TEXAS A&M UNIVERSITY
KINGSVILLE, TEXAS

and

TEXAS AGRICULTURAL EXPERIMENT STATION
BEEVILLE, TEXAS

and the

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
PLANT MATERIALS CENTER
KINGSVILLE, TEXAS

NOTICE OF RELEASE OF ATASCOSA GERMPLASM TEXAS GRAMA SELECTED CLASS OF NATURAL GERMPLASM

Texas A&M University-Kingsville (South Texas Natives Project), and Texas Agricultural Experiment Station at Beeville, Texas and the Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), announce the release of a selected ecotype of Texas grama (*Bouteloua rigidiseta* (Steud.) Hitchc.) for the south Texas ecoregion. Atascosa Germplasm is a composite of 4 collections that were tested under the following accession numbers: 9088532, 9086289, 9086275, 9086282, 9086281, and 9088708. (Accessions 9086289 & 9086275 were originally evaluated as separate accessions, but were combined because of similar collection site, originating soil type, morphology, and phenology. Accessions 9086282 & 9086281 were also evaluated as separate accessions, but were later combined because of similar collection site, originating soil type, morphology, and phenology.)

As a selected release, this plant will be referred to as Atascosa Germplasm Texas grama to document that a majority of its heritage comes from Atascosa County, Texas. Atascosa Germplasm is released as a selected class of certified seed (natural track).

This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted Texas grama. The potential for immediate use is high especially for highway right-of ways and in range seeding mixes for restoration and wildlife habitat.

Collection Site Information: Table 1 shows the origin and collection information of each accession. Figure 1 shows the field location of each collection. Each accession is made up of seed obtained from a single wild population of Texas grama. Seed was collected from the wild, cleaned and stored at the E. Kika De La Garza Plant Materials Center (PMC) in Kingsville, TX. No breeding or genetic manipulation was conducted on the accessions.

Table 2. Collection information of 21 accessions of Texas grama obtained by *South Texas Natives* from 2001-2003.

Accession	County	Location	Soil type
9068275	Atascosa	74 Ranch	Sandy loam
9086281	Atascosa	ALT US HWY 281	Loam
9086282	Live Oak	ALT US HWY 281	Loam
9086289	Atascosa	74 Ranch	Sandy loam
9088514	Duval	US HWY 359	Sandy loam
9088532	Zavala	Westwind Ranch	Sandy loam
9088599	Bee	FM 673	Loam
9088708	Webb	Old Mines Road	Gravel/loam
9088947	Atascosa	Smith Ranch	Clay loam
9088960	Frio	Shiner Ranch	Loam
9089044	Dimmit	Piloncillo Ranch	Sandy loam
9089074	Webb	Cerrito Prieto Ranch	Sandy loam
9090517	Frio	CR 212	Loam
9090525	Frio	Half Ranch	Sandy loam
9090559	McMullen	Franklin Ranch Road	Gravel/loam
9090560	Frio	Half Ranch	Sandy loam
9090585	Medina	FM 1343	Sandy loam
9090596	Maverick	Faith Ranch	Loam
9090601	Maverick	Faith Ranch	Loam
9090672	Dimmit	San Pedro Ranch	Sandy loam
9090728	Bexar	Thrift Ranch	Loam

Initial Field Evaluations: Seed from these accessions was used to grow transplants for initial field evaluations at Bladerunner Farms near Poteet, TX (Soil type Miguel fine sandy loam (USDA-SCS, 1977)) in 2003. Two 10' x 20' plots of each accession were established, with 25 plants from each accession per plot. Fourteen of the 24 accessions experienced 100% mortality by August of 2003.

Germination Tests: Seed was collected from the 10 surviving accessions from June-August of 2003 (Table 3) and tested for active germination in January 2004 (Table 4). In germination tests, each spike was counted as a single unit, even though 5-8 spikelets are contained in each spike. Cleaning and processing individual spikelets from spikes is impractical, and would likely result in damage to the individual caryopsis. The Association of Official Seed Analysts (AOSA) does not give specific guidelines for testing germination of Texas grama, but similar species such as sideoats grama are tested for germination by this method (AOSA, 2003). Germination was tested for 30 days (12 hours. light @ 85° F, 12 hours dark @ 65° F). Germinated seedlings were counted daily for each accession. Spikes that had more than one germinated caryopsis were counted as one, regardless of the number of spikelets germinating. Three repetitions of 50 seeds for each accession were tested. Seed from each accession was also tested using potting soil in a controlled climate greenhouse (day 88° F, night 65° F). Seventy two seeds of each accession were planted in flats, watered as needed and counted weekly. Three accessions were randomly chosen for tetrazolium tests (TZ) to determine seed dormancy and seed-fill in January of 2004. Seed fill was excellent among the three accessions tested, averaging 96.6%, and dormant seed averaged 27% (Table 5). Plots at Bladerunner Farms were subjected to rain-fed conditions in 2004.

Advanced Field Evaluations: Six accessions were chosen for further field evaluations based on germination tests conducted in January of 2004. These 6 accessions were evaluated in November 2004 (Table 6). Plots of all other accessions were removed from the experiment. Field evaluations were used to define and rank the performance of each accession according to commercially important traits. Accessions were compared to one another by visual estimation, and scored on a scale of 1 to 9. A score of 1 represents superior performance, and a score of 9 represents poor performance. Good performance was noted on all six accessions in the November 2004 evaluation. Plant survival was excellent on all six accessions.

Table 3. Seed production record of 10 accessions of Texas grama at Bladerunner Farms, June-August of 2003. Seed was collected when ripe June-August.

Accession	Lbs. seed produced	Plot Size (ft^2)	Seed production (lbs/acre)
9086275	0.511	400	55
9086281	0.522	400	56
9086282	0.288	400	31
9088532	0.320	400	34
9088708	0.016	100*	7
9089044	0.243	400	26
9086289	0.434	400	47
9088514	0.273	400	29
9088599	0.181	400	19
9089074	0.062	400	6

*limited by number of plants

Table 4. Active germination of 10 accession of Texas grama seed collected from Bladerunner Farms, June-August 2003.

Accession	Standard germination (% active germination)*	Greenhouse germination (% active germination)**
9086275	75.33	75.00
9086281	71.33	75.00
9086282	66.00	80.56
9088532	62.00	73.61
9088708	68.00	58.33
9089044	59.33	47.22
9086289	18.00	20.83
9088514	24.00	30.56
9088599	23.33	20.83
9089074	50.00	0.00

* Standard germination used controlled climate germination chambers (12 hrs light @ 85 F, 12 hrs dark @ 65 F), 3 repetitions of 50 seeds per accession

** Greenhouse germination conducted with 72 seeds in potting soil, watered as needed in a controlled climate greenhouse (day 88 F, night 65 F)

Table 5. Seed dormancy of 3 accessions of Texas grama.

Accession	% active germination	TZ test (%)	% dormant seed*
9086281	71.33	96.00	24.67
9086275	75.33	97.00	21.67
9088532	62.00	97.00	35.00

*Dormancy is calculated as the difference between tetrazolium test values and the percent active germination values determined on the same seedlot.

Table 6. Evaluation scores of 6 accessions of Texas grama planted at Bladerunner Farms (Poteet), evaluated in November 2004 (1=best, 9=worst).

Accession	9088532	9086289	9086282	9086275	9086281	9088708	Mean
Plant Vigor*	1	2	2	2	3	3	2.12
Foliage density	2	1	1.5	2	3	4	2.25
Uniformity	1	2	1.5	3	1	2	2.75
Development stage	1	1	1	1	1	1	1
Seed production	1	3	5	3	3	4	3.17
Forage production	1	2	1.5	3	2	3	2.08
Plant height	1	2	1.5	3	2	2	1.91

* Plant vigor: overall health and performance, including evidence of tillering, vegetative production, seed production, size

Foliage density: determination of the cover value of each accession, leaf density and growth habit are major considerations

Uniformity: an index of similarity of the individual plants within an accession

Development stage: a numerical value defining the morphologic and phenologic stage of the accession. A value of 1 is given to accessions with ripe seed, a value of 9 to the seedling stage of the plant.

Seed production: estimate of the amount of seed produced by the accession, number and size of seed stalks and spikelets, and spikes/spikelet are taken into account

Forage production: amount of herbaceous matter produced that could be consumed by grazing animals

Plant height: height of the above ground portion of the plant

In February 2005, the 6 accessions of Texas grama selected because of high germination rates were grown for advanced evaluation at 3 locations in the Rio Grande Plains. Transplants were grown from original seed and planted at the Caesar Kleberg Wildlife Research Institute (CKWRI) Wildlife Complex in Kingsville, TX (soil type Victoria clay), TAES Beeville (soil type Clareville sandy clay loam & Parrita sandy clay loam (USDA-SCS, 1979)), and Rancho Blanco, near Laredo, TX (soil type Lagloria silt loam (USDA-SCS, 1981)) (Figure 1). Field plots were established at Rancho Blanco in March 2005, TAES Beeville in May 2005, and CKWRI Wildlife complex in June 2005. Plots at Rancho Blanco and CKWRI Wildlife complex were planted in a split plot design (2 replications x 10 plants of each accession), and plots at TAES Beeville were planted in isolated blocks, 900 ft. apart to facilitate use of the site as a seed increase site. All plots were irrigated to ensure establishment and weeded as needed. Plots at TAES Beeville were irrigated year-round to facilitate seed production. Plots were evaluated monthly (Rancho Blanco), or whenever significant growth occurred (Beeville, CKWRI Wildlife Complex) for important traits, and seed was collected when ripe. Tables 7, 8, and 9 summarize the performance of each accession at Rancho Blanco, TAES Beeville, and the CKWRI Wildlife Complex, respectively. Seed was tested for active germination in December 2005. Results of the germination tests are given in Table 10.

Table 7. Evaluation data collected during the 2005 growing season on 6 accessions of Texas grama planted at Rancho Blanco (Laredo) (1=best, 9=worst).

Accession	9088532	9089289	9086282	9086275	9086281	9088708	Mean
Plant vigor	2.50	2.83	3.33	2.67	2.42	3.55	2.83
Foliage density	2.42	2.58	3.08	2.83	2.50	3.55	2.82
Uniformity	2.25	2.42	2.08	2.42	2.25	3.09	2.41
Development stage	1.33	1.92	2.75	2.33	2.33	2.09	2.12
Seed production	2.75	2.50	3.27	3.25	3.33	3.91	3.16
Forage production	2.50	2.83	3.25	2.83	2.17	3.45	2.83
Plant height	3.00	3.08	2.83	3.00	2.92	3.36	3.03

Table 8. Evaluation data collected during the 2005 growing season on 6 accessions of Texas grama planted at CKWRI Wildlife Complex (Kingsville) (1=best, 9=worst).

Accession	9088532	9089289	9086282	9086275	9086281	9088708	Mean
Plant vigor	3	3	2	2	2	3	2.5
Foliage density	2	1	3	4	2	2	2.3
Uniformity	3	2	2	2	3	3	2.5
Development stage	1	1	1	1	1	1	1
Seed production	4	3	4	4	3	2	3.3
Forage production	3	2	4	3	3	2	2.8
Plant height	2	2	4	4	2	2	2.6

Table 9. Evaluation data collected during the 2005 growing season on 6 accessions of Texas grama planted at TAES Beeville (1=best, 9=worst).

Accession	9088532	9089289	9086282	9086275	9086281	9088708	Mean
Plant vigor	3	3	6	4	3	2	3.5
Foliage density	3	4	6	4	3	3	3.8
Uniformity	3	3	6	4	2	3	3.5
Development stage	1	1	2	2	2	1	1.5
Seed production	3	4	5	4	3	2	3.5
Forage production	3	4	6	3	3	3	3.5
Plant height	2	3	6	3	2	1	2.8

Table 10. Active germination of 6 accessions of Texas grama seed from 2 locations (2005).

Accession	% active germ. (Rancho Blanco)	% active germ. (TAES Beeville)	Mean % active germ/acc
9088532	48.00	14.00	31.00
9086289	46.67	1.33	24.00
9086282	40.00	37.33	38.67
9086275	50.67	44.00	47.33
9086281	42.67	13.33	28.00
9088708	56.00	29.33	42.67
Mean % active germ/site	47.33	23.22	35.28

Seeding trials: Two seeding trials were initiated in the fall of 2005. Seed of accession 9086282 was used in both trials. The first was in conjunction with a herbicide tolerance study being conducted at the Welder Wildlife Refuge near Sinton, TX. Four 10' x 10' plots were seeded at 10 lbs. PLS/acre. Three of the four plots were treated with one of the following pre-emergent herbicides (Plateau (Imazapic) @ 3 oz/acre, Plateau @ 6 oz/acre, or Stalker (Imazapyr) @ 12 oz/acre). One plot was a control. Plots were seeded in October 2005. Plots will be monitored in 2006 for stand establishment and resistance to each herbicide. The second planting was the TXDOT US HWY 77 planting near Kingsville. Texas grama was seeded as part of a native grass mixture at a rate of 0.6 lbs. PLS/acre in the highway medians. This planting will be monitored for stand establishment and percent cover/species throughout 2006. Medians were seeded in November 2005. Additional rangeland seeding trials are planned for 2006 at various locations (Uvalde, Webb, Frio, Duval, and Hidalgo counties) throughout South Texas.

Seed production: Accession 9086282 was chosen for a large scale seed increase for use in a demonstration planting for TXDOT on US HWY 77. In August 2004, 1280 transplants were started from seed collected at Bladerunner Farms in 2003. Seedlings were transplanted at the CKWRI Wildlife Complex (Victoria clay soil) in October 2004. Transplants were planted at a rate of 1per ft^2 (plot size = 1280 ft^2). Plants were watered and fertilized, and seed was harvested throughout 2005. Table 11 shows the amount of seed produced and seed quality from this increase. Seed production of 37 lbs pure live seed (PLS)/acre was achieved. Seed was harvested by hand and by the use of a Flail-vac seed stripper at 1000 rpm. Seed production was lower than expected; active germination was 40-50% lower than observed in pervious harvests.

Table 11. Seed production of accession 9086282 at CKWRI Wildlife Complex in 2005.

Bulk seed produced (lbs.)	5.46
Purity (%)	100
Active germination (%)	20
Pure live seed (PLS) (%)	20
Lbs. PLS produced	1.09
Seed production (bulk lbs./acre)	185
Seed production (lbs. PLS/acre	37

Insect damage: The rice stink bug (*Oebalus pugnax*) has been observed on plants of Texas grama from flowering until seed maturity. Rice stink bugs are known to destroy the endosperm of developing grass seeds (Drees and Jackman, 1999). The seed production plot at the CKWRI Wildlife Complex showed severe infestations of rice stink bugs (5-20 bugs/plant) in August and September 2005. The field was treated with Sevin XLR at 3 quarts/acre; rice stink bugs were effectively controlled. Production fields of Texas grama should be monitored closely to detect and control rice stink bugs before severe infestations occur. No other insects or pests have been documented as being detrimental to seed production of Texas grama.

Criteria for inclusion in release*:* All 6 accessions selected from the 2004 germination tests, and evaluated at 3 locations in 2005, have shown excellent adaptability, seed production, and performance at each location. The distribution of the original collections mirrors that of the native range of the species. All 6 accessions show similarity in flowering and seed maturity. Accessions 9086281 and 9086282 were combined because of the close proximity of collection sites, and the similarity of collection attributes (range site, soil type). Accessions 9086289 and 9086275 were also combined for the same reason. All plots will be monitored for long term survival until 2008. Seeding trials of each accession will be conducted at various locations throughout South Texas in 2006. Seed production data will be collected from foundation seed fields, as well as insect and pest identification and control information.

Current/projected seed availability: Small quantities of original seed from each accession are in storage at the PMC. Seed from the 2005 increase plots at Beeville was used to grow transplants for a large seed increase in January 2006. Several years may be necessary to produce large amounts of seed for this release.

Ecological Considerations and Evaluation: An Environmental Evaluation of Plant Materials Releases was completed using guidelines established by NRCS (USDA-NRCS, 2000), and the best available information for this species. Results of this evaluation determined that Atascosa Germplasm Texas grama was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that Texas grama is a naturally occurring species in Texas and planting it would therefore not constitute an introduction of an exotic species into local ecosystems. Any negative impacts on other native plant species would likely be minimal to non-existent. Also, release of this species will make available an additional native species for rangeland planting, and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies

Conservation Use: Texas grama has potential for use on highway right of ways, reclamation sites, and in rangeland plantings. It also can be used in many types of conservation plantings, such as stream-side buffers and filter strips. However, Texas grama is reported to have poor grazing value for livestock. It increases under heavy grazing pressure, and has poor wildlife value (Hatch et al. 1999).

Area of Adaptation: Accessions comprising this release of Selected Plant Material were originally collected from sandy loam, loam and gravelly loam soil types in South Texas. Table 12 shows the soil types that these accessions have been evaluated on; acceptable performance has been documented on each soil type. Texas grama occurs in the Rio Grande Plains, Edwards

Plateau, eastern Plains country, southwestern portions of east Texas, north central Texas, and from Oklahoma to Coahuila, Mexico (Correll and Johnston, 1996). Gould (1975) states that Texas grama is found throughout Texas except in far east and west Texas, in grasslands, grassy woods, openings, road right of ways and moist slopes. It is frequently found on clay and clay loam soils, and on disturbed sites in the Gulf Prairies and Marshes. Based on evaluation results, distribution of the original collections and observations of the species distribution, these Selected accessions should be adapted to the South Texas Plains, Coastal Sand Plains, Gulf Prairies and Marshes and Edwards Plateau of Texas (Figure 1). Adaptation outside of the area described is unknown.

Table 12. Soil types of known adaptability for Selected Plant Material of Texas grama.

Site/location	Year(s)	Soil Type
Bladerunner Farms (Poteet, TX)	2003-2006	Miguel fine sandy loam
TAES Beeville (Beeville, TX)	2005-2006	Clareville sandy clay loam
TAES Beeville (Beeville, TX)	2005-2006	Parrita sandy clay loam
Rancho Blanco (Laredo, TX)	2005-2006	Lagloria silt loam
CKWRI WLC (Kingsville, TX)	2005-2006	Victoria clay

Availability of Plant Materials: Foundation seed will be produced and maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service. Seed will be produced from transplants grown from original seed or from seed grown at isolated increase plots at TAES Beeville. Each of the 6 (4 after bulking of two sets of accessions) accessions must be separated from existing plots of Texas grama and each other by 900 ft. Seed harvested from Foundation Seed Fields will be cleaned and stored at the PMC in Kingsville, TX. All seed will be tested by outside laboratories for germination, purity, and dormancy.

Certified seed fields must be isolated from native or other cultivated stands of Texas grama by 900 ft. Foundation and certified seed fields have a 7 year production limit. Foundation and certified seed must be produced in the state of Texas.

References:

AOSA. 2003. Rules for testing seeds. Association of Official Seed Analysts.

Correll, D.V., and M.S. Johnston. 1996. Manual of the Vascular Plants of Texas. The University of Texas at Dallas. Dallas, Texas. Fourth Printing.

Gould, F.W. 1975. The Grasses of Texas. Texas A&M University Press. College Station, Texas.

Hatch, S. L., J. L. Schuster, and D. L. Drawe. 1999. Grasses of the Gulf Prairies and Marshes. Texas A&M University Press. College Station, Texas.

USDA-SCS. 1977. Soil Survey of Atascosa County, Texas. United States Department of Agriculture, Washington, D.C.

USDA-SCS. 1979. Soil Survey of Bee County, Texas. United States Department of Agriculture, Washington, D.C.

USDA-SCS. 1981. Soil Survey of Webb County, Texas. United States Department of Agriculture, Washington, D.C.

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Atascosa Germplasm Texas grama
(*Bouteloua rigidiseta* (Steud.) Hitchc.)

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