

2010 Progress Report of Activities

Booneville Plant Materials Center

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Introduction:

The Booneville Plant Materials Center (PMC) was established and became part of the national system of PMC's in 1987 and serves the plant material needs of the Southern Ozarks, the Arkansas River Valley, the Boston and the Ouachita Mountains. 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.



**Dale Bumpers Small Farm Research Center
Booneville, Arkansas**

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 (2823 ft.) is to the northeast of the PMC and is well known as being the highest mountain between the Appalachian and Rocky Mountains. The PMC leases 282 acres from the State of Arkansas.

Service Area:

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



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

Manager: Randy King

Assistant Manager: Lance Tharel

Biological Science Technicians: Eddie Pratt and Dale Goff

Administrative Assistant: Deborah Orick

Bottom left to right are: Lance Tharel, Assistant PMC Manager; Dale Goff, Biological Science Technician; Top left to right: Randy King, PMC Manager; Debbie Orick, Administrative 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 *Sorghastrum nutans*
Virginia wildrye *Elymus virginicus*

Technology Development:

Irrigation/fertility biofuels study
Growth curve studies for: switchgrass, big bluestem, and eastern gamagrass.
Agroforestry Silvopasture study
Testing 4 warm season grass species for their suitability as a biofuel feedstock
Inter-center species trial of big bluestem

Oklahoma Department of Transportation:

Poteau Native grasses species/mulch
Heavener Native grasses species/mulch
State Highway 128 Native grasses species/mulch
State Highway 128 Phase 2

Demonstrations:

Weyerhaeuser Plywood Mill (Dierks)
Native grasses for Quail Habitat (Wildlife Management Institute Grant, Franklin Co.)
Eastern gamagrass 'Pete' (Altus)
Big bluestem 'Kaw' (Altus)
Switchgrass 'Alamo' (Altus)
Switchgrass 'Alamo' (on Center)
Eastern gamagrass 'Pete' (on Center)
Native Grasses (University of Arkansas Pine Bluff, Lonoke Research Farm)
Native Grasses for the United States Forest Service (Cass)

Seed Production:

'Bumpers' Eastern Gamagrass Commercially Available:

Calven Ernst, owner of Ernst Conservation Seeds, is producing 'Bumpers' eastern gamagrass commercially in North Carolina. The PMC shipped 500 pounds of foundation seed to Ernst in November 2008. The new cultivar will be available for commercial purchase by the spring 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 in the future.

Release Potential Summary:

Indiangrass:

Indiangrass accessions (45) were collected in western Arkansas and eastern Oklahoma in the fall of 2006. The assembly was made to identify plants with superior drought tolerance for use as forage in the southern Ozarks. Nine accessions were selected for their drought tolerance and will be moved to advanced evaluation. These accessions will be planted in a polycross nursery in the spring of 2011.

Virginia Wildrye:

One hundred twenty three accessions of Virginia Wildrye were collected from western Arkansas in 2009. The assembly was made to select a native cool season perennial grass for wildlife in the southern Ozarks. Plants were germinated in the greenhouse during the winter of 2009, and transplanted to a space plant initial evaluation nursery in May 2010.

Technology Development Study Summaries:

Irrigation/fertility/harvest frequency 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 in the form of a biofuel feedstock.

Switchgrass may one day help ease the pain of the American motorist as 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.



Switchgrass

Development of a substantial capacity to use perennial forage crops such as switchgrass for biofuels 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.

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 then fermented into alcohol for marketing as ethanol. Cellulosic material, which can be produced directly from switchgrass, may be directly converted into ethanol and requires less energy to produce.

The PMC has initiated a study using switchgrass cultivars, 'Alamo' and 'Cave in Rock'; irrigated vs. non-irrigated; and commercial fertilizer vs. animal waste (broiler litter) fertility to determine an optimum combination to maximize the production of annual biomass.

This study is beneficial from the stand point of answering some questions relative to the management of switchgrass for maximum yields. Historically, switchgrass has been produced for the leaf portion of the plant which contains the higher forage nutritive value. Switchgrass production for biofuel feedstock focuses on cellulose production. This study compares animal waste (broiler litter) to commercial fertilizer; irrigation to non-irrigation; and multiple harvests to a single annual harvest. Yield data from this study will be reported in the 2010 technical report.



Harvesting switchgrass plots

Growth curve studies for: switchgrass, big bluestem, and eastern gamagrass:



'Bumpers' eastern gamagrass

This study will produce 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, big bluestem, 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.

Agroforestry Silvopasture Study:

Silvopasture is the process 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 silvopasture system, these may include reduced wind and soil erosion, improved water quality and wildlife habitat, improved utilization of nutrients, and improved crop production.

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 & grass. The study uses three tree planting



Silvopasture Study with Shortleaf Pine trees and native warm season grasses

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 'Kaw' big bluestem, 'Alamo' switchgrass and, 'Cheyenne' indiagrass.

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 stands. 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 plume grass (*saccarum giganteum*), miscanthus *gigantius*, 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 is harvested in the fall (after killing frost) each year. Biomass yield is recorded and analysis of biofuel feedstock suitability is determined by the Agricultural Research Service.

Inter-center Species Trial of Big Bluestem *Andropogon gerardii*:



Hampton Big Bluestem Germplasm

Eleven big bluestem accessions are being tested at Booneville AR, Coffeeville MS, Elsberry MO, and Manhattan Kansas for their range of adaptation, forage yield, and forage quality. Hampton germplasm big bluestem, released by Booneville in 2006, is an entry in the study. Data collected from this 3 year study will support Hampton at the cultivar status.

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 permanent vegetation on these areas with little or no success. The PMC conducted a complete site characterization of each of these areas in 2006.



Seedbed preparation on ODOT right of way

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' indiangrass, 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 2009-2010 indicated a high level of success where seedbed preparation was done and little success where materials were no-till planted.

Heavener Site:

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

State Highway 128 Site:



Mulching 2:1 ODOT slope

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. The decision was made 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 fines, and soil. In early November 2007, the center staff hydro seeded the slope using various seeding rates of big bluestem, indiangrass, 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 area was replanted in the spring of 2009. The seeding was done with a hydroseeder, and grass hay mulch applied. Mulch was then "glued down" with a tackifier applied with the hydroseeder. Establishment was very successful, and had good survival through the summer months. Evaluations of the site in 2010 indicated a 75% cover

over the entire site.

State Highway 128 Phase 2:

The ODOT in many cases uses bermudagrass "slab sod" to control erosion on highway slopes immediately following highway construction. The sod performs well for a few months then usually dies during a summer drought. The following winter, rills begin to form on slopes following the decay of the bermudagrass sod. The final phase of the ODOT contract is to determine the ability of native grasses to germinate and establish in the decaying bermudagrass sod. The PMC prepared a seedbed (1000



Using Round Hay Bales to Mulch ODOT Slopes

square feet) on an ODOT slope on State Highway 128 five miles east of Heavener Oklahoma. Bermudagrass sod was

placed on the seedbed in August 2010 to simulate the ODOT practice. The PMC will hydro seed 'Kaw' big bluestem, 'Alamo' switchgrass, 'Cheyenne' indiagrass, and 'Bumpers' eastern gamagrass on two dates in FY 2011. The first planting will be during the first week of December, and the second will be during the first week of April. Germination dates will be recorded, and evaluations of stand performance will be noted during 2011-2013.

Demonstrations/Field Planting Summary:



Demo planting along the Mulberry River

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. An 8 acre planting of 'Bumpers' eastern gamagrass was established by the PMC for Weyerhaeuser, at their Dierks, Arkansas plywood mill in 2010. The planting is over a fly ash disposal area at the mill. 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.

The Plant Materials Center maintains eight 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' Indiangrass 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

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