AU Ground Cover' Caley Pea release involved a cooperative effort with Auburn University)		
'Sharp' Marshhay Cordgrass* ('94)	*Spartina patens*	Beach Stabilization
(The 'Sharp' Marshhay Cordgrass release involved a cooperative effort with NRCS PMC in Brooksville, Florida)		
'AU Sunrise' Crimson Clover ('97)	*Trifolium incarnatum*	Winter Cover Crop and Conservation Tillage
(The 'AU Sunrise' Crimson Clover release involved a cooperative effort with Auburn University)		
'Americus' Indiangrass * (2002)	*Sorghastrum nutans*	Forage, landscape, restoration
(The 'Americus' Indiangrass release involved a cooperative effort with Alabama Crop Improvement)		
'Highlander' Eastern Gamagrass * (2003)	*Tripsacum dactyloides*	Forage, buffer, conservation
(The 'Highlander' release involved Coffeeville Miss PMC as primary with MAFES)		
' Kinchafoonee' Virginia Wildrye* (2004)	*Elymus virginicus*	Conservation, log roads, restoration
' Newberry' Indiangrass* (2005)	*Sorghastrum nutans*	Conservation buffers,wildlife habitat,urban landscape, restoration and critical areas
'Union' Purpletop* (2005)	*Tridens flavus*	Conservation buffers,wildlife habitat, urban landscape,restoration and critical areas
(Newberry and Union release involved cooperative effort with USDA-USFS and SC Native Plant Society)		
'Muckalee' Woolgrass*(2008)	*Scirpus cyperinus*	Small constructed wetlands and wetland restoration
'Sumter' Softrush * (2008)	*Juncus effuses*	Small constructed wetlands and wetland restoration
'AU Sunup' Crimson Clover (2009)	*Trifolium incarnatum*	Winter cover, green manure, pollinator, organic crop
'Penn Center' Switchgrass* (2010)	*Panicum virgatum*	Coastal soil stabilization

***Native plants**

For more information concerning the plant materials center and its conservation efforts, contact the center's manager at 295 Morris Drive, Americus, Georgia 31709. Phone: (229) 924-4499 or 924-7003.