

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
BROOKSVILLE, FLORIDA

NOTICE OF RELEASE OF GATOR GERMPLASM BLUE MAIDENCANE
TESTED CLASS OF NATURAL GERMPLASM

The Natural Resources Conservation Service, U.S. Department of Agriculture announces the release of a tested ecotype of blue maidencane [*Amphicarpum muehlenbergianum* (Schult.) Hitchc.].

This plant will be referred to as Gator Germplasm blue maidencane. It was tested under the NRCS accession number 9059971. It is being released as a vegetatively propagated material, increased from the original source collection.

This alternative release procedure is justified because there are no existing commercial sources of blue maidencane. This accession was selected for its outstanding vigor, spread, and stand persistence. The potential demand for this release is very high due to the need for additional wetland plants for use in reclaimed mined lands, constructed wetlands, and freshwater restoration sites in Florida. There is no potential to create improved materials through breeding due to its geocarpic seed production mechanism.

Collection Site Information: Gator Germplasm was collected in Citrus County, Florida, not far from its northeastern border with Marion County. It was found on the south side of state Hwy 200, 5 miles east (northeast) from the junction with US Hwy 41 at Hernando, Florida. The collection site is north of Tsala Apopka Lake and is in the floodplain of the Withlacoochee River, so it is often seasonally flooded. Soil type at the collection site is a Tavares fine sand, 0 to 5 percent slopes. Mean annual precipitation in the area is 53 inches, average maximum temperatures are 83 °F and average minimum temperatures are 59 °F, with approximately 300 frost-free days per year.

Description: Blue maidencane is a rhizomatous grass with erect culms that grow 15-100 cm tall. The fairly stiff leaves are bluish green, lanceolate, often with a narrow white margin, 5-15 mm wide and 10-15 cm long, without a prominent midrib. The genus name *Amphicarpum* is derived from the Greek word that means doubly fruit-bearing because this grass produces two types of spikelets. The obvious ones on the aerial inflorescence are bisexual, held in an open panicle that is 10-25 cm long. These spikelets are sterile. The subterranean fertile female spikelets are cleistogamous, produced on slender branches from the base of the culm (or occasionally from the lower nodes) and are 7-9 mm long. Due to its underground seed formation, this species is also commonly referred to as goobergrass.

Method of Breeding and/or Selection: Gator germplasm was selected from an assembly of 157 accessions of blue maidencane collected from throughout Florida from 1993 to 1998. Vegetative material, consisting of shoots, rhizomes, and roots, was collected from each site for testing. In March of 1999, these accessions were planted in an initial evaluation block at the Plant Materials Center (PMC) in Brooksville, Florida (Hernando County) in replicated 5' x 5' plots spaced 4 feet apart. Five plants were planted in each plot, with four plants on the corners and one in the middle to form the shape of an "X". 'Halifax' maidencane (*Panicum hemitomom* J.A. Schultes) was used as a standard of comparison. The blue maidencane accessions spread so quickly, that the plots began to grow together by the end of first year, which precluded continued evaluation; however, there was sufficient data to select eleven superior accessions for advanced evaluation (Table 1). These accessions were planted in tubs in March 2000 to confine them and ensure their isolation from the other blue maidencane accessions. Accessions 9059859, 9060309, and 9060311 had similar performance and were from a similar geographic location, so they were combined in one tub, which was assigned the accession number 9060489. Accessions 9059866, 9060066, and 9060067 were also combined in one tub for similar reasons and given the accession number 9060490 (Table 2). This resulted in seven tubs containing the superior blue maidencane accessions.

Table 1. Summary of initial evaluation results for eleven selected blue maidencane accessions at Brooksville, FL.

| Accession | Cover ---%--- | Height --cm-- | Foliage Abund. ¹ | Foliage Vigor ¹ | Spread Potential ¹ | Seedhead Abund. ¹ | Disease Injury ² | Insect Injury ² | Weed Comp. ² |
|----------------|------------------|------------------|--------------------------------|-------------------------------|----------------------------------|---------------------------------|--------------------------------|-------------------------------|----------------------------|
| 9059859 | 87 | 48 | 2.3 | 2.3 | 3.0 | 6.0 | 6.0 | 5.0 | 2.0 |
| 9060309 | 67 | 48 | 2.2 | 2.3 | 3.0 | 6.3 | 5.3 | 5.0 | 2.0 |
| 9060311 | 68 | 39 | 2.5 | 2.0 | 2.0 | 4.7 | 6.7 | 5.0 | 2.3 |
| 9059866 | 83 | 42 | 2.8 | 2.7 | 2.7 | 5.3 | 6.0 | 5.0 | 2.3 |
| 9060066 | 83 | 41 | 3.3 | 2.7 | 5.7 | 7.0 | 5.7 | 5.0 | 2.3 |
| 9060067 | 88 | 38 | 3.3 | 3.0 | 3.0 | 7.0 | 5.0 | 5.3 | 2.7 |
| 9059869 | 60 | 38 | 3.7 | 4.0 | 5.0 | 4.3 | 5.0 | 5.0 | 2.3 |
| 9059956 | 88 | 27 | 3.8 | 3.0 | 5.7 | 5.3 | 5.7 | 5.0 | 2.0 |
| 9059971 | 75 | 47 | 3.0 | 3.0 | 5.7 | 5.8 | 5.7 | 5.0 | 2.0 |
| 9060008 | 88 | 30 | 3.7 | 2.7 | 5.0 | 4.3 | 5.0 | 5.0 | 2.0 |
| 9060295 | 60 | 40 | 2.7 | 3.0 | 2.7 | 4.0 | 5.3 | 5.0 | 2.0 |

¹ Visual Observation Rating Scale: 9 = least; 5 = average; and 1 = most.

² Visual Observation Rating Scale: 1 = least; 5 = average; and 9 = most.

Table 2. Florida counties of origin and collectors for eleven superior blue maidencane accessions.

| Accession No. | County of Origin | Collectors |
|---------------------|------------------------------|----------------|
| 9059859 | Pasco | Pfaff/Gonter |
| 9060309 | Pasco | Deal/Pfaff |
| 9060311 | Pasco | Deal/Pfaff |
| Combined as 9060489 | | |
| 9059866 | Charlotte | Pfaff/Gonter |
| 9060066 | Sarasota (Myakka State Park) | Lackmann/Perry |
| 9060067 | Sarasota (Myakka State Park) | Perry/Lackmann |
| Combined as 9060490 | | |
| 9059869 | Palm Beach | Gonter/Pfaff |
| 9059956 | Madison | Gonter/Black |
| 9059971 | Citrus | Pfaff/Santucci |
| 9060008 | St. Johns | Pfaff/Santucci |
| 9060295 | Polk | Gonter/Pfaff |

Two advanced evaluation plantings using rhizomes of these accessions were planted in 2000, one in Collier County, Florida, near Naples and the second in Polk County, south of Bartow. The Collier County site was a flatwoods site that had previously been treated to control Brazilian pepper (*Schinus terebinthifolius* Raddi) and the Polk county site was on reclaimed mined land, adjacent to a small lake. Halifax and Citrus Germplasm common maidencane were planted as standards. A row of eastern gamagrass [*Tripsacum dactyloides* (L.)L.] was planted between the maidencane plots to act as a barrier to prevent the plots from growing together. Cattle grazing initially impacted growth on the Collier County site; however, after the site was fenced to exclude the cattle, the plants recovered nicely (Table 3). The height differential between the blue maidencane accessions and the common maidencane is due to inherent size differences between these two species.

Table 3. Performance of blue and common maidencane accessions on a flatwoods site in Collier County, Florida 11 months after planting.

| Accession | Plant Height | Canopy Width | Vigor ¹ | Ground Cover | Spread Rate ¹ | Drought Tol. ¹ | Disease Resist. ¹ | Insect Resist. ¹ | Weed Competition ² |
|----------------|--------------|--------------|--------------------|--------------|--------------------------|---------------------------|------------------------------|-----------------------------|-------------------------------|
| | -----cm----- | | | ---%--- | | | | | |
| 9059869 | 9.7 | 7.0 | 4.3 | 18.8 | 3.5 | 4.5 | 5 | 5 | 6 |
| 9059956 | 6.0 | 4.7 | 5.3 | 5.3 | 6.7 | 6.3 | 5 | 5 | 6 |
| 9059971 | 9.0 | 7.7 | 4.0 | 12.0 | 4.0 | 4.7 | 5 | 5 | 4 |
| 9060008 | 7.7 | 7.0 | 3.8 | 21.8 | 3.5 | 5.0 | 5 | 5 | 4 |
| 9060295 | 7.7 | 5.3 | 5.6 | 7.5 | 5.0 | 6.0 | 5 | 5 | 4 |
| 9060489 | 9.5 | 5.5 | 5.8 | 7.8 | 5.8 | 5.8 | 5 | 5 | 6 |
| 9060490 | 10.5 | 6.3 | 4.0 | 14.5 | 3.5 | 4.6 | 5 | 5 | 5 |
| Citrus | 19.0 | 11.0 | 3.5 | 16.0 | 3.8 | 4.3 | 5 | 5 | 4 |
| Halifax | 12.5 | 5.8 | 5.0 | 7.8 | 6.0 | 5.8 | 5 | 5 | 6 |

¹ Visual Observation Rating Scale: 9 = least; 5 = average; and 1 = most.

² Visual Observation Rating Scale: 1 = least; 5 = average; and 9 = most.

Soils at the Polk County site consisted of overburden with a heavy clay fraction. These soils tend to be sticky when wet and crust badly as they dry. These soil physical characteristics negatively affected emergence because shoots of all accessions had difficulty penetrating the crust. A heavy infestation of bermudagrass [*Cynodon dactylon* (L.) Pers.] and torpedograss (*Panicum repens* L.) created severe competition that affected survival of the plants. Citrus Germplasm exhibited the best survival, with an average emergence of 10.5 shoots when the plots were evaluated seven months after planting. All of the blue maidencane accessions averaged less than 3 shoots that had emerged at this same evaluation date. The taller stature of the common maidencane and its greater affinity for heavy textured soils probably gave it a competitive edge over blue maidencane at this site.

A third advanced evaluation plot was planted in 2001 in Hamilton County, Florida, near Jasper. These plots were on disturbed soils near a cypress marsh. A similar planting scheme, using the same accessions and rows of eastern gamagrass between the plots was used. Partial shading at the site affected growth of Citrus and Halifax, resulting in tall spindly plants (Table 4). All of the blue maidencane accessions were better adapted to the shade and their growth was much more vigorous. Ample access to moisture from the marsh prevented evaluation of drought tolerance.

Table 4. Performance of blue and common maidencane accessions on a cypress swamp border site Hamilton County, Florida 6 months after planting.

| Accession | Plant Height | Canopy Width | Vigor ¹ | Ground Cover | Spread Rate ¹ | Drought Tol. ¹ | Disease Resist. ¹ | Insect Resist. ¹ | Weed Competition ² |
|----------------|--------------|--------------|--------------------|--------------|--------------------------|---------------------------|------------------------------|-----------------------------|-------------------------------|
| | -----cm----- | | | ---%--- | | | | | |
| 9059869 | 22.3 | 7.3 | 5.7 | 3.0 | 8.7 | --- | 5.8 | 5 | 2 |
| 9059956 | 21.5 | 8.3 | 4.8 | 4.5 | 7.5 | --- | 4.8 | 5 | 2 |
| 9059971 | 20.8 | 6.3 | 5.5 | 3.5 | 8.3 | --- | 5.5 | 5 | 2 |
| 9060008 | 26.5 | 19.8 | 3.3 | 9.0 | 6.5 | --- | 3.1 | 5 | 2 |
| 9060295 | 26.0 | 9.3 | 5.5 | 3.5 | 8.3 | --- | 5.3 | 5 | 2 |
| 9060489 | 22.0 | 4.0 | 6.5 | 1.5 | 9.0 | --- | 6.0 | 5 | 2 |
| 9060490 | 53.5 | 26.3 | 4.0 | 17.0 | 6.8 | --- | 5.0 | 5 | 2 |
| Citrus | 39.0 | 12.5 | 5.0 | 7.5 | 7.8 | --- | 5.3 | 5 | 2 |
| Halifax | 22.3 | 7.3 | 5.7 | 3.0 | 8.7 | --- | 5.8 | 5 | 2 |

¹ Visual Observation Rating Scale: 9 = least; 5 = average; and 1 = most.

² Visual Observation Rating Scale: 1 = least; 5 = average; and 9 = most.

Accession 9059971 consistently ranked near, but not necessarily at the top, in the evaluation criteria examined during these advanced evaluation plantings; however, the decision to release this germplasm was made based on its superior stand persistence under adverse conditions. The seven tubs at the PMC were provided minimal maintenance, other than regularly scheduled irrigation, for five years after planting. When examined in the fall of 2005, the other five accessions had mostly succumbed to severe weed pressure, but the tub containing 9059971 still had a fairly dense stand of shoots that were competing well with the weeds.

Ecological Considerations and Evaluation: Gator Germplasm is a clonal line increased from materials naturally occurring in the region of anticipated use of this release. Its vegetative rate of spread is not significantly greater than that of other blue maidencane plants found in its native range and the potential for widespread dispersal by seed is extremely limited. For these reasons, it is not anticipated to have the potential to displace other native species or have a negative affect on environmental quality. Gator Germplasm was evaluated through the Plant Materials Program Environmental Evaluation worksheet and was found to pose no problems for release.

Conservation Use: Blue maidencane is classified as a facultative wetland species; therefore, Gator Germplasm is well adapted for use in freshwater wetland restoration sites and constructed wetlands for wastewater treatment. Gator will form colonies with dense networks of roots and rhizomes and can provide excellent erosion control along the edges of ponds, streams, and ditches. Harvesting and spreading rhizomes on restoration sites can be mechanized, using standard agronomic equipment commonly available in Florida.

Blue maidencane is a palatable grass that is considered to be an important component of flatwoods rangeland in southern Florida. It is classified as a decreaser species that can provide grazing for up to 9 months. The University of Florida, IFAS Extension report yields for blue maidencane during the summer months averaged 4000 lb/ac of dry matter. Yield data for Gator Germplasm was not collected during the evaluation process, but should be comparable to these reported levels. Although vegetative planting of forages is generally considered to be prohibitively expensive, it is not an uncommon practice for many pasture grasses (i.e., hybrid bermudagrass, limpograss) used in Florida. Although commercial planting in those instances utilizes shoot material, since Gator Germplasm rhizomes can also be planted mechanically, using this grass in pastures and restored rangelands with suitable soils and hydrology is feasible. Deer will also graze blue maidencane and hogs will root up the rhizomes in the winter.

Anticipated Area of Adaptation: Gator Germplasm has been planted in northern (Hamilton County), central (Hernando and Polk Counties), and southern (Collier County) Florida. It grew well in all these areas, with the exception of the Polk County site, with its adverse soils and intense weed pressure. It has not undergone testing outside Florida; however, the native range of the species extends north to the coastal areas of Georgia and southern South Carolina. It is well adapted to acid to neutral sandy soils that are wet for part of the year. It will not grow in deep, stagnant water. Blue maidencane is reported to be tolerant of shade and Gator Germplasm grew well in the damp, shaded area at the Hamilton County site.

Availability of Plant Materials: G0 planting stock will be maintained by the Brooksville Plant Materials Center. Rhizomes can be requested from the Florida Plant Materials Specialist, Gainesville, Florida.

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Gator Germplasm blue maidencane [*Amphicarpum muehlenbergianum* (Schult.) Hitchc.]

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Gainesville, Florida

Date

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Date