

2009 Progress Report of Activities

Booneville Plant Materials Center

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Introduction:

The Booneville Plant Materials Center, (PMC) located at the Dale Bumpers Small Farms Research Center, was established and became part of the national system of PMCs in 1987. It serves the plant materials needs of the Southern Ozarks, the Arkansas River Valley, the Boston Mountains, and the Ouachita Mountains.

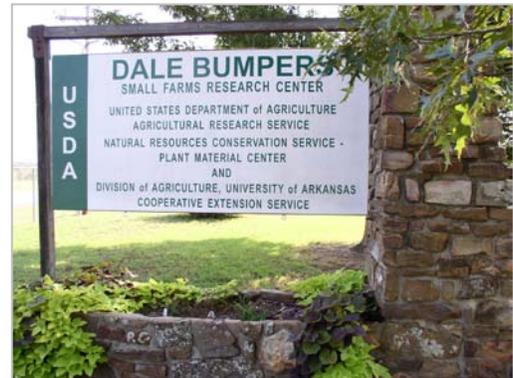
Location:

The Booneville Plant Materials Center is located along the Petit Jean River in Logan County, Arkansas. The Center lies along the north edge of the Ouachita National Forest. Mt. Magazine, the highest mountain between the Appalachian and Rocky Mountains, is to the northeast of the PMC.

Plant Materials Purpose and Priorities:

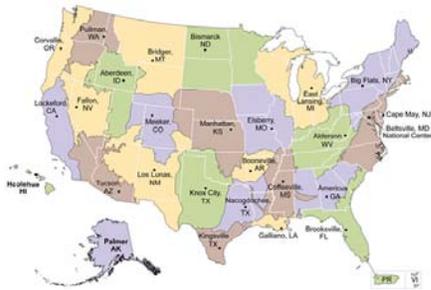
The purpose of the NRCS Plant Materials Program is to: a) assemble test, and release plant materials for conservation use, b) determine techniques for successful use and management of conservation species, c) facilitate and commercial increase of conservation species, d) provide for the timely development and transfer of effective state-of-the-art applied plant science technology to solve conservation problems, and, e) promote the use of plant science technology to meet the goals and objectives of the USDA and NRCS Strategic Plan.

The Center's priorities include protection and enhancement of water quality, protection and enhancement of pastureland, critical area treatment, protection and enhancement of woodlands, and protection and enhancement of wildlife land.



Service Area:

The primary service area of the Booneville Plant Materials Center includes portions of Arkansas, Oklahoma, and Missouri (approximately 54 million acres). This area includes the following Major Land Resource Areas:



Ozark Highland	116A
Ozark Border	116B
Boston Mountains	117
Arkansas Valley and Ridges	118
Ouachita Mountains	119
Western Coastal Plain	133B
Alabama, Mississippi & Arkansas Backland Prairie	135

Much of the service area is characterized by rugged terrain with elevations from 300 to 2,800 feet. Average annual rainfall varies from 36 inches in the west to 53 inches in the eastern higher mountain areas. Forage production and woodlands are the major land uses, and small family farms characterize the agriculture.

Staff: Randy King has served as Manager of the Booneville PMC since 1989. In 1992 Dr. Lance Tharel became the assistant Manager. The Center has two Biological Science Technicians: Dale Goff and Eddie Pratt. Deborah Orick is the PMC Office Assistant.



Bottom left to right are: Dr. Lance Tharel, Assistant PMC Manager; Dale Goff, Biological Science Technician; Top left to right: Randy King, PMC Manager; Debbie Orick, Office Assistant; and Eddie Pratt, Biological Science Technician.

Soils on the Center include:

Leadville silt loam, 1 to 3 percent slopes. This is a deep, moderately well drained, nearly level soil on old stream terraces in broad valleys. Individual areas range from about 10 to 400 acres in size.

Taft silt loam, 0 to 2 percent slopes. This is a deep, somewhat poorly drained, level to nearly level soil on old stream terraces in broad valleys. Individual areas range from about 10 to 400 acres.

Linker fine sandy loam, 3 to 8 percent slopes. This is a moderately deep, well-drained, gently sloping soil on hilltops. Individual areas range from about 5 to 200 acres.

Enders-Mountainburg association, rolling. This association consists of well-drained soils in a regular and repeating pattern on rolling hillsides. Slopes are 8 to 20 percent. The mapped areas on this association range from about 50 to 700 acres.

Studies:

Releases:

Hampton germplasm big bluestem
'Bumpers' eastern gamagrass
'OH-370' big bluestem

Release potential:

Indiangrass (45 accessions in initial evaluation)
Wildrye (138 accessions collected)

Technology Development:

Irrigation/fertility biofuels study
Switchgrass Biofuels study (lowland types)
Switchgrass Biofuels study (upland types)
Growth curve studies for: switchgrass, indiangrass, and eastern gamagrass.
Fruit and nut tree production on reclaimed coal mined land
Agroforestry Silvopasture study
Testing 4 warm season grass species for their suitability as a biofuel feedstock
Grazing trial of 'Bumpers' eastern gamagrass (with Agricultural Research Service (ARS))

Oklahoma Department of Transportation:

Poteau Native grasses (species/mulch)
Heavener Native grasses (species/mulch)
State Highway 128 Native grasses (species/mulch)

Fort Chaffee Maneuvers Training Center (MTC):

MTC-1 Rehabilitation on Maneuver areas
MTC-2 Rehabilitation on Maneuver areas

Demonstrations:

Native grasses for Quail Habitat (Wildlife Management Institute Grant, Franklin Co.)
Eastern gamagrass 'Pete' (Elm Park)
Eastern gamagrass 'Pete' (Altus)
Eastern gamagrass 'Bumpers' (Waveland)
Big bluestem 'Kaw' (Altus)
Switchgrass 'Alamo' (Altus)
Switchgrass 'Alamo' (on Center)
Eastern gamagrass 'Pete' (on Center)
Switchgrass 'Alamo' (Morrilton)
Native Grasses (University of Arkansas Pine Bluff, Lonoke Research Farm)
Indiangrass 'Cheyenne' (on Center)
Native grasses for the United States Forest Service (Cass)
Native grasses, Trail of Tears Park, University of Arkansas, Little Rock

Seed Production:

'Bumpers' Eastern Gamagrass Commercially Available 2011:

Ernst Conservation Seeds Inc., is producing 'Bumpers' eastern gamagrass commercially in North Carolina and Maryland. The PMC shipped 500 pounds of foundation seed to Ernst in November 2008. The new cultivar should be available for commercial purchase by the fall of 2011.

Hampton Germplasm Big Bluestem:

Ernst will also commercially produce Hampton germplasm in North Carolina. Materials harvested from seed increase plantings will be shipped to Ernst during the fall of 2010.

Release Potential Summary:

Indiangrass Cultivar:

Booneville will release an indiagrass cultivar with superior drought tolerance for the Southern Ozarks in 2011. Indiangrass collections were made from eastern Oklahoma and Western Arkansas in the fall of 2006. Eighty-eight accessions were collected during this effort. The seed was germinated and grown in the greenhouse during the winter and spring of 2007. Seedlings were transplanted to the field in May 2007. Irrigation was used during the establishment year. 'Cheyenne', 'Lometa', and 'Americus' indiagrass cultivars are used as standards in a randomized complete block arrangement. Data was collected and analyzed during the 2008 and 2009 growing seasons and will be reported in the 2009 Annual Technical Report.

Wildrye Cultivar:

One hundred and thirty eight accessions of Wildrye were collected by field office and PMC personnel during the fall of 2009. The area of collection was western Arkansas and eastern Oklahoma. These accessions will be germinated in flats in the greenhouse during the winter of 2010. They will be transplanted to replicated plots for initial evaluation in April 2010.



Technology Development Study Summaries:

Irrigation/fertility biofuels study:



Switchgrass is a perennial warm-season grass grown for decades on marginal lands not well suited for conventional row crop production. It is being recognized as a potential renewable energy source and an alternative cash crop. Preliminary studies indicate that switchgrass has potential for biomass production.

Switchgrass may one day help ease the heartburn that the American motorist has been experiencing every time they go to the gas pump. The ability to use energy crops produced on American farms as a source of renewable fuels is a concept with great relevance to current economic and environmental issues. In the near future, switchgrass may provide an answer to this problem.



Development of a substantial capacity to use perennial forage crops such as switchgrass for biofuels feedstock could benefit our agricultural economy by providing an important new source of income for farmers. Biofuel production from perennial cropping systems would help reduce loss of agricultural soils, reduce our dependence on imported oil supplies, and lower greenhouse gas emissions and other toxic material in the atmosphere.

American produced ethanol may help reduce imports of oil by 1.5 billion barrels a year. Corn which has been used to produce ethanol must first be converted to sugar and the sugar fermented into alcohol for marketing as ethanol. Cellulosic material, which can be produced directly from switchgrass, may be directly converted into ethanol and this requires less energy to produce.

The PMC has initiated a study using two cultivars ('Alamo' and 'Cave-in-Rock') of switchgrass, irrigation/non-irrigated, and commercial fertilizer/animal waste fertility to determine the optimum combination of these variables to maximize the production of annual biomass.

This study will be beneficial from the stand point of answering some questions relative to the production and harvesting of switchgrass. Historically, switchgrass has been produced for the leaf portion of the plant which contains the higher nutritive quality. Switchgrass production for ethanol focuses on cellulose and fiber production. This study compares animal waste (broiler litter) to commercial fertilizer; irrigation to non-irrigation; and multiple harvests to an annual harvest. Yield data from this study will be reported in the 2009 Technical Report.

Lowland Switchgrass for a Biofuel Source:

A contract with the Department of Energy and a cooperative agreement with Dr. Charles Taliaferro (Oklahoma State University) as the principal investigator have resulted in the PMC testing switchgrass for biomass production. 'Alamo', 'Cave-in-rock', 'Kanlow', along with seven of Dr. Taliaferros' experimental lines were planted at Booneville in 1997, harvested annually, and reported to Taliaferro. The results are also reported annually to other cooperators along with a narrative summary of the study. An accession developed by Dr. Taliaferro, consistently out yielded all other accessions and cultivars during the four year study.



Upland Switchgrass for a Biofuel Source:

This study is identical to the above, with the exception of cultivar entries which are upland types. This study began in 2000, and will be completed in 2012. Dr. Taliaferro also provided the experimental upland lines.

Growth curve studies for: switchgrass, indiangrass, and eastern gamagrass:



This study will enhance information that will increase utilization and efficiency of grazed and stored forage and will benefit producers in planning for annual forage availability, dry-matter production, and controlled grazing scenarios. Warm-season grass species of switchgrass, indiangrass, and eastern gamagrass are harvested at various heights to provide dry-matter predictions to calculate growth curves to provide dry-matter information that will assist producers in planning annual forage budgets and harvesting dry-matter for stored winter feed.

Fruit and Nut Tree Production on Reclaimed Coal Mined Land:

Coal strip (surface) mining in the 1930s which was reclaimed in the mid 1980s has resulted in large unproductive areas. Since these are “pre-law” mines, there was no topsoil stockpiled for use during reclamation. Fruit and nut tree production is being evaluated on land that was basically characterized as low production. The study consists of four varieties each of apple, peach, pecan, and walnut. The trees were planted in 1994, and have recorded excellent growth. Drip irrigation is used, and the orchard is mowed twice per year. The apple and peach trees are in full production with only moderate pecan production and slight walnut yield. Diameter at Breast Height (DBH) is recorded annually in the fall. This study will be concluded in 2011. A Technical Note will be developed.

Agroforestry Silvopasture Study:

Silvopasture is the art of combining two enterprises which will produce a practical and economic system and forms a mutually beneficial interaction. Silvopasture systems may provide both economic and conservation benefits consistent with a landowner’s goals. The two enterprises of this system include trees and forage. Silvopasture results when trees are deliberately introduced into a forage production system or when forage crops are introduced into a timber production system. Trees produce a high-value product that adds increased economic stability and returns while creating a sustainable production system that has many environmental benefits. Both short and long range benefits may be derived from a silvopasture system, these may include reduced wind and soil erosion, improved water quality and wildlife habitat, improved utilization of nutrients, and improved crop production.



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There is a lack of information on the production of well managed warm-season forages under intensively managed pine trees from the time forages are established until the growth of trees begin impacting production. We have initiated a study examining the growth characteristics of both trees and grass. The study uses three tree planting configurations consisting of various row widths and tree spacing within the row. These include a 14 x 14, a double row 8 x 8, and a single row 8 x 24 ft. arrangement. The three treatments have similar numbers of trees per acre. The grass species include big bluestem, eastern gamagrass, and indiangrass.

The grass plots are harvested to determine dry-matter and quality. Another important evaluation will be the percent stand of the various grass species over time. Initially, it is expected that production will

be quite high but as the trees increase in height, the grass production will decrease. The information gained from this study will aid producers in determining what the dry-matter of the grass species will be during the growth of the pine trees. The grass production will supplement income until the tree stand produces some marketable timber.

Four Species Biofuels Study:

Four species (Hampton germplasm big bluestem, sugarcane plumegrass [*saccharum giganteum*], miscanthus giganteus, and 'Alamo' switchgrass) of warm-season perennial grasses were planted in 2008 to determine their suitability as a biofuels feedstock. These species were planted in a replicated study in April 2008. This study will be harvested 2009-2011. Samples will be analyzed by ARS to determine cellulosic/sugar content and suitability as a cellulosic biofuel feedstock.



Grazing Trial of 'Bumpers' Eastern Gamagrass:



Four 2.5 acre replicates were established on the ARS Dale Bumpers Small Farms Research Center in the spring of 2006. Grazing trials started in April of 2008. Yearling steers stocked at two head per acre grazed the plots for 140 days of 2008. Animals were weighed on 45 day intervals. Average daily gain over the 140 days was 2.3 lbs./day/animal. Data will be collected by ARS and the PMC thru 2012.

Oklahoma Department of Transportation Contract:

The Oklahoma Department of Transportation (ODOT) contracted with the PMC to develop standards and specifications for establishment of native grasses along ODOT rights of way in eastern Oklahoma.

The problem originates from moderate to severe erosion along highway rights-of-way that is depositing silt in the drainage systems and impacting the drainage down stream. Three studies have been established in 2007 that are representative of most of the severe slope problems in eastern Oklahoma. The slopes are populated with cool season annuals with very little perennial vegetation present. Several attempts have been made by ODOT in the past to establish vegetation on these areas with little or no success. The PMC conducted a complete site characterization of each of these areas in 2006.



Poteau Site: The Poteau OK site was planted in April, 2007. An area of slope (3:1) 600' long and 50' wide was selected to conduct the first study. Half the slope (300' X 50') was prepared as clean firm seedbed, with the remaining slope untouched. Replications on both tilled and untilled were then staked. Various seeding rates were applied, that included 'Alamo' switchgrass, 'Cheyenne' indiagrass, and 'Kaw' big bluestem. All materials were applied with a hydro-seeder. After seeding, various rates of wood fiber hydro-mulch were applied. Evaluations were conducted 14 days after planting to collect germination data. Evaluations were conducted on a monthly basis there after. Data collected during 2008 indicated a high level of success where seedbed preparation was done and little success where materials were no-till planted. Data collected in 2009 will be published in the PMC Annual Technical Report.

Heavener Site:

The Heavener site was established identically to the Poteau site. This site was selected by ODOT because of the dramatic difference in soil type.

State Highway 128 Site:

State Highway 128 poses a unique challenge from both an agronomic and mechanical prospective. The site was originally a sheer rock wall. Engineers with ODOT discovered the stone was underlain with shale stone which would weather over time allowing the rock (sandstone) above to tilt toward the highway, creating a potentially dangerous situation. They decided to lay the slope back to a 2:1 ratio. Seedbed and planting equipment can't operate on such a steep slope. The entire slope was 2.1 acres of rock mixed with some fines, and soil. In early November 2007, the center staff hydro seeded the slope using with various seeding rates of big bluestem, indiagrass, and switchgrass and applied various rates (1/2 and 1 ton) of wood fiber hydro mulch. Torrential rains in the spring of 2008 caused severe damage to the slope. The site was again seeded and mulched in April 2009. Germination was very successful, and a mild summer allowed seedlings to become well established.



Ft. Chaffee Maneuvers Training Center (MTC):

This study was designed to develop specifications for establishing warm season perennial native grasses, and establish costs associated with rehabilitating areas that have been disturbed by tracked vehicles. A heavy off-set disk was used to work down ruts left by tanks and other tracked vehicles. Cost per acre was established for the disking, and then the number of trips that it took to achieve a suitable seedbed was recorded. The area was planted with 'Kaw' big bluestem, 'Alamo' switchgrass, 'Cheyenne' indiagrass, and 'Pete' eastern gamagrass. Half of the area was mulched with 1.5 tons of grass hay mulch. The site was harvested during summer 2006. Dry-matter yield and quality were recorded.



Ft. Chaffee will use the technology developed from these studies to write rehabilitation specifications for large tracts of disturbed land. After rehabilitation, these tracts will be offered for lease to the public for hay production. Data collected during 2008-2009 indicates that the native warm-season

grasses, (NWSG) established in 2005, are producing excellent yields of high quality forage. Evaluations of these sites will be conducted until 2011.

Demonstrations/Field Planting Summary:



The Plant Materials Center maintains thirteen demonstration sites. A two-acre plot of ‘Pete’ eastern gamagrass was established for demonstration on the Center in 1997. A four-acre plot of ‘Pete’ was established for the Idabel Oklahoma Conservation District on their Demonstration Farm in 1999. ‘Pete’ was established for demonstration at Elm Park in Altus, Arkansas in 2000. Native grasses ‘Pete’ eastern gamagrass, ‘Alamo’ switchgrass, ‘Kaw’ big bluestem, and ‘Lometa’ indiagrass were established on the University of Arkansas at Pine Bluff research farm near Lonoke, Arkansas in 1999. ‘Alamo’ switchgrass was established to

demonstrate erosion control on a sand fill in Morrilton, Arkansas for the Arkansas Power Corporation in 1998. ‘Alamo’ has also been planted for demonstration in Altus, Arkansas and on Center in 2003. A native grasses demo plot was planted for the United States Forest Service near Cass, Arkansas on the Mulberry River in the spring of 2005. The off center plots are managed by the cooperator and evaluated by the District Conservationist in that county. The PMC staff makes annual visits to each site. A native grasses demonstration was established for the University of Arkansas, Little Rock, along Coleman Creek, located on the campus. The area planted is an original campsite along the Trail of Tears.

FFA Field Day:

Each year the Plant Materials Center staff lends their support in the annual FFA Field Day. School districts across the the state attend the one day event. The field day judging event is held at the Logan County Fairgrounds, Dale Bumpers Small Farm Research Center and the Rogers Scout Reservation all located in or near Booneville.

There are eight judging activities available to students which include: Floriculture, Nursery/Landscape, Dairy Products, Land, Crops, Poultry, Livestock, and Forestry.

Students utilize their classroom instructions along with the actual “hands on” judging event to prepare them to advance for the up-coming district and state events



Tours, Presentations & Workshops:

<u>Date</u>	<u>Event</u>
10/06/2008	Switchgrass Production for BioFuel Feedstock, Forest City, Arkansas
10/21/2008	Biofuel Feedstocks, at the Meeting Place in Booneville, Arkansas
12/09/2008	PMC Current Research, Wyndem Hotel, Little Rock, AACD Mtg.
12/10/2008	Mission of the Booneville PMC, Little Rock
12/15/2008	ODOT Report of Progress, Heavener, Oklahoma
03/03/2009	Burning Tall Grass Prairie, Booneville, Arkansas
03/07/2009	National Plant Materials Program, Garden Show, Fort Smith, Arkansas
03/08/2009	Booneville PMC Activities, Fort Smith, Arkansas
03/09/2009	Biofuel Feedstock Production, Fort Smith, Arkansas
03/09/2009	Mission of the PMC, Little Rock, Arkansas
03/17/2009	PMC Program, Salem Arkansas
04/24/2009	Native Grasses for Livestock Consumption, Booneville PMC
05/07/2009	Native Grass Restoration on Coleman Creek, U of A, Little Rock
06/02/2009	Switchgrass as a Biofuel, Booneville, Arkansas
06/18/2009	Current Studies of the Booneville PMC, Arkadelphia, Arkansas
07/21/2009	Plant Materials, Booneville, Arkansas
09/18/2009	Enhancement of Quail Habitat using Native Grasses, Rotary Club
09/22/2009	Developing Establishment & Management Criteria for Native Grasses As Quail Habitat, National Wildlife Society Mtg., Monterey, California

Publications:

Plant Materials Progress Report of Activities

Four Newsletters

Progress Report-Average Daily Gain & Gain per Acre for Heifers Grazing Easter Gamagrass

Progress Report-Growth Curve Results for Eastern Gamagrass

Progress Report-Growth Curve Results for Indiangrass

Progress Report-Growth Curve Results for Switchgrass

Progress Report-2008 Indiangrass Initial Evaluation Study Report of Progress

Progress Report-Vegetative Rehabilitation of Highway Cut Slopes

Inter-Center Strain Trial-Yield and Persistence of 11 Big Bluestem Sources in Kansas, Missouri,
Arkansas and Mississippi

Progress Report-Sunn Hemp Intercenter Specie Trial