



# Georgia Plant Materials Program Athens, GA

## NATIVE WARM SEASON GRASSES FOR GEORGIA ALABAMA AND SOUTH CAROLINA





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# **NATIVE WARM SEASON GRASSES FOR GEORGIA ALABAMA AND SOUTH CAROLINA**

Donald Surrency  
Charles M. Owsley  
Sid Brantly  
Valerie Pickard

## **INTRODUCTION**

Historically, all forage production and landscape cover in the area east of the Mississippi River has been accomplished through the use of introduced grasses and legumes. In the Northeastern US species from the European or Mediterranean areas have predominated, while species of tropical or subtropical origin have been commonly used in the Southeastern US.

In recent years interest in the use of a number of native grasses has increased. Species of interest include switchgrass (*Panicum virgatum*), indiangrass (*Sorghastrum nutans*), eastern gamagrass (*Tripsacum dactyloides*), big bluestem (*Andropogon gerardii*), and little bluestem (*Schizachyrium scoparium*). These grasses are currently used on rangeland and planted pastures in the West Central United States. It has been proposed that these grasses have potential for pasture, hay, erosion control, biomass, wildlife habitat, and as a plant material for riparian buffer strips in the southeast. A significant amount of data on native warm season grasses has been accumulated by USDA-Natural Resources Conservation Service, Plant Materials Centers in the southeast. Much of this has been oriented toward erosion control, grazing land, wildlife, establishment, and management.

The use of native warm season grasses has become a top priority across the nation. NRCS has emphasized their use in several programs such as CRP and WHIP. However, many field office personnel are unfamiliar with the most widely used native grasses such as switchgrass, indiangrass, big bluestem, little bluestem, and eastern gamagrass.

Native warm season grasses have the potential of producing forage for small farmers in the southeast with less commercial nitrogen (N) fertilizer in a low-input system.

## CHARACTERISTICS OF NATIVE WARM SEASON GRASSES

Of the many native warm season grasses, switchgrass, big bluestem, indiangrass and eastern gamagrass show the most potential for the southeast. All are called warm season grasses because of their adaptation to warm day climates, but they differ in their seasonal production of forage. In general, eastern gamagrass and switchgrass greens up and mature earliest, while big bluestem is intermediate and indiangrass matures latest. Unlike tall fescue and other cool season grasses, warm season grasses are most productive from June to early September. Therefore, a combination of separate cool and warm season pastures can be managed to supply a more constant supply of high quality forage throughout the season than either cool or warm season grasses alone.

Native grass seedlings have very low vigor and do not compete well with weeds. Consequently, switchgrass, big bluestem and indiangrass are moderately difficult to establish and may need two years before they can be hayed or grazed. In exceptional years, plantings may establish well enough to allow grazing in the first year.

Warm season grass pastures will not withstand continuous, close grazing or close clipping without reducing yield the following year. Rotational grazing is necessary to maintain productive warm season grass stands.

In return for careful management, a farmer can produce two to four tons of forage per acre on well-fertilized, warm season grasses between late June and early September. Assuming a mature cow requires 30 pounds of forage per day, one acre of warm season grass can supply sufficient forage for two cows during the summer. During low rainfall or long drought periods, native warm season grasses provide forage for grazing.



### **Switchgrass (*Panicum virgatum*)**

Switchgrass is a warm season, rhizomatous, perennial grass that ranges in height from 3 to 6 feet. It is a bunch grass with flat leaf blades about 1/2 inch wide and 30 inches in length. It is a good cover plant for birds and some small game. 'Alamo' is a good forage on sites in coastal plain and Piedmont regions. It can be used for forage, conservation buffers, streambank stabilization, filter strips and wildlife.



### **Big Bluestem (*Andropogon gerardii*)**

Big bluestem is a warm season, rhizomatous, perennial bunch grass 4 to 6 feet tall. Leaf blades are long and flat. Seedheads consist of 2 to 3 distinct racemes on top of the stem and resemble the toes of a turkey's foot which suggests another common name, turkey-foot grass. Livestock prefer it to most associated grasses during early stages of growth. The large amount of top growth makes it ideal as a cover and nestling areas for small game and birds.



**Indiangrass (*Sorghastrum nutans*)**

Indiangrass is a rhizomatous, perennial warm season grass. It attains heights of 3 to 7 feet. Flat, narrow (at the base), sometimes hairy leaf blades are 10 to 24 inches long. It is relished by all livestock and provides high quality forage when green. The seed head is a panicle of 6 to 12 inches in length with golden bronze to yellow seed.

**Eastern gamagrass (*Tripsacum***

Eastern gamagrass is a robust warm-rhizomatous perennial grass that grows height. Leaf blades are 12 to 24 inches wide, flat and have a pronounced Recommended varieties are ‘Pete’ and adapted and responds well to like it so well, grazing should be closely stand from being grazed too hard. up to 16,000 pounds of dry matter per year.



***dactyloides*)**

season, from 5 to 9 feet in long and 3/8 to 1/2 midrib. ‘Iuka’. Lowland fertilization. Cattle monitored to keep ‘Pete’ can produce



**Little Bluestem (*Schizachyrium scoparium*)**

Little bluestem is a warm season bunch grass that is perennial and grows between 2 and 4 feet in height. Leaf blades are flat and are from 6 to 10 inches long and 1/8 to 1/4 inch wide. It is an important forage grass that is grazed readily by livestock, deer. Small game such as rabbit and quail can be found in stands of this grass.

**ESTABLISHMENT OF NATIVE WARM SEASON GRASSES**

Native warm season grass may need special attention given for purchasing and planting seed, and for management of established stands. The following features are important to note which make warm-season grass planting different from other traditional plantings:

- Planting rates for warm season grasses are based on pure live seed (PLS) lb/acre and **NOT** bulk lb/acre.
- All warm-season grasses require a firm seedbed for best establishment.



**Switchgrass (*Panicum virgatum*)**

- Traditional seeding equipment works well for switchgrass and eastern gamagrass, but fluffy-seeded species such as big bluestem, little bluestem and indiangrass require special equipment and/or techniques for successful seedings.



Planting Eastern gamagrass at the Jimmy Carter Plant Materials Center.



Eastern gamagrass 3 months after planting.



Eastern gamagrass InterCenter Strain Trial (clipping in progress) to determine dry matter production from 13 accessions and one standard called 'Pete'. The dry matter yield for all accession averaged 13,726 lbs./Ac. One accession from Montgomery, AL produced 17,000 lbs./Ac. of dry matter yield.

### **PURCHASING SEED**

It is best to purchase certified seed of varieties adapted to the region of planting. Certified seed is guaranteed to be true to a variety, and use of certified seed may lead to a more reliable planting. It is best to order different species and varieties separately instead of pre-mixed because seeding and management specification will differ between species.

Warm season grass species should be purchased on a pure live seed (PLS) basis. Do not confuse 12 lb PLS/acre with 12 bulk lb/acre. Failure to recognize PLS when purchasing seed and figuring seeding rates may yield unexpected results.

### **TIME OF SEEDING**

Warm season grasses are best established during March through May. Early planting is critical even though warm season grasses do not germinate until soil temperatures are above 50 to 55 degrees F. Avoid planting after June 1 because moisture and weed competition may delay stand establishment.

Early establishment allows seedlings to develop good root systems before summer drought and greatly increases the ability of the grasses to compete with weeds. Irrigation (if available) should be applied when soil conditions are very dry to enhance seed germination and stand establishment.

Native grass seed typically contains higher percentages of dormant seed than cool season forages. Planting early into cool soil will chill the seed and may help dormant seed to germinate.

Seeding into warmer soil in late spring can be helpful in controlling weeds. The first flush of weeds is allowed to germinate and then is killed by final tillage or contact herbicide just prior to planting. Ideally, this practice

would result in the shortest period of bare ground and would get grass seedlings up as quick as possible to compete with other weeds.

## **SEEDBED FERTILITY**

Warm season native grasses can be productive on low fertility soils, but fertilization will increase plant vigor. Soil test the field prior to planting or cultivating. The pH should be adjusted to a range of 5 - 6 if needed. Incorporate lime in the fall to allow it time to adjust pH before planting in the spring. Fertility up to medium levels for phosphorous (P), and potassium (K). Incorporate P and K into the soil at planting time. Do not apply nitrogen (N) at or before planting time. Nitrogen and phosphorous have been shown to increase productivity. However, nitrogen promotes weed growth, as well. Unless weed competition is low, N should be excluded the first year until a stand becomes established. The only exception for N application is planting critical sites, such as log decks, log roads, skid trails and other impoverished soils.

In addition to the above guidelines, follow the fertilizer and lime recommendation in your state. Consult your Field Office Technical Guide (FOTG) for more specific information based on site and soils.

## **SEEDBED PREPARATION**

Native warm season grasses are best established by creating a tilled, firm seedbed. It is best to remove all vegetative cover through the use of approved herbicides or extensive tillage. Seedbeds should be adequately plowed, disked and packed prior to planting. A cultipacker works well for firming the seedbed. If a prepared hard seedbed is rained on before planting, harrow and cultipack again before planting.

## **EQUIPMENT USED FOR SEEDING**

Ideally seed will be drilled into a prepared seedbed. Switchgrass may be planted with a conventional drill because it has a hard, smooth seed coat. Conventional drills equipped to seed alfalfa work well. Eastern gamagrass seed is about the size of corn seed and is best planted with a corn planter. Big and little bluestem and indiangrass seed have appendages with fine hair and will not pass through conventional equipment unless they can be ordered as "debearded" or brushed seed. Debearded seed may pass through a conventional drill, though it may still be best to use a special drill designed for fluffy seed. Seed drills advertised as "native grass drills", such as a Tye or Truax drill, have special boxes equipped with picker wheels and augers which help prevent seed from sticking together and move the seed to the drilling mechanism. Many native seed drills have multiple boxes, which allow for the sowing of both switchgrass and fluffy seeded species at the same time. Switchgrass, indiangrass, and big and little bluestem should be seeded at 1/4 to 1/2 inch deep. In sandy soils be especially careful not to bury seed too deep! Eastern gamagrass is usually seeded at 1/2 to 3/4 inches deep. Planting native grasses with conservation tillage equipment is not recommended at this time.

If a seed drill is not available, seed may be broadcast over a site. Broadcast fluffy seed (bluestem and indiangrass) with a drop spreader or cyclone spreader and then drag to lightly cover seed. If you are using a cyclone spreader, try mixing seed with inert matter such as kitty litter or sawdust for better spreading. Successful broadcast seeding can be achieved by increasing seeding rate and by rolling or cultipacking before and after seeding. When planting a small area (1/4-acre) in droughty conditions, an optional step to enhance the stand would involve lightly mulching the seeded area.

**SEEDING RATES**

Warm season grasses species vary in their growth characteristics. This makes it more difficult to manage mixtures for pasture or hay use, so only one species should be seeded per field. In areas planted for wildlife and erosion control the management of mixtures is not as critical. Information is being developed on the use and adaptability on establishing native grasses in mixtures.

Seeding rates for pasture and hay, wildlife, critical area treatment and conservation buffers are found in the tables 1 and 2.

**Table 1: Seeding rate for species planted alone**

Species	Seeds/lb.	Pounds of Pure Live Seed (PLS) per Acre			
		Forage	Wildlife	Buffers	Critical Area
Big bluestem	165,000	7	3	7	8
Little bluestem	255,000	7	3	7	8
Switchgrass	389,000	6	2	10	10
Indiangrass	175,000	7	3	8	8
Eastern gamagrass	7,800	14	7	14	14

**Table 2: Seeding rate for mixed species plantings**

Species	Seeds/lb.	Pounds of Pure Live Seed (PLS) per Acre			
		Forage	Wildlife	Buffers	Critical Area
Big bluestem	165,000	4	3	4	7
Little bluestem	255,000	3	2	3	7
Switchgrass*	389,000	4	2	3	5
Indiangrass	175,000	4	2	3	7
Eastern gamagrass*	7,800	**	**	4	**
<b>Total lbs PLS / Ac.</b>		<b>15</b>	<b>9</b>	<b>17</b>	<b>26</b>

\* Switchgrass and eastern gamagrass should not be pre-mixed with fluffy-seeded species

\*\* Eastern gamagrass is best when used alone for these applications

**SEED QUALITY**

Warm season grasses can be quite variable in germination rate and the purity of seed. Pure Live Seed (PLS) should always be used when purchasing seed and to determine the bulk amount of seed necessary for a planting. It may be necessary to increase your seeding rate to provide the recommended rates of pure live seed.

Read the seed tag to determine contents of the bag and seed quality. From the tag you can obtain information on **% germination, % inert material, % other seed, and % weed seed**. With this information you can compute the **percent pure live seed and pounds of bulk seed** required using the steps in Figure 1.

## Figure 1. Steps for computing seed quality and seed requirements

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**TO DETERMINE PURE LIVE SEED PERCENTAGE, USE THIS CALCULATION:**

$$\text{pure live seed \%} = (\text{purity \%} \times \text{germination \%}) / 100$$

where

$$\text{purity \%} = 100\% - (\text{inert matter \%} + \text{other crop seed \%} + \text{weed seed \%})$$

then

$$\text{lbs. bulk seed required} = \text{seeding rate} / (\text{pure live seed \%} / 100)$$

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Native grass seed typically contains higher percentages of dormant seed than do introduced cool-season grasses or legumes. Dormant seed is assumed to be alive and is counted in total germination, but seed companies are not required to specify the percent dormant seed on the label. With the new minimum seeding rates, first-year stands can be sparse simply due to dormant seed. As a consequence, stands should not be considered a failure until the second summer at the earliest. If one or more seedlings are found per square foot of soil, the stand will usually be adequate.

## RECOMMENDED VARIETIES OF NATIVE WARM SEASON GRASSES FOR USE IN GEORGIA, ALABAMA AND SOUTH CAROLINA

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### Big bluestem

'Rountree' Preferred variety for hay production, adapted to the southeast, good seedling vigor and forage productivity. Matures two weeks earlier than 'Kaw'. Origin: Iowa. Recommended for wildlife plantings in a mixture (3 lbs PLS/ac) with other native grasses.

'Kaw' Preferred pasture variety; adapted in most of the southeast, especially to drought sites. Not recommended as a pure stand but in a mixture (3 lbs PLS/ac) with other native grasses. Origin: Kansas.

### Little bluestem

Cimarron Preferred variety for wildlife plantings. Adapted to the southeast.

Aldous Not well adapted in most of the southeast. Can be used for wildlife plantings in a mixture with other native grasses. Not recommended for forage. Demo plantings in South Carolina have been successful.

### Indiangrass

'Lometa' Preferred variety for the southeast. Good seedling vigor and superior forage production given normal rainfall. Survival and production is better than 'Rumsey' and 'Cheyenne' at the Jimmy Carter Plant Materials Center.

Recommended for forage, buffers, wildlife plantings and critical areas.

'Rumsey'	Survival and production not as good as 'Lometa'. Not recommended as a pure stand but in a mixture with other native grasses for forage. Can be planted in mixtures for wildlife plantings.
'Cheyenne'	Not a certified variety, although noncertified seed is available. The performance in most of the southeast is not as good as 'Lometa' or 'Rumsey'. Recommended use is in mixed stands for wildlife plantings on drought sites. Not recommended for forage.
'Oto'	Not well adapted in most of the southeast. Can be used for wildlife plantings in a mixture with other native grasses. Not recommended for forage. Origin: Nebraska.
Americus (Experimental Accession)	This experimental accession is in the final stage of testing at the Jimmy Carter Plant Materials Center. It is a native of the southeast (Georgia and Alabama). It has a wide range of adaptation and performs better than 'Lometa' in most sites in the southeast. Competes well with 'Pensacola' bahiagrass. Performs better than bahiagrass on drought sites. Recommended in pure stands. Conservation uses include: forage, buffers, wildlife, urban landscapes and critical areas. This accession is scheduled for release in 2-3 years. It will be the only indiagrass variety that is native to the southeast.

### Eastern gamagrass

'Pete'	Adapted to most of the southeast. It can be used for forage, silage, hay, nutrient reclamation from lagoons and municipal spray fields because of good nitrogen and phosphorus uptake. Used for urban conservation during the 1996 Atlanta Olympics for beautification and erosion control. Can be used for conservation buffers.
'Tuka'	'Tuka' is a new variety and its full range of adaptation is unknown at this time. The plant materials centers have established plantings to determine the performance and adaptation in the southeast. Pete is the preferred variety at this time.

### Switchgrass

'Alamo'	'Alamo' switchgrass is highly recommended throughout the southeast. It has been fully tested for conservation uses and is recommended for forage, buffers, wildlife plantings, critical area treatment, shoreline and streambank stabilization and nutrient reclamation.
'Cave-In-Rock'	'Cave-In-Rock' is recommended in the northern portion of the Southeastern Region. Not as good on critical sites as 'Alamo'. Adapted to lowland and upland sites with good palatability and animal gains. More

dormant seed than 'Blackwell' and tends to be slow to establish. It is a good variety for wildlife plantings.

'Blackwell'

Not well adapted in the lower southeastern portion of the Southeastern Region. Can be used in mixed stands for wildlife plantings. Less forage production than 'Cave-In-Rock. Fine stemmed and rust resistant

'Shelter'

Adapted mostly for wildlife plantings. Not recommended for forage and/or erosion control.

Miami

Stuart

Wabasso

These relatively new pre-varietal releases (source-identified) which are adapted for use in Florida. The conservation uses include forage, wildlife and critical area treatment. These releases are established vegetatively.

## SPECIAL USES OF NATIVE WARM-SEASON GRASSES

### Erosion Control

On critical areas, warm-season grasses will control erosion. They will provide low maintenance cover on banks and roadsides of state and U.S. highways. Excellent for streambank stabilization and conservation buffers. Native grasses can be used successfully for critical area treatment for urban conservation.

**Photo 1 Switchgrass Buffer- conservation buffer/filter strip reduces erosion from adjacent croplands. Use of switchgrass instead of fescue in a filter strip vastly improves it for wildlife cover while retaining all of the erosion control ability.**

**Photo 2 Urban conservation of Eastern gamagrass. Eastern gamagrass is used at Wolf Creek Skeet Shoot for the Atlanta 96 Olympics in Atlanta, Ga.**

**Photo 3 Eastern gamagrass used for municipal wastewater Sprayfield in Bellview/Perry located in Marion County, near Ocala, Florida.**



### **Wildlife Habitat**

Wildlife biologists and upland game managers use warm-season grasses for game habitat, nesting and holding areas. The stubble of the grasses remains over the winter providing nesting cover and protected “trafficways”. Little bluestem, big bluestem and indiagrass are usually in these seeding mixtures.

For wildlife plantings on fallow and cropland fields and woodland edges use the planting information provided below.



**Wildlife planting – Mixture of switchgrass, little bluestem, and indiagrass plants for wildlife after a clear-cut in Abbeville, South Carolina.**

### **SEEDBED PREPARATION**

#### **Fallow/Cropland Fields**

Till soil to a depth of 3 inches prior to seeding. Follow the procedures described above for seedbed preparation.

#### **Woodland Edges**

Establishing food plots along woodland edges can be difficult due to compacted soils and tree roots. Till soil or disk the area to a depth of 3 inches or as much as possible to loosen the soil. Broadcast seed and cultipack to ensure good seed soil contact.

#### **Slopes Greater than 8 Percent**

Disk area lightly, no less than 2 inches. Broadcast seed and cultipack to ensure good seed soil contact. Area must be mulched to prevent erosion and loss of seed. Mulch should be applied on slopes at a rate of 1000 lbs./Ac.

#### **Planting Date, Seeding Rates, Fertilizer and Lime**

Procedures described above for planting dates, seeding rates and fertility should be followed. The only exception is on highly erodible sites and sites with very poor sterile soils. On these sites use 40 to 60 lbs./Ac of nitrogen to promote growth.

## **MANAGEMENT OF NATIVE WARM SEASON GRASSES**

### ***Grazing Management***

Initial grazing of native warm season grasses in the early summer should not begin until the plants are 12 to 15 inches tall. Plants may be grazed no lower than 8 to 10 inches. These are tall grasses and the taller the plants are maintained the more vigorous the forage production that you will have. Grazing lower than 6 inches will result in plants with less vigor. You can graze the plants somewhat more intensely in the late spring to early summer as long as you reduce the grazing pressure in time to permit growth back to 12 inches in late summer and give the grass some rest in the fall. A rest in the fall before frost will provide for a vigorous start the next year.

Rotational grazing (grazing different fields) is recommended to reduce trampling and enhance utilization. A 4 to 6 week rest period allows grasses to recover and light regrowth can occur. In a rotational grazing system regulate to avoid regrowth. The duration of grazing of an individual paddock or field should not exceed 1 week.

**DO NOT GRAZE WARM SEASON GRASSES AS CLOSE TO THE GROUND AS TALL FESCUE OR YOU WILL DAMAGE THE STAND. YOU WILL GET MAXIMUM PRODUCTION WITH MODERATE GRAZING INTENSITY.**



**Rotational grazing demonstration at the Jimmy Carter PMC**

### ***Hay Management***

Switchgrass should be hayed in the late boot stage (usually mid to late June). Bluestem reaches this stage in early to mid July. This produces the best compromise between hay quality and tonnage. It allows regrowth prior to frost, replacing energy reserves in the roots so that the stand can produce a vigorous growth the following year. At the same time, it permits adequate regrowth that can provide wildlife with good winter cover. Gamagrass can be hayed up to three cuttings (early June, July and August); however it needs 45 days rest before first frost.

DO NOT cut hay stubble lower than 8 inches to allow the grass to make a more rapid recovery to maintain a healthy stand. If you are emphasizing wildlife in the haying operation, consider leaving a band of unmowed grass adjacent to woody cover, fencerows and drainage corridors.

### ***Prescribed Burning***

Native warm season grasses are especially well adapted to management with fire. A spring burn will remove old growth, recycle nutrients tied up in standing dead vegetation, control invasive, control brush invasion, and produce a succulent forage for calves and young stock. Prescribed burning is the most economical method to improve or maintain native grasses. The best time to burn is from December through March. Check with the State Forestry Commission before burning.



**Periodic controlled burning of warm season grasses maintains their vigor, improves palatability for livestock, removes old growth, and helps control invasive weed competition.**

Mowing native warm-season grasses can also be an effective way of management. The best time of year to mow is during the fall through late winter. Mow on a three-year cycle where 1/3 of the area is mowed each year. Do not mow during the spring or summer months because of the nesting season. When mowing, cut grass no lower than 6 inches and allow stubble to remain

until spring to help insulate plant roots and provide cover for wildlife. If native warm-season grasses are cut lower than 6 inches during the active growing season, the stand will be reduced significantly.

### **Weed Control**

Post-planting weed control requires prompt attention especially during the establishment year. Inspect the planting every two to four weeks for weed pressure. Light infestations of foxtail or broad-leaved weeds during the establishment year are generally not considered to be a problem. Severe infestations of noxious or highly competitive weeds, such as crabgrass, may require spot spraying with an herbicide such as glyphosate. There are a few broadcast herbicides available to control weeds in native grass restoration plantings. Plateau™ is a relatively new herbicide labeled for most warm-season grasses, though switchgrass may be sensitive to this herbicide. The use of glyphosate during the winter when warm-season grasses are dormant may be useful for controlling cool-season species such as tall fescue. A combined program of mowing, herbicides, and prescribed burning often provides the best results at controlling weeds.

### **Weed Control The First Year**

Mow the growing plants to a height of 8-10 inches during June, July, and August. This will slow the weeds but won't harm the grasses. It is important to mow early and often to assure adequate control. Mowing height should never be less than 6 inches.

### **Weed Control The Second Year**

Evaluate the stand to determine if mowing for weed control is necessary. If it is, mow to a height of 8-10 inches. For wildlife habitat, do not disturb during nesting season.

If there is enough material for a spring burn, burning may be used for weed control. Spring burns will tend to encourage warm-season species and work well to control cool-season plants. Burn, in the spring, when the cool-season plants are growing and the warm-season plants are just barely starting to grow.



**A 2<sup>nd</sup> year planting of Alamo switchgrass in late May, 1998 on Sugarhill Farm located in Barnesville, Georgia.**

## **About the Authors**

### **Donald Surrency**

Team Leader - Plant Materials Specialist  
with USDA-NRCS in Athens, GA  
Provides technical assistance to AL, GA, and SC

### **Charles M. Owsley**

USDA-NRCS  
Manager, Jimmy Carter Plant Materials Center  
located in Americus, GA

### **Sid Brantly**

Regional Grazing Land Coordinator for the  
Southeast Region, Located at the USDA-NRCS  
State Office in Auburn, AL

### **Valerie Pickard**

District Conservationist with  
Natural Resources Conservation Service in Marietta, GA

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Ed Hackett, Wildlife Habitat Management Institute, USDA-NRCS, Madison, MS  
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Sam Sanders, Plant Materials Specialist, USDA-NRCS, Gainesville, FL  
Clarence Maura, Manager, Brooksville Plant Materials Center, Brooksville, FL  
Sue Roach, Bio-Tech, USDA-NRCS, Jimmy Carter PMC, Americus, GA  
Malcome Kirkland, Asst. Mgr., Jimmy Carter PMC, Americus, GA  
John Vance, Biologist, USDA-NRCS, Athens, GA  
Jimmy Dean, Agronomist, USDA-NRCS, Athens, GA  
Louis Justice, Biologist, USDA-NRCS, Athens, GA  
Holli Kuykendall, Grazing Spec., USDA-NRCS, Athens, GA  
Jim Dial, SRC, USDA-NRCS, Athens, GA  
John Lawrence, SRC, USDA-NRCS, Gainesville, FL  
John C. Meetze, SRC, USDA-NRCS, Auburn, AL  
Bobby Brock, Agronomist, USDA-NRCS, Raleigh, NC  
Joel Douglas, Manager, Jamie L. Whitten PMC, Coffeeville, MS  
USDA-NRCS National Plant Materials Center, Beltsville, MD  
Mike Hall, Grazing Lands Specialist, Greenwood, SC  
Kenneth M. Rogers, Conservationist, Auburn, AL

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### **Availability**

For more information about native warm season grasses or to obtain a copy of this publication, contact the Natural Resources Conservation Service in Athens, Georgia (706-546-2114), or contact your local Natural Resources Conservation Service office.

### **On the Cover**

Eastern Gamagrass rotational grazing demonstration at the Jimmy Carter Plant Materials Center in Americus, GA.