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Selection and Use of Native Warm-Season Grass Varieties for the Mid-Atlantic Region



Helping People Help the Land

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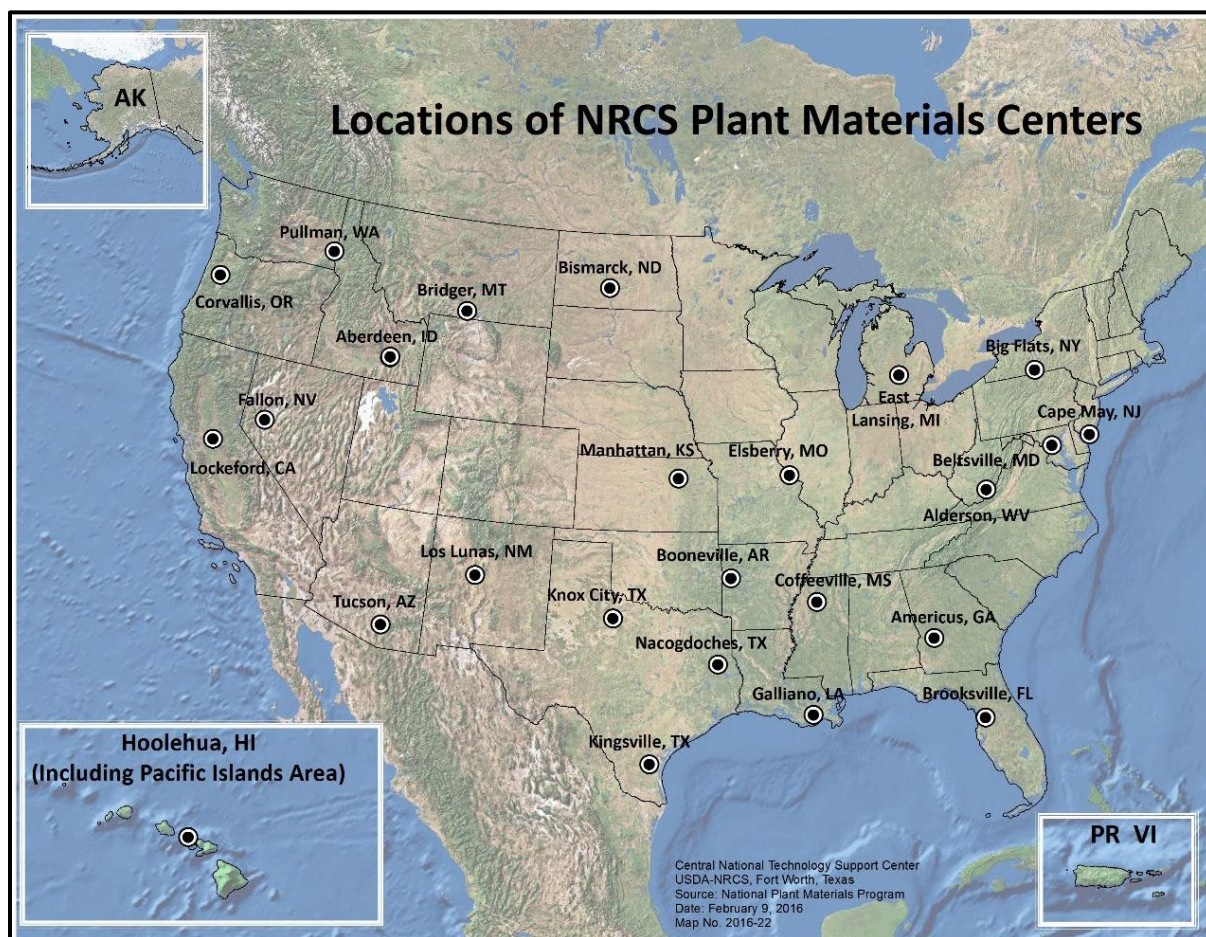
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Preface

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Plant Materials Program has been involved in the evaluation of conservation plants and planting technology for more than 80 years. This publication provides adaptation and performance recommendations of highly utilitarian Native Warm Season Grass varieties for Mid-Atlantic NRCS specialists and conservation planners.

For additional information on specific species of plants mentioned in this publication, please see the USDA PLANTS database at: (<http://plants.usda.gov/java/>) or contact the nearest Plant Materials Center or plant materials specialist (<http://plant-materials.nrcs.usda.gov/contact/>) and/or the Land Grant Universities that serves the State. For specific information on soils and soil health, please see USDA NRCS soils website at: (<http://www.nrcs.usda.gov/wps/portal/nrcs/site/soils/home/>). Also, see technical resources on the National Plant Materials Program Web site at: (<http://www.plant-materials.nrcs.usda.gov/>).



Overview:

Native warm-season grasses (NWSG) are the primary components of many of the conservation plant mixes used in the Mid-Atlantic United States. These versatile and utilitarian grasses are used for a multitude of purposes including:

- Soil, Streambank, or Shoreline Stabilization
- Wildlife Food and/or Habitat
- Improved Water and/or Air Quality
- Forage

Conservation practices reflecting these uses include:

- 327 Conservation Cover
- 332 Contour Buffer Strips
- 390 Riparian Herbaceous Cover
- 422 Hedgerow Planting
- 580 Stream/Shore Stabilization
- 386 Field Border
- 420 Wildlife Habitat Planting
- 512 Pasture and Hay Planting
- 601 Vegetative Barriers

Purpose:

To provide adaptation and performance recommendations of NWSG varieties for Mid-Atlantic NRCS specialists and conservation planners.

Findings:

The plant materials program and partners have introduced eight superior and/or local origin NWSG varieties since our initial 2008 publication. NRCS specialists and conservation planners can select from twenty-four different NWSG varieties to address a multitude of resource concerns.

NWSG Species and Variety Selection:

Selecting the best NWSG species and variety is mostly decided by the planting objectives and site conditions. A given variety may be very well suited for one purpose may sometimes be poorly suited for another. It may be necessary to prioritize planting objectives and which resource concerns are most important and best addressed by individual species and/or varieties. There are many cultivars, selected ecotypes, and source-identified (collectively referred to here as varieties) native warm-season grasses available commercially that meet conservation goals.

NWSG Utilization

The following conservation standards are potential uses of NWSG. Some conservation practices may be used for more than one purpose.

Soil and Water Conservation (Conservation Cover-Practice Standard 327, Contour Buffer Strips 332, Vegetative Barrier 601)

Conservation plantings that are used for specific functions such as slowing water runoff, trapping sediments, and reducing sheet and rill erosion may require NWSG varieties with higher levels of tested performance. Cultivars with proven performance may be more desirable, especially for difficult site conditions, than a local ecotype or source-identified material. Additionally, nutrients, pesticides and other potential pollutants are filtered out as water flows through the grass strips (Contour Buffer Strips (332) and Vegetative Barriers (601)).

Wildlife Habitat Planting (Conservation Practice Standards 386, 390 and 420)

Wildlife plantings benefit from NWSG seed that is locally adapted. Sources within 100 miles north or south and 500 miles east or west ensure climatic adaption and proper flowering and seed maturity timing. In meadows, complete cover is not desirable, rather patchy vegetation from smaller clumping species (purple top, little bluestem, broom sedge) is desired. Lower seeding rates as compared to higher seeding rates may increase plant diversity and the spacing between plants for wildlife movement. Conversely, most of the NWSG should also be large enough to sustain prescribed burns in locations where maintenance burns are feasible. Forb and small clumping grass diversity can be preserved by avoiding an overabundance of tall, vigorous NWSG (switchgrass, big bluestem, and to a lesser extent Indiangrass) which can out-compete the forbs. However, some tall, stiff stemmed, grasses create vertical diversity and winter habitat.

Hedgerow Planting (Conservation Practice Standard 422)

Swine and poultry houses generate particulates, ammonia, and other odors that are expelled from the houses by the ventilation system. Particulates (dust, bits of feathers, bedding, and manure) have been linked to respiratory effects in swine and poultry workers and can be a source of complaints from neighbors who live near farms. Ammonia emitted from poultry houses has been linked to degradation of air quality. Ammonia emissions can also affect water quality by increasing nutrient loading in waterways.

Tall, stiff-stemmed warm-season grasses planted near poultry house ventilation fans help trap particles, absorb or capture ammonia and other odors, and serve as visual screens, especially when planted with trees and shrubs. Grasses have many stems and relatively small leaves that provide a dense barrier to capture or disperse ventilation fan emissions. Warm-season grasses are more tolerant of heat and drying winds than most tree/shrub barriers, and can be planted alone or in front of shrubs and trees to provide an initial filter for ventilation fan emissions, and to slow wind speed providing shelter for the subsequent rows of shrubs and trees.

Pasture and Hay Planting (Conservation Practice Standard 512)

NWSG forage plantings can produce 3 – 5.5 tons/acre of dry matter annually (Ugiansky, Vough 2013) and fill the hot, dry periods (also known as summer slump) when cool season grasses are typically less productive (Denison, Perry 1990). One drawback in their adoption is the long establishment period of 2 to 3 years which may limit their adoption by producers and landowners.

Big bluestem and Indiangrass varieties establish easily, mature late, are highly palatable and have high yields (Table 1). Specifically, OZ-70 Germplasm big bluestem and ‘Rumsey’ Indiangrass varieties go to boot stage latest in the summer and were largest in a Maryland Plant Materials Center field trial (Belt 2019). Prescribed grazing switchgrass requires an extra level of management as it boots early, select varieties selected for forage production (i.e., leafiness, thinner stems, and vigorous re-growth). Most varieties of Eastern gamagrass produce excellent forage (high yield and palatability (Table 1)) but mature early.

Table 1: Comparative yield, establishment, and management attributes of native warm-season grass forages (Keyser et al. 2015).

Attribute	switchgrass	big bluestem	little bluestem	Indiangrass	eastern gamagrass
Yield	Very High	High	Moderate	High	Very high
Maturity	Early	Medium	Late	Late	Earliest
Palatability	Moderate	Highest	Moderate	High	High
Establishment	Difficult	Moderate/Easy	Easiest	Easiest	Moderate
Management	Difficult	Easier	Easier	Easier	Moderate

Streambank and Shoreline Stabilization (Conservation Practice Standard 580)

NWSG root biomass far exceeds that of the introduced cool season grasses and hence can frequently stabilize and protect streambanks and shorelines. They are very deep rooted, making for long lasting, stress tolerant, and low maintenance plants. The extensive root mass provides increased organic matter in soils and more rapid water infiltration rates. The bunch-type habit of warm-season grasses provides space for the inclusion of native forbs and legumes to further improve habitat quality while also stabilizing these potentially highly erodible areas.

Species Descriptions

Warm-season grasses can be categorized into three groups, based on method of planting. All the grasses described in Groups A, B, and C are native to the mid-Atlantic, have extensive, deep fibrous roots, and are bunchgrasses or have short rhizomes (the cordgrasses are very rhizomatous). Warm-season grasses are generally slow to establish, long lived, and tolerant of droughty and acid to alkaline conditions, but not to shade. Most are tall grasses that provide wildlife cover.

Group A. Smooth seeded species that can be planted with common drills

Switchgrass (*Panicum virgatum*) - a tall, stiff-stemmed, smooth-seeded, and widely adapted grass that reaches a mature height of 3 to 8 feet. Although bunch-like in appearance, switchgrass produces short rhizomes, especially when grazed. This perennial grass can tolerate poorly drained soils and has good drought tolerance. Specific cultivars can also withstand occasional flooding and perched water tables. Forage quality is good when immature but both palatability and nutrient content decline after seed head formation. Late season leafy re-growth arises from basal tillers and shoots will emerge along the lower stems at leaf nodes. Generally, switchgrass is divided into two ecotypes: lowland ecotypes and upland ecotypes. Upland varieties are typically associated with dry habitats and colder northern regions, while lowland varieties are associated with moist habitats and warmer southern regions.





Coastal panicgrass (*Panicum amarum* var. *amarulum*) - much like switchgrass but with better seedling vigor, however not reliably hardy north of zone 6. It can be used to provide initial temporary cover in mixes with other warm-season grasses. This grass is deep rooted (± 6 feet), robust, long lived, and grows to heights of 3 to 6 feet. It has excellent drought tolerance and does well on very coarse, well to excessively drained soils. It is used for dune stabilization, and gravel pit and mine land stabilization. The stems may be as thick as 1/2 inch, with bluish green leaves from 8 to 20 inches long and 1/4 to 1/2 inch wide. It produces short outwardly spreading rhizomes and forms clumps or bunches. Like most other species in the genus *Panicum*, coastal panicgrass has a large terminal branched inflorescence, but in coastal panicgrass the branches are held close together in a tight arrangement.

Eastern gamagrass (*Tripsacum dactyloides*) - a very large, robust grass with wide leaves and thick stems that grow 4 to 8 feet tall. Plants form large clumps with sizeable space between plants. It is among the earliest of warm season grasses to begin growth each spring and has excellent forage quality. Although tolerant to drought, ideal growing sites include fertile bottomlands and alongside streams. It is a relative of corn (*Zea mays*), with similarly large seed. Seed can be planted with a corn planter since it requires greater seeding depth than other warm season grasses. Eastern gamagrass is very slow to establish and has a high percentage of seed dormancy.





Florida paspalum (*Paspalum floridanum*) - a perennial rhizomatous grass ranges in height from 3 to 5 feet and up to 8 feet tall (in fertile soils). Seedlings are vigorous, establish easily (compared to many other NWSG), are bunch-like in their growth and spread slowly. It greens up in the early spring, has good seedling vigor, stand establishment and excellent drought tolerance. It is palatable, has good initial yields, is readily grazed by cattle, but deteriorates rapidly after maturity and may be best seeded as a companion to slower establishing grasses to increase initial yields rather than seeded in pure stands (Ugiansky, Vough 2013). Florida paspalum grows on disturbed (especially wet) areas providing good erosion control especially along vegetated swales or waterways. Wildlife (especially game birds) are readily attracted to its abundant large grain-like seeds from late summer into winter.

Group B. Chaffy seeded species that require de-bearding or specialized seed drills

Big bluestem (*Andropogon gerardii*) - like switchgrass, it is one of the major grasses of the tallgrass prairie and eastern native grasslands. Big bluestem is a tall upright bunchgrass with short rhizomes to expand the basal cover. It typically grows from 5 to 8 feet, but can reach up to 12 feet, and often takes on an attractive reddish-purple leaf and stem color at maturity. Big bluestem can be used on sites with excessively well drained soils and has moderate drought tolerance. It is most abundant on moist, well drained, fertile loamy soils. Highly preferred forage, second only to eastern gamagrass, it also retains its palatability after reaching maturity better than switchgrass or Indiangrass.



Indiangrass

(*Sorghastrum nutans*) - a tall upright grass that matures at 3 to 6 feet, sometimes up to 8 feet. Like big bluestem, it is slowly spreading and produces short, knobby rhizomes. It is later to green up in the spring and flowering than most other warm-season grasses, adding significantly to diversity. Moderately well-drained soils are preferred but Indiangrass can withstand occasional flooding. It begins growth later than switchgrass or big bluestem but produces good quality forage throughout most of the summer, retaining moderate palatability after seed head formation.

Little bluestem (*Schizachyrium scoparium*) - a long-lived, perennial warm-season, bunchgrass that grows to a height of 1½ to 5 feet. Little bluestem plants are slender, with flattened basal shoots that are often purplish at the base. The entire plants have a reddish cast after frost. Seeds with very hairy appendages are held in 3-inch long racemes along each stem. Having exceptional drought tolerance, little bluestem can be successful on very dry sites with thin or coarse soils. Full stands develop where moisture is sufficient but gets clumpy on drier sites. It has value as persistent low maintenance cover and as summer forage. It is very compatible with forbs due to its shorter growth. It is easily mistaken for common broomsedge (*Andropogon virginicus*), which has low forage value.



Coastal little bluestem (*Schizachyrium littorale*) - Coastal little bluestem is a short (1-2 foot) bunch grass with coarse blue-green stems and basal leaves which often appear purplish. It is very similar to little bluestem but can be distinguished by stems that point outward at their base and then bend to point upward. Leaves are smooth, but frequently are covered with hair at the base. Leaves tend to fold with maturity. Seed head clusters are about three inches long and have several short, silvery hairs (awns) when the seeds are ripe. In the late summer to early fall a low sun shining across the seed heads of this grass give the plant a frosty appearance. Like most dune adapted species, it will survive on droughty, hot and infertile sites. Coastal little blue can be used for diversifying sand dune plant communities, beach replenishment projects, and critical area stabilization within coastal zone areas or on droughty inland sites such as sand and gravel mines.

Group C. Vegetative planted species

Saltmeadow cordgrass (*Spartina patens*) – This short warm season perennial grows from 1 to 3 feet tall, and spreads extensively by long slender rhizomes, spreading about 1 foot per year. It grows immediately above the intertidal zone, commonly forming solid stands in estuarine marshes, and grows on secondary and back dunes. Dark green stems emerge from the rhizomes. The rolled leaf blades are typically 1/2 to 1 foot long, and 0.1 to 0.2 inches wide. Leaves are drooping and wiry in appearance. In late summer the inflorescence emerges at the end of the stem, which is composed of 2 to 10, 2- inch long spikelets.



Prairie cordgrass (*Spartina pectinata*) - Prairie Cordgrass is a 6 – 8-foot-tall, robust, grass, easily recognized by its very sharply serrated leaf blade edges. It has low seed viability, vigorous rhizomes provide great erosion control, freshwater shoreline protection and erosion control of dams, spillways and drainage channels. Prairie cordgrass has stiff stems, is shade intolerant and is not appropriate as a forage. It grows on seasonally dry sites, tolerates high water tables but doesn't tolerate prolonged flooding. Thick stands in mesic or wet soils provide good cover for game birds, songbirds, and small mammals.

Table 2. Recommended NWSG for the mid-Atlantic region by species, variety, origin, and potential uses.

SPECIES	COMMON NAME	VARIETY NAME	ORIGIN	USES
<i>Andropogon gerardii</i>	big bluestem	'Niagara'	NY	Forage
<i>Andropogon gerardii</i>	big bluestem	OZ-70 Germplasm	MO	Forage
<i>Andropogon gerardii</i>	big bluestem	Suther Germplasm	NC	Forage
<i>Panicum amarum</i> var. <i>amarulum</i>	coastal panicgrass	'Atlantic'	VA	Bank/Shoreline Stabilization
<i>Panicum virgatum</i>	switchgrass	'Bo Master'	NC	Biomass
<i>Panicum virgatum</i>	switchgrass	'Carthage'	NC	Forage
<i>Panicum virgatum</i>	switchgrass	High Tide Germplasm	MD	Bank/Shoreline Stabilization
<i>Panicum virgatum</i>	switchgrass	'Colony'	NC	Biomass
<i>Panicum virgatum</i>	switchgrass	'Kanlow'	OK	Hedgerow
<i>Panicum virgatum</i>	switchgrass	'Performer'	NC	Forage
<i>Panicum virgatum</i>	switchgrass	'Shelter'	WV	Wildlife
<i>Panicum virgatum</i>	switchgrass	Timber Germplasm	NC	Hedgerow
<i>Paspalum floridanum</i>	Florida paspalum	Mid-Atlantic Germplasm	MD	Forage, Wildlife
<i>Schizachyrium scoparium</i>	little bluestem	'Aldous', Suther Germplasm	KS, NC	Wildlife
<i>Schizachyrium littorale</i>	coastal bluestem	Dune Crest Germplasm	NJ/DE	Bank/Shoreline Stabilization
<i>Sorghastrum nutans</i>	Indiangrass	'Americus'	GA/AL	Forage, Wildlife
<i>Sorghastrum nutans</i>	Indiangrass	Prairie View Germplasm	IN	Forage, Wildlife
<i>Sorghastrum nutans</i>	Indiangrass	'Rumsey'	IL	Forage
<i>Sorghastrum nutans</i>	Indiangrass	Suther Germplasm	NC	Forage, Wildlife
<i>Spartina patens</i>	saltmeadow cordgrass	'Avalon', 'Flageo'	NJ/ NC	Bank/Shoreline Stabilization
<i>Spartina pectinata</i>	prairie cordgrass	Southampton Germplasm	NY	Bank/Shoreline Stabilization
<i>Tripsacum dactyloides</i>	Eastern gamagrass	'Highlander', 'Meadowcrest'	TN/ MD	Forage

Table 3. Optimal and acceptable site conditions and intended conservation practices of NWSG varieties recommended for the mid-Atlantic region.

COMMON NAME	VARIETY	SITE CONDITIONS					CONSERVATION PRATCICE/USE							
		DRY SOILS	MESIC SOILS	WET SOILS	SALT TOLERANT	pH (Min. – Max.)	327 CONSERV. COVER	386 FIELD BORDERS	390 RIPARIAN HERB. COVER	420 WILDLIFE HABITAT PLANTING	422 HEDGEROW/ WIND BARRIER	512 PASTURE HAY	512 BIOMASS	580 STREAM/SHORE STABILIZATION
big bluestem	'Niagara'	★	★	★		6-7.5		★	★	✓		✓	✓	
big bluestem	OZ-70 Germplasm	✓	★	★		6-7.5						★		
big bluestem	Suther Germplasm	✓	★	★		6-7.5		★	★	★		✓		
coastal panicgrass	'Atlantic'	★	★	✓	★	4.5 - 7.5			★	✓	★		✓	★
switchgrass	'Bo Master'	★	★	★	✓	4.5-8	✓						★	✓
switchgrass	'Colony'	★	★	★	✓	4.5-8	✓						★	✓
switchgrass	'Carthage'	★	★	✓	✓	4.5-8	✓	★	★	✓		★	✓	
switchgrass	High Tide Germplasm		★	★	★	4.5-8	✓	★	★					★
switchgrass	'Kanlow'	★	★	★	✓	4.5-8					★		★	★
switchgrass	'Performer'	★	★	★	✓	4.5-8						★		
switchgrass	'Shelter'	★	★	✓	✓	4.5-8	★	★	★	★		✓		
switchgrass	Timber Germplasm	★	★	✓	✓	4.5-8				✓	★		★	★
Florida paspalum	Mid-Atlantic Germplasm		★	★		5-7.5	★	✓	★			★	★	
little bluestem	'Aldous', Suther Germplasm	★				5-8.4	★	★	★	★		✓		
coastal bluestem	Dune Crest Germplasm	★			★	4.5-7.5				✓				✓
Indiangrass	'Americus'	★	★			4.8-8	★	★	★	✓		★		
Indiangrass	Prairie View Germplasm	★	★			4.8-8	★	★	★	★		★		
Indiangrass	'Rumsey'	★	★			4.8-8	★	★	★	✓		★		
Indiangrass	Suther Germplasm	★	★			4.8-8	★	★	★	★		✓		
saltmeadow cordgrass	'Avalon', 'Flageo'		✓	★	★	4.8-8				★				★
prairie cordgrass	Southampton Germplasm	✓	★	★	✓	6-8.5			★	★			★	★
Eastern gamagrass	'Highlander', 'Meadowcrest'	✓	★	✓		5.1-7.5	★	★	★	★	★	★		★

(★) Optimal (✓) Acceptable

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